EDEXCEL GCSE APPLICATIONS OF MATHEMATICS

MATHS



EXAM QUESTION PACK

UNIT 2 HIGHER TIER 5AM2H PAPERS

STEMUP

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Surname	Other names

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Candidate Number | | | | |

Applications of Mathematics

Unit 2: Applications 2

For Approved Pilot Centres ONLY

Higher Tier

Thursday 8 June 2017 – Morning
Time: 1 hour 45 minutes

Paper Reference
5AM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

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Turn over ▶

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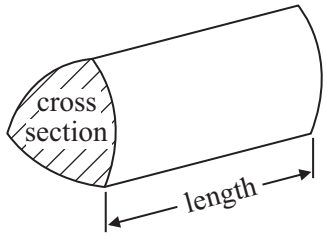
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GCSE Mathematics 2AM01

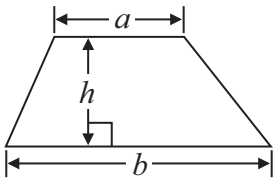
Formulae: Higher Tier

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Volume of prism = area of cross section × length

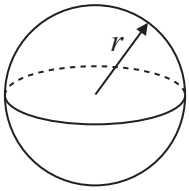


Area of trapezium = $\frac{1}{2}(a + b)h$



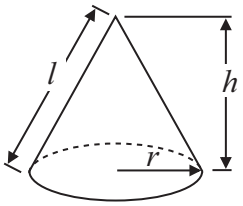
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

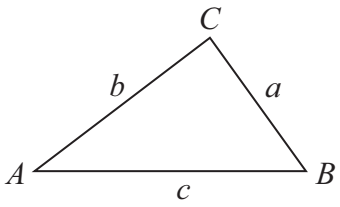


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



The Quadratic Equation
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$

DO NOT WRITE IN THIS AREA
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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 John buys 3 portions of chips.
The total cost is £3.45

Celia buys 1 fish and 2 portions of chips.
The total cost is £5.60

(a) Work out the cost of the fish.

£.....

(3)

Celia and Dave share the £5.60 cost in the ratio 4 : 3

(b) Work out how much Celia pays and how much Dave pays.

Celia £.....

Dave £.....

(3)

(Total for Question 1 is 6 marks)

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2 Harry owns a factory that makes plastic toys.

Each toy is tested.
If the toy is perfect, it is put into a box.
The boxes are then put into cartons.
Each carton holds 36 boxes.

The factory makes 500 toys an hour.
2% of these toys are **not** perfect.

Toys are made for $10\frac{1}{2}$ hours each day in the factory.

How many cartons are needed each day?
You must show all your working.

.....

(Total for Question 2 is 5 marks)

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3 Rashmi works at a home for dogs.

She has 4 types of dog food to feed the dogs.
She takes at random a tin of dog food.

The table below shows the probabilities that Rashmi will take a tin of lamb dog food or a tin of beef dog food or a tin of turkey dog food.

Dog Food	lamb	beef	chicken	turkey
Probability	0.35	0.25		0.30

(a) Work out the probability that Rashmi will take a tin of chicken dog food.

.....

(2)

(b) Work out the probability that Rashmi will take a tin of turkey dog food or a tin of lamb dog food.

.....

(2)

Rashmi has 400 tins of dog food.

(c) Work out the number of tins of lamb dog food she has.

.....

(2)

(Total for Question 3 is 6 marks)

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***4** Here are the ingredients to make 12 cupcakes.

For **12** cupcakes
200 g butter 200 g caster sugar 4 eggs 250 g flour

Mark is making cupcakes to sell at his school play.
Mark wants to make 1 cupcake for each adult and 2 cupcakes for each child.

There will be 152 adults and 80 children at the school play.

Mark can get these ingredients from the school kitchen.

5 kg butter
5 kg caster sugar
90 eggs
5 kg flour

Make a shopping list of any ingredients Mark still needs, showing the amount of each ingredient.
You must show all your working.

(Total for Question 4 is 5 marks)

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5 GasIn is an insurance company that insures central heating systems.

GasIn insures 350 000 central heating systems each year.
GasIn charges £55 to insure a central heating system for a year.

The probability that a central heating system will develop a fault is 0.18
The average claim for a central heating system fault is £273

How much profit is GasIn likely to make in a year?

£.....

(Total for Question 5 is 4 marks)

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***6** Abigail is 5 years older than Brenda.
Brenda is twice as old as Carly.

The total of their ages is less than 40

What is Abigail's greatest possible age?
Give your answer as a whole number of years.

(Total for Question 6 is 4 marks)

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7 The diagram shows a wire frame.
The frame is a rectangle and two diagonals.

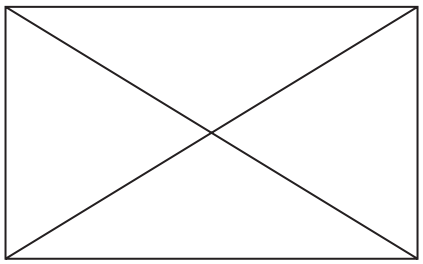


Diagram **NOT** accurately drawn

Work out the total length of the wire used to make the frame.
Give your answer correct to the nearest centimetre.

..... cm

(Total for Question 7 is 5 marks)

8 Here is a diagram of Pete's garage.

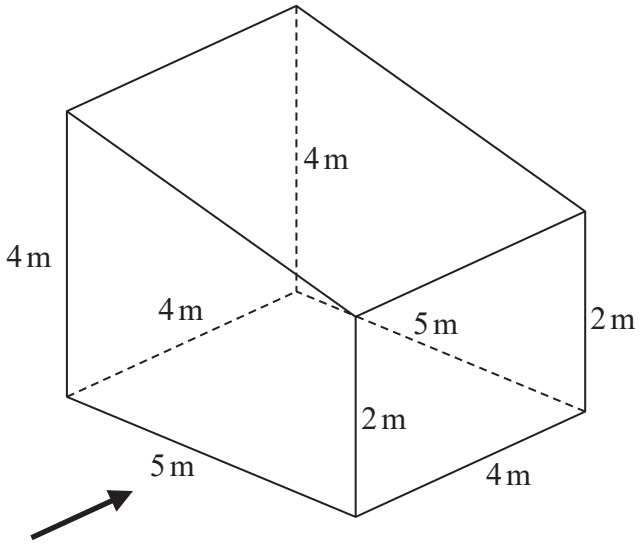


Diagram **NOT** accurately drawn

The floor of the garage is horizontal.
All the walls are vertical.

(a) Draw the side elevation of the garage from the direction of the arrow.
Use a scale of 1 cm to 1 m.

(2)

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Pete is going to paint the 4 walls and the ceiling of his garage.

(b) Work out an estimate for the total area he is going to paint.

..... m^2

(5)

(Total for Question 8 is 7 marks)

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9 The diagram shows a shape made out of solid wood.

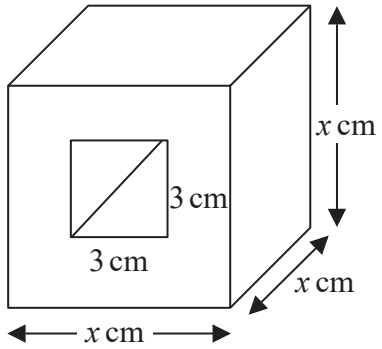


Diagram **NOT** accurately drawn

The shape is made by cutting a square hole all the way through a wooden cube.

The cube has edges of length x cm.
The hole has a square cross section of side 3 cm.
The volume of the wood in the shape is 70 cm^3.

(a) Show that $x^3 - 9x = 70$

(2)

The equation $x^3 - 9x = 70$ has a solution between 4 and 5

(b) Use a trial and improvement method to find this solution.
Give your answer correct to 1 decimal place.
You must show **all** your working.

.....

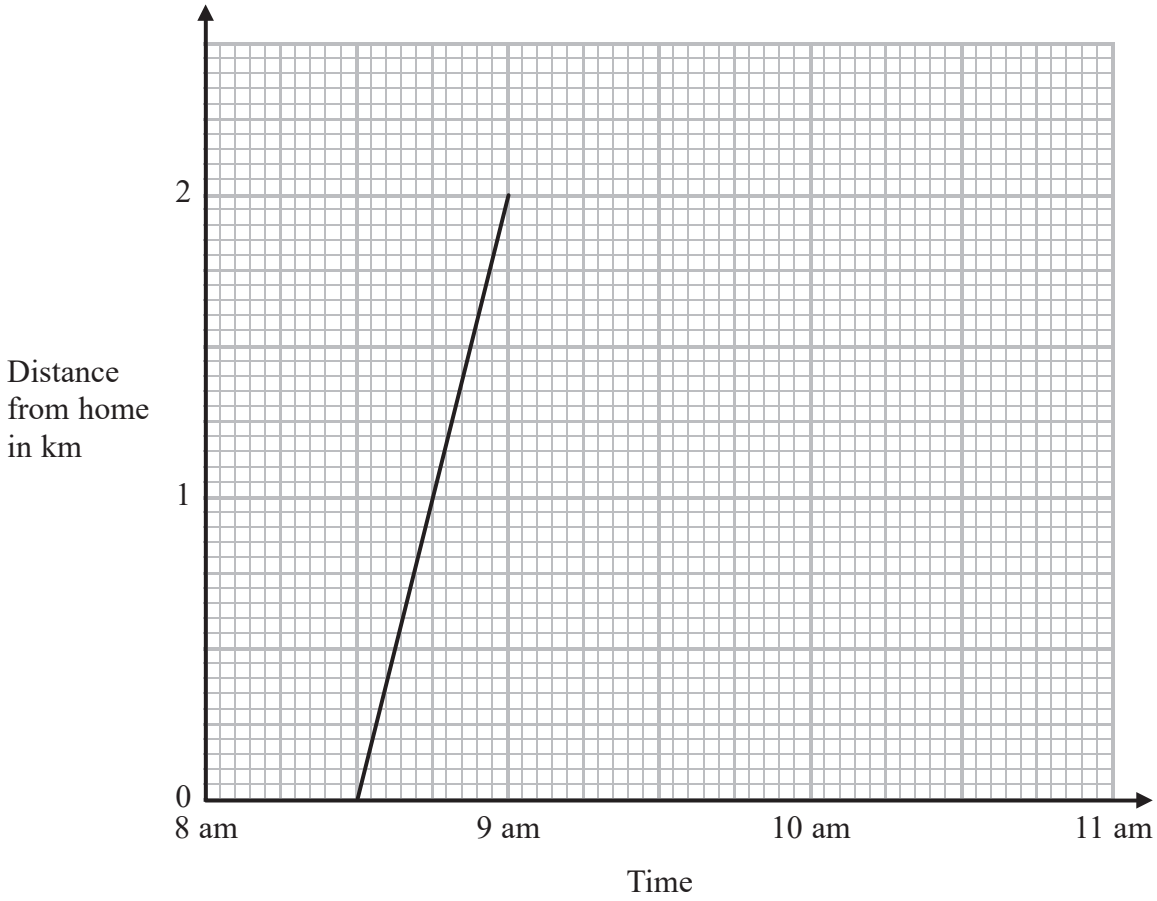
(4)

(Total for Question 9 is 6 marks)

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10 Selma walked from her home to her friend's house.

The travel graph shows Selma's journey to her friend's house.



Selma spent 1 hour at her friend's house.
She then walked home at a steady speed.
Selma took 45 minutes to walk home.

(a) Complete the travel graph for this information.

(2)

(b) What was the total distance that Selma walked?

..... km

(1)

(Total for Question 10 is 3 marks)

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11 Oil is stored in a tank at an oil refinery.
The tank is in the shape of a cylinder.

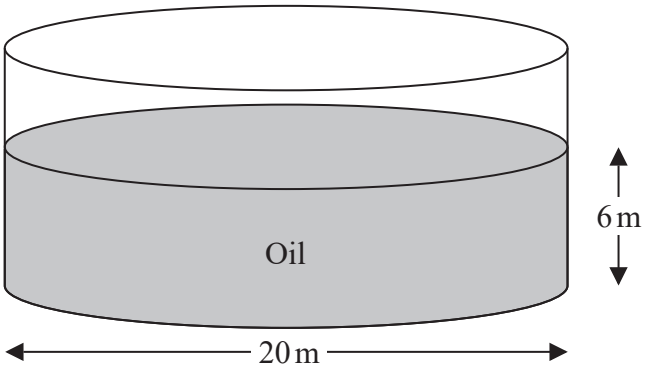


Diagram **NOT** accurately drawn

The tank has a diameter of 20 m.
The depth of the oil in the tank is 6 m.

The density of the oil is 800 kg per m^3.
Oil tankers can hold up to 45 000 kg of oil.

How many of these oil tankers are needed to empty all the oil from the tank?
You must show all your working.

.....

(Total for Question 11 is 5 marks)

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12 Nathalie is playing a board game.
She must throw two fair 6-sided dice.

She must get a 1 on each dice to start the game.

Work out the probability that she will **not** start the game on her first go.

.....

(Total for Question 12 is 3 marks)

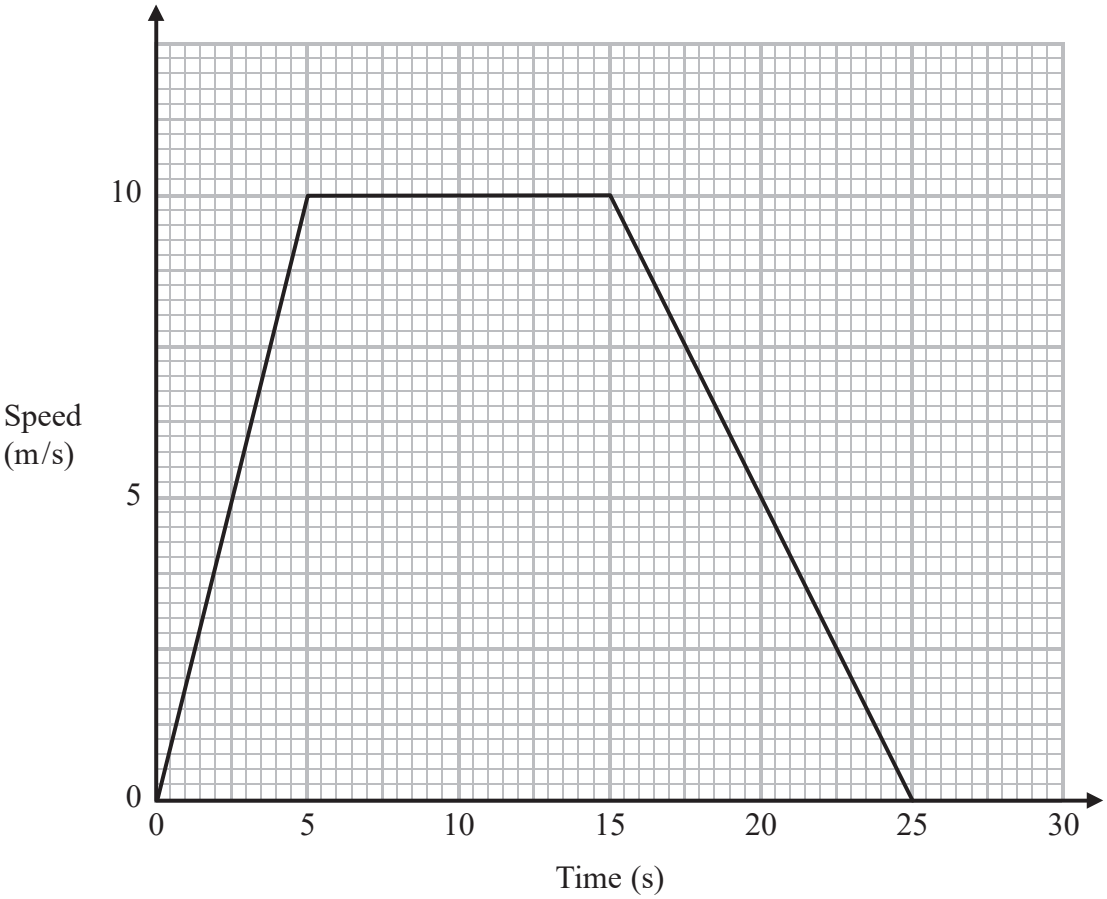
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13 A car travels along a straight road between two sets of traffic lights.

Here is the speed-time graph for this journey.



(a) Work out the acceleration of the car during the first 5 seconds.

..... m/s^2

(2)

(b) Describe what happens to the speed of the car between the times of 5 s and 25 s.

.....

.....

(2)

(c) Find the total distance, in metres, that the car travels between the two sets of traffic lights.

..... m

(2)

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(d) Work out the average speed of the car in kilometres per hour between the two sets of traffic lights.

..... km/h

(3)

(Total for Question 13 is 9 marks)

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14 *PQR* is the side of a vertical building.

AB is a ramp.
ACP is horizontal ground.
BQ is a horizontal path.

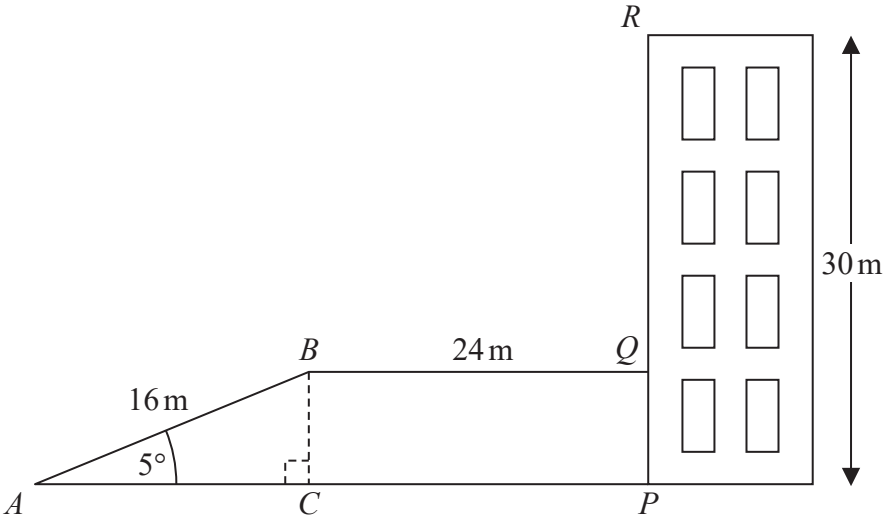


Diagram **NOT** accurately drawn

The building has a height of 30 m.
The ramp *AB* is at an angle of 5° to the horizontal ground.
The ramp has a length of 16 m.
The path has a length of 24 m.

(a) Calculate the height, *BC*, of the ramp.
Give your answer correct to 3 significant figures.

..... m

(3)

(b) Calculate the angle of elevation of the top of the building, *R*, from the top of the ramp, *B*.
Give your answer correct to 3 significant figures.

..... °

(3)

(Total for Question 14 is 6 marks)

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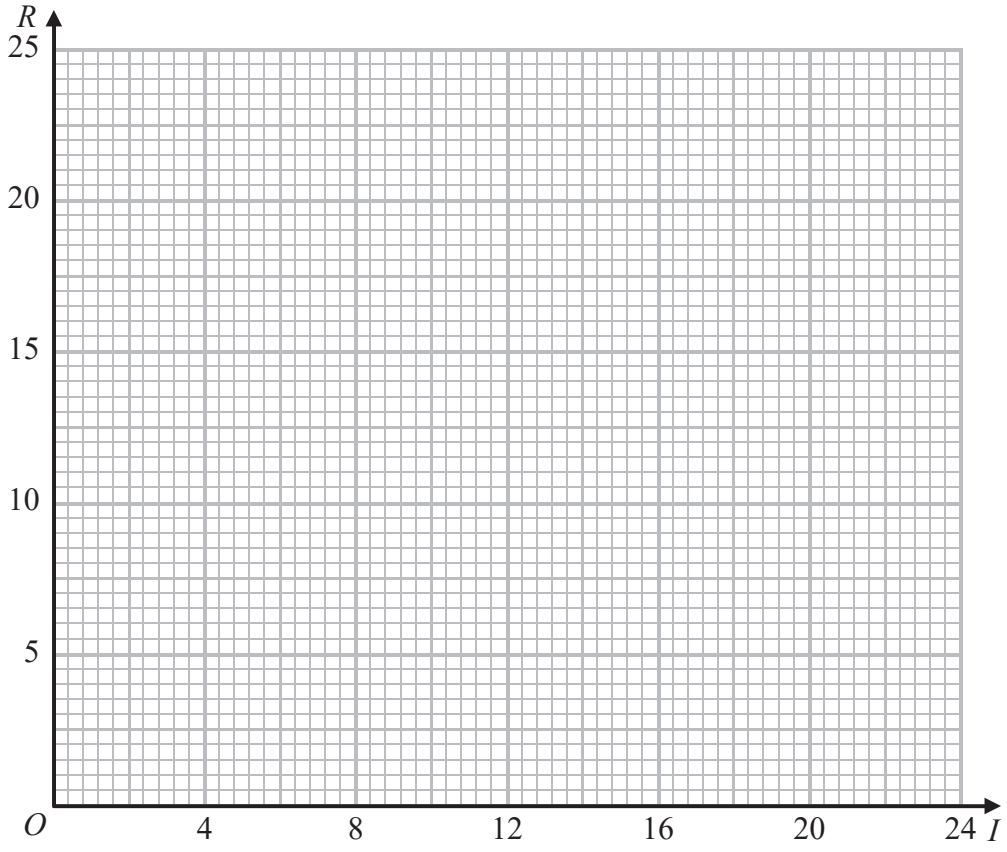
15 Jason uses the formula $R = \frac{24}{I}$ in his science lesson.

(a) Complete the table of values for $R = \frac{24}{I}$

I	1	2	4	6	8	10	12	24
R	24							1

(2)

(b) On the grid, draw the graph of $R = \frac{24}{I}$



(2)

(Total for Question 15 is 4 marks)

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***16** Here is a diagram of a room in Sammy's house.

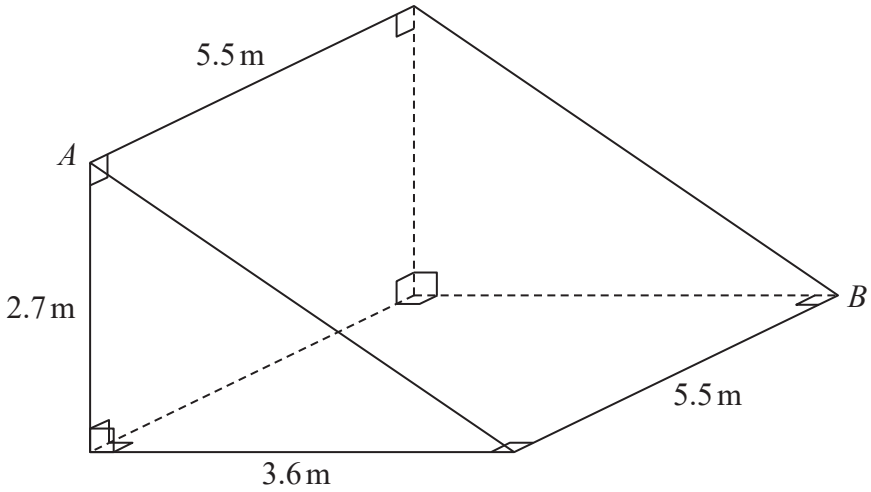


Diagram **NOT** accurately drawn

Sammy is putting an electric cable across the ceiling of the room.
The cable will go from *A* to *B*.

Calculate the shortest possible length of the cable.
Give your answer to 3 significant figures.
You must show all your working.

(Total for Question 16 is 4 marks)

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17 The time period, T, of a simple pendulum is directly proportional to the square root of the length, d, of the pendulum.

When $d = 6$, $T = 5$

Find the value of T when $d = 3$

.....

(Total for Question 17 is 4 marks)

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18 A scientist is studying some rabbits.
A disease is killing the rabbits.

A population of 240 of these rabbits was reduced to 180 rabbits in two days.
The rabbit population is decreasing exponentially.

Work out how many of the 240 rabbits will still be alive at the end of 7 days.

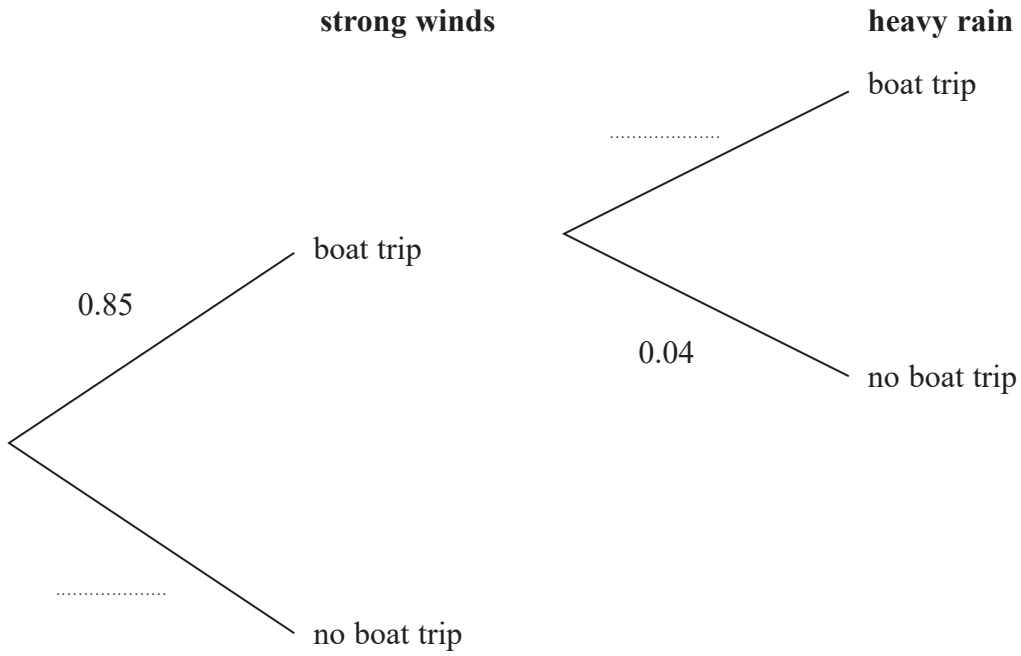
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(Total for Question 18 is 5 marks)

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19 Strong winds and heavy rain can independently stop boat trips taking place.

The decision tree diagram shows information about the probabilities that strong winds or that heavy rain will stop the boat trip taking place on any day.



(a) Complete the decision tree diagram.

(1)

A charity plans boat trips on 80 days during the summer.
The charity will make a profit if the boat trips take place on at least 60 days.

*(b) Should the charity expect to make a profit?

(3)

(Total for Question 19 is 4 marks)

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***20** The average fuel consumption (c) of a car, in kilometres per litre, is given by the formula

$$c = \frac{d}{f}$$

where d is the distance travelled in kilometres and f is the fuel used in litres.

$d = 180$ correct to 3 significant figures.
$f = 25.4$ correct to 1 decimal place.

By considering bounds, work out the value of c to a suitable degree of accuracy.
You must show **all** of your working **and** give a reason for your final answer.

(Total for Question 20 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

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Write your name here

Surname	Other names

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Centre Number | | | | | |

Candidate Number | | | | |

Applications of Mathematics

Unit 2: Applications 2

For Approved Pilot Centres ONLY

Higher Tier

Friday 7 November 2014 – Morning
Time: 1 hour 45 minutes

Paper Reference
5AM2H/01

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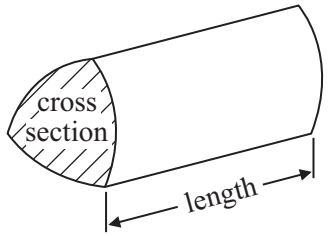
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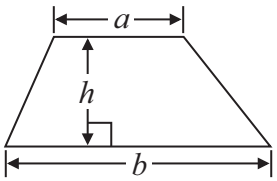
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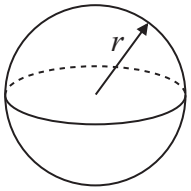


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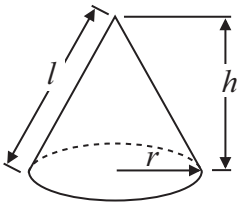
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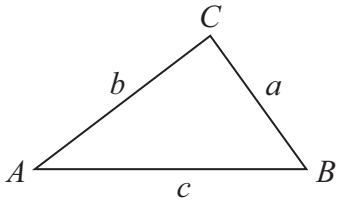


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



The Quadratic Equation
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$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 Eggs are sold in small boxes and in large boxes.

There are 6 eggs in each small box.
There are 12 eggs in each large box.

Sam buys x small boxes of eggs and y large boxes of eggs.
Sam buys a total of t eggs.

(a) Write down a formula for t in terms of x and y.

.....

(3)

There are 600 eggs in a shop.

The probability that an egg is bad is $\frac{1}{40}$

(b) Work out an estimate for the number of eggs that are bad.

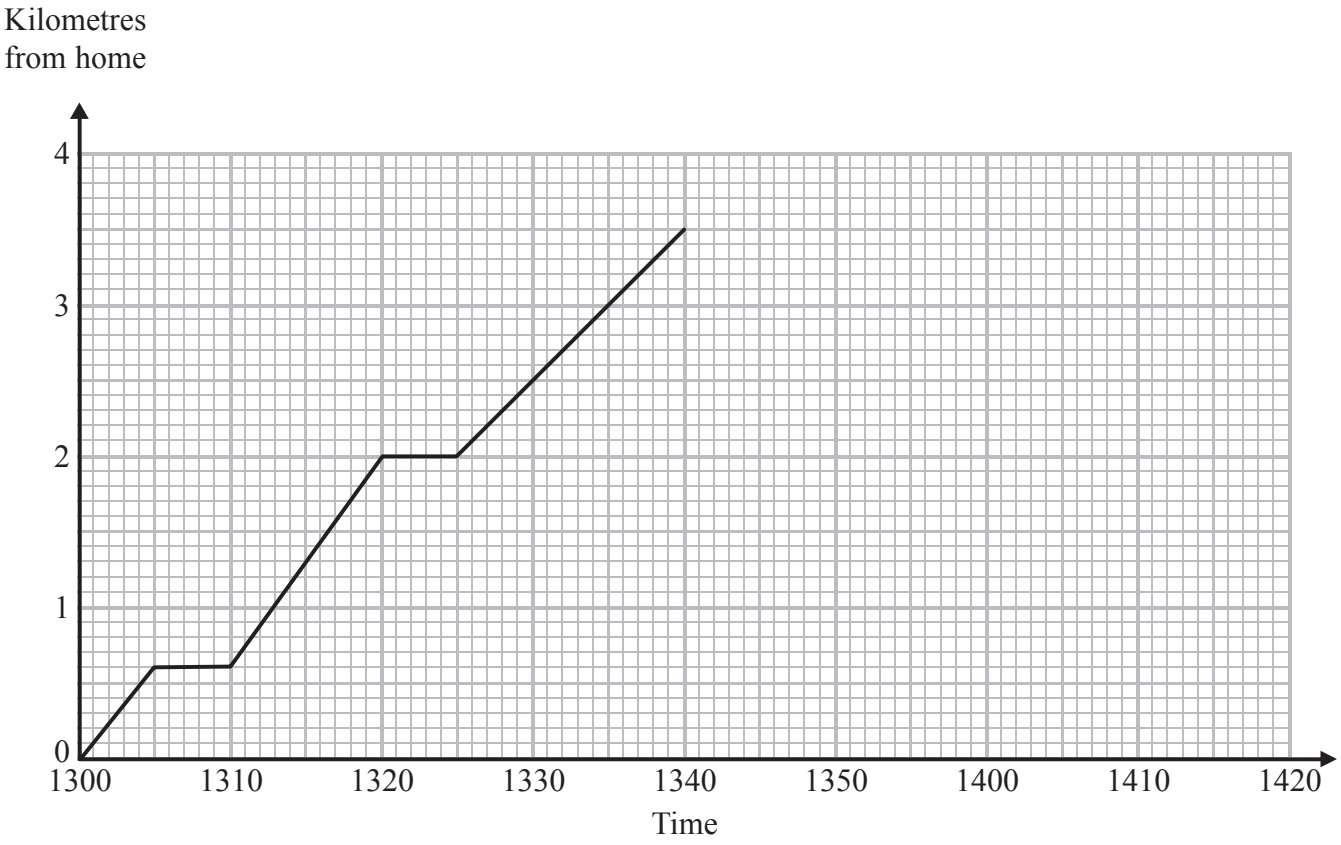
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(2)

(Total for Question 1 is 5 marks)

2 Asif delivers parcels on his bike.
He starts from his home.

Here is a travel graph for the first 40 minutes of Asif's journey.



(a) What time did Asif start his journey?

.....

(1)

Asif stops to deliver each parcel.

(b) How many minutes long was his first stop?

..... minutes

(1)

(c) What is the distance between the first stop and the second stop shown on the travel graph?

..... km

(2)

At 1340, Asif stops for 10 minutes to deliver his last parcel.
He then cycles back home at a steady speed.
Asif gets home at 1415

(d) Complete the travel graph.

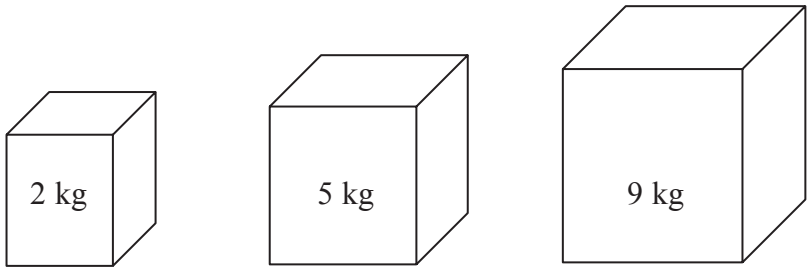
(2)

(Total for Question 2 is 6 marks)

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***3** Soap powder is sold in three sizes of box.

Diagram **NOT** accurately drawn



£1.90 £4.35 £8.45

A 2 kg box costs £1.90
A 5 kg box costs £4.35
A 9 kg box costs £8.45

Which size of box is the best value for money?
Explain your answer.
You must show all your working.

(Total for Question 3 is 4 marks)

4 Bill has some models of meerkats.
He has models of meerkat children and models of meerkat adults.

Bill has twice as many models of meerkat children as models of meerkat adults.
He has a total of 30 models.

Each model meerkat child has a value of £2.80
Bill's models have a total value of £98.00

Each model meerkat adult has the same value.

Work out the value of a model of a meerkat adult.



meerkat

£ .....

(Total for Question 4 is 4 marks)

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5 A small photograph has a length of 6 cm and a width of 5 cm.
The small photograph is enlarged to make a large photograph.

The large photograph has a length of 21 cm.

Diagram **NOT** accurately drawn



Small photograph



Large photograph

The two photographs are similar rectangles.

Work out the perimeter of the large photograph.

..... cm

(Total for Question 5 is 3 marks)

***6** Here are the ingredients to make 12 cupcakes.

For **12** cupcakes

200 g butter
200 g caster sugar
4 eggs
240 g flour

Martin is making cupcakes to sell at his school play.
Martin wants to make 1 cupcake for each adult and 2 cupcakes for each child.

There will be 90 children and 120 adults at the school play.

Martin can get these ingredients from the school kitchen.

5 kg butter
5 kg caster sugar
90 eggs
5 kg flour

Make a shopping list of any ingredients Martin still needs, showing the amount of each ingredient.
You must show all your working.

(Total for Question 6 is 5 marks)

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7 The students in a class are asked how they got to school on Monday.
12 students used the bus, 7 students travelled by car and 8 students walked.

A student is chosen at random from the class.

(a) Write down the probability that this student travelled by car.

.....

(2)

There are 18 boys in a different class.
A student is chosen at random from this class.
The probability that this student is a girl is 0.4

(b) Work out the total number of students in this class.

.....

(3)

(Total for Question 7 is 5 marks)

8 The diagram shows a wire frame.
The diagram is a rectangle and two diagonals.

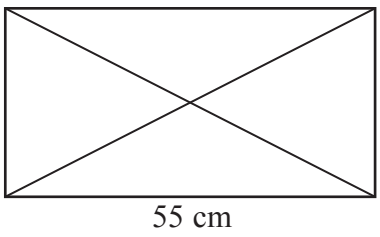


Diagram **NOT** accurately drawn

Work out the total length of wire used to make the frame.

..... cm

(Total for Question 8 is 5 marks)

***9** Here is a diagram of part of a wooden roof.

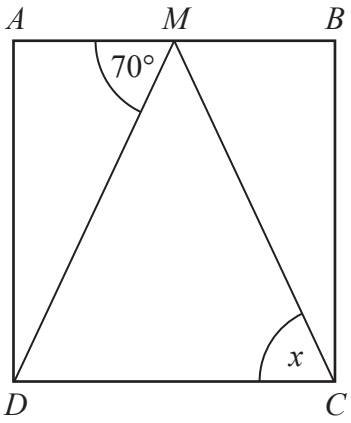


Diagram **NOT** accurately drawn

ABCD is a rectangle.
M is the midpoint of *AB*.
Angle *AMD* is 70°

Work out the size of the angle marked *x*.
You must give reasons for your answer.

(Total for Question 9 is 3 marks)

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10 Manchester is on a bearing of 335° from London.

(a) Find the bearing of London from Manchester.

.....°

(2)

The distance from Manchester to London is 185 miles.

A plane flies at an average speed of 125 mph from Manchester to London.

(b) Work out how long the plane takes.

.....

(3)

(Total for Question 10 is 5 marks)

11 Jill makes solid metal shapes.

The diagram shows a prism Jill made.

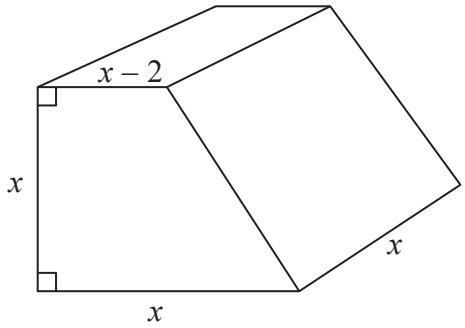


Diagram **NOT** accurately drawn

All measurements are in centimetres.

The prism has a volume of 24 cm^3.

(a) Show that $x^3 - x^2 = 24$

(2)

(b) Use a trial and improvement method to find the value of x.
You must show **all** your working.
Give your answer correct to 1 decimal place.

$x =$ .....

(4)

(Total for Question 11 is 6 marks)

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12 Coventry Estates sells houses.

In February they sold twice as many houses as in January.
In March they sold 10 more houses than in February.
In April they sold half as many houses as in March.

Coventry Estates sold a minimum of 123 houses from 1st January to 30th April.

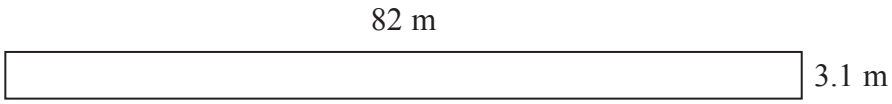
Find the least number of houses sold in January.

.....

(Total for Question 12 is 5 marks)

13 The diagram shows a rectangular path.

Diagram **NOT** accurately drawn



The length of the path is 82 metres, to the nearest metre.
The width of the path is 3.1 metres, to the nearest 0.1 metre.

Work out the lower bound for the area of the path.

..... m^2

(Total for Question 13 is 3 marks)

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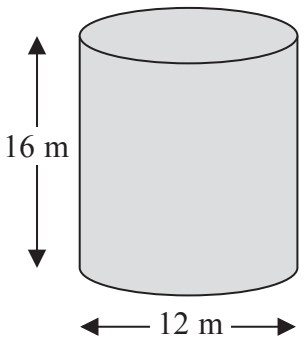
14 A farmer has two closed storage tanks.
Each tank is a cylinder.

The first tank has a diameter of 12 m.
It has a height of 16 m.

The outside of this tank needs painting.

(a) Work out the total surface area of this tank.
Give your answer correct to 1 decimal place.

Diagram **NOT** accurately drawn



..... m^2

(3)

The second tank holds 225 000 litres of water when it is full.
It has a diameter of 6 m.

(b) Calculate the height of the second tank.
Give your answer correct to 3 significant figures.

..... m

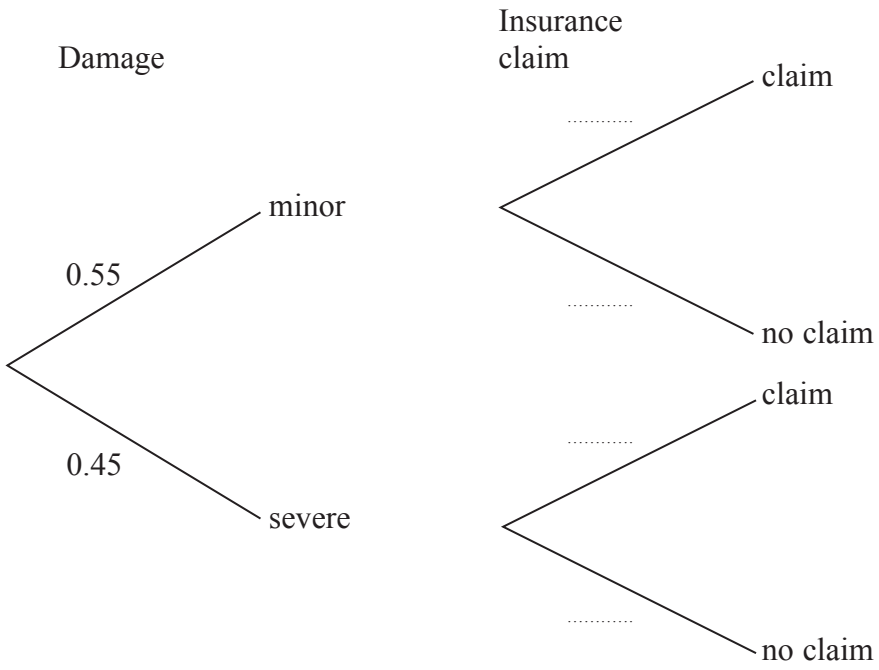
(4)

(Total for Question 14 is 7 marks)

***15** When a water pipe bursts the water can cause damage.

The damage can be minor or severe.
The probability of minor damage is 0.55
The probability of severe damage is 0.45

Insurance claims can be made for the damage.
When the damage is minor, the probability that an insurance claim is made is 0.22
When the damage is severe, the probability that an insurance claim is made is 0.74



(a) Complete the decision tree diagram.

(2)

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The insurance company uses the information in the decision tree diagram to decide whether they need to increase their charges for insurance.

If the probability that insurance claims for damage will be made is greater than 50%, the insurance company will increase their charges for insurance.

*(b) Will the insurance company increase their charges?

(4)

(Total for Question 15 is 6 marks)

16 An activity park has zip lines.

The diagram below shows information about two of their zip lines, *DB* and *DC*.

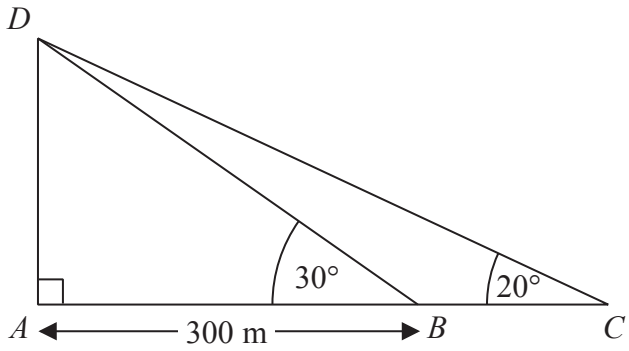


Diagram **NOT** accurately drawn

A, *B* and *C* are three points in a straight line on horizontal ground.
The angle of elevation of *D* from *B* is 30°.
The angle of elevation of *D* from *C* is 20°.

(a) Calculate the distance *BC*.
Give your answer correct to 3 significant figures.

..... m

(5)

At the activity park the maximum speed along a zip line is directly proportional to the angle of elevation.

The maximum speed along the zip line *DC* is 16 km/h.

(b) Find the angle of elevation needed to give a maximum speed of 50 km/h along a zip line.

..... °

(3)

(Total for Question 16 is 8 marks)

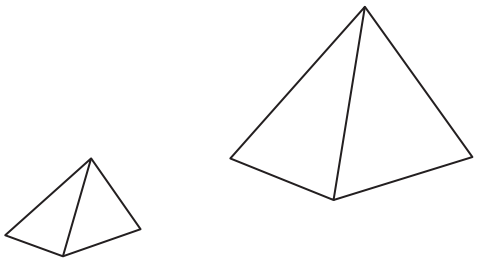
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17 Fred has a solid brass model of an Egyptian pyramid.

The model has a volume of 3000 cm^3.
The density of the brass is 8.5 g/cm^3.

(a) Calculate the mass of the model.
Give your answer in kg.

Diagram **NOT** accurately drawn



Model Egyptian pyramid

..... kg

(2)

The model and the Egyptian pyramid are mathematically similar.
The length of the base of the model is 25 cm.
The length of the base of the Egyptian pyramid is 225 m.

(b) Calculate the volume of the Egyptian pyramid.
Give your answer in m^3.

..... m^3

(3)

(Total for Question 17 is 5 marks)

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18 Gary has smoothies of different flavours.
He has 3 strawberry smoothies, 4 banana smoothies and 5 orange smoothies.

Gary takes at random one smoothie and drinks it.
He then takes at random a second smoothie.

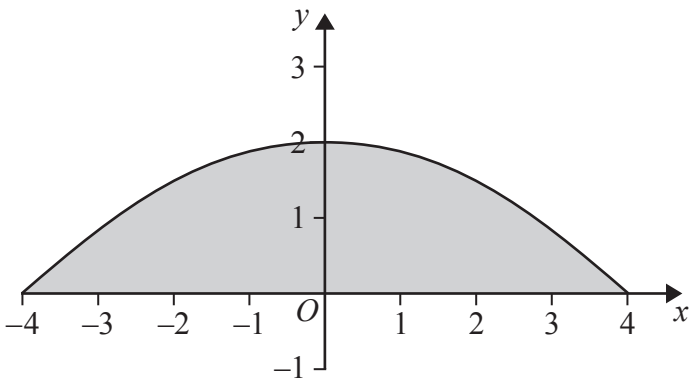
Work out the probability that both smoothies were different flavours.

.....

(Total for Question 18 is 5 marks)

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19 Here is a sketch of the graph of $y = 2 - \frac{1}{8}x^2$



The graph is used to model the shape of a cross-section of a domed roof.
The cross-section of the roof is shaded.

(a) Calculate an estimate of the area of the cross-section of the roof.

(4)

(b) Describe how you could increase the accuracy of your estimate.

(1)

(Total for Question 19 is 5 marks)

20 The number of mosquitoes in a colony is increasing exponentially.

On Monday there are 1000 mosquitoes.
After 2 days there are 1800 mosquitoes.

After how many days will there be 10 000 mosquitoes in the colony?

..... days

(Total for Question 20 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

November 2014

Pearson Edexcel GCSE
Linked Pair Pilot in Mathematics
Application of Mathematics
Higher: (Calculator) Unit 2

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Note that in some cases a correct answer alone will not score marks unless supported by working; these situations are made clear in the mark scheme. Examiners should be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will award marks for the quality of written communication (QWC).
The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Partial answers shown (usually indicated in the ms by brackets) can be awarded the method mark associated with it (implied).
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks; transcription errors may also gain some credit. Send any such responses to review for the Team Leader to consider.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

14 The detailed notes in the mark scheme, and in practice/training material for examiners, should be taken as precedents over the above notes.

Guidance on the use of codes within this mark scheme
M1 – method mark for appropriate method in the context of the question A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		$t = 6x + 12y$	3	B3 for $t = 6x + 12y$ (B2 for t = [linear expression in x and y] or $6x + 12y$) (B1 for $6x$ or $6y$ or t = [linear expression in x or y])
	(b)		15	2	M1 for $600 \div 40$ or $600 \times \frac{1}{40}$ A1 cao
2	(a)		1300	1	B1 oe
	(b)		5	1	B1 cao
	(c)		1.4	2	M1 0.6 to 2 or 2 – 0.6 oe A1 cao
	(d)		Graph complete	2	B1 horiz. line from 1340 to 1350 B1 horiz line starting at 1340 and line of negative gradient joining graph (ft) to (1415,0)

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*3			5 kg	4	M1 for one of 1.90÷2 (=0.95), 4.35÷5 (=0.87); 8.45÷9 (=0.93(888..)) M1 for all of 1.90÷2 (=0.95), 4.35÷5 (=0.87); 8.45÷9 (=0.93(888..)) A1 for all 3 answers correct C1 (dep on M1) for a comparison of their answers leading to a correct deduction (ft). OR M1 for one of 2÷1.90 (=1.05(26..)), 5÷4.35 (=1.14(9..)), 9÷8.45 (=1.06(5…)) M1 for all of 2÷1.90 (=1.05(26..)), 5÷4.35 (=1.14(9..)), 9÷8.45 (=1.06(5…)) A1 for all 3 answers correct C1 (dep on at least M1) for a statement comparing of their three values leading to a correct deduction (ft). OR M1 price of 2 comparable quantities e.g 1.90 × 5 ÷ 2 (=4.75) M1 price of 3 comparable quantities A1 for all 3 answers correct C1 (dep on M1) for a comparison of their answers leading to a correct deduction (ft).

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4			4.20	4	M1 for 30 ÷ (2 + 1) (=10) M1 for "10" × 2 × 2.8 (=56) oe M1 for (98 – "56") ÷ "10" A1 cao 4.2(0) OR algebraic approach M1 for (eg) $c=2a$ and $c+a=30$ M1 for (eg) 2.8 $c+wa=98$ M1 for (w =) (98 – "56") ÷ "10" A1 cao 4.2(0) [SC B2 for 3.5(0) as final answer]
5			77	3	M1 for 21÷6 (=3.5) for sf length or 21÷6 × 5 (=17.5) M1 for 3×"3.5" + 3×"3.5" + 21 + 21 or 17.5+17.5+21+21 oe A1 cao OR M1 for 21÷6 (=3.5) for sf length M1 for (6+5+6+5)×"3.5" or 22×3.5 oe A1 cao

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*6			Needed: 10 eggs 1 kg flour	5	M1 number of cupcakes is 90×2 + 120 (=300) M1 scaling “300”÷12 (=25) M1 needed 200 × “25” or 4 × “25” or 240 × “25” or 5000 or 100 or 6000 A1 5000 (g) and 100 (eggs) and 6000 (g) C1 (dep on at least M1) correct statement of which items are needed with quantities and units OR M1 number of cupcakes is 90×2 + 120 (=300) M1 scaling “300”÷12 (=25) M1 no. cupcakes 5 ÷ “25” or 90 ÷ “25” A1 0.2, 3.6, 0.2 f C1 (dep on at least M1) correct statement of which items are needed with quantities and units. OR M1 number of cupcakes is 90×2 + 120 (=300) M1 200 ÷ 12(=16.6..), 4 ÷ 12(= 0.33..), 240 ÷ 12 (=20) M1 “300” × “16.6” and “300” × “0.33” and “300” × “16.6” A1 5000 (g) and 100 (eggs) and 6000 g) C1 (dep on at least M1) correct statement of which items are needed with quantities and units

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7	(a)		$\frac{7}{27}$	2	M1 for $\frac{7}{12+7+8}$ A1 for $\frac{7}{27}$ oe
	(b)		30	3	M1 for 1 – 0.4 (=0.6) M1 for 18 ÷ 6 × 10 or 18 ÷ "0.6" A1 cao
8			326	5	M1 for $55^2 + 40^2$ M1 for $\sqrt{3025+1600}$ or $\sqrt{4625}$ A1 for 68(.00735…) M1 for 40 + 40 + 55 + 55 + "68" + "68" OR 2 × ("68" + 55 + 40) A1 for 326 or better

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*9			70°	3	M1 for angle *MDC* = 70° or for 90 – (180 – 90 – 70) A1 cao C1 for Alternate angles are equal and Base angles of an isosceles triangle are equal. OR M1 for angle *MCB* = 20° or for 180 – (90 + 70) A1 cao C1 for Angles in a triangle add up to 180^{o} and angles of a rectangle are 90°
10	(a)		155	2	M1 for 360-335 (=25) or 180-25 or a diagram showing the correct bearing identified A1 cao
	(b)		1 h 28 min to 1 h 29 min	3	M1 for distance ÷ speed or 185 ÷ 125 A1 for 1.48 oe B1 appropriate units

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		$x^3 - x^2 = 24$	2	M1 for $x \times [x \times x - \frac{1}{2}\ (x \times 2)]$ or $x \times [x(x - 2) + \frac{1}{2}\ (x \times 2)]$ or $\frac{1}{2}x \times [x-2+x] \times x$ A1 rearrangement to $x^3 - x^2 = 24$
	(b)	x $x^3 - x^2$ 3 18 4 48 3.1 20.(181) 3.2 22.(528) 3.3 25.(047) 3.4 27.(744) 3.5 30.(625) 3.25 23.7(6563) 3.26 24.0(1838) 3.27 24.2(7288) 3.28 24.5(2915) 3.29 24.7(8719) 3.31 25.3(0859) 3.32 25.5(7197) 3.33 25.8(3714) 3.34 26.1(041) 3.35 26.3(7288)	3.3	4	B2 for trial $3.2 \leq x \leq 3.3$ (B1 for trial $3 \leq x \leq 4$) B1 for a different trial $3.25 \leq x \leq 3.27$ B1 (dep on at least one previous B1) for 3.3 Accept trials correct to the nearest whole number (rounded or truncated) if the value of x is to 1 dp but to 1dp (rounded or truncated) if the value of x is to 2 dp NB: no working scores no marks, even if the answer is correct. All trials must be evaluated.

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
12		Jan x Feb $2x$ Mar $2x + 10$ Apr $\frac{1}{2}(2x + 10)$ $x + 2x + 2x + 10 + \frac{1}{2}(2x + 10) > 123$ $6x+15 \geq 123$	18	5	M1 for a method to express all 4 months' amounts algebraically (at least 3 correct, ft) M1for an expression for total with at least 3 correct terms added M1 for a correct inequality stated algebraically M1 for an inequality reduced to $ax > b - c$ A1 cao NB: accept inequalities written as equations SC T&I is 5 marks for 18, otherwise 0 marks
13			248.5 – 248.6	3	M1 for sight of 82.5 or 81.5 or 3.15 or 3.05 M1 for 81.5 × 3.05 A1 for 248.5 – 248.6
14	(a)		716.3	3	M1 for $\pi r^2 = \pi \times 6^2$ (=113.09734.. or 36π) M1 for $2\pi r \times 16 = 2 \times \pi \times 6 \times 16$ (=603.18579.. or 192π) A1 716 – 717 or 228π Allow 829-330 or 264π [base included]
	(b)		7.96	4	M1 for 225 000 ÷ 1000 (=225) M1 for "225" = $\pi \times 3^2 \times h$ oe M1 rearrange to $h = \frac{"225"}{\pi \times 3^2}$ oe A1 7.95 – 7.96

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
15	(a)		0.22,0.78,0.74,0.26	2	B1 for 0.78,0.22 correctly placed B1 for 0.26,0.74 correctly placed
	*(b)		No As 0.454<0.5	4	M1 for 0.55 × “0.22” or 0.45 × “0.74” oe M1 for 0.55 × “0.22” + 0.45 × “0.74” oe A1 for 0.454 oe C1 (dep on M1) for conclusive statement based on their answer compared to 50%

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)		176	5	M1 for $\tan 30 = \frac{AD}{300}$ M1 for $AD = 300 \times \tan 30$ A1 for (AD=) 173 – 174 M1 for $\tan 20 = \frac{"173"}{AC}$ or $AC = \frac{"173"}{\tan 20}$ (=475.877) A1 175 – 176 OR M1 for $\cos 30 = \frac{300}{DB}$ M1 for $DB = \frac{300}{\cos 30}$ A1 for (DB=) 346(.41….) M1 for $\frac{BC}{\sin 10} = \frac{"346.4.."}{\sin 20}$ or $BC = \frac{"346.41..." \times \sin 10}{\sin 20}$ A1 175 – 176
	(b)		62.5°	3	M1 for speed = k × angle oe M1 for 16 = k × 20 or speed = 0.8 × angle oe A1 cao
17	(a)		25.5	2	M1 for 3000 × 8.5 A1 cao
	(b)		2.187×10^6	3	M1 for $\left(\frac{225}{0.25}\right)^3$ or 900^3 oe or $\left(\frac{225}{25}\right)^3$ or 9^3 M1 for correct conversion of units (cm^3 to m^3) A1 cao

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18			$\frac{94}{132}$	5	M1 for use of 11 as denominator for 2nd probability M1 for $\frac{3}{12}\times\frac{4}{11}$ or $\frac{3}{12}\times\frac{5}{11}$ or $\frac{4}{12}\times\frac{3}{11}$ or $\frac{4}{12}\times\frac{5}{11}$ or $\frac{5}{12}\times\frac{3}{11}$ or $\frac{5}{12}\times\frac{4}{11}$ M2 for $\frac{3}{12}\times\frac{4}{11}+\frac{3}{12}\times\frac{5}{11}+\frac{4}{12}\times\frac{3}{11}+\frac{4}{12}\times\frac{5}{11}+\frac{5}{12}\times\frac{3}{11}+\frac{5}{12}\times\frac{4}{11}$ (M1 for at least 3 of these) A1 for $\frac{94}{132}$ oe OR M1 for use of 11 as denominator for 2nd probability M1 for $\frac{3}{12}\times\frac{2}{11}$ or $\frac{4}{12}\times\frac{3}{11}$ or $\frac{5}{12}\times\frac{4}{11}$ M1 for $\frac{3}{12}\times\frac{2}{11}+\frac{4}{12}\times\frac{3}{11}+\frac{5}{12}\times\frac{4}{11}$ $(=\frac{38}{132})$ M1 for $1-"\left(\frac{38}{132}\right)"$ A1 for $\frac{94}{132}$ oe SC: B2 for $\frac{106}{144}$ oe or B1 for $\frac{3}{12}\times\frac{2}{12}+\frac{4}{12}\times\frac{3}{12}+\frac{5}{12}\times\frac{4}{12}$ or $\frac{38}{144}$ oe

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
19	(a)	$2\times\left(\frac{2\times(2+1.5)}{2}+\frac{1.5}{2}\right)=2\times(3.5+0.75)$ or $2\times\left(\frac{2+1.875}{2}+\frac{1.875+1.5}{2}+\frac{1.5+0.875}{2}+\frac{0.875}{2}\right)=$ $2\times(1.9375+1.6875+1.1875+0.4375)$ $=2\times5.25$	8 – 10.6	4	M1 for use of at least one triangle or rectangle or trapezium to calculate an approximation to the area under the curve. M1 for any correct calculation of the area of at least one appropriate triangle or trapezium or rectangle. M1 for any correct method that would lead to an answer in the interval 8 – 10.6 A1 8 – 10.6
	(b)		explanation	1	eg take more strips oe

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
20		2 1800 3 2414.95 4 3240 5 4346.916 6 5832 7 7824.45 8 10497.6	8	5	M1 for introducing a fully defined growth factor eg Growth factor = $\frac{100+x}{100}$ M1 $1000\times\left(\frac{100+x}{100}\right)^2=1800$ or $\left(\frac{100+x}{100}\right)^2=\frac{1800}{1000}=1.8$ M1 $\frac{(100+x)}{100}=\sqrt{1.8}$ (= 1.34..) leading to x = 34 or 34% M1 1000×("1.34.".)^7 (=824(.45..)) or 1000×("1.34..")^8 (=10497(.6..)) oe A1 cao OR M1 for introducing a fully defined growth factor eg $p=ka^t$ M1 1000 = ka^0 at t=0, or k=1000 or $p=1000a^t$ M1 for use when t=2 eg when t=2, $1800=1000a^2$; a=1341.641.. $p=1000\times1.341^t$ M1 1000×("1.34.".)^7 (=824(.45..)) or 1000×("1.34..")^8 (=10497(.6..)) oe A1 cao

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5º
Measurements of length: ±5 mm

PAPER: 5AM1H_01			
Question		**Modification**	**Notes**
Q02		Beginning of graph changed (1300, 0) (1305, 0.5) (1310, 0.5) (1320, 2) – rest of graph line remains. Vertical axis 1½ cm for 0.5 Horizontal axis 1½ cm for 5 minutes	
Q03		Diagrams removed	
Q04		Picture removed	
Q05		Diagram: 5 cm moved to left 6 cm and 21 cm at top Headings put at the top	
Q08		40 cm and 55 cm moved to the left and top of diagram	

PAPER: 5AM1H_01			
Question		**Modification**	**Notes**
Q10		Diagram given with Manchester and London marked and joined with a dashed line and N lines going up from each place	
Q11		Model provided for all candidates. Diagram provided for MLP.	
Q13		3.1 moved to the left of the diagram	
Q14		Model provided for all candidates. Cross section diagram provided for MLP	
Q15		Decision tree diagram enlarged Braille only: Roman numerals (i) to (iv) placed on answer lines	
Q15	(a)	Wording added: There are four spaces to fill	
Q16		Wording added ‘The distance AB is 300 metres’	
Q17		2 models provided for all candidates Diagram provided for MLP	

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Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Applications of Mathematics

Unit 2: Applications 2

For Approved Pilot Centres ONLY

Higher Tier

Friday 13 June 2014 – Morning
Time: 1 hour 45 minutes

Paper Reference
5AM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P44579A

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5/6/1/

P 4 4 5 7 9 A 0 1 2 8

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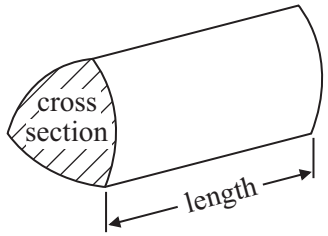
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GCSE Mathematics 2AM01

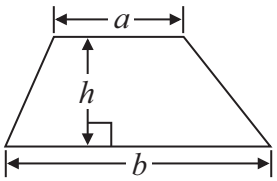
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

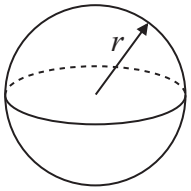


Area of trapezium = $\frac{1}{2}(a + b)h$



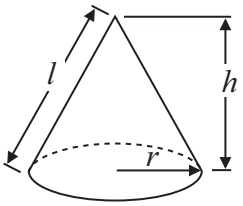
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

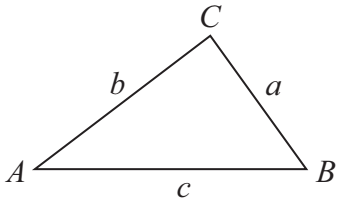


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



The Quadratic Equation
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$

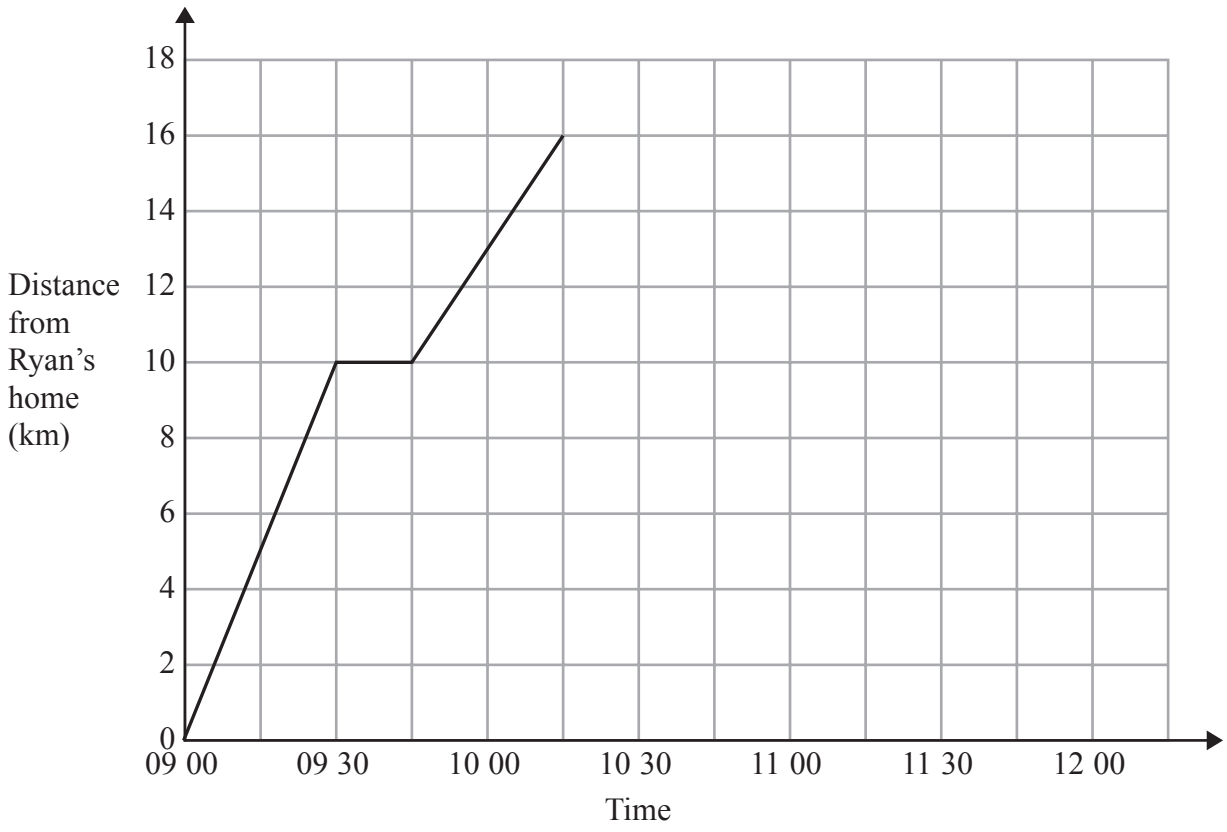
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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 Here is a travel graph of Ryan's cycle journey from his home to the shops.



Ryan was at the shops for 30 minutes.
He then cycled back home without stopping.
He got home at 12 00

(a) Complete the travel graph.

(2)

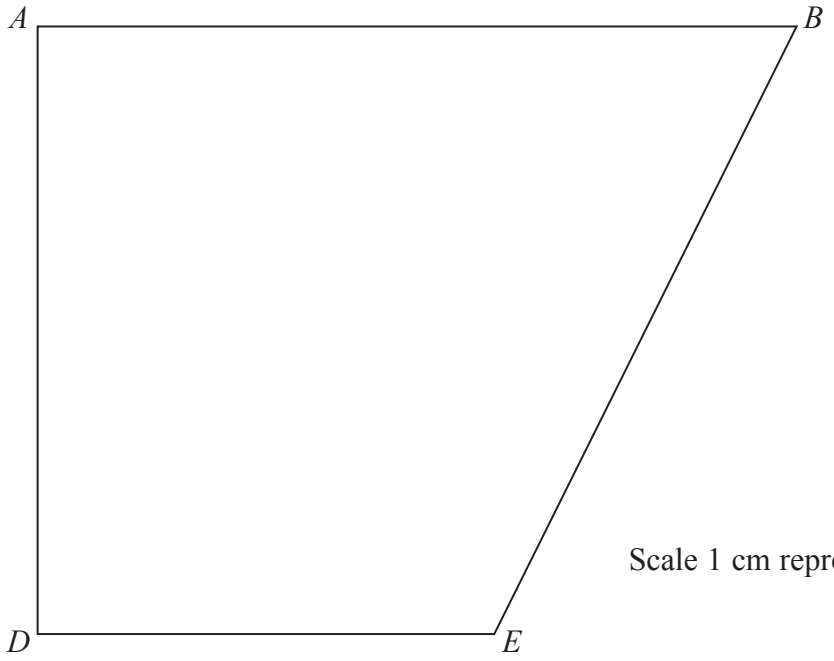
(b) What was Ryan's average speed on his way home?

..... kilometres per hour

(2)

(Total for Question 1 is 4 marks)

2 Here is an accurate scale drawing of Zena's garden.



Scale 1 cm represents 10 m

Zena is going to plant a tree in the garden.

She will plant the tree

nearer to AB than to BE,

more than 50 m from AD,

and less than 60 m from E.

On the diagram, show accurately by shading, the region where Zena will plant the tree.

(Total for Question 2 is 4 marks)

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***3** Mario sells coffee in three different sizes of cup.



Small Medium Large

Which size cup of coffee is the best value for money?

(Total for Question 3 is 4 marks)

4 Here is a list of ingredients for making fruit buns.

Fruit buns

Flour	300 g
Butter	150 g
Sugar	150 g
Mixed fruit	100 g
Eggs	1

Makes 12 fruit buns

Rosie has

3 kg of flour
900 g of butter
1 kg of sugar
800 g of mixed fruit
12 eggs

What is the greatest number of fruit buns Rosie can make?
You must show your working.

.....

(Total for Question 4 is 4 marks)

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***5** Rashmi is 3 years older than Narinder.
Bhavinda is twice as old as Rashmi.

The total of their ages is less than 50

What is Rashmi's greatest possible age?
Give your answer as a whole number of years.

(Total for Question 5 is 4 marks)

6 Gavin does his shopping in Roots supermarket.
He gets 4 points on his Roots store card for every £1 he spends.

Gavin has spent a total of £660 in Roots supermarket.
He wants to use all the points he has got when he buys a pair of sunglasses.

The sunglasses cost £99
Gavin gets 20p off the cost of the sunglasses for every 10 points on his store card.

Gavin buys the sunglasses.
He uses all the points he has got on his store card.
He pays the rest of the cost in money.

How much of the £99 does he pay in money?

£ .....

(Total for Question 6 is 5 marks)

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7 An insurance company insured 10 000 small boats last year.
A total of 150 insurance claims were made on these small boats last year.
The company paid an average amount of £1200 on each insurance claim.

The company does **not** want to make a loss when it insures small boats.

What is the least amount of money the company should charge to insure each small boat?

£ .....

(Total for Question 7 is 3 marks)

***8** Susi is going to grow vegetables in a container in her garden.
The container is in the shape of a prism.
The ends of the prism are trapeziums.

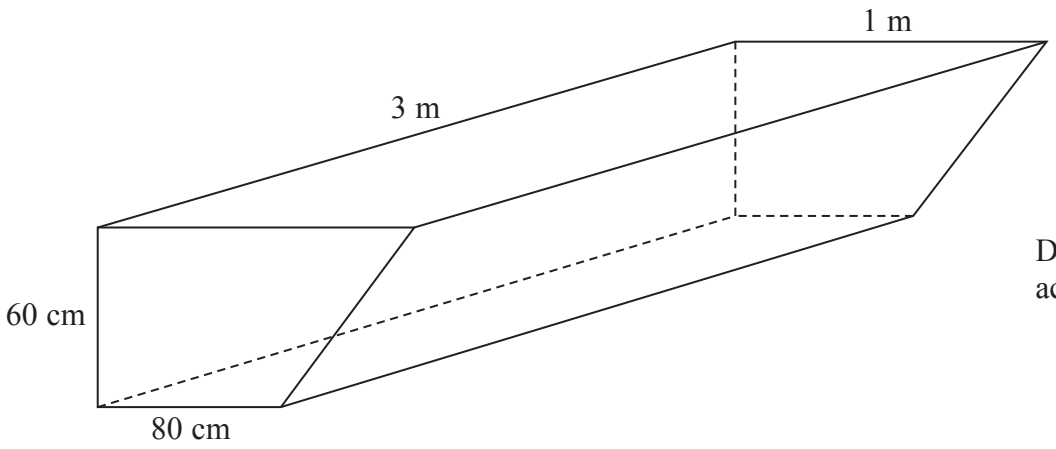


Diagram **NOT** accurately drawn

Susi plans to fill the container completely with compost to a depth of 60 cm.

Compost is sold in 65 litre bags.
1 m^3 = 1000 litres

How many bags of compost will Susi need to buy?

(Total for Question 8 is 5 marks)

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9 There is only one winning ticket in a raffle.

80 raffle tickets are sold.
The winning ticket will be chosen at random.

Helen buys three raffle tickets.

(a) Work out the probability that Helen will **not** win the raffle.

.....

(1)

Jonty also buys some of the raffle tickets.
The probability that Jonty will win the raffle is 0.05

(b) How many raffle tickets does Jonty buy?

.....

(2)

(Total for Question 9 is 3 marks)

10 The aspect ratio of a television is the ratio

width of screen : height of screen

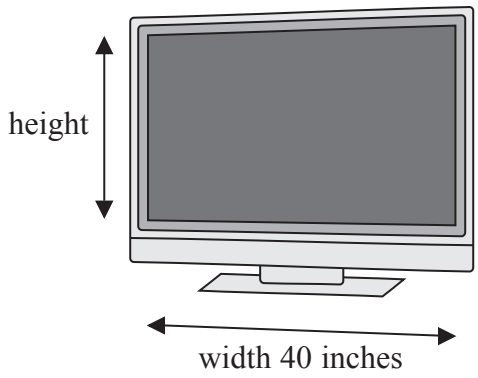


Diagram **NOT** accurately drawn

Robin buys a television with an aspect ratio of 16 : 9
The screen of the television has a width of 40 inches.

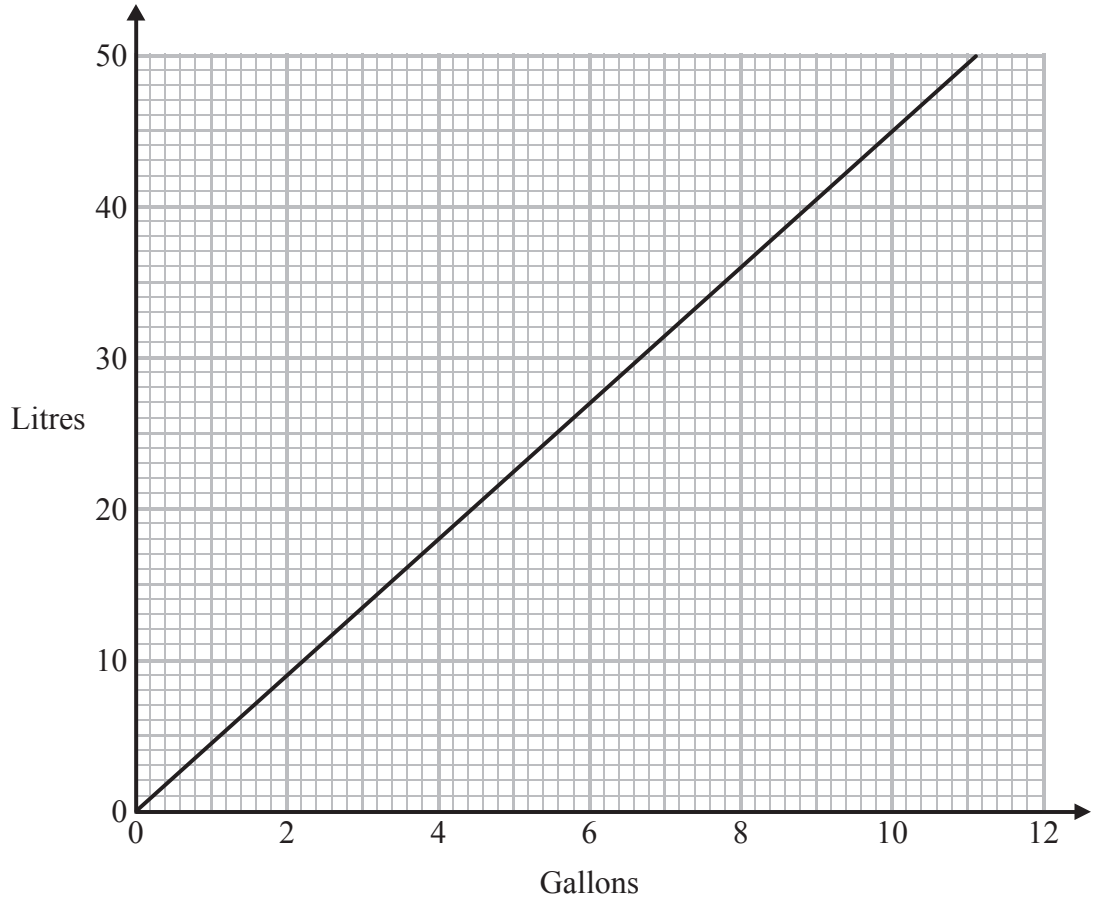
Work out the length of a diagonal of the screen.
Give your answer to the nearest whole number.

..... inches

(Total for Question 10 is 5 marks)

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11 Neil uses this conversion graph to change between litres and gallons.



(a) Change 5 gallons to litres.

..... litres

(1)

Neil stores the same type of fuel in two fuel tanks.

There are

2000 litres of fuel in tank A
800 gallons of fuel in tank B

Neil has to deliver 5000 litres of the fuel to a customer.
He takes all the 2000 litres from tank A and takes some of the fuel from tank B.

(b) How many gallons of fuel are left in tank B?

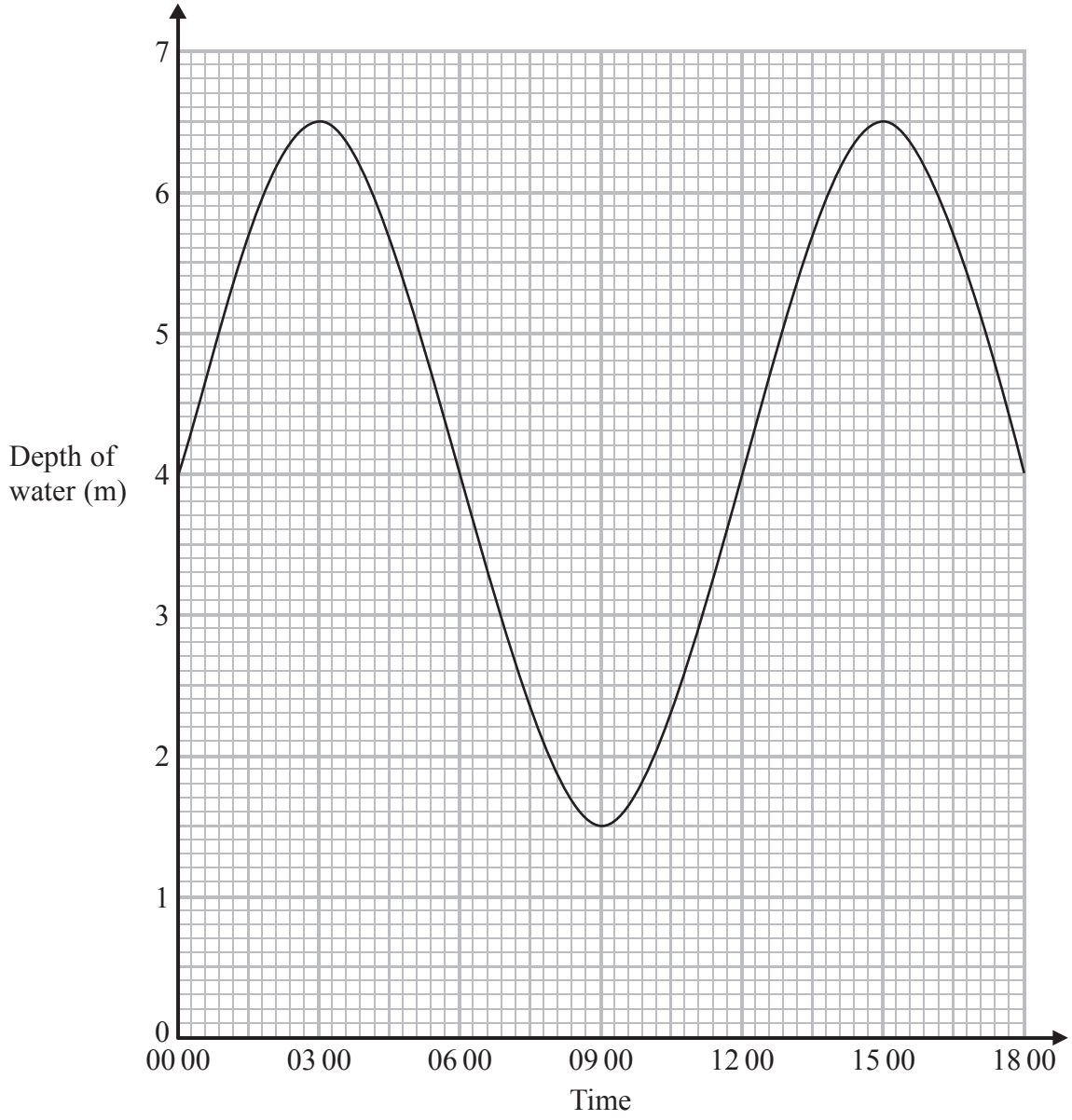
..... gallons

(4)

(Total for Question 11 is 5 marks)

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12 This graph shows the depth of water in a harbour between 00 00 and 18 00 one day.



(a) What is the depth of water at 09 00?

..... m

(1)

(b) At what times is the depth of water 3 m?

.....

(2)

(c) How long was the depth of water 5 m or less between 03 00 and 15 00?

.....

(1)

(Total for Question 12 is 4 marks)

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13 Ben, Gerri and Lisa go to a fish and chip shop.

Gerri buys 4 portions of chips.
It costs her £3.60

Ben buys 3 portions of chips and 4 fish.
It costs him £9.90

(a) Work out the cost of one fish.

£ .....

(4)

Lisa gets a discount.
She gets $\frac{1}{5}$ off her bill.
She pays £10.80

(b) Work out the amount of her bill before the discount.

£ .....

(3)

(Total for Question 13 is 7 marks)

14 The diagram shows a TV mast on horizontal ground.

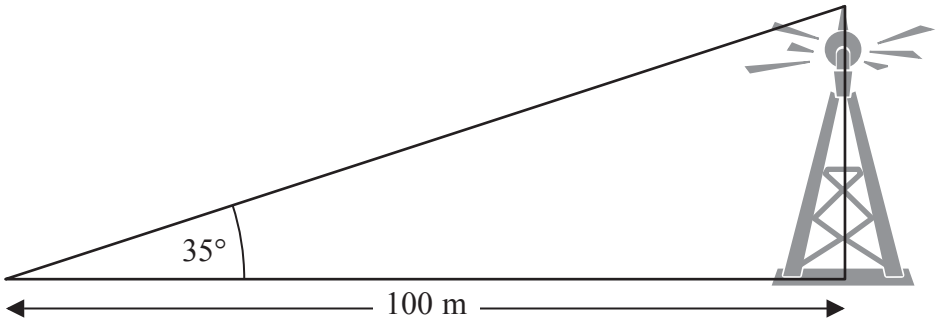


Diagram **NOT** accurately drawn

Rhianna measures the angle of elevation of the top of the TV mast.
She is 100 m from the TV mast.

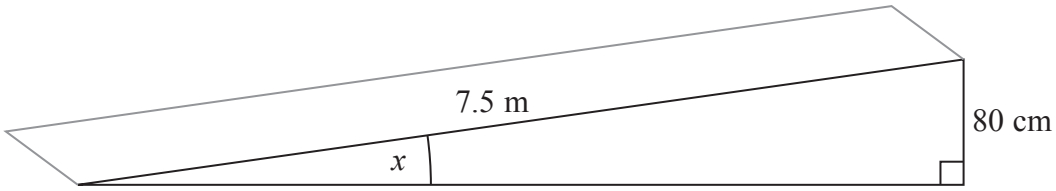
(a) Work out the height of the TV mast.

..... m

(3)

The diagram shows a ramp.

Diagram **NOT** accurately drawn



Rhianna has to find the size of the angle marked x.

(b) Work out the size of the angle marked x.

.....°

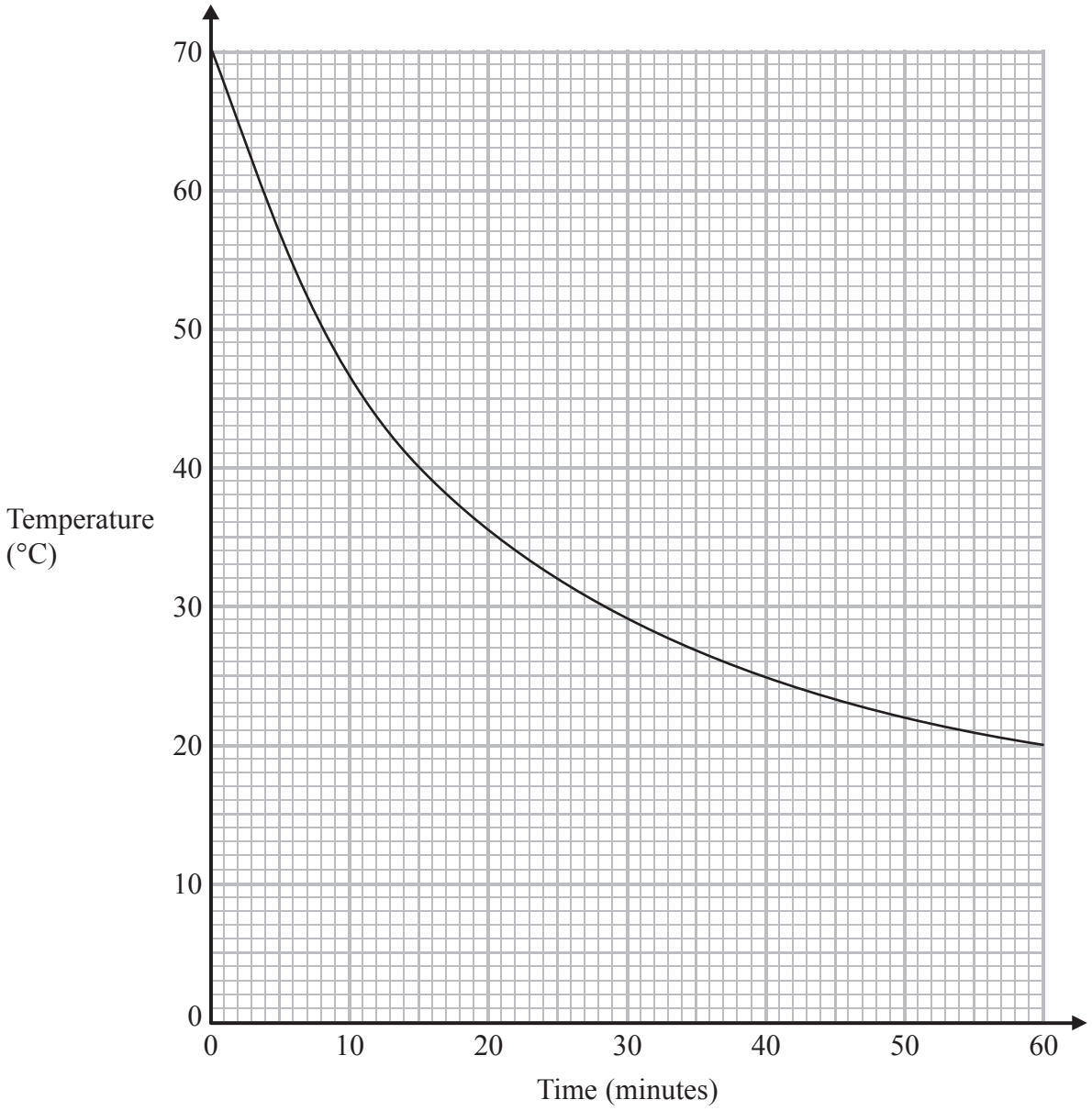
(3)

(Total for Question 14 is 6 marks)

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15 Hot drinks are served at a temperature of 70 °C.

The graph shows the temperature of a hot drink as it cools in a china mug from the time it is served.



Work out the rate of cooling of the drink at time 20 minutes.

..... °C per minute

(Total for Question 15 is 3 marks)

16 Here is the diagram of a cold frame.
The frame is in the shape of a right-angled triangular prism.

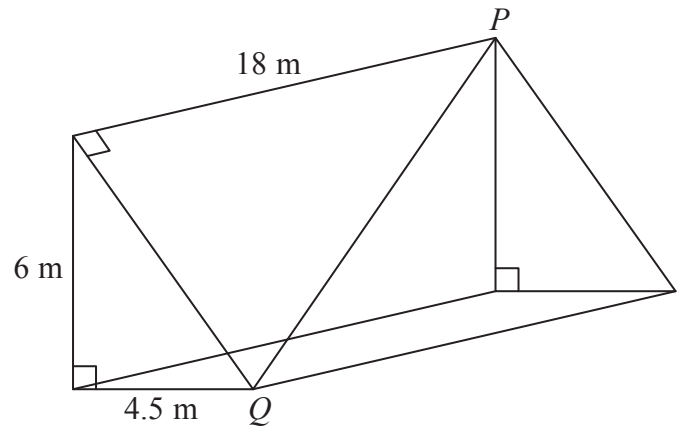


Diagram **NOT** accurately drawn

A straight rod joins P to Q.

Work out the length of the rod.

..... m

(Total for Question 16 is 4 marks)

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17 Oil is stored in a tank at an oil refinery.
The tank is in the shape of a cylinder.

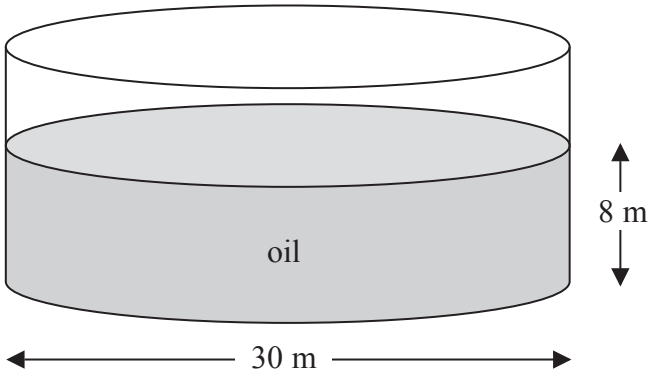


Diagram **NOT** accurately drawn

The tank has a diameter of 30 m.
The depth of the oil in the tank is 8 m.

The density of the oil is 800 kg per m^3.
An oil tanker can hold up to 50 000 kg of oil.

How many of these oil tankers are needed to empty all the oil from the tank?
You must show all your working.

.....

(Total for Question 17 is 5 marks)

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***18** The average fuel consumption (c) of a car, in kilometres per litre, is given by the formula

$$c = \frac{d}{f}$$

where d is the distance travelled in kilometres and f is the fuel used in litres.

$d = 190$ correct to 3 significant figures.
$f = 25.7$ correct to 1 decimal place.

By considering bounds, work out the value of c to a suitable degree of accuracy.
You must show **all** of your working **and** give a reason for your final answer.

(Total for Question 18 is 5 marks)

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19 Mr Jones marks out the sports field for a discus competition.

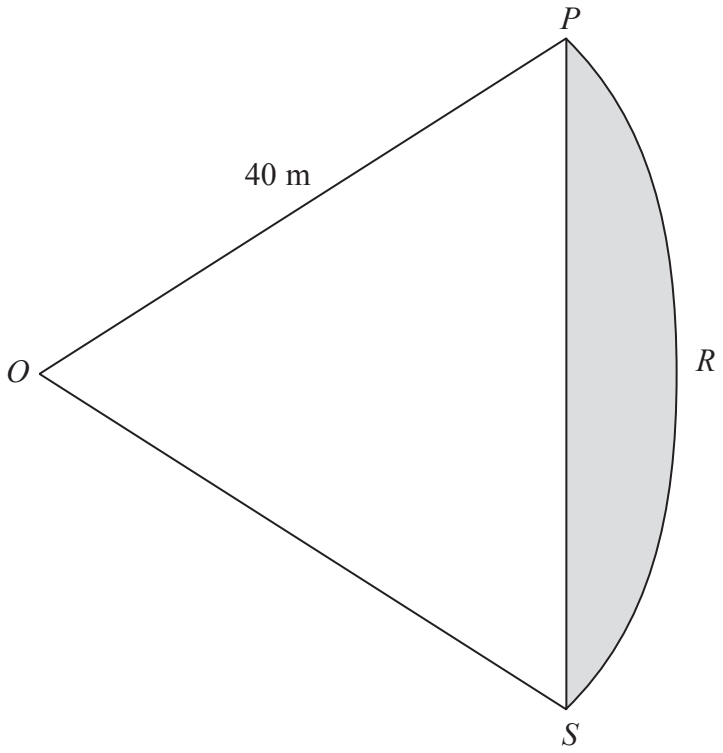


Diagram **NOT** accurately drawn

PRS is an arc of a circle centre *O* with radius 40 m.
PS is a chord of the circle.
OPS is an equilateral triangle.

Calculate the area of the shaded segment.
Give your answer correct to 3 significant figures.

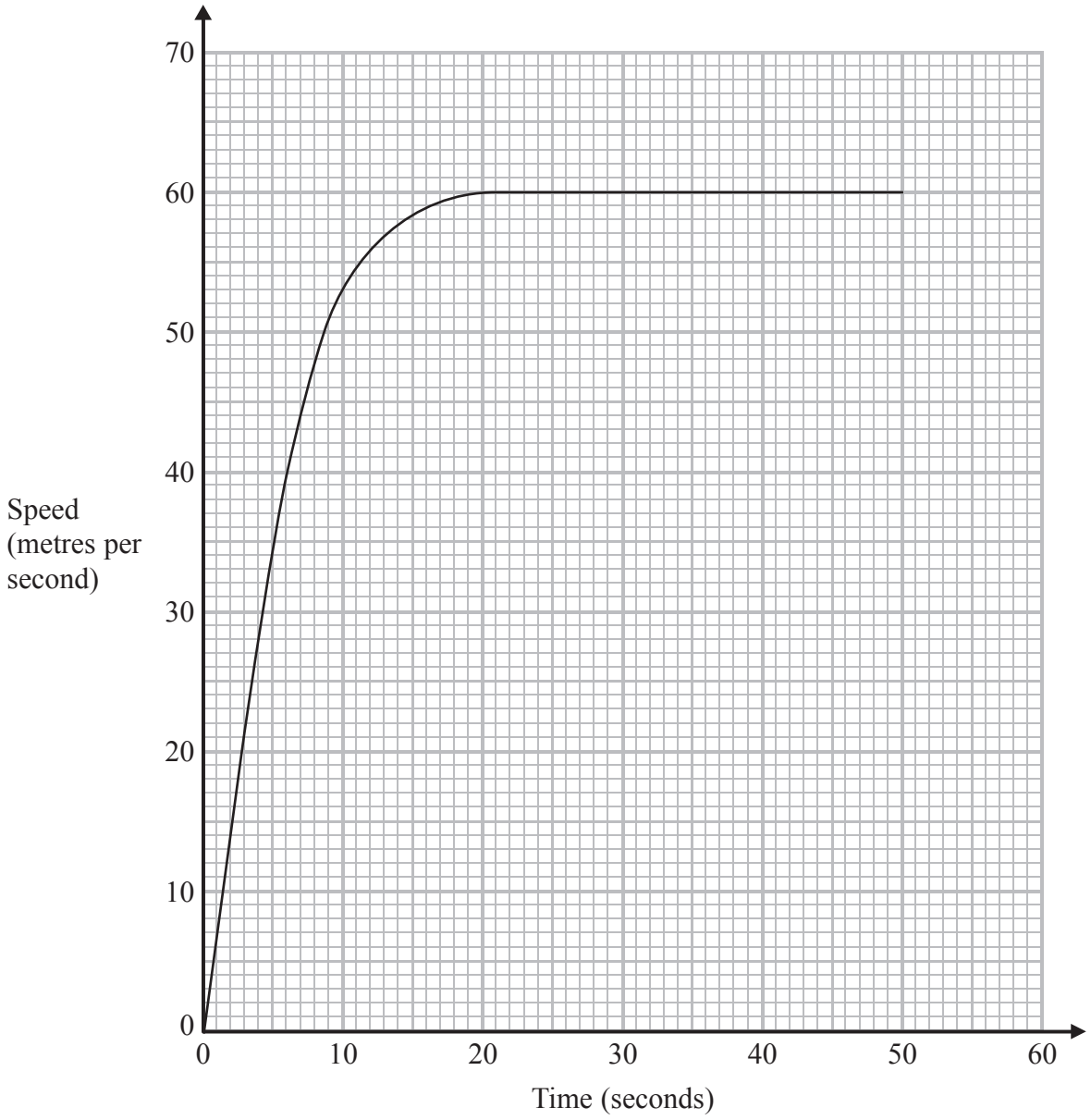
..... m^2

(Total for Question 19 is 5 marks)

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20 A car accelerates from 0 metres per second to 60 metres per second in 20 seconds.
It then travels at a constant speed of 60 metres per second for 30 seconds.

The speed-time graph shows this information.



Work out an estimate for the distance the car travelled in these 50 seconds.

..... km

(Total for Question 20 is 3 marks)

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21 Rhodri is investigating the population growth of the rabbits in an enclosure.

He counted the number of rabbits at the start of month 0
He counted the number of rabbits at the start of month 2

Here are his results.

Month	Population
0	100
2	200

The population of rabbits is increasing exponentially.

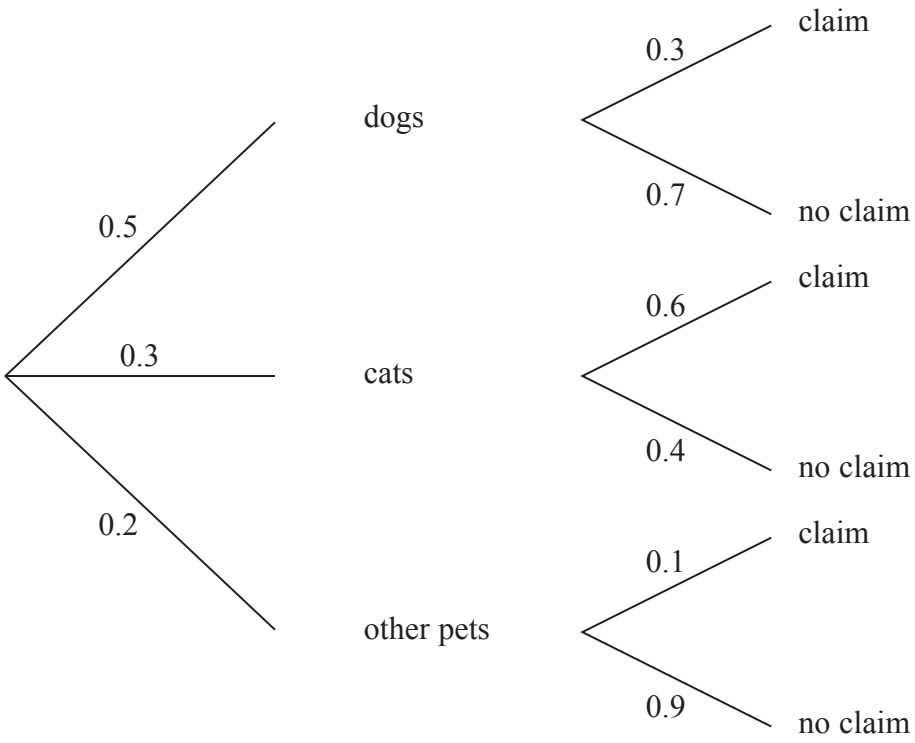
How many rabbits will there be at the start of month 5?
You must show your working.

..... rabbits

(Total for Question 21 is 5 marks)

***22** Polly insures pets.
50% of the pets insured are dogs.
30% of the pets insured are cats.

The probability tree diagram shows information about the probability of insurance claims being made on these pets.



The table shows the average cost of each claim for each type of pet.

Dog	£360
Cat	£310
Other pets	£160

Compare the risk to Polly for each type of pet.

(Total for Question 22 is 3 marks)

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23 Farouk makes models by pouring resin into moulds.
The models are mathematically similar.



small medium large

The height of the small model is 10 cm.
The height of the medium model is 15 cm.
The height of the large model is 25 cm.

Farouk uses 250 g of resin to make the small model.

(a) How much resin does he use to make the medium model?

..... g
(2)

Farouk uses 90 m*l* of paint to paint the large model.

(b) How much paint does he use to paint the small model?

..... m*l*
(2)

(Total for Question 23 is 4 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

Summer 2014

Pearson Edexcel GCSE
Linked Pair Pilot in Mathematics
Application of Mathematics (2AM01)
Higher Paper 2H

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where QWC is being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		Travel graph	2	M1 for horizontal line joining (10 15, 16) to (10 45, 16) or for joining their ("10 45", 16) to (12 00, 0) [Note: A single line from (10 15, 16) to (12 00, 0) gets M0] A1 cao
	(b)		12.8	2	M1 for 16 ÷ "1.25" oe A1 cao
2			Region shaded	4	B1 for bisector of angle *ABE* B1 for line drawn parallel to *AD* and 5 cm from *AD* B1 for arc of circle drawn centre *E* with radius 6 cm B1 ft for shading a region to the right of their vertical line **and** above their angle bisector **and** below their arc
3		225 ÷ 175 = 1.28(57....) 275 ÷ 250 = 1.10 375 ÷ 300 = 1.25 175 ÷ 225 = 0.7(77...) 250 ÷ 275 = 0.9(09...) 300 ÷ 375= 0.8	Medium with reasons	4	M1 for a method that results in at least two values that can be used to compare at least two cups M1 for a complete method that results in values that can be used to compare the three cups A1 for all correct values that are used for comparison C1 ft (dep on M2) for comparison of their values with a correct conclusion

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4		Flour: 300 ÷ 12 = 25 3000 ÷ 25 = 120 Butter 150 ÷ 12 = 12.5 900 ÷ 12.5 = 72 Sugar 150 ÷ 12 = 12.5 1000 ÷ 12.5 = 80 Fruit 100 ÷ 12 = 8.3(33..) 800 ÷ 8.3(33..) = 96 Eggs 1÷ 12 = 0.08(33..) 12 ÷ 0.08(33..) = 144 Flour: 3000 ÷ 300 = 10 12 × 10 = 120 Butter 900 ÷ 150 = 6 12 × 6 = 72 Sugar 1000 ÷ 150 = 6.6(66..) 12 × 6.6(66..) = 80 Fruit 800 ÷ 100 = 8 12 × 8 = 96 Eggs 12÷ 1 = 12 12 × 12 = 144	72	4	M1 for a correct method to either find the amount of one ingredient required for one bun, eg. 300 ÷ 12 (= 25 g), 150 ÷ 12 (= 12.5 g), etc. or for a correct method to find the number of groups of 12 buns that are possible with the amount of one ingredient available, eg. 3000 ÷ 300 (= 10), 900 ÷ 150 (= 6), etc. M1 (dep) for a correct method for considering all ingredients in this way M1 for a fully complete and correct method leading to the number of buns that can be made from each ingredient. A1for 72 cao

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5			13	4	M1 for a correct algebraic representation showing a correct relationship between at least two ages, eg (Narinder =) x, (Rashmi =) $x + 3$ Note: $x + 3$ or $2(x + 3)$ can imply Narinder = x. M1 (dep on M1) for deriving an algebraic inequality (or equality), correct from their 3 algebraic expressions, eg. $x + x + 3 + 2(x + 3) <$ (or =) 50 M1 (dep on M2) for a complete and correct method to simplify their inequality (or equality) to for eg. $4x < 41$ ($4x = 41$) C1 (dep on previous M1) for $x < 10.25$ ($x = 10.25$) and a statement identifying Rashmi as 13 years of age, cao OR M1 for one correct trial showing total of ages under 50 M1 for one correct trial showing total of ages over 50 M1 for identifying 10, 13 and 26 as their ages with a sum of 49 years. C1 (dep on previous M1) for fully correct arithmetic and a statement identifying Rashmi as 13 years of age, cao

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6			46.20	5	M1 for 660 × 4 (= 2640) M1 for "number of points" ÷ 10 (= 264) M1 for "264" × 20p (= £52.80) M1 (dep on M2) for £99 – "£52.80" A1 for 46.2(0) OR M1 for £99 ÷ 20p (= 495) M1 for "495" × 10 (= 4950) points needed M1 for 660 ×4 (= 2640) M1 (dep on M2) for ("4950 – 2640") ÷ 10 × £0.20 A1 for 46.2(0)
7			18	3	M1 for Total claimed is 150 × 1200 (= 180 000) M1 for "180 000" ÷ 10 000 A1 cao OR M1 for writing probability of a claim as $\frac{150}{10000}$ M1 for "$\frac{150}{10000}$" × 1200 A1 cao OR M1 for 10000 ÷ 150 (= 66.66....) M1 for 1200 ÷ "66.66.." A1 cao

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*8			25	5	M1 for a correct method to find area of trapezium, eg. ½ (0.8 + 1) × 0.6 (= 0.54m^2) Units must be consistent M1 for Vol of prism = "0.54" × 3 (= 1.62 m^3) oe M1 (dep on previous M1) for a correct method to find number of bags, eg. "1.62" × 1000 ÷ 65 oe. eg. "1620000" ÷ 1000 ÷ 65 A1 cao for 24.9(230…) C1 ft (dep on previous M1) for correct rounding up of "24.9230..."
9	(a)		$\frac{77}{80}$	1	B1 for $\frac{77}{80}$ oe, eg. 96.25% or 0.9625
	(b)		4	2	M1 for 0.05 × 80 or $\frac{4}{80}$ A1 for 4 oe. (eg. 4 out of 80)

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10			45.8 to 46	5	M1 for $40 \div 16$ (= 2.5) or $\frac{9}{16} = (0.5625)$ or $\frac{16}{9} = (1.777..)$ M1 for "2.5" × 9 (= 22.5) or 40 × "0.5625" (= 22.5) or 40 ÷ "1.777..." (= 22.5) M1 (dep on at least M1) for 40^2 + "22.5"^{2} M1 for $\sqrt{1600 + 506.25}$ A1 answer in the range 45.8 to 46 OR M1 for a build up method using equivalent ratios to 16 : 9 M1 for a complete method to find the height of the television (= 22.5) M1 (dep on at least M1) for $40^2 + 22.5^2$ M1 for $\sqrt{1600 + 506.25}$ A1 answer in the range 45.8 to 46 OR M1 for $16^2 + 9^2$ (=337) M1 for $\sqrt{256 + 81}$ (= 18.35(755975)) M1 for $40 \div 16$ (= 2.5) or $16 \div 40$ (= 0.4) M1 for "18.35(75)" × "2.5" or "18.35(75)" × "0.4" (=45.89(39389938)) A1 answer in the range 45.8 to 46 [SC: M1 for $40^2 + 14.4^2$ or $40^2 + 25.6^2$ M1 for $\sqrt{1600 + 207.36}$ or $= \sqrt{1600 + 655.36}$]

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		22.5	1	B1 for 22 - 23
	(b)		115–160	4	M1 for correct method to convert 800 gallons to litres (≈ 3600) M1 for "3600" + 2000 – 5000 (≈ 600) M1 (dep on the previous M1) for correct method to convert "600 *l*" back to gallons A1 for value in the range 115–160 OR M1 for 5000 – 2000 (≈ 3000) M1 for correct method to convert '3000*l*' to gallons (≈ 660) M1 (dep on the previous M1) for 800 – "660" A1 for value in the range 115–160 OR M1 for correct method to convert 5000 *l* (≈ 1100) **and** 2000 *l* (≈ 440) to gallons M1 for "1100"–"440" (≈ 660) M1 (dep on the previous M1) for 800 –"660" A1 for a value in the range 115–160

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		1.5 m	1	B1 cao
	(b)		06 54 and 11 12	2	B1 for 06 48 to 07 00 B1 for 11 06 to 11 18
	(c)		7 hr 30 min to 8 hr (7.5 to 8 hours)	1	B1 for answer in range 7 hr 30 min to 8 hr (7.5 to 8 hours) oe
13	(a)		1.80	4	M1 for £3.60 ÷ 4 (= 90p) M1 (indep) for 9.90 – 3 × "90p" = (£7.20) M1 (dep on previous M1) for "7.20" ÷ 4 A1 for 1.8(0) oe OR M1 for correctly setting up two simultaneous equations, with an attempt to eliminate *c* M1 for a correct method to eliminate terms in *c* (chips), condone one arithmetic error M1 for a correct method to solve an equation in the form *af* = *b*, where *f* = fish A1 for 1.8(0) oe
	(b)		13.50	3	M1 for recognising that $\frac{4}{5} = 10.80$ oe M1 for 10.80 ÷ 4 × 5 oe A1 for 13.5(0)

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)		70.0....	3	M1 for tan (35) = $\frac{ht}{100}$ M1 for 100 × tan 35 A1 for 70(.02...)
	(b)		6.12....	3	M1 for consistent use of units, eg. 7.5 and 0.8 or 750 and 80 or for sin = $\frac{80}{7.5}$ M1 for $\sin^{-1}\frac{0.8}{7.5}$ oe A1 for 6.1(23198866)
15			0.7 to 0.9	3	M1 for drawing a tangent to the curve at 20 minutes M1 (dep) for $\frac{\text{correct vertical distance}}{\text{correct horizontal distance}}$ eg. $\frac{30}{37}$ A1 (dep on M1M1) for answer in range 0.7 to 0.9 (condone a negative answer)
16			19.5	4	M1 for a correct quote of Pythagoras' theorem on one triangle, eg. $4.5^2 + 6^2$ (= 56.25) M1 for a correct second step in solution, eg. √(20.25 + 36) (= 7.5) M1 (indep) for second use of Pythagoras' theorem, eg. "7.5"^{2} + 18^2 (= 380.25) A1 for 19.5 cao OR M2 for $4.5^2 + 6^2 + 18^2$ (=380.25) M1 for √(20.25 + 36 + 324) A1 cao for 19.5

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
17			91	5	M1 for $\pi \times \left(\frac{30}{2}\right)^2$ (= 706.(858...)) M1 (dep) for "706.85..." × 8 (= 5654.8(667…)) M1(indep) for "5655" × 800 (= 4523893) or 50000 ÷ 800 (=62.5) M1 (dep on previous M1) for "4 523 893" ÷ 50 000 (= 90.47.....) or "5655" ÷ "62.5" (= 90.47....) A1 for 91 cao
*18		*d*: UB = 190.5 (190.49..) LB = 189.5 *f*: UB = 25.75 (25.749..) LB = 25.65	7.4 because the LB and UB agree to that number of figures	5	B1 for one correct bound of *d* B1 for one correct bound of *f* M1 for a correct method to find the upper bound of *c*, eg. "190.5" ÷ "25.65" (= 7.4269....) or for a correct method to find the lower bound of *c*, eg. "189.5" ÷ "25.75" (= 7.359....) A1 for 7.42(69…) and 7.35(92…) C1 (dep on M1) for a statement that both LB and UB round to "7.4" to one decimal place oe **NB** an answer of 7.39(2996…) or 7.4 without working or from 190 ÷ 25.7 scores no marks

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
19			144 to 147	5	B1 for $\frac{60}{360}$ oe seen or 0.166(666…) seen M1 for $\frac{60}{360} \times \pi \times 40 \times 40$ oe or sight of answer in range 837 - 839 M1 for a correct method to find the area of the triangle (= answer in the range 692 to 693) M1 (dep on M1) for the intention to find the difference between the area of triangle *OPS* and the area of sector *OPRS* A1 for answer in the range 144 to 147
20		Examples: ½ × 10 × 53 = 265 m ½ × (53 + 60) × 10 = 565 m 30 × 60 =1800 m 2630 m **or** 10 × 60 × 3 =1800 m ½ × 5 × 34 = 85 m ½ × (34 + 53) × 5 = 217.5 m ½ × (53 + 58) × 5 = 277.5 m ½ × (58 + 60) × 5 = 295 m 2675 m	2.6 to 2.7	3	M1 for a method to find the area of a triangle or a trapezium or a rectangle between the graph and the Time axis M1 for a complete method to find the area of at least 3 correct shapes under the graph A1 for answer in range 2.6 to 2.7 km or 2600 to 2700 m

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
21			565or 566	5	M1 for using other than a linear relationship attempt to establish Month 1 population as $100 \times x$ oe. eg $100\left(1+\frac{r}{100}\right)$ M1 for forming equation $100x^2 = 200$ oe. eg. $100\left(1+\frac{r}{100}\right)^2 = 200$ M1 for method to solve equation to establish $x = \sqrt{2}$ M1 for attempting to find Month 5 population e.g. $100 \times \sqrt{2}^5$ oe A1 for 565 or 566 given as answer dependent on working seen **Or** M1 for realising that population doubles in 2 months in a non-linear relationship, eg month 4 = 400, month 6 = 800, etc. M1 for forming the equation $2 = x^2$ or $x = \sqrt{2}$ M1 for method to solve equation to establish $x = \sqrt{2}$ M1 for attempting to find Month 5 population is $100 \times \sqrt{2}^5$ A1 for 565 or 566 given as answer dependent on working seen **Or** M1 for establishing population is of form $N = Ab^t$ oe M1 for substituting $t = 0$, $N = 100$ gives $100 = Ax^0$ or $A = 100$ M1 for substituting $t = 2$, $n = 200$ gives $200 = 100x^2$ and $x^2 = 2$ so $x = \sqrt{2}$ M1 for attempting to find Month 5 population is $100 \times \sqrt{2}^5$ A1 for 565 or 566 given as answer dependent on working seen

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*22			Cats with reason	3	M1 for Dogs risk is 0.5 × 0.3 × 360 (= 54) or 15 × 360 (= 5400) oe or Cats risk is 0.3 × 0.6 × 310 (= 55.80) or 18 × 310 (= 5580) oe or Other pets risk is 0.2 × 0.1 × 160 (= 3.20) or 2 × 160 (= 320) oe A1 for three correct values for the risk for each pet type that can be used for comparison. C1 ft (dep on M1) for a statement comparing their calculated risks
23	(a)		843.75	2	M1 for $\left(\frac{15}{10}\right)^3$ oe. or $\left(\frac{10}{15}\right)^3$ oe A1 for 843(.75)
	(b)		14.4	2	M1 for a complete method e.g. $90 \div \left(\frac{25}{10}\right)^2$ or $90 \times \left(\frac{10}{25}\right)^2$ oe A1 for 14.4

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 5AM2H_01			
Question		**Modification**	**Notes**
Q1		2cm grid. Right axis labelled	
Q2		Kept the same m to metres	
Q3		Diagrams removed – information given instead	
Q8		Model supplied as well as diagram	
Q10 Q11		Just a rectangle given not full TV set x axis – 1 ½ cm for 1. y axis 1 ½ cm for 5	
Q12		x axis 1 ½ cm for 45 minutes. y axis 1 ½ cm for ½. Graph line to go through 05.15 and 12.45 at 5 metres	

PAPER: 5AM2H_01			
Question		**Modification**	**Notes**
Q14	(a) (b)	Drawing of TV mast removed. Vertical line labelled 'TV mast'. 'Horizontal ground' labelled Just triangle given. Wording changed to 'The diagram shows the front face of a ramp'	
Q15		2 cm for 5 both axis	
Q16		Model supplied as well as diagram	
Q17		Model supplied as well as diagram. Diagram is a cross section of the tank	
Q20		2 cm for 5 both axes	
Q22		size × 2	
Q23		No pictures	

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Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Applications of Mathematics

Unit 2: Applications 2

For Approved Pilot Centres ONLY

Higher Tier

Friday 8 November 2013 – Morning
Time: 1 hour 45 minutes

Paper Reference
5AM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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6/5/5/5/

P 4 3 6 0 4 A 0 1 2 8

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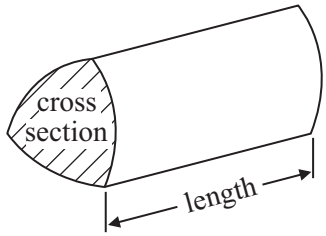
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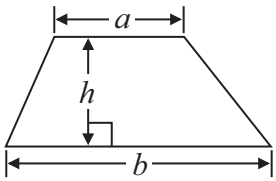
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

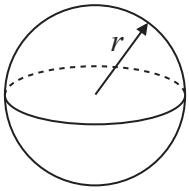


Area of trapezium = $\frac{1}{2}(a + b)h$



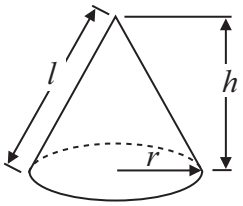
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

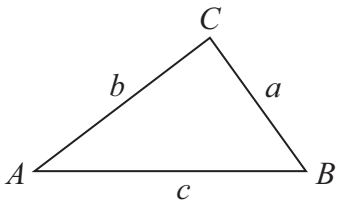


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



The Quadratic Equation
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

***1** Here is a picture frame.

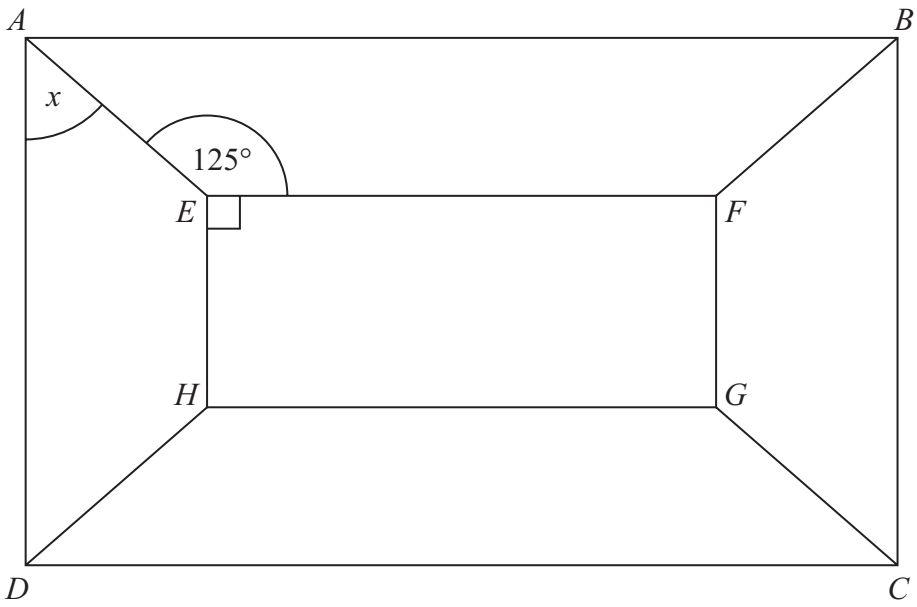


Diagram **NOT** accurately drawn

ABCD and *EFGH* are rectangles.
AB is parallel to *EF*.

Work out the size of angle *x*.
You must give reasons for your answer.

(Total for Question 1 is 3 marks)

2 Blue paint, white paint and red paint are mixed together to make purple paint.

Here are the amounts of blue paint, white paint and red paint needed to make 12 pots of purple paint.

Purple Paint	
800 m*l*	**blue paint**
500 m*l*	**white paint**
700 m*l*	**red paint**
Makes 12 pots	

All the pots of purple paint are the same size.

Sarah works in a paint factory.
On Monday, she needs to make 27 pots of purple paint.

Work out the amount of blue paint, white paint and red paint Sarah needs.
Write your answers in the table below.

Purple Paint	
.....m*l*	**blue paint**
.....m*l*	**white paint**
.....m*l*	**red paint**
Makes 27 pots	

(Total for Question 2 is 3 marks)

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3 Tia works at a kennels for dogs.

She has 4 types of dog food to feed the dogs.
She takes, at random, a tin of dog food.

The table below shows the probabilities that Tia will take a tin of lamb dog food or a tin of beef dog food or a tin of chicken dog food.

Dog Food	lamb	beef	chicken	turkey
Probability	0.35	0.26	0.07	

(a) Work out the probability that Tia will take a tin of turkey dog food.

.....

(2)

(b) Work out the probability that Tia will take a tin of chicken dog food or a tin of lamb dog food.

.....

(2)

Tia has 500 tins of dog food.

(c) Work out the number of tins of lamb dog food she has.

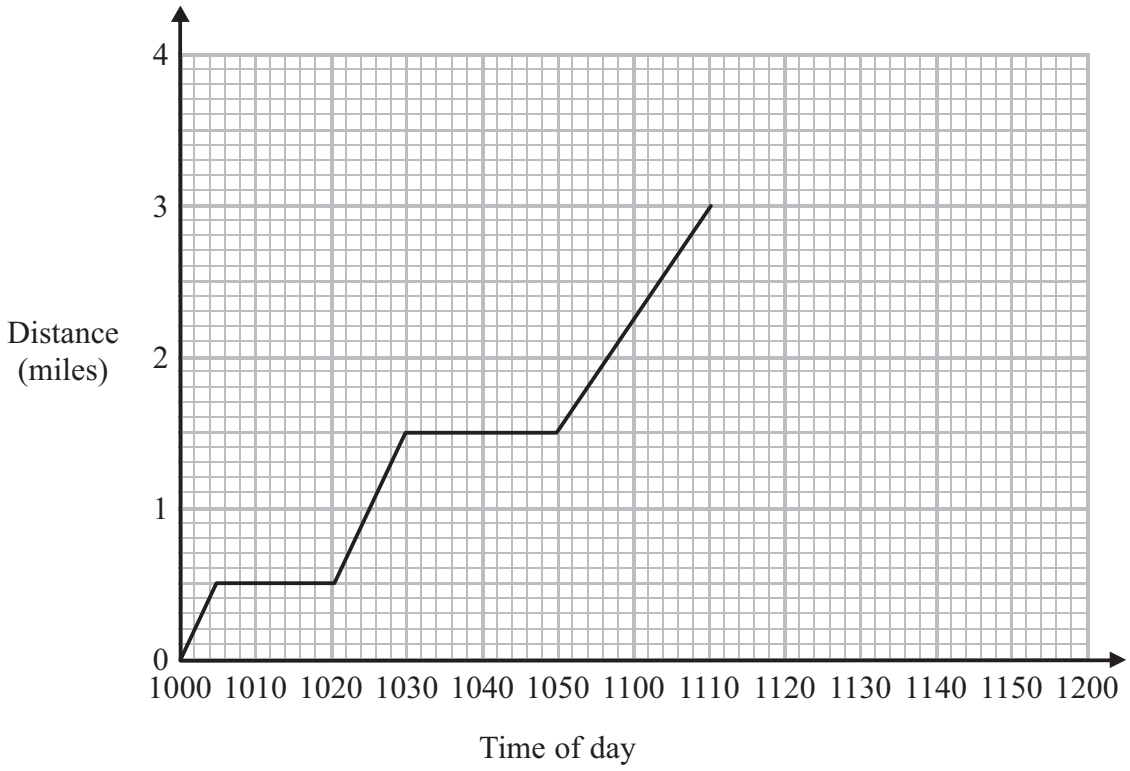
.....

(2)

(Total for Question 3 is 6 marks)

4 The Cooper family go to a Safari park by car.

Here is a travel graph for the first 3 miles of their drive through the Safari park.



(a) What time did the Cooper family start their drive through the Safari park?

.....

(1)

The first time they stopped they watched the lions.

(b) How long did they watch the lions for?

..... minutes

(1)

The second time they stopped they watched the monkeys.

(c) Find the total distance they drove through the Safari park to the second time they stopped.

..... miles

(1)

The Cooper family then drove to see the elephants.

They stopped to watch the elephants at 1110
They watched the elephants for 10 minutes.

The family then drove to the end of the Safari park.
They got to the end of the Safari park at 1140

The family drove a total distance of 4 miles through the Safari park.

(d) Complete the travel graph.

(2)

(Total for Question 4 is 5 marks)

5 Sweets are sold in packets and in boxes.

There are 20 sweets in each packet.
There are 50 sweets in each box.

Claire buys p packets of sweets and b boxes of sweets.
Claire buys a total of T sweets.

Write down a formula for T in terms of p and b.

.....

(Total for Question 5 is 3 marks)

***6** A slice of wholemeal bread weighs 36 grams.
There are 84 calories in the slice.

A slice of white bread weighs 1.4 ounces.
There are 98 calories in the slice.

10 grams = 0.35 ounces.

Which slice of bread has more calories per gram?

(Total for Question 6 is 4 marks)

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7 The diagram shows the lines of a netball court.

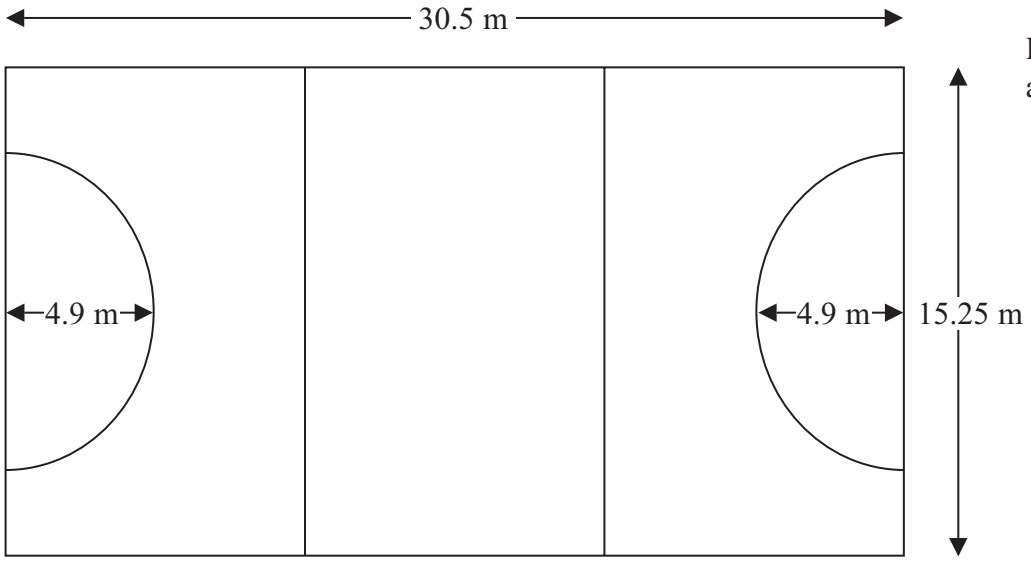


Diagram **NOT** accurately drawn

The court is made from three rectangles and two semi-circles.

All the corners are right angles.

Mr Handy is painting the lines for the netball court on the floor of a school sports hall.

Work out the total length of the lines of the netball court.
Give your answer correct to the nearest metre.

..... m

(Total for Question 7 is 4 marks)

8 Jennifer wins £4560

She shares the money between a charity, herself and her son in the ratio 2 : 7 : 3

Work out how much money Jennifer gives to the charity.

£ .....

(Total for Question 8 is 3 marks)

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9 Stephen throws a ball vertically downwards.

The distance, x, which the ball travels, is given by the formula $x = \dfrac{v^2 - u^2}{19.6}$

$v = 14.3$
$u = 6.2$

Work out the value of x.
Give your answer correct to 1 decimal place.

$x =$ .....

(Total for Question 9 is 2 marks)

10 Frank makes wooden blocks.
The wooden blocks are cuboids.

The diagram shows one of the wooden blocks.

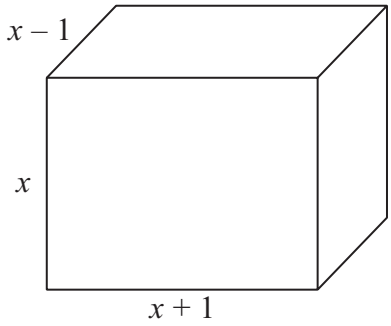


Diagram **NOT** accurately drawn

All measurements are in centimetres.

The cuboid has a volume of 16 cm^3.

(a) Show that $x^3 - x = 16$

(2)

(b) Use trial and improvement to find the value of x.
You must show **all** your working.
Give your answer correct to 1 decimal place.

x = ...

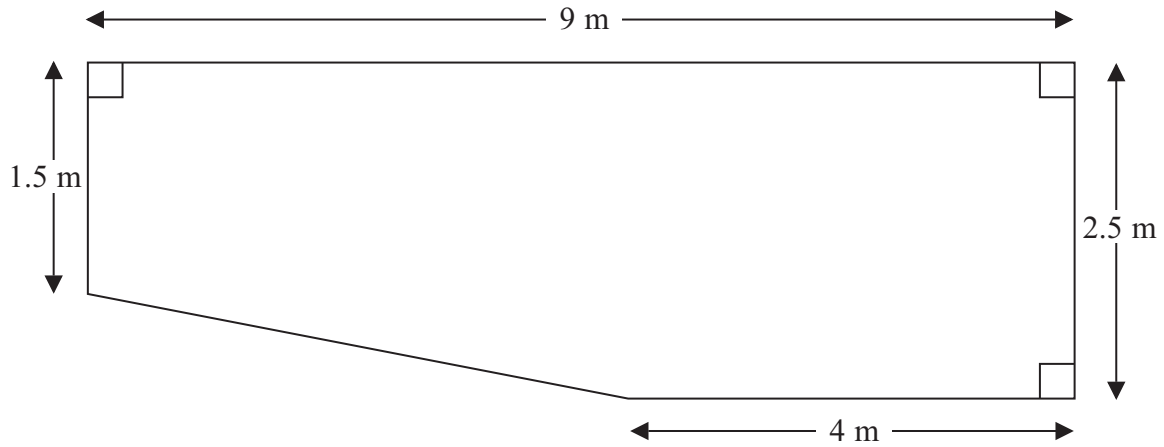
(4)

(Total for Question 10 is 6 marks)

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11 The diagram shows the cross-section of a swimming pool.

Diagram **NOT** accurately drawn



The pool is a prism.
The width of the pool is 5 m.

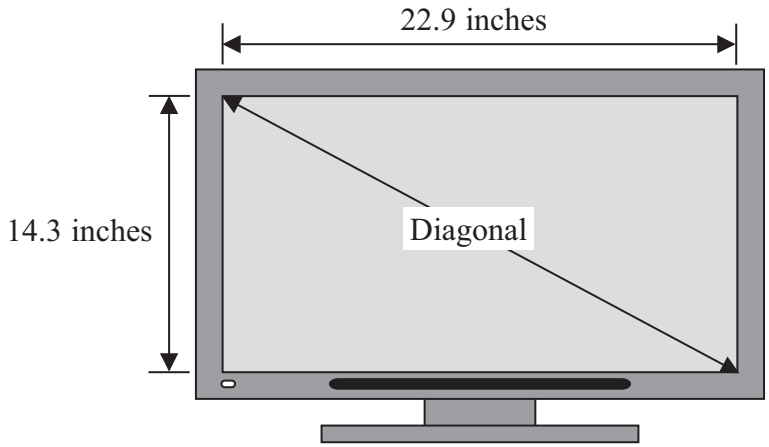
Calculate the volume of water needed to fill the swimming pool.

..... m^3

(Total for Question 11 is 4 marks)

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12 Here is a picture of a television.



The television screen is a rectangle.

The size of a television screen is the length of a diagonal of the screen.

Calculate the size of the television screen.
Give your answer to the nearest inch.

..... inch

(Total for Question 12 is 4 marks)

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***13** When you know the length of an adult's foot (i) in inches, you can use the formula

$$S = 3i - 25$$

to calculate their UK shoe size (S).

When you know an adult's UK shoe size (S), you can use the formula

$$E = S + 33$$

to calculate their European shoe size (E).

Tamsin is buying some shoes as a present for her friend Jane.

Jane is an adult with a foot length of 11 inches.

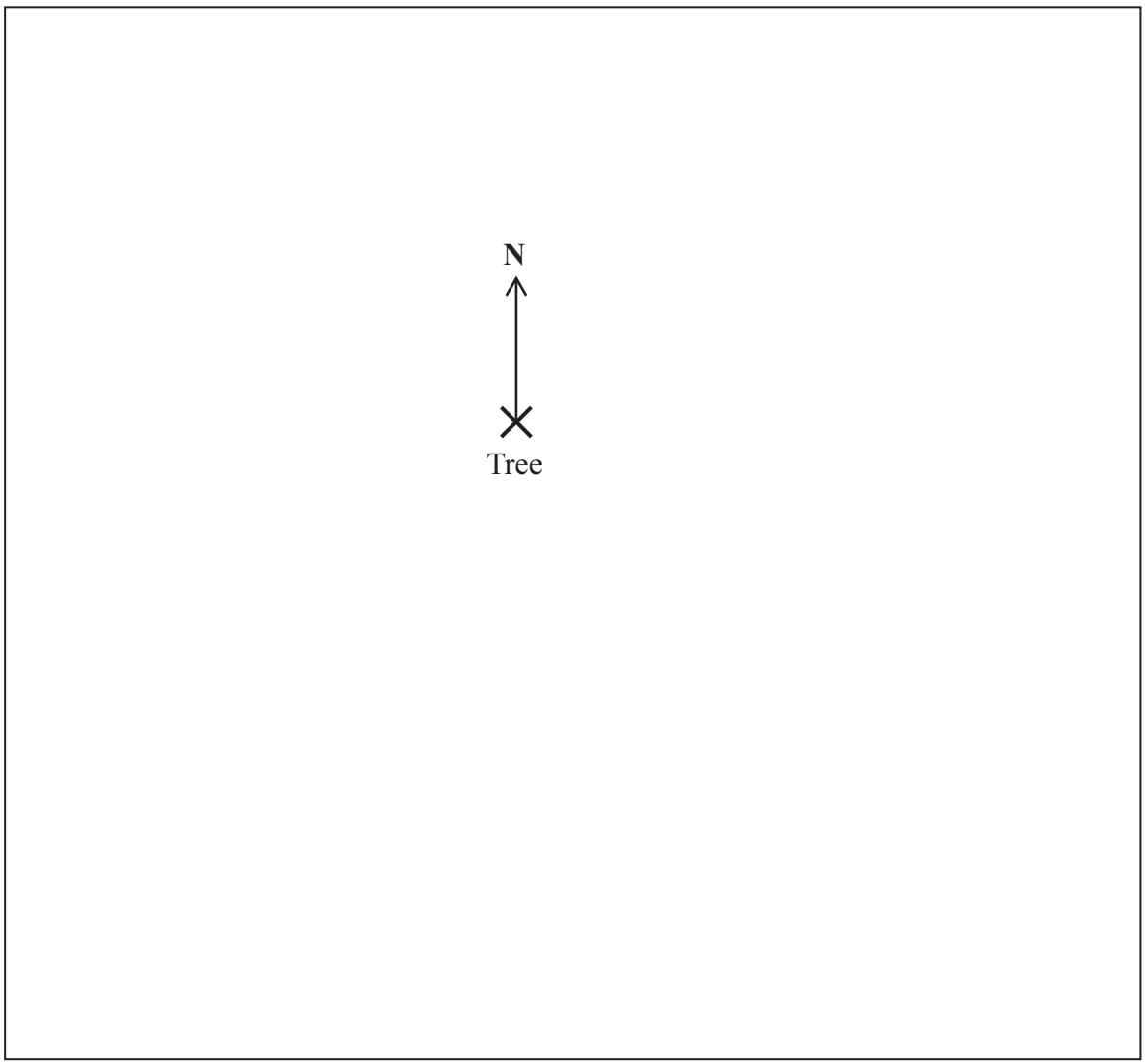
Tamsin orders some shoes.
The shoes are European size 38

Will the shoes fit Jane?
You must show all your working.

(Total for Question 13 is 3 marks)

14 Here is a clue to find some treasure.

You will find the treasure 7.5 m from the tree on a bearing of 125°



Scale: 1 cm represents 1.5 m

Draw an accurate diagram to show the position of the treasure.
Mark the position of the treasure with a cross (×). Label it ***T***.

(Total for Question 14 is 2 marks)

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15 Malcolm knows he eats too many biscuits.
He wants to eat less than 30 biscuits a week.

On Monday, Malcolm ate some biscuits.
On Tuesday, he ate half as many biscuits as on Monday.
On Wednesday, he ate five biscuits less than on Tuesday.
On Thursday, he ate 9 biscuits.
On Friday, Saturday and Sunday he ate no biscuits.

Malcolm ate less than 30 biscuits from Monday to Sunday.

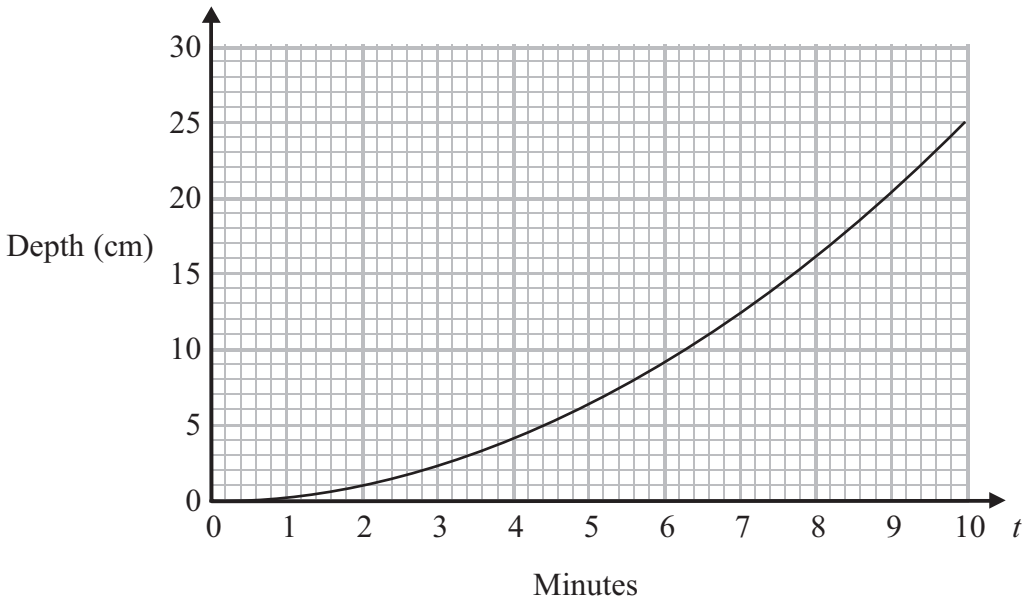
What is the biggest number of biscuits Malcolm could have eaten on Monday?

..... biscuits

(Total for Question 15 is 4 marks)

16 Mrs Wilson is filling a bath.

The graph below shows the depth, in centimetres, of water in the bath after t minutes.



(a) Work out an estimate for the rate of change of the depth of water at $t = 6$

..... cm / min

(3)

(b) Work out the average rate of change in the depth of the water from $t = 3$ to $t = 8$

..... cm / min

(2)

(Total for Question 16 is 5 marks)

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17 A boat delivers food to an oil rig R, and a lighthouse L.

The boat sails in a straight line from the harbour H, to the oil rig.
The oil rig is 8 km from the harbour and on a bearing of 070° from the harbour.

The boat then sails due south to the lighthouse.

The boat then sails back to the harbour in a straight line.
The harbour is 8 km from the lighthouse.

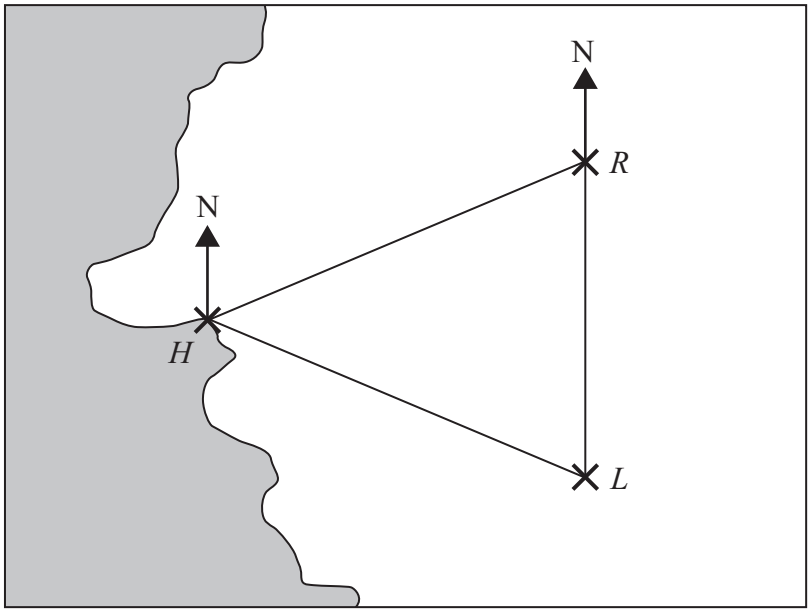


Diagram **NOT** accurately drawn

Calculate the total distance the boat sails.
Give your answer to 3 significant figures.

..... km

(Total for Question 17 is 4 marks)

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18 Jeremy is driving on a motorway.

He drives on the motorway for 99.7 miles, correct to 1 decimal place.
He drives at an average speed of 67 miles per hour, correct to 2 significant figures.

Calculate the upper bound of the time Jeremy is driving on the motorway.

..... hours

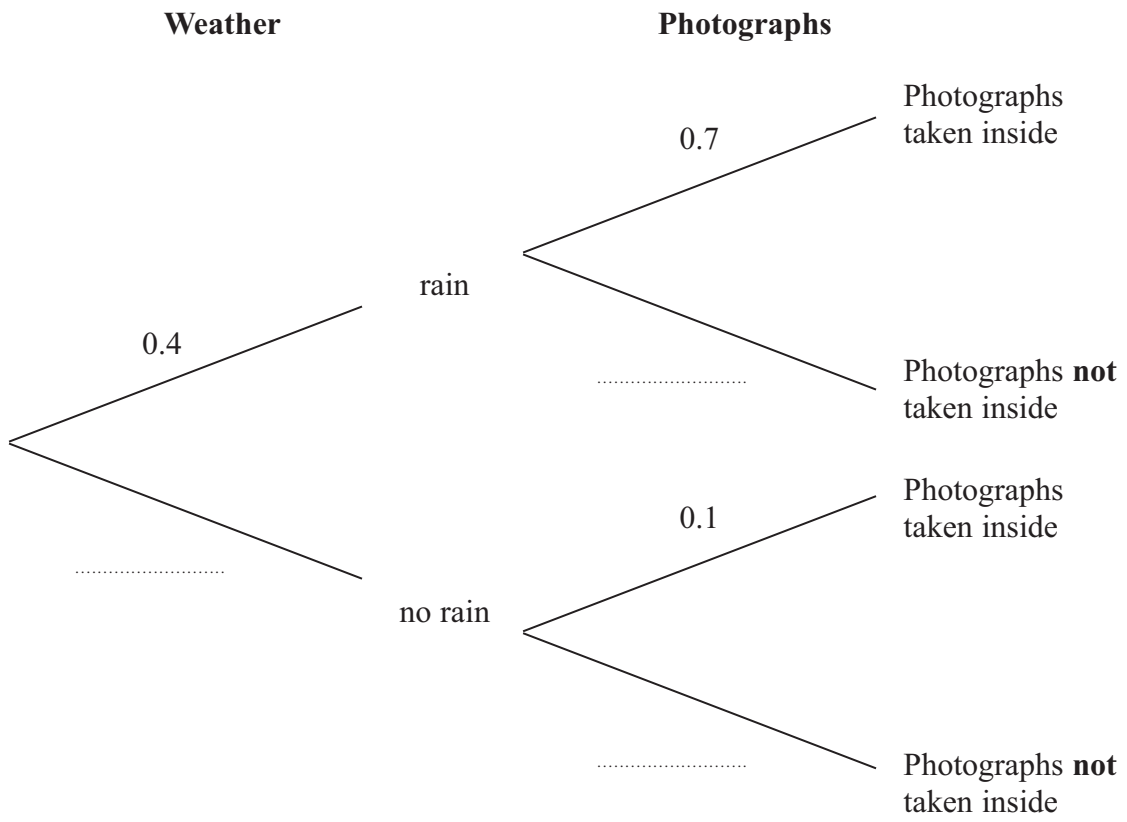
(Total for Question 18 is 4 marks)

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19 Amira is getting married in a hotel on a Saturday.

If it rains on the Saturday, the photographs might need to be taken inside the hotel.

The decision tree diagram gives information about the probability of it raining on the Saturday and the probabilities that the photographs will need to be taken inside the hotel.



(a) Complete the decision tree diagram.

(2)

The hotel has two rooms for hire, a basic room and a luxury room.

If the risk of the photographs needing to be taken inside is greater than 0.5, Amira will hire the luxury room.

*(b) Will Amira need to hire the luxury room?

(4)

(Total for Question 19 is 6 marks)

20 A company makes cola drinks.

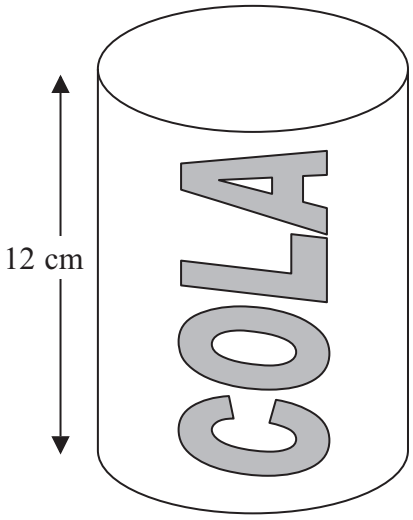
The company is designing a doll for an advert for the cola.
The company wants the doll to hold a can of cola.

A real can of cola and the doll's can of cola are similar cylinders.

A real can of cola has a radius of 3.2 cm and a height of 12 cm.
The doll's can of cola has a volume of 48.25 cm^3.

Work out the height of the doll's can of cola.

Diagram **NOT** accurately drawn



..... cm

(Total for Question 20 is 5 marks)

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21 There are only

4 mint biscuits
and 1 toffee biscuit in a tin.

There are only

5 mint sweets
and 3 strawberry sweets in a packet.

Michael's mum lets him take one biscuit from the tin and one sweet from the packet.

Michael takes a biscuit at random from the tin.
He also takes a sweet at random from the packet.

Work out the probability that either the biscuit is mint or the sweet is mint, but not both.

.....

(Total for Question 21 is 3 marks)

22 In the winter a farmer feeds his cows with hay each day.

The number of days, d, the hay will last is inversely proportional to the number of cows, c, the farmer has.

The farmer has enough hay to feed 280 cows for 25 days.

(a) Find a formula for d in terms of c.

.....

(2)

The farmer has 350 cows.

(b) How many days will the farmer be able to feed all his cows with hay?

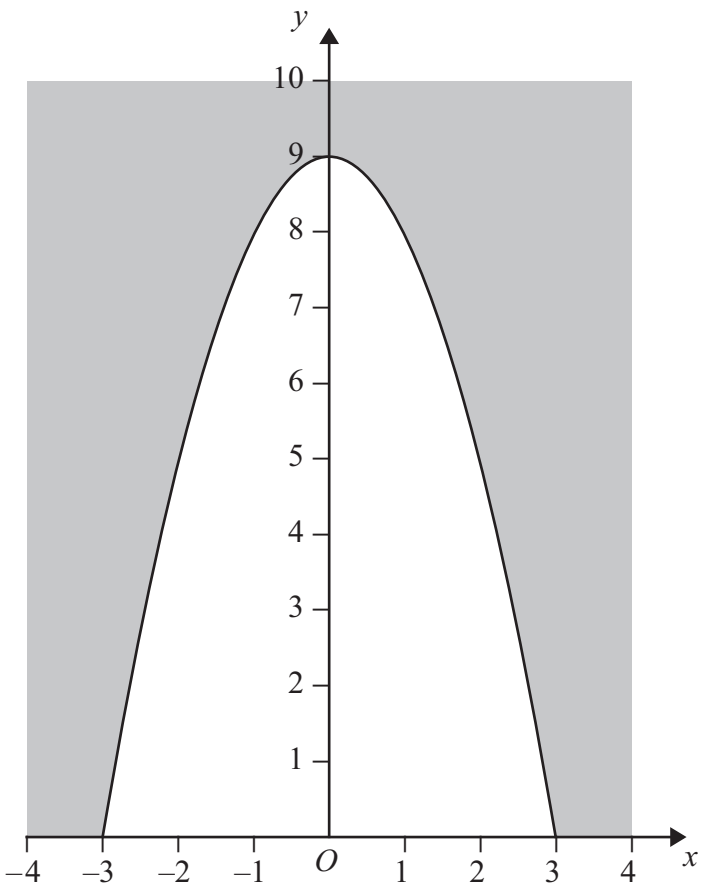
..... days

(2)

(Total for Question 22 is 4 marks)

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23 Here is a sketch of the graph of $y = 9 - x^2$



The graph is used to model the cross section of a tunnel.
The unshaded area is the cross section of the tunnel.

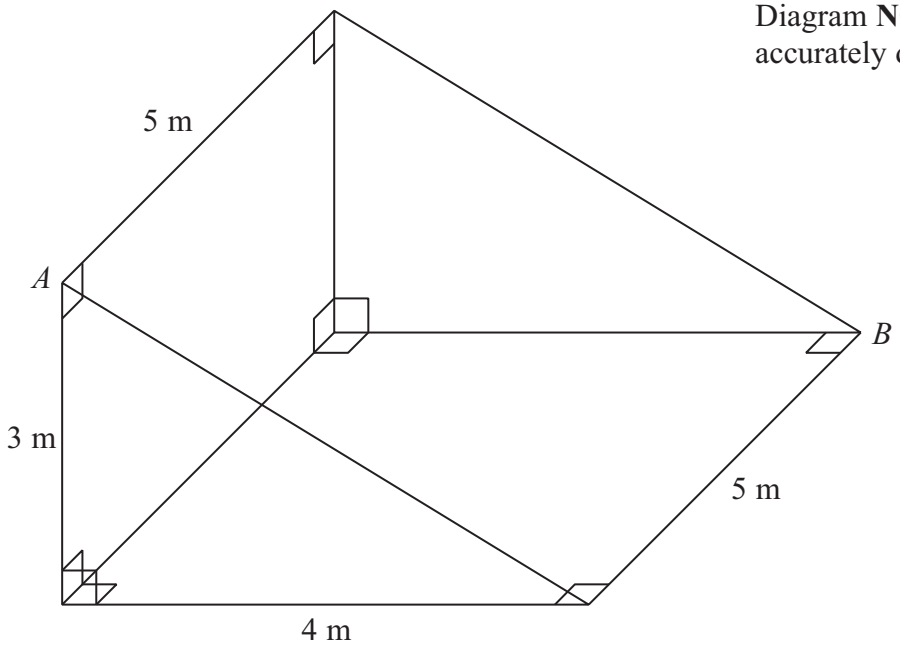
Calculate an estimate of the area of the cross section of the tunnel.

.....

(Total for Question 23 is 4 marks)

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***24** Here is a diagram of a room in Sanjay's house.



Sanjay is putting an electric cable across the ceiling of the room.
The cable will start from *A* and go to *B*.

Calculate the shortest possible length of the cable.
Give your answer to 3 significant figures.
You must show all your working.

(Total for Question 24 is 4 marks)

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25 A scientist is studying some rabbits.
The rabbits have a disease that kills the rabbits.

A population of 160 of these rabbits was reduced to 90 rabbits in two days.

The rabbit population is decreasing exponentially.

Work out how many of the 160 rabbits will still be alive at the end of 7 days.

.....

(Total for Question 25 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

November 2013

Pearson Edexcel GCSE
Linked Pair Pilot in Mathematics
Application of Mathematics (2AM01)
Higher Paper 2H

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

Paper 5AM2H_01					
Question		Working	Answer	Mark	Notes
*1		180 – 125 = 55 90 – 55 **or** 360 – 125 – 90 = 145 180 – 145	35	3	M1 for a correct first step to find an angle which will lead to x e.g 180 – 125 or 360 – 125 – 90 A1 $x = 35$ C1 (dep M1) One relevant reason **eg Alternate angles** are equal
2			1800 1125 1575	3	M1 27 ÷ 12 (= 2.25) M1 800 × 2.25 or 500 × 2.25 or 700 × 2.25 A1 all three answers correct **or** M1 800 ÷ 12 (= 66.6…) or 500 ÷ 12 (41.6…) or 700 ÷ 12 (= 58.3…) M1 27 × 66.6… or 27 × 41.6… or 27 × 58.3… A1 all three answers correct

Paper 5AM2H_01					
Question		Working	Answer	Mark	Notes
3	(a)		0.32	2	M1 1 – (0.35 + 0.26 + 0.07) or 1 – "0.68" A1 cao
	(b)		0.42	2	M1 0.07 + 0.35 or 1 – ("0.32" + 0.26) A1 oe
	(c)		175	2	M1 500 × 0.35 A1 cao
4	(a)		10 00	1	B1 10 00 oe
	(b)		15 to 16	1	B1 15 to 16
	(c)		1.5	1	B1 1.5 oe
	(d)		(on graph)	2	B1 line joining (11 10, 3) to (11 20, 3) B1 line joining (11 20, 3) to (11 40, 4) SC If B0, B0 award B1 for line joining (11 10, 3) to (11 30, 4)

Paper 5AM2H_01					
Question		Working	Answer	Mark	Notes
5			$T=20p+50b$	3	B3 $T = 20p + 50b$ (B2 $20p + 50b$ as an expression not in a formula or $T = k + 50b$ oe or $T = 20p + k$ oe $k \neq 0$) (B1 for $T = cp + db$, c and d numerical and not both zero or $k + 50b$ oe or $20p + k$ oe any $k \neq 0$)
*6		eg 1.4 ÷ 0.35 × 10 or 40 98 ÷ 40 = 2.45 84 ÷ 36 = 2.33... **or** 1.4 ÷ 0.35 × 10 = 40 84 ÷ 36 × 40= 93.(333..)	white bread	4	M1 for correct method to convert to consistent units M1 for correct method which would enable a comparison of the number of calories per gram in each bread A1 for two appropriate correct values C1(dep M2) for white bread from their comparison

Paper 5AM2H_01					
Question		Working	Answer	Mark	Notes
7			153	4	M1 $\pi \times 9.8$ (= 30.(7916...)) or $\pi \times 4.9$ (= 15.(3938..)) M1 15.25×4 (= 61) or 30.5×2 (= 61) M1 (dep on first M1) for a correct method to find the total length of all lines A1 152 -153
8			760	3	M1 $4560 \div$ "2 + 7 + 3" M1 "380" $\times 2$ A1 cao
9		$(14.3^2 - 6.2^2) \div 19.6$ $= (204.49 - 38.44) \div 19.6$ $= 166.05 \div 19.6$	8.5	2	M1 $\frac{14.3^2 - 6.2^2}{19.6}$ A1 8.45 - 8.5
10	(a)		Equation shown	2	M1 $x(x - 1)(x + 1)$ or $x(x^2 - 1)$ A1 (dep on M1) for expansion and equating to 16

Paper 5AM2H_01					
Question		Working	Answer	Mark	Notes
	(b)	<table><tr><th>x</th><th>$x^3 - x$</th></tr><tr><td>2</td><td>6</td></tr><tr><td>3</td><td>24</td></tr><tr><td></td><td></td></tr><tr><td>2.5</td><td>13.125</td></tr><tr><td>2.6</td><td>14.976</td></tr><tr><td>2.7</td><td>16.983</td></tr><tr><td>2.8</td><td>19.152</td></tr><tr><td>2.9</td><td>21.489</td></tr><tr><td></td><td></td></tr><tr><td>2.61</td><td>15.16958</td></tr><tr><td>2.62</td><td>15.36473</td></tr><tr><td>2.63</td><td>15.56145</td></tr><tr><td>2.64</td><td>15.75974</td></tr><tr><td>2.65</td><td>15.95963</td></tr><tr><td>2.66</td><td>16.161096</td></tr><tr><td>2.67</td><td>16.364163</td></tr><tr><td>2.68</td><td>16.568832</td></tr><tr><td>2.69</td><td>16.775109</td></tr></table>	2.7	4	B2 for trial $2.6 \le x \le 2.7$ evaluated (B1 for an evaluated trial) B1 for different trial $2.65 \le x < 2.7$ evaluated B1 (dep on at least one previous B1) for 2.7 Values evaluated can be rounded or truncated, but to nearest whole number when x has 1 dp or less, and to 1 dp when x has 2 dp

Paper 5AM2H_01					
Question		Working	Answer	Mark	Notes
11			100	4	M1 correct method to work out one part of the cross-sectional area M1 correct method to work out total cross-sectional area M1 cross - sectional area × 5 A1 cao **or** M1 correct method to work out one part of the volume M1 correct method to work out a second part of the volume M1 correct method to work out total volume A1 cao
12			27	4	M1 for use of Pythagoras' rule M1 $14.3^2 + 22.9^2$ M1 $\sqrt{728.9}$ oe A1 27

Paper 5AM2H_01					
Question		Working	Answer	Mark	Notes
*13		$S = 3 \times 11 - 25$ $S = 8$ $E = 33 + 8$ $E = 41$ **Or** $38 = S + 33$ $S = 5$ $S = 3 \times 11 - 25$ $S = 8$	No the shoes won't fit	3	M1 $S = 3 \times 11 - 25$ M1 $E = 33 +$ "8" C1 (dep on M1) 41 and 'the shoes will not fit' **or** M1 $38 = S + 33$ or $S = 38 - 33$ or $S = 5$ M1 $S = 3 \times 11 - 25$ or $S = 33 - 25$ or $S = 8$ C1 (dep on M1) 8 and 5 and 'the shoes will not fit'
14			Correct diagram	2	B1 correct bearing (within guidelines) B1 correct distance (within guidelines) (see overlay)
15			12	4	M1 x, $\frac{x}{2}$, $\frac{x}{2} - 5$, 9 M1 $x + \frac{x}{2} + \frac{x}{2} - 5 + 9 < 30$ M1 correct method to isolate x A1 cao

Paper 5AM2H_01					
Question		Working	Answer	Mark	Notes
16	(a)		3	3	M1 tangent drawn at $t = 6$ M1 height ÷ base for a triangle with the tangent as hypotenuse A1 2.5 to 3.5
	(b)	$\frac{16-2}{8-3}$ $\frac{14}{5}$	2.8	2	M1 difference in depths ÷ (8 – 3) A1 2.7 – 2.9
17		$8 + 8 + 2 \times 8 \sin 20^o$ $16 + 2 \times 2.73(6\ldots)$ $16 + 5.47(2\ldots)$	21.5	4	M2 correct method to find RL (M1 for $8 \sin 20^o$ or $8 \cos 70^o$ or correct substitution into cosine rule or sine rule) M1 $8 + 8 +$ "$2 \times 8 \sin 20^o$" oe A1 21.4 to 21.5
18		99.75 ÷ 66.5	1.5	4	B1 99.75 or 99.65 or 99.7499 (recurring) B1 67.5 or 66.5 or 67.499 (recurring) M1 for $\text{miles}_{max} \div \text{speed}_{min}$ eg "99.75" ÷ "66.5" A1 1.5 from correct figures

Paper 5AM2H_01					
Question		Working	Answer	Mark	Notes
*19	(a)		0.6 0.3, 0.9	2	B1 0.6 B1 0.3 and 0.9
	(b)		no she does not need to hire the luxury room	4	M1 0.4 × 0.7 or 0.6 × 0.1 or 0.28 or 0.06 M1 0.4 × 0.7 + 0.6 ×0.1 or "0.28" + "0.06" A1 0.34 oe C1 (dep M1) luxury room not needed from their figures
20		$\pi \times 3.2^2 \times 12 = 15.36\ \pi = 386.0389$ Volume factor = 386.0389 ÷ 48.25 = 8.008 Length scale factor = $\sqrt[3]{8.008} = 2$ 12 ÷ 2 **or** $\pi \times (3.2\ x)^2 \times 12\ x = 48.75$ $x^3 = \frac{48.25}{\pi \times 10.24 \times 12} = 0.125$ $x = 0.5$ 0.5 × 12	6 cm	5	M1 for method to find the volume of the real can M1 for method to find the volume scale factor M1 for method to find the length scale factor M1(dep M3) 12 ÷ "2" or 12 × "0.5" A1 5.9 to 6.1

Paper 5AM2H_01					
Question		Working	Answer	Mark	Notes
		$\frac{1}{2}$ (0 +2×5+2×8+2×9+2×8+2×5+0) = $\frac{1}{2}$(0 + 10 + 16 + 18 + 16 + 10 +0) = 70 ÷ 2 **or** $\frac{1}{2}$(0 +2×5+2×8+9) = $\frac{1}{2}$(0 + 10 + 16 + 9) = 35 ÷ 2 = 17.5 17.5 × 2			(A1 for 33 ≤ area < 35)
21			$\frac{17}{40}$	3	M1 $\frac{4}{5}\times\frac{3}{8}$ or $\frac{1}{5}\times\frac{5}{8}$ or $\frac{12}{40}$ or $\frac{5}{40}$ M1 $\frac{4}{5}\times\frac{3}{8}+\frac{1}{5}\times\frac{5}{8}$ A1 $\frac{17}{40}$ oe

<table>
<tr><th colspan="6">Paper 5AM2H_01</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>22</td><td>(a)</td><td></td><td>$d = \frac{7000}{c}$</td><td>2</td><td>M1 $d = k \div c$ or $25 = k \div 280$
A1 oe</td></tr>
<tr><td></td><td>(b)</td><td></td><td>20</td><td>2</td><td>M1 $d = \frac{7000}{350}$
A1 cao

or

M1 $25 \times 280 \div 350$ oe
A1 cao</td></tr>
<tr><td>23</td><td></td><td>eg
<table><tr><td>x</td><td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>y</td><td>0</td><td>5</td><td>8</td><td>9</td><td>8</td><td>5</td><td>0</td></tr></table></td><td>36</td><td>4</td><td>M1 for attempting to find area under curve
M1 for correct method to find the area under the curve
between $x = -3$ and $x = 3$ (at least 3 areas)
A2 for 35 – 36</td></tr>
<tr><td>*24</td><td></td><td></td><td>7.07m</td><td>4</td><td>M2 $3^2 + 4^2 + 5^2$ or $9 + 16 + 25$ or 50
(M1 for correct use of Pythagoras in 2D to find a length)
M1 $\sqrt{3^2 + 4^2 + 5^2}$ or $\sqrt{"9"+"16"+"25"}$ or $\sqrt{50}$
C1 (dep on M1) correctly found the shortest distance with 7.07(10678.....) and the correct units</td></tr>
</table>

Paper 5AM2H_01					
Question		Working	Answer	Mark	Notes
25			21 or 22	5	M1 for $160r^2=90$ or $\frac{90}{160}$ M1 for $(r=)\sqrt{\frac{90}{160}}$ oe M1 (dep M2) for $160 \times \left(\sqrt{\frac{90}{160}}\right)^7$ oe A1 for 21.3… A1 for 21 or 22 **or** M1 for $160 \times r^2 = 90$ or $\frac{90}{160}$ M1 for $160 \times \frac{100-n}{100} \times \frac{100-n}{100} = 90$ M1 (dep M2) for 160×0.75^7 A1 for 21.3… A1 for 21 or 22







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Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Applications of Mathematics

Unit 2: Applications 2

For Approved Pilot Centres ONLY

Higher Tier

Friday 14 June 2013 – Morning
Time: 1 hour 45 minutes

Paper Reference
5AM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P42063A

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6/7/8/

P 4 2 0 6 3 A 0 1 2 8

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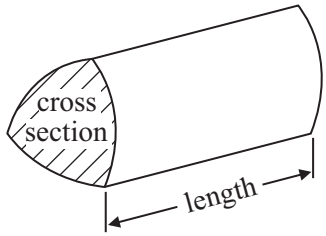
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GCSE Mathematics 2AM01

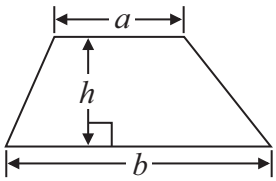
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

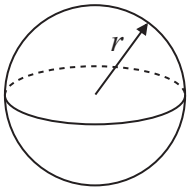


Area of trapezium = $\frac{1}{2}(a + b)h$



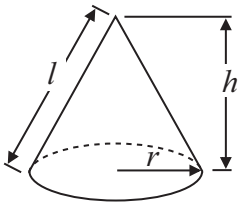
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

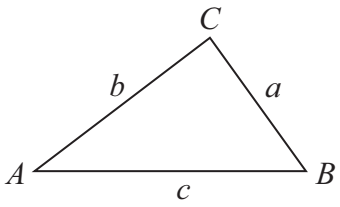


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



The Quadratic Equation
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$

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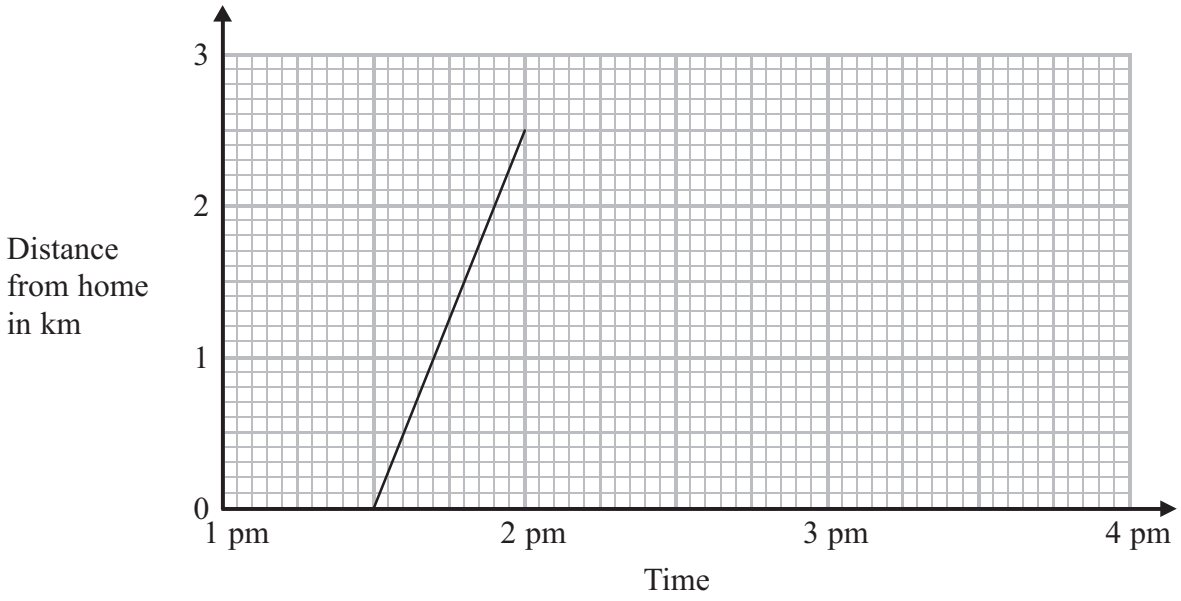
Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 Sophie walked from her home to her friend's house.

The travel graph shows Sophie's journey to her friend's house.



(a) What time did Sophie get to her friend's house?

.....

(1)

Sophie spent 1 hour at her friend's house.
She then walked home at a steady speed.
It took her 45 minutes to walk home.

(b) Complete the travel graph for this information.

(2)

(c) What was the total distance Sophie walked?

..... km

(1)

(Total for Question 1 is 4 marks)

*2 Here are the ingredients needed to make 20 cookies.

Cookies

Ingredients to make **20** cookies

225 g of butter
120 g of castor sugar
275 g of flour

Liz is going to make some cookies for a party.

There will be 4 adults and 14 children at the party.

Liz wants to make 2 cookies for each adult and 3 cookies for each child.

Liz has

500 g of butter
300 g of castor sugar
1 kg of flour

Does Liz have enough butter, enough castor sugar and enough flour to make all the cookies for the party?
You must show all your working.

(Total for Question 2 is 5 marks)

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3 Greta, Hakim and Chloe wanted to know how often the letter 'e' is used in English words.

They each chose a different section from the same book written in English.
They each counted the total number of letters in their section
and the number of times the letter 'e' occurred.

The table gives information about their results.

	Greta	Hakim	Chloe
Total number of letters counted	20	1000	30 000
Frequency of letter 'e'	5	170	4100

Which of these results should give the best estimate for the probability that a letter picked at random from the book will be the letter 'e'?
Give a reason for your answer.

.....

.....

.....

.....

(Total for Question 3 is 2 marks)

4 Here is a diagram of Jim's shed.

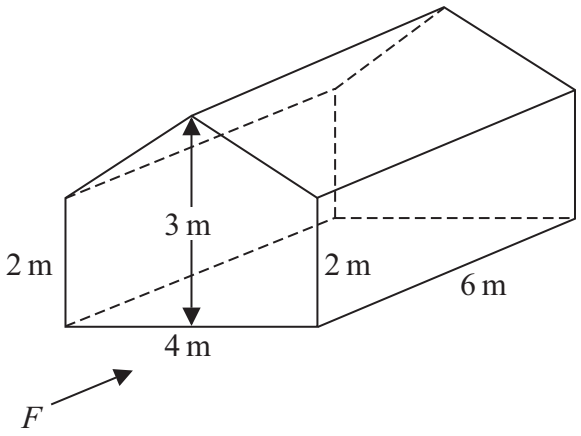
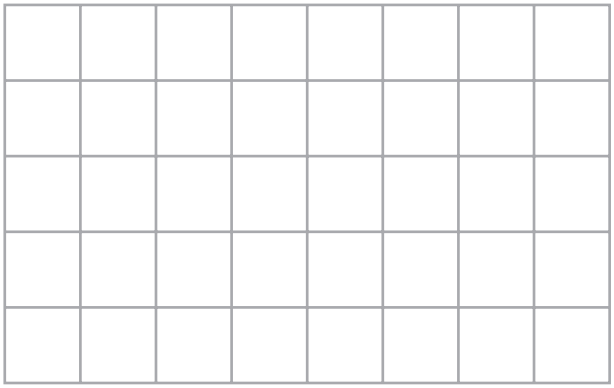


Diagram **NOT** accurately drawn

The shed is in the shape of a prism.
The shed is on horizontal ground.
The two ends and the two sides of the shed are vertical.

(a) On the centimetre grid, draw the front elevation of the shed from direction *F*.
Use a scale of 1 cm to 1 m.



(2)

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Jim is going to paint the two ends and the two sides of the shed.

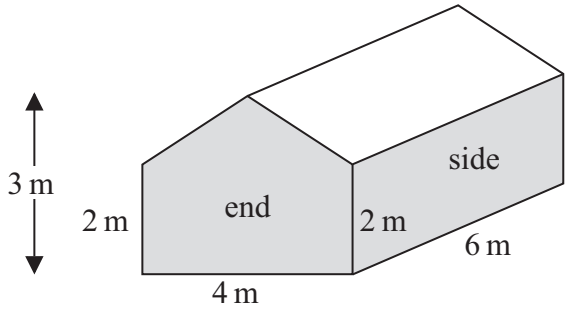


Diagram **NOT** accurately drawn

1 litre of paint will cover an area of 8 m^2.

Paint is sold in 1 litre tins, in 2.5 litre tins and in 5 litre tins.



Jim wants the total cost of the paint to be as little as possible.

(b) Work out the total cost of the paint.
You must show all your working.

£ .....

(6)

(Total for Question 4 is 8 marks)

5 Colin has a piece of wood 200 cm long.
He cuts the wood into pieces with lengths in the ratio 2 : 3 : 5

Work out the length of each piece of wood.

..... cm

..... cm

..... cm

(Total for Question 5 is 3 marks)

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*6 The diagram shows a sandpit in the shape of a cuboid.

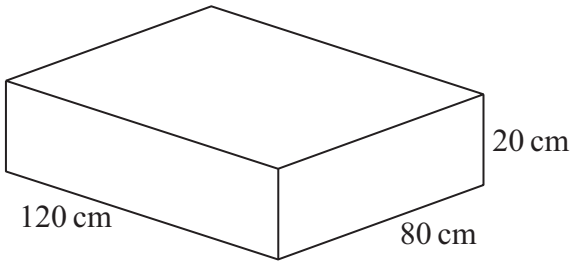


Diagram **NOT** accurately drawn

The sandpit is 120 cm by 80 cm by 20 cm.

The sandpit is empty.
Jade is going to put sand into the sandpit.

A bag of sand costs £2.99
There are 10 000 cm^3 of sand in a bag.

Jade has only £50 to spend on sand.

Show that Jade cannot buy enough sand to fill the sandpit completely.
You must show all your working.

(Total for Question 6 is 5 marks)

7 Here is a formula used to work out the speed, v mph, of a car making an emergency stop.

$$v = \sqrt{21d}$$

d feet is the length of the mark the car's tyres make on the road when making an emergency stop.

A car makes an emergency stop.
The car's tyres make a mark 90 feet long.

(a) Work out the speed of the car.
Give your answer correct to the nearest whole number.

..... mph
(2)

A car made an emergency stop.
The car's speed was 50 mph.

(b) Work out the length of the mark on the road.
Give your answer correct to the nearest whole number.

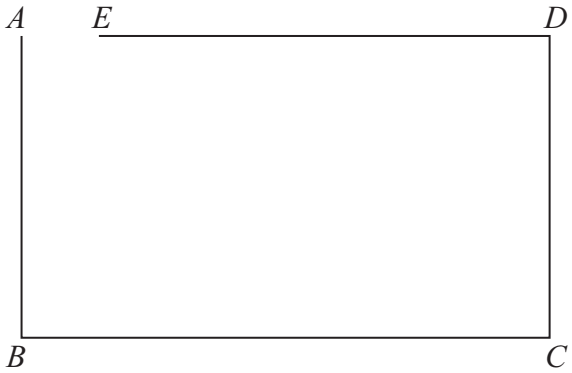
..... feet
(3)

(Total for Question 7 is 5 marks)

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8 The diagram represents a harbour *ABCDE*.

The scale of the diagram is 1 cm represents 10 m.



Scale: 1 cm represents 10 m

People can leave boats in the harbour.

People **cannot** leave boats

less than 30 metres from point *A*
or less than 10 metres from the line *ED*.

On the diagram, shade the region where people **cannot** leave boats.

(Total for Question 8 is 4 marks)

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9 The diagram represents a frame for a window.

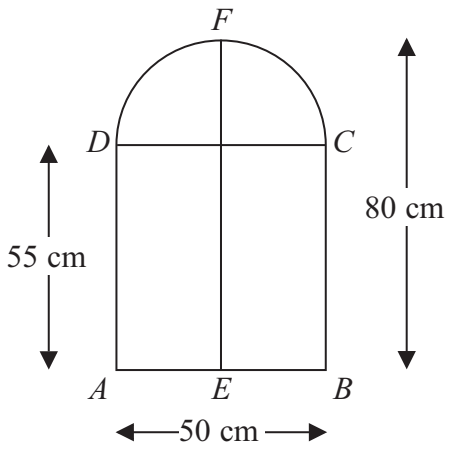


Diagram **NOT** accurately drawn

The frame is made from metal bars.

AD, *BC* and *EF* are vertical bars.
AB and *DC* are horizontal bars.

DFC is a bar in the shape of a semicircle.
E is the midpoint of *AB*.

AB = 50 cm
AD = 55 cm
EF = 80 cm

(a) Work out the total length of the metal bars in the frame.

..... cm

(4)

(b) Work out the total area of the window.

..... cm^2

(3)

(Total for Question 9 is 7 marks)

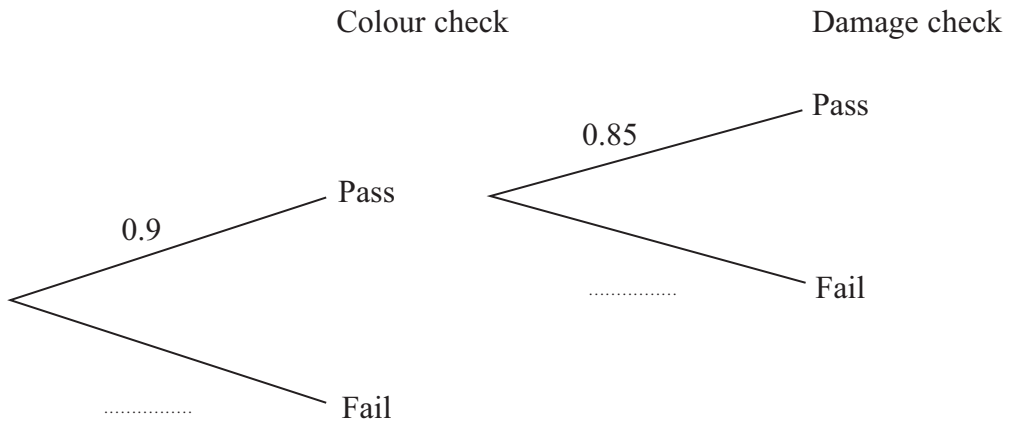
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10 Joe has a job packing tomatoes in boxes.

First he has to check the colour of each tomato.
He also has to check the tomato for damage.

The decision tree diagram gives information about the probability of a tomato passing the colour check and the probability of a tomato passing the damage check.

(a) Complete the decision tree diagram.



(2)

Joe packs the tomatoes that pass both the colour check and the damage check.

On Thursday Joe has to check 9600 tomatoes.

(b) Work out an estimate for the number of these tomatoes he will pack.

.....

(4)

(Total for Question 10 is 6 marks)

11 The diagram represents a door wedge.
The door wedge is in the shape of a triangular prism.

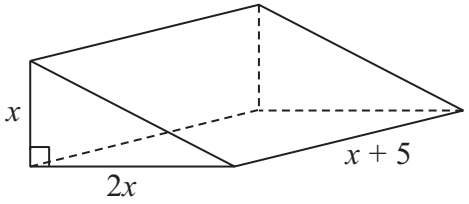


Diagram **NOT** accurately drawn

All the measurements shown on the diagram are in centimetres.

The triangular prism has a volume of 100 cm^3.

(a) Show that $x^3 + 5x^2 = 100$

(2)

(b) Use trial and improvement to find the value of x.
You must show all your working.
Give your answer correct to 1 decimal place.

$x =$ .....

(5)

(Total for Question 11 is 7 marks)

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12 *ABCDE* is a car jack on horizontal ground as shown in the diagram.

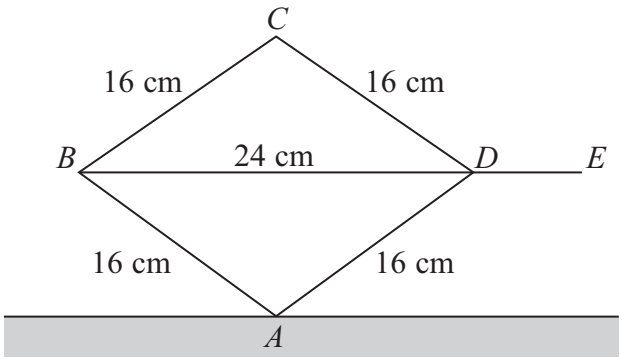


Diagram **NOT** accurately drawn

$AB = BC = CD = DA = 16$ cm
$BD = 24$ cm
BDE is horizontal.

Calculate the height of C above A.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 12 is 4 marks)

13 AT is a vertical tower on horizontal ground as shown in the diagram.

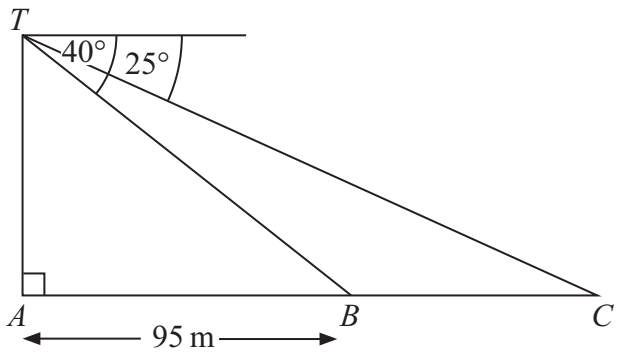


Diagram **NOT** accurately drawn

ABC is a straight line.
$AB = 95$ m.

The angle of depression of B from T is 40°
The angle of depression of C from T is 25°

Calculate the distance of B from C.
Give your answer correct to 3 significant figures.

..... m

(Total for Question 13 is 5 marks)

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14 A town has three car parks.

South car park has x spaces.
North car park has 48 more spaces than South car park.
Central car park has four times as many spaces as South car park.

The total number of spaces in South car park and Central car park is more than twice the number of spaces in North car park.

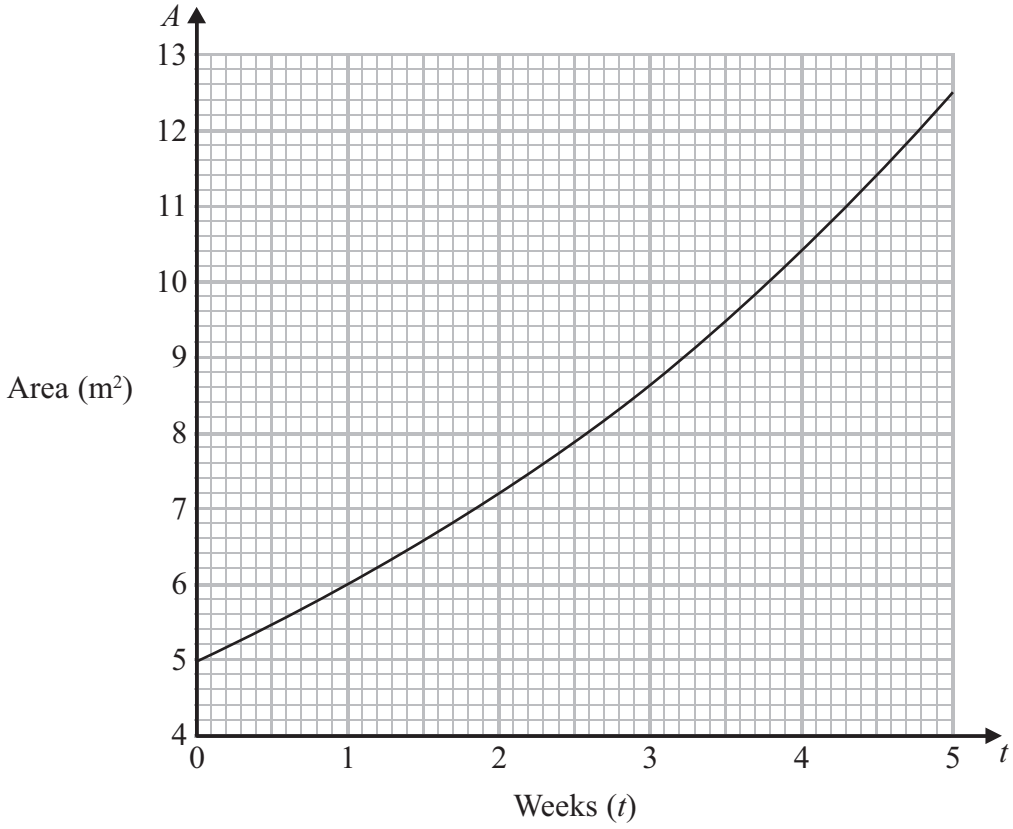
Work out the least possible number of spaces in South car park.

.....

(Total for Question 14 is 5 marks)

15 Waterweed is growing in a pond.
Each week a student records the area of the pond covered by the waterweed.

The graph gives information about the area, A m^2, covered by the waterweed after t weeks.



The area covered by the waterweed increased during the first 4 weeks.

(a) How much did the area increase during the first 4 weeks?

..... m^2

(2)

(b) The area, A m^2, covered by the waterweed after t weeks is given by the formula $A = ka^t$

(i) Write down the value of k.

.....

(ii) Work out an estimate for the value of a.

.....

(3)

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Waterweed is also growing in a different pond.
The student puts weed killer on this waterweed.

The area covered by the waterweed decreases by x% each week.

The area covered by the waterweed halves in 10 weeks.

(c) Work out the value of x.
Give your answer correct to 1 decimal place.

.....

(3)

(Total for Question 15 is 8 marks)

16 Amir is standing on a cliff by the sea.
He is looking at the horizon.

The distance, d km, to the horizon is proportional to the square root of the height, h m, Amir is above sea level.

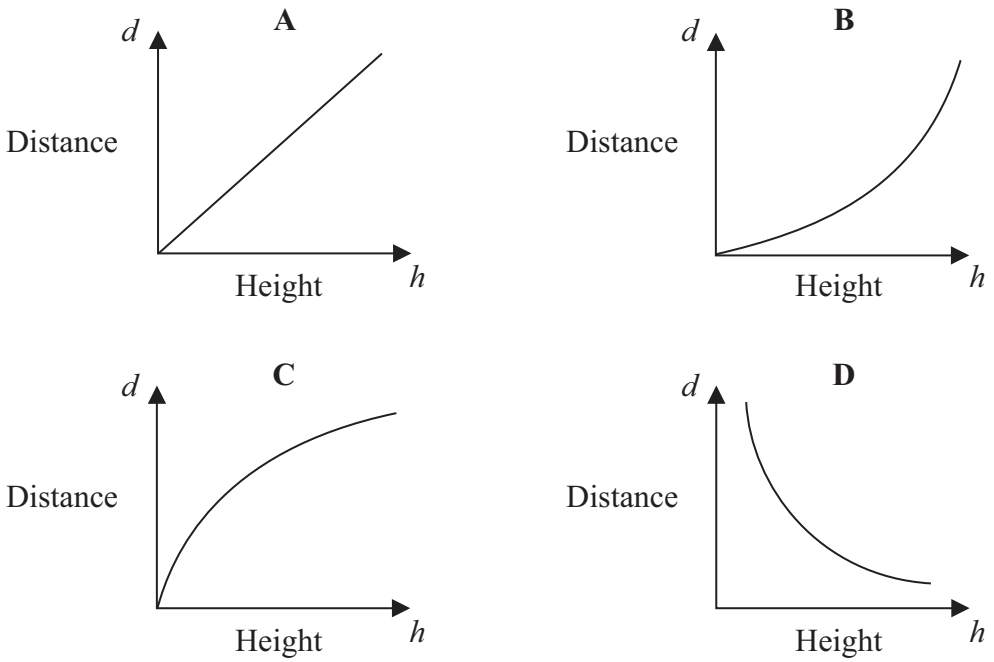
When Amir is 38 m above sea level, the distance to the horizon is 22 km.

(a) Work out the distance to the horizon when Amir is 25 m above sea level.

..... km

(3)

Here are four graphs.



(b) Write down the letter of the graph that best shows the relationship between the distance to the horizon and the height Amir is above sea level.

.....

(1)

(Total for Question 16 is 4 marks)

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***17** A car is driven through a tunnel in 89 seconds, correct to the nearest second.
The tunnel is 2460 m long, correct to the nearest 10 metres.

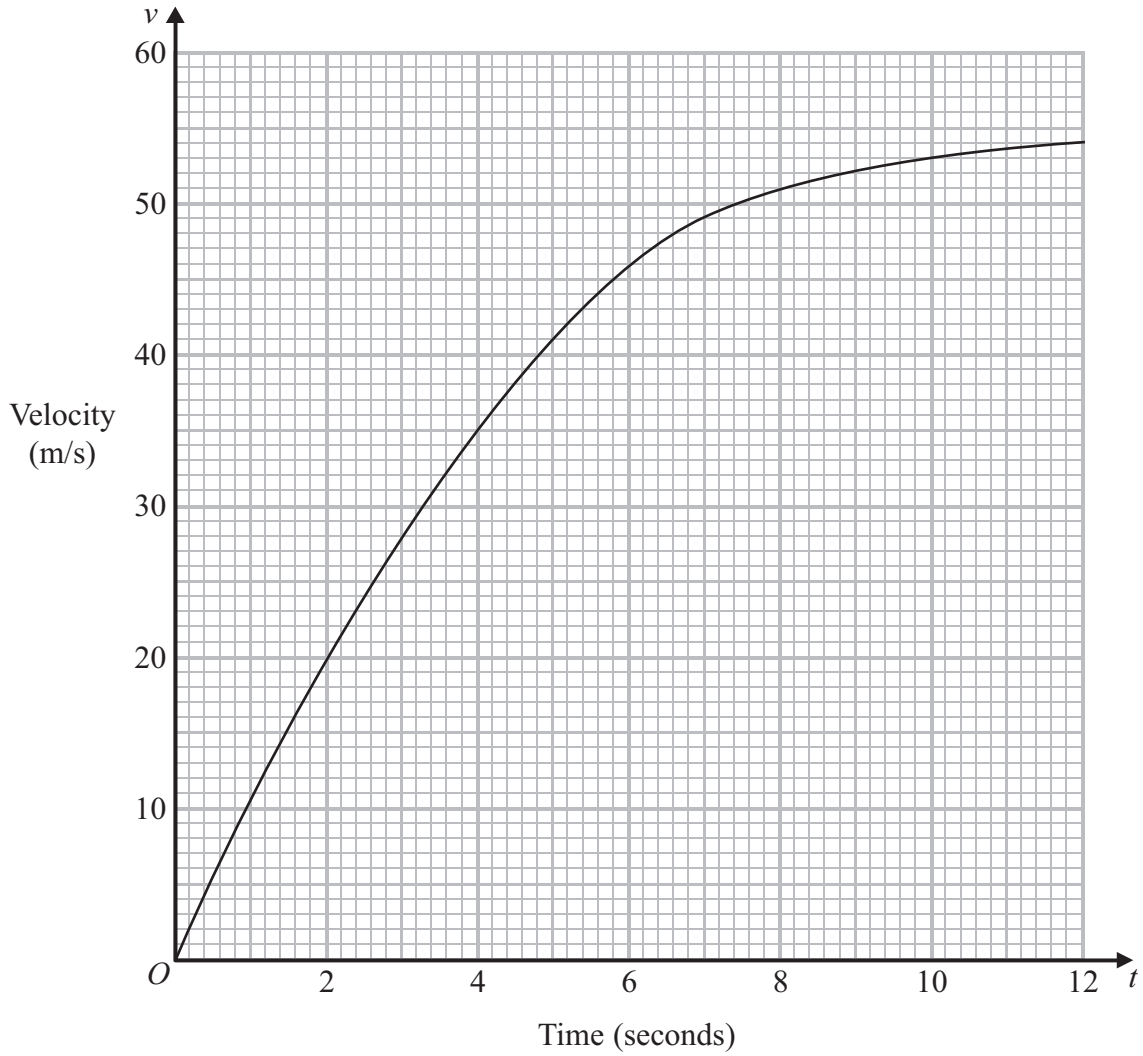
The average speed limit in the tunnel is 100 km/h.

Could the average speed of this car have been greater than 100 km/h?
You must show your working.

(Total for Question 17 is 4 marks)

18 A parachutist jumps out of a plane.

This graph shows information about the velocity, v m/s, of the parachutist t seconds after he jumped.



(a) Work out an estimate for the acceleration of the parachutist when $t = 8$

..... m/s^2

(3)

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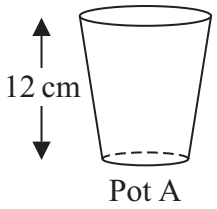
(b) Work out an estimate for the distance the parachutist falls in the first 6 seconds.

..... m

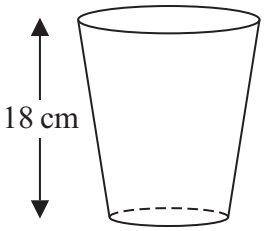
(3)

(Total for Question 18 is 6 marks)

19 Here are two plant pots.



Pot A



Pot B

Diagrams **NOT** accurately drawn

Pot A and pot B are mathematically similar.

Pot A has a height of 12 cm.
Pot B has a height of 18 cm.

Pot A has a volume of 1000 cm^3.

Work out the volume of pot B.

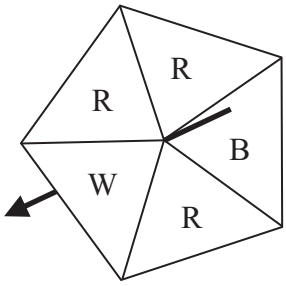
..... cm^3

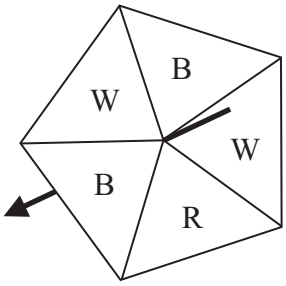
(Total for Question 19 is 3 marks)

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***20** Simon wants to raise money for charity.
He designs a game for people to play.

Simon uses two fair 5-sided spinners for the game.





People spin each spinner once.
A person wins the game when both spinners land on the same letter.

People pay 40p for each game they play.
The prize for a win is £1

Work out if Simon is likely to raise any money for charity with his game.

(Total for Question 20 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

Summer 2013

GCSE Mathematics Linked Pair Pilot
Application of Mathematics (2AM01)
Higher (Calculator) Paper 2H

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

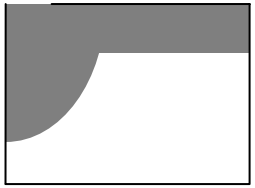
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		2pm	1	B1 for 2 (pm) (accept 2 o'clock in the afternoon or 14 00 but not 2 am or 0200)
	(b)		Graph completed	2	B1 for line from (2 pm, 2.5) to (3pm, 2.5) B1 for line from (t, 2.5) to (t + 45mins, 0)
	(c)		5	1	B1 for 5 or ft from graph in part (b)
*2			Not enough butter, enough sugar and enough flour	5	M1 for a correct method to find the total number of cookies required (= 50) M1 (dep) for "50" ÷ 20 (= 2.5) M1 (dep on M2) for 2.5 used as a factor A1 for two of: 562.5, 300, 687.5 or two of: 2.22… , 2.5, 3.636… or two of: 200, 120, 400 C1 (dep on M2) for 562.5g and 300g and 687.5g or for 2.22… and 2.5 and 3.636… or for 200g and 120g and 400g AND a correct decision for all three ingredients **OR** M1 for a correct method to find the total number of cookies required (= 50) M1 for a correct method to find the number of cookies one ingredient could produce M1 for correct method to find the number of cookies that ALL ingredients could produce A1 for two of: 44. … , 50 and 72. … C1 (dep on at least M2) for 44. .. cookies and 50 cookies and 72. … cookies AND a correct decision for all three ingredients

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
3			4100/30 000 or Chloe The larger the sample the better the estimate	2	B1 for identifying the trial that gives the best estimate, e.g. 4100/30 000 or Chloe B1 for the larger the sample the better the estimate oe
4	(a) (b)	 $6 \times 2 = 12$ $4 \times 2 + 0.5 \times 4 \times 1 = 10$ $12 + 12 + 10 + 10 = 44$ $44 \div 8 = 5.5$	Diagram 42.98	2 6	M1 for pentagon with at least two sides correct A1 cao M1 for a correct method to find the area of either a side (= 12) or an end (= 10) M1 for a correct method to find both the area of a side (= 12) and the area of an end (= 10) A1 for 44 or '12' and '12' and '10' and '10' M1 for an area $\div 8$ or for a correct method to work out how many m^2 can be painted from each tin M1 (dep on previous M1) for a correct method to find a cost of paint required for their number of litres to cover a total area of 4 faces A1 cao
5			40, 60, 100	3	M1 for $200 \div (2 + 3 + 5)$ M1 (dep) for $2 \times$ "20" or $3 \times$ "20" or $5 \times$ "20" A1 for 40, 60, 100 in any order

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*6			She cannot buy enough sand to fill the sandpit	5	M1 for a correct method to find the volume of the sandpit (= 192000) M1 (dep) for "192000" ÷ 10000 (= 19.2) M1 (dep on previous M1) for their number of bags × 2.99 A1 for 59.8(0) (20 bags) or 57.40(8) or 57.41 (19.2 bags) C1 (dep on at least M2) for comparing cost of sand needed (with units) with £50 **SC**: B1 for correct value(s) with units and correct statement if M0 scored **OR** M1 for a correct method to find the volume of the sandpit (= 192000) M1 for 50 ÷ 2.99 (= 16.722...) M1 (dep on previous M1) for "16" × 10000 A1 for 160000 (cm^3) C1 (dep on at least M2) for comparing volume of sand needed (with units) with volume that can be bought for £50 **SC**: B1 for correct value(s) with units and correct statement if M0 scored
7	(a)	$21 \times 90 = 1890$ $\sqrt{1890}$	43	2	M1 for $\sqrt{21 \times 90}$ or 1890 seen A1 for an answer in the range 43 – 43.5
	(b)	$50 = \sqrt{21 \times d}$ $2500 = 21d$ $d = 2500 \div 21$	119	3	M1 for $50 = \sqrt{21 \times d}$ oe or 50^2 M1 for $21d = 50^2$ oe A1 for an answer in the range 119 – 119.05

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8		B1 for arc of radius 3 cm (± 0.2)	Correct region 	4	B4 fully correct [B3 for fully correct shading of the area where people **can** leave boats] OR B1 for arc of radius 3 cm (± 0.2 cm) centre *A* B1 for a straight line parallel to ED and 1 cm (± 0.2 cm) from it B1 shading inside their arc or for shading above their line, provided that their line is drawn parallel to ED B1 fully correct Ignore any drawing outside the harbour
9	(a)	$\pi \times 50 \div 2 = 78.5398$ $50 + 50 + 80 + 55 + 55 + 78.5$	368.5	4	M1 for $\pi \times 50 \div 2$ oe M1 for $50 + 50 + 80 + 55 + 55$ oe (= 290) M1 for $50 + 50 + 80 + 55 + 55 + (50\pi$ or $25\pi)$ oe A1 for 368.5 – 369
	(b)	$\pi \times 25^2 \div 2 = 981.747$ $55 \times 50 = 2750$ $2750 + 981.747$	3731	3	M1 for $\pi \times 25^2 \div 2$ or $\pi \times 25^2$ oe M1 for 50×55 oe A1 for 3731 – 3732
10	(a)		0.1 on 1st branch 0.15 on 2nd branch	2	B1 for 0.1 on 1st branch B1 for 0.15 on 2nd branch
	(b)		7344	4	M3 for $0.9 \times 0.85 \times 9600$ (M2 for $0.9 \times 0.85 = 0.765$ or $0.9 \times 9600 = 8640$ or $0.85 \times 9600 = 8160$ M1 for 0.9×0.85 or 0.9×9600 or 0.85×9600) A1 cao

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)	$0.5 \times x \times 2x \times (x + 5) = 100$ $= x^2 \times (x + 5) = 100$	Proof shown	2	M1 for $0.5 \times x \times 2x \times (x + 5)$ (= 100) A1 fully correct, must include both $x^2 \times (x + 5)$ (= 100) and $x^3 + 5x^2 = 100$
	(b)	3 – 72 4 – 144 3.1 – 77.(841) 3.2 – 83.(96) 3.3 – 90.(387) 3.4 – 97.(104) 3.5 – 104.(125) 3.6 – 111.(456) 3.45 – 100.5(76125) 3.44 – 99.8(755) 3.43 – 99.0(78)	3.4	5	M1 any trial for positive x substituted into $x^3 + 5x^2$ B2 for trial $3.4 \leq x \leq 3.5$ (B1 for trial $3 \leq x \leq 4$) B1 for different trial $3.4 < x \leq 3.45$ B1 (dep on at least one previous B1) for 3.4 All trials must be evaluated correctly to at least the nearest whole number (rounded or truncated) for values of x correct to 1 dp and to at least 1 dp (rounded or truncated) for values of x correct to 2 dp
12			21.2	4	M1 for using Pythagoras with a right-angled triangle M1 for $16^2 - 12^2$ oe M1 for $\sqrt{16^2 - 12^2}$ oe A1 for 21.1 – 21.2 OR M1 for correct trig statement to find an angle M1 for another correct trig statement to find $AC/2$ M1 for a complete correct method to find AC A1 for 21.1 – 21.2

<table>
<tr><th colspan="4">PAPER: 5AM2H_01</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>13</td><td></td><td></td><td>75.9</td><td>5</td><td>M1 for correct statement to find AT or BT
using 95 with an appropriate trig ratio

A1 for AT = 79.7.or BT = 124. ...

M1 (dep on M1) for correct trig statement involving
BC and ‘AT’ or BC and ‘BT’ or AC and ‘AT’

M1 (dep on M2) for complete correct method

A1 for 75.9 – 75.95</td></tr>
<tr><td>14</td><td></td><td>$x + 4x > 2(x + 48)$
$5x > 2x + 96$
$3x > 96$
$x > 32$

OR

<table><tr><td>S</td><td>N</td><td>C</td><td>S+C</td><td>2N</td></tr><tr><td>10</td><td>58</td><td>40</td><td>50</td><td>116</td></tr><tr><td>20</td><td>68</td><td>80</td><td>100</td><td>136</td></tr><tr><td>30</td><td>78</td><td>120</td><td>140</td><td>156</td></tr><tr><td>32</td><td>80</td><td>128</td><td>160</td><td>160</td></tr><tr><td>33</td><td>81</td><td>132</td><td>165</td><td>162</td></tr></table></td><td>33</td><td>5</td><td>B1 for $x + 48$ (or $2x + 96$ oe) and $4x$
M1 for $x + 4x > 2(x + 48)$ oe
M1 for subtracting $2x$ from both sides
A1 for $3x > 96$ oe
A1 cao for 33

OR Trial and Improvement

B1 for 1 correct trial of S, N and C
M1 for an improved correct trial of S, N and C
M1 for a correct trial of 32
M1 for a correct trial of 33
A1 (dep on M2) for 33 cao

NB: Accept other letters instead of x
NB: an answer of 32 without working scores 0 marks</td></tr>
</table>

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
15	(a)		5.4	2	M1 for '10.4' – '5' with at least one correct A1 for 5.4
	(b)(i)		5	3	B1 cao
	(ii)		1.2		M1 for $\frac{'6'}{'5'}$ oe (any pair of values which differ by 1 week) or substitution of a correct pair of values in A = '5'a^t A1 for 1.15 – 1.25
	(c)	$0.5 = r^{10}$ $r = \sqrt[10]{0.5} = 0.933...$ $x = 100 - 0.933 \times 100$ OR $0.5 = 1 \times \left(\frac{100 - x}{100}\right)^{10}$ $\sqrt[10]{0.5} = \frac{100 - x}{100}$ $x = 100 - \sqrt[10]{0.5} \times 100$	6.7	3	M1 for $0.5 = r^{10}$ M1 for $r = \sqrt[10]{0.5}$, can be implied by 0.933(03299) seen A1 for 6.69 – 6.7 **OR** M1 for $0.5 = 1 \times \left(\frac{100 - x}{100}\right)^{10}$ M1 for $\sqrt[10]{0.5} = \frac{100 - x}{100}$ A1 for 6.69 – 6.7

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	$d = k\sqrt{h}$ $22 = k\sqrt{38}$ $k = 22 \div \sqrt{38} = 3.5688....$ $3.5688.... \times \sqrt{25} =$	17.8	3	M1 for $d = k\sqrt{h}$ oe M1 for $k = 22 \div \sqrt{38}$ oe A1 for 17.8 – 17.88
	(b)		C	1	B1 cao
*17		2465 ÷ 88.5 = 27.853107 27.74011299 ÷ 1000 × 3600 = 100.2711864	Yes, average speed could have been as high as 100.27	4	B1 for 88.5 or 2465 seen M1 for upper bound of 2460 ÷ lower bound of 89 M1 for "speed" ÷ 1000 and × 3600 oe C1 for Yes and 100.2(711864) or 100.3
18	(a)		1.5	3	B1 for tangent drawn at $t = 8$ M1 for height ÷ base for a triangle with the tangent as hypotenuse A1 for 1.25 to 1.75
	(b)		156	3	M1 for attempting to find area under curve M1 for correct method to find the area under the curve between $t = 0$ and $t = 6$ (at least 3 areas) A1 for 150 – 160

PAPER: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
19			3375	3	M1 for $18 \div 12$ (= 1.5) OR volume scale factor eg 2^3 3^3 eg $3^3 : 2^3$ eg 1.5^3 M1 for $1000 \times$ "1.5"^{3} A1 cao
*20		$\frac{3}{5} \times \frac{1}{5} + \frac{1}{5} \times \frac{2}{5} + \frac{1}{5} \times \frac{2}{5} = \frac{7}{25}$ oe $\frac{7}{25} \times$ £1 = 28p 40p > 28p OR e.g. 200 games 200×40p = £80 "$\frac{7}{25}$" $\times 200 \times$ £1 = £56 £80 > £56	Yes, with justification	5	M1 or $\frac{3}{5} \times \frac{1}{5}$ or $\frac{1}{5} \times \frac{2}{5}$ or $\frac{1}{5} \times \frac{2}{5}$ M1(dep) for $\frac{3}{5} \times \frac{1}{5} + \frac{1}{5} \times \frac{2}{5} + \frac{1}{5} \times \frac{2}{5}$ A1 for $\frac{7}{25}$ oe M1 for "$\frac{7}{25}$" $\times$ £1 OR "$\frac{7}{25}$" $\times n \times$ £1 **and** $n \times 40$p C1 f.t. (dep on M3) for correct conclusion with fully correct justification based on expected profit per game or expected profit for a particular number of games

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5º
Measurements of length: ±5 mm

PAPER: 5AM2H_01			
Question		**Modification**	**Notes**
Q01		*x* axis: 1.5 cm for 15 mins. *y*-axis: 1.5 cm for $\frac{1}{2}$ km.	Standard mark scheme.
Q04	(a)	Model of shed given as well as diagram. Part (a) four shapes given, drawn accurately. Correct answer is B. Look at the diagram for Question 4(a). There are four shapes. Which of the four shapes, A, B, C or D, shows the front elevation of the shed from direction F? (2 marks) Shape _____	Standard mark scheme.
Q04	(b)	Diagram given showing one end and one side of the shed.	Standard mark scheme.

PAPER: 5AM2H_01			
Question		**Modification**	**Notes**
Q6		Model and diagram provided.	
Q8		Diagram size x2 exactly. Scale kept the same but 30 m and 10 m changed to 60m and 20 m.	Allow 0.5 cm tolerance on lines and arcs rather than 0.2 cm tolerance in the scheme.
Q10	(a)	Decision tree diagram enlarged. Wording added: "There are two spaces to fill."	Standard mark scheme.
Q11		Model and diagram provided. x changed to y throughout.	Standard mark scheme.
Q12		A label 'horizontal ground' is inserted.	Standard mark scheme.
Q18		grid. x-axis: 1.5 cm for $\frac{1}{2}$. y-axis: 1.5 cm for 5	Standard mark scheme.

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Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Applications of Mathematics

Unit 2: Applications 2

For Approved Pilot Centres ONLY

Higher Tier

Thursday 8 November 2012 – Afternoon
Time: 1 hour 45 minutes

Paper Reference
5AM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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6/6/7/

P 4 0 6 5 7 A 0 1 2 8

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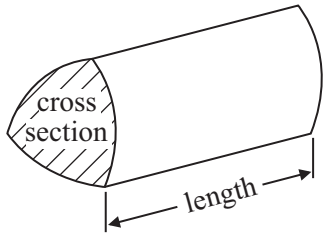
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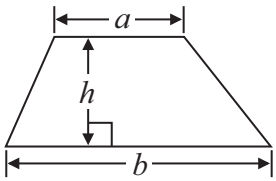
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

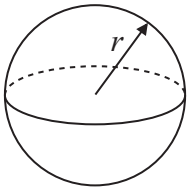


Area of trapezium = $\frac{1}{2}(a + b)h$



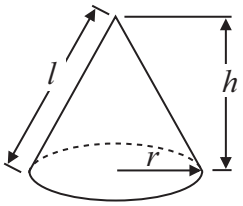
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

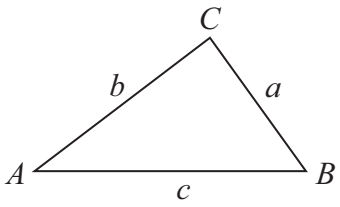


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



The Quadratic Equation
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

***1** The diagram shows the side view of a kitchen step ladder.

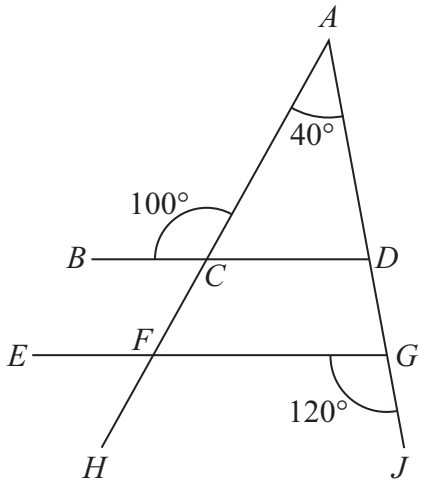


Diagram **NOT** accurately drawn

Brian says the straight lines *BCD* and *EFG* are parallel.

Is Brian correct?
You must show all your working.
Give reasons for your answer.

(Total for Question 1 is 3 marks)

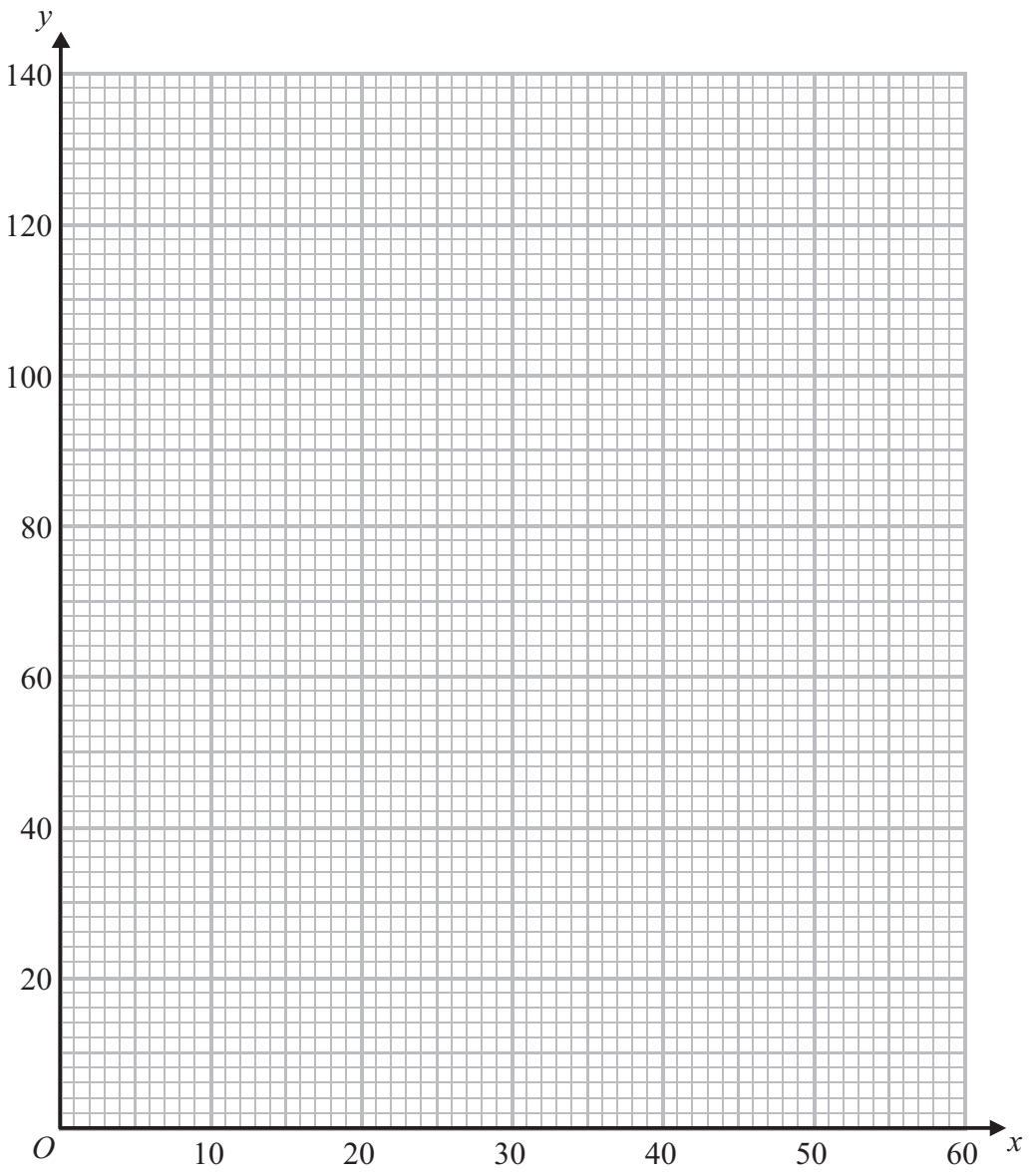
2 Jason sells shirts.
He needs to work out the selling price of the shirts.

He uses the formula

$$y = 2x + 10$$

where x is the cost price of a shirt in pounds (£)
and y is the selling price of a shirt in pounds (£)

(a) On the grid, draw a graph that shows the relationship between the selling price and the cost price of a shirt.



(3)

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Meg is Jason's business partner.
She wants to use a different formula to work out the selling price of the shirts.

Meg's formula is

$$y = x + 25$$

where x is the cost price of a shirt in pounds (£)
and y is the selling price of a shirt in pounds (£)

There is only one value of x when the two formulas give the same selling price.

(b) Find this value of x.

.....

(3)

(Total for Question 2 is 6 marks)

3 Here is a diagram of a house.

The house is in the shape of a prism.

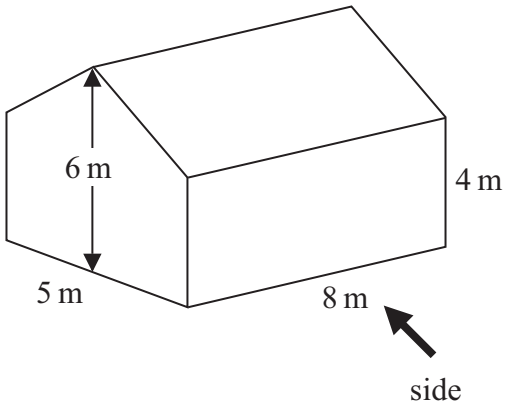
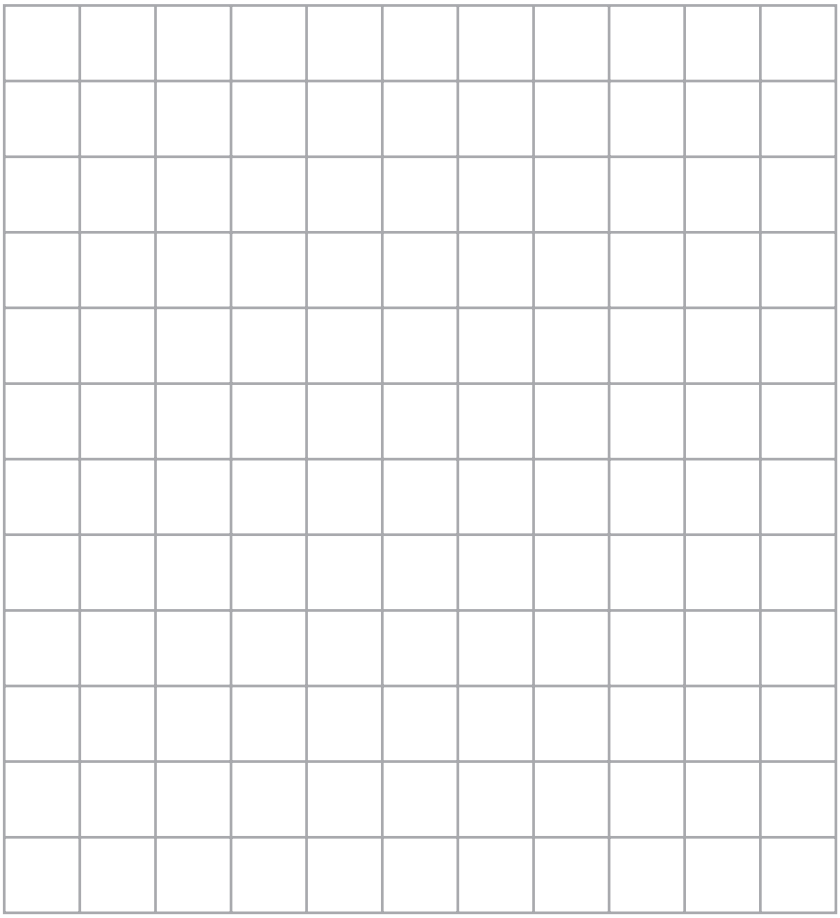


Diagram **NOT** accurately drawn

On the grid, draw accurately the side elevation of the house from the direction marked with the arrow.

Use the scale 1 cm represents 1 m.



(Total for Question 3 is 2 marks)

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4 There are only red pens and blue pens in a box.

There are 12 red pens in the box.

The probability of taking at random a blue pen from the box is $\frac{2}{3}$

Work out the total number of pens in the box.

.....

(Total for Question 4 is 3 marks)

5 Stefan is x years old.

Martin is 5 years younger than Stefan.
James is twice as old as Stefan.

The sum of their ages, in years, is less than 30

Work out the oldest age Stefan can be.
Give your answer as a whole number of years.

.....years

(Total for Question 5 is 4 marks)

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6 A compost bin is in the shape of a prism.

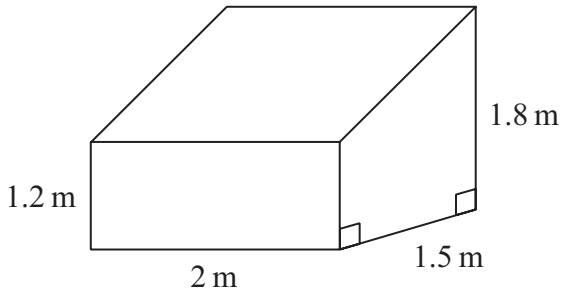


Diagram **NOT** accurately drawn

Work out the volume of the compost bin.

.....m^3

(Total for Question 6 is 4 marks)

7 There are 36 small rulers in a packet.

There are 24 large rulers in a box.

A shopkeeper needs to work out the total number of rulers, T, in x packets and y boxes.

Write down a formula for T in terms of x and y.

.....

(Total for Question 7 is 3 marks)

8 Here is the side view of a sandwich carton.

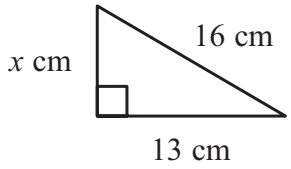


Diagram **NOT** accurately drawn

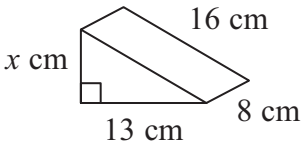
(a) Work out the value of x.
Give your answer correct to 3 significant figures.

.....

(3)

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The diagram shows the same sandwich carton.
It is in the shape of a triangular prism.
The diagram also shows a box in the shape of a cuboid.



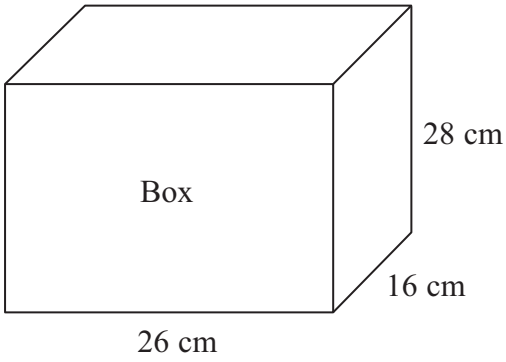


Diagram **NOT** accurately drawn

Nina has to fill the box with sandwich cartons.

(b) Work out the greatest number of sandwich cartons she can put in the box.

.....

(3)

(Total for Question 8 is 6 marks)

9 The diagram shows a doorstop.

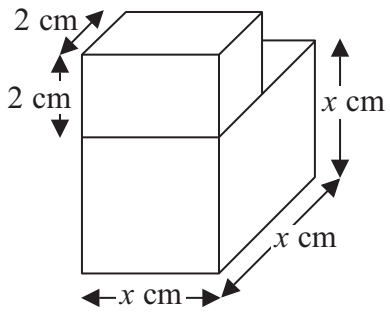


Diagram **NOT** accurately drawn

The volume, V cm^3, of the doorstop is given by the formula

$$V = x(x^2 + 4)$$

Use a trial and improvement method to find the value of x when $V = 100$
Give your answer correct to one decimal place.
You must show **ALL** your working.

$x =$.....

(Total for Question 9 is 4 marks)

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10 Here is a barrel.

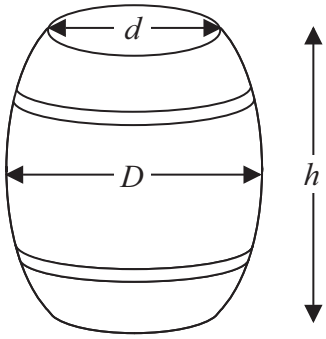


Diagram **NOT** accurately drawn

The volume, V m^3, of the barrel is given by the formula

$$V = \frac{2hD^2 + hd^2}{4}$$

$d = 0.4$ metres
$D = 1.25d$
$h = 1.5d$

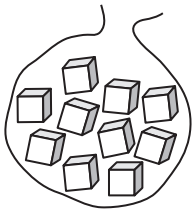
Work out the volume of the barrel.

.....metres^3

(Total for Question 10 is 4 marks)

11 Raj has a bag of cubes.
There are 3 red cubes, 1 green cube, 3 blue cubes, 2 white cubes and 1 yellow cube in the bag.

Raj takes at random a cube from the bag.
He then puts the cube back into the bag.
Raj does this 50 times.

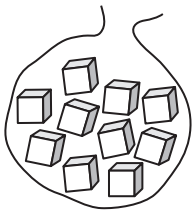


(a) Work out an estimate for the number of times Raj will take a red cube from the bag.

.....

(2)

Raj's school is raising money for charity.
Raj uses his bag of cubes for a game.



Each person pays 10p to play the game.

Each person takes at random a cube from the bag.
Raj looks at the colour of the cube.
He then puts the cube back in the bag.

Each person gets the prize value of that colour shown in the table.

Colour	red	green	blue	white	yellow
Prize value	20p	10p	5p	2p	1p

*(b) Is Raj likely to raise any money for charity with his game?
You must explain your answer.

(3)

(Total for Question 11 is 5 marks)

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12 A baker makes jam rolls.

The baker uses flour, butter and jam in the ratio 8 : 4 : 5 to make jam rolls.

The table shows the cost per kilogram of some of these ingredients.

Cost per kilogram	
Flour	40p
Butter	£2.50
Jam	£1.00

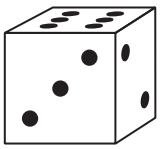
The total weight of the flour, butter and jam for each jam roll is 425 g.

Work out the cost of these ingredients for 200 jam rolls.

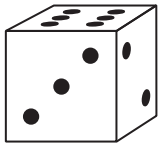
£.....

(Total for Question 12 is 6 marks)

13 Naomi is playing a board game.
She must throw two fair dice.



She must get a 6 on each dice to start the game.



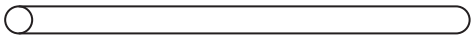
Work out the probability that she will **not** start the game on her first throw.

.....

(Total for Question 13 is 3 marks)

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14 A steel rod has a density of 7.6 g per cm^3.
The rod has a mass of 200 g.



steel rod

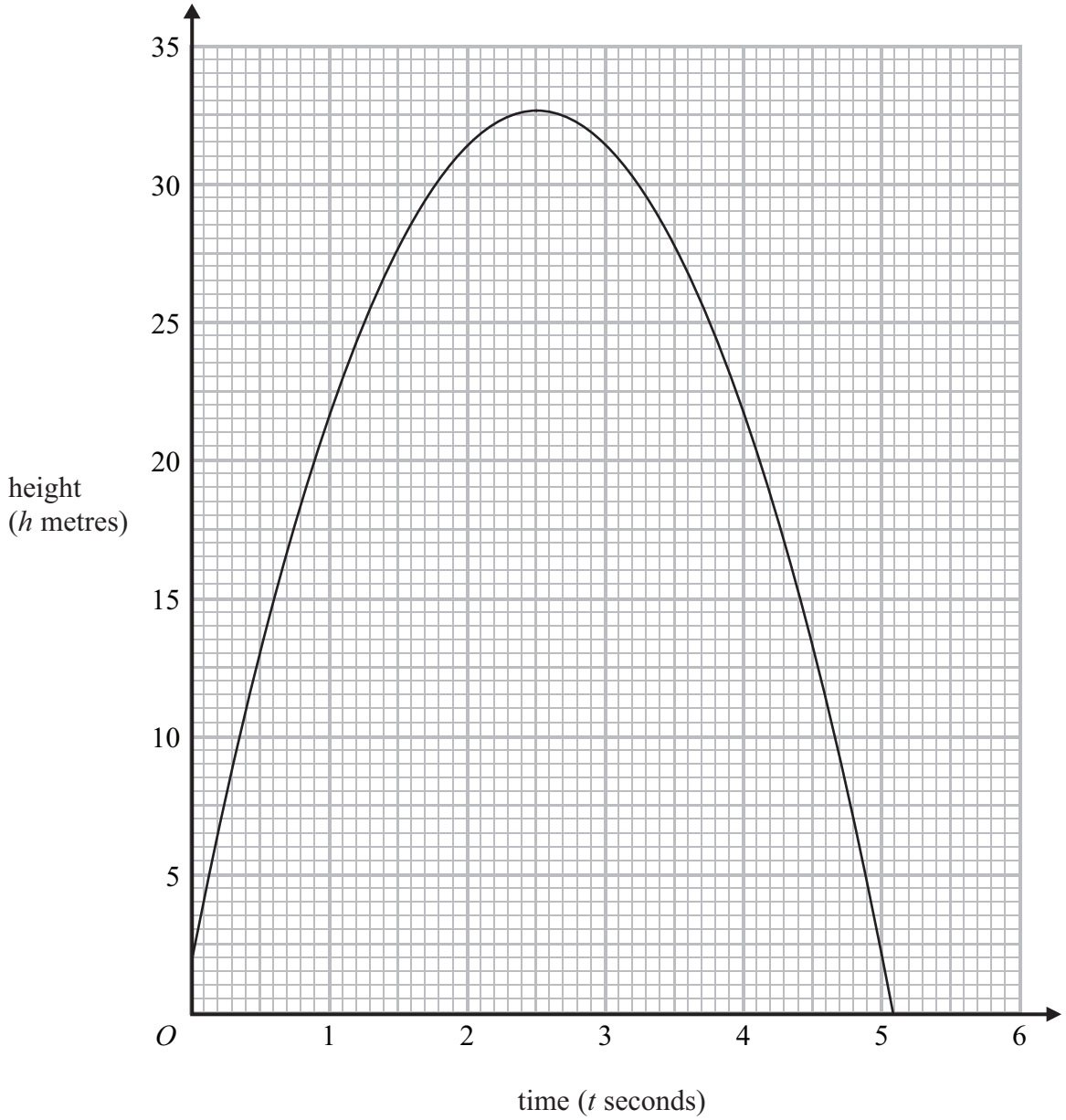
Work out the volume of the rod.
Give your answer correct to 3 significant figures.

.....

(Total for Question 14 is 3 marks)

15 Silas throws a ball vertically upwards.

The graph shows the height, h metres, of the ball above the ground, t seconds after Silas throws the ball.



(a) Write down the maximum height of the ball above the ground.

.....m

(1)

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(b) After how many seconds is the ball at a height of 18 metres above the ground?

.....

(2)

(c) Work out an estimate for the speed of the ball 2 seconds after Silas throws it.

.....m/s

(3)

(Total for Question 15 is 6 marks)

16 PQR is the side of a vertical building.

AB is a ramp.
AP is horizontal ground.
BQ is a horizontal path.

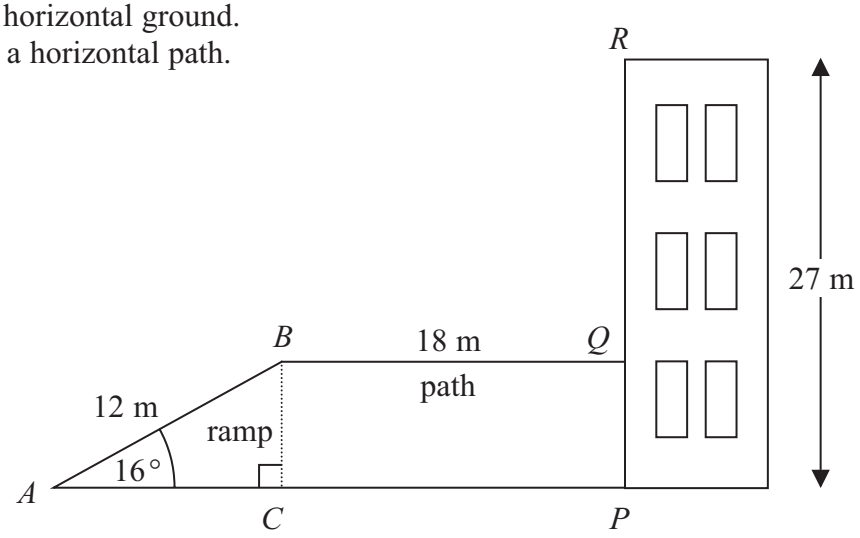


Diagram **NOT** accurately drawn

The building has a height of 27 m.
The ramp AB is at an angle of 16° to the horizontal ground.
The ramp has a length of 12 m.
The path has a length of 18 m.

(a) Work out the height of the ramp.
Give your answer correct to 3 significant figures.

.....m
(3)

(b) Calculate the angle of elevation of the top of the building, R, from the top of the ramp, B.
Give your answer correct to 3 significant figures.

.....°
(3)

(Total for Question 16 is 6 marks)

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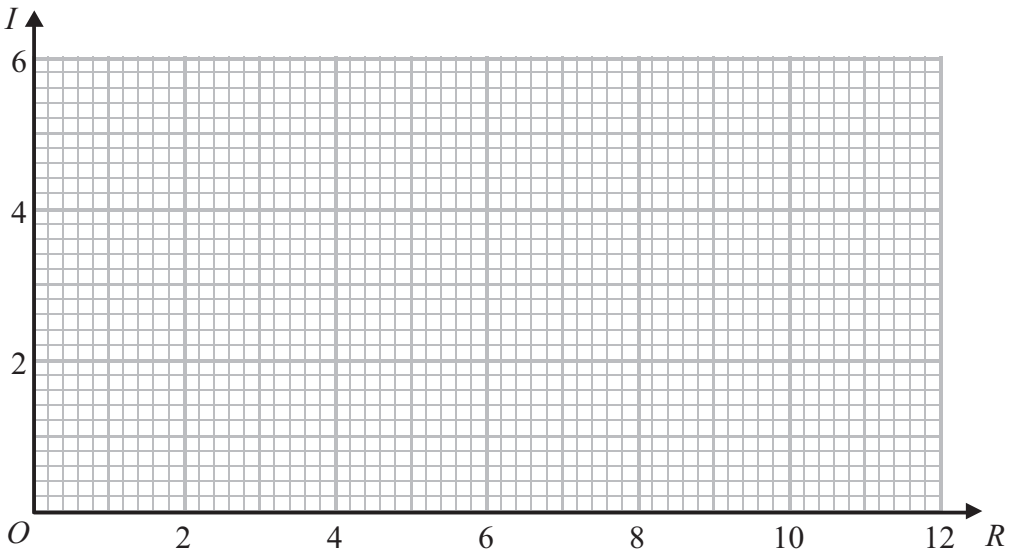
17 Jake uses the formula $I = \frac{12}{R}$ in his science lesson.

(a) Complete the table of values for $I = \frac{12}{R}$

R	2	4	6	8	10	12
I	6		2		1.2	

(2)

(b) On the grid, draw the graph of $I = \frac{12}{R}$



(2)

(Total for Question 17 is 4 marks)

18 Ben sells 30 raffle tickets.

7 of the tickets are pink.
13 of the tickets are yellow.
The rest of the tickets are blue.

Ben puts the 30 tickets in a bag.
Sophie takes at random 2 tickets from the bag.

Work out the probability that the 2 tickets are different colours.

.....

(Total for Question 18 is 5 marks)

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19 The diagram shows a windscreen wiper on a car.
It also shows the area of the windscreen the wiper cleans.

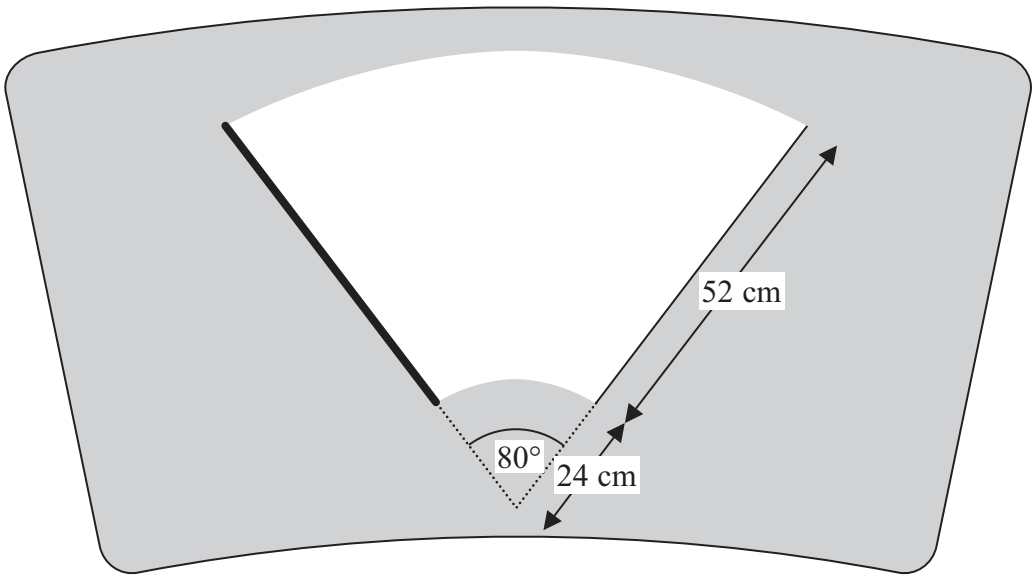


Diagram **NOT** accurately drawn

Work out the area of the windscreen the wiper cleans.
Give your answer correct to 3 significant figures.

.....cm^2

(Total for Question 19 is 4 marks)

***20** The diagram shows Diana's suitcase.
The suitcase is in the shape of a cuboid.

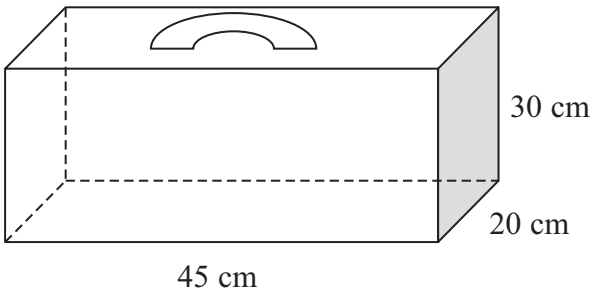


Diagram **NOT** accurately drawn

Diana has a walking stick that folds.
The folded walking stick has a length of 60 cm.

Diana wants to put the folded walking stick in the suitcase.

Will the folded walking stick fit in the suitcase?

(Total for Question 20 is 4 marks)

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21 The time, t seconds, it takes a pendulum to swing from its start position and back to its start position is directly proportional to the square root of its length, L cm.

A pendulum with a length of 100 cm takes 2 seconds to swing from its start position and back to its start position.

A different pendulum has a length of 64 cm.

How many seconds will it take this pendulum to swing from its start position and back to its start position?

.....seconds

(Total for Question 21 is 4 marks)

22 Pietro cycled to work.

His average speed was 6.0 m/s correct to 1 decimal place.
It took him 15 minutes correct to the nearest minute.

(a) Calculate the lower bound of the distance Pietro cycled to work.
Give your answer in kilometres.

.....km

(3)

Pietro took a different route home from work.

He cycled a distance of 4.6 km correct to 1 decimal place.
It took him 17 minutes correct to the nearest minute.

(b) Calculate the upper bound of Pietro's average speed for his journey home from work.
Give your answer in m/s.

.....m/s

(3)

(Total for Question 22 is 6 marks)

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23 At the beginning of December 2010 there were 8400 bees in a beehive.
The number of bees in the beehive increases by 7% each year.

In which year will there be at least 15 000 bees in the beehive?

.....

(Total for Question 23 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

November 2012

GCSE Mathematics Linked Pair Pilot
Application of Mathematics (2AM01)
Higher (Calculator) Paper 2H

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g. 3.5 – 4.2) then this is inclusive of the end points (e.g. 3.5, 4.2) and includes all numbers within the range (e.g. 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

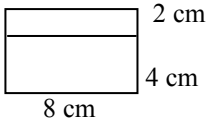
5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1 **QWC**		eg $<DGF = 60$ (line = 180) $<AFG = 80$ ($<$s in Δ AFG) $<EFC = 100 = <BCA$ (corresponding angles) eg $<DGF = 60$ (line = 180) $<AFG = 80$ ($<$s in Δ AFG) $<DCF = 100$ (opposite $<$s) (co-interior $<$s sum to 180)	Yes with reasons	3	B1 for at least two correct angles given or marked on the diagram C1 for any one reason given from angles on a line = 180 angles in a triangle = 180 vertically opposite angles are equal angles in a quadrilateral add to 360 exterior angle of a triangle = sum of interior opposite angles C1 for Yes with clearly identified angles with fully correct reasons that define the parallel lines e.g. identified alternate angles equal, identified corresponding angles equal , identified allied or co-interior angles sum to 180

<table>
<tr><th colspan="5">5AM2H_01</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>2</td><td>(a)</td><td>$y = 2x + 10$

<table><tr><td>x</td><td>y</td></tr><tr><td>10</td><td>30</td></tr><tr><td>20</td><td>50</td></tr><tr><td>30</td><td>70</td></tr><tr><td>40</td><td>90</td></tr><tr><td>50</td><td>110</td></tr><tr><td>60</td><td>130</td></tr></table></td><td>Line</td><td>3</td><td>TABLE OF VALUES
M1 for at least 2 correct attempts to find points by substituting values of x
M1 ft for plotting at least 2 points (any points plotted from their table must be correct)
A1 for correct straight line between $x = 10$ and $x = 50$ (accept dotted line or complete line)

NO TABLE OF VALUES
M2 for at least 2 correct points (and no incorrect points) plotted
OR line segment of $2x + 10$ drawn (ignore any additional incorrect segments)
(M1 for at least 3 correct points with no more than 2 incorrect points)
A1 for correct straight line between $x = 10$ and $x = 50$ (accept dotted line or complete line)

USE OF $y = mx + c$
M1 for line drawn with gradient of 2
M1 for line drawn with a y intercept of 10
A1 for correct straight line between $x = 10$ and $x = 50$ (accept dotted line or complete line)</td></tr>
</table>

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
2	(b)	$y = x + 25$ x | 0 | 10 | 20 | 30 y | 25 | 35 | 45 | 55 **OR** $2x + 10 = x + 25$ $2x - x = 25 - 10$	15	3	**Draw Line** M2 draw $y = x + 25$ between $x = 10$ and $x = 30$ (M1 for at least 2 correct attempts to find points and plotting them correctly or Line through (0, 25) with positive gradient) A1 (dep on M1) ft for '15' **OR Table of values** M1 trials at least 3 values in $y = x + 25$ M1 for an attempt at interpolation between $x = 10$ and $x = 20$ A1 cao **OR Algebraic Method** M1 for $2x + 10 = x + 25$ M1 for $2x - x = 25 - 10$ A1 cao
3			side elevation	2	B2 for 8 cm by 6 cm side elevation with horizontal line at ht 4 cm (B1 for any rectangle base 8 cm or height 6 cm)

<table>
<tr><th colspan="6">5AM2H_01</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>4</td><td></td><td>12 are red.
$\frac{1}{3}$ are red
$12 \times 3 =$

OR
2 blue for 1 red
24 blue for 12 red
$24 + 12 =$</td><td>36</td><td>3</td><td>M1 for P(red) = $\frac{1}{3}$
M1 for $\frac{1}{3} \times 36 = 12$ red or 12×3
A1 for 36 cao

OR
M1 for 2 blue for 1 red
M1 for 24 blue for 12 red or $24 + 12$
A1 for 36 cao</td></tr>
<tr><td>5</td><td></td><td>$x + x - 5 + 2x < 30$
$x + x + 2x < 30 + 5$
$4x < 35$
$x < 35 \div 4$

OR<table><tr><td>S</td><td>10</td><td>9</td><td>8</td></tr><tr><td>M</td><td>5</td><td>4</td><td>3</td></tr><tr><td>J</td><td>20</td><td>18</td><td>16</td></tr><tr><td>Sum</td><td>35</td><td>31</td><td>27</td></tr><tr><td></td><td>no</td><td>no</td><td>yes</td></tr></table></td><td>8</td><td>4</td><td>M1 for $x - 5$ for Martin or $2x$ for James
M1 (dep on M1) for $x +$ '$x - 5$' + '$2x$' $<$ 30 (or = 30)
M1 (dep on M2) for complete correct method to solve their equality or inequality or 8.75 oe seen
A1 cao

OR for trial and improvement method
M1 for $x - 5$ for Martin or $2x$ for James (can be implied by 1 correct trial)
M1 for 3 trials with correct ages (totals not needed) or 2 trials with correct ages and totals
M1 for a trial total < 30 and a trial total > 30 or 8, 3, 16 identified as answer
A1 cao</td></tr>
</table>

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6		Area cross section is $\frac{1}{2}(1.2 + 1.8) \times 1.5$ $= 1.5 \times 1.5 \quad = 2.25$ OR $1.5 \times 1.2 + \frac{1}{2}\ 1.5 \times (1.8 - 1.2)$ $1.8 + 0.45 = 2.25$ OR $1.5 \times 1.8 - \frac{1}{2}\ 1.5 \times (1.8 - 1.2)$ $2.7 - 0.45 = 2.25$ Volume $= 2.25 \times 2 =$ **OR** Cuboid volume is $1.2 \times 2 \times 1.5 = 3.6$ Triangular prism volume is $\frac{1}{2} \times 1.5 \times (1.8 - 1.2) \times 2 = 0.9$ $3.6 + 0.9$ **OR** Outer cuboid volume is $2 \times 1.5 \times 1.8 = 5.4$ Triangular prism volume is $\frac{1}{2} \times 1.5 \times (1.8 - 1.2) \times 2 = 0.9$ $5.4 - 0.9$	4.5	4	**Volume from Area of cross section × length** M2 for $\frac{1}{2}(1.2 + 1.8) \times 1.5$ oe or $1.5 \times 1.2 + \frac{1}{2}\ 1.5 \times (1.8 - 1.2)$ or $1.5 \times 1.8 - \frac{1}{2}\ 1.5 \times (1.8 - 1.2)$ or 2.25 given as cross sectional area (M1 for $(1.2 + 1.8) \times 1.5$ or $1.5 \times 1.2 + 1.5 \times (1.8 - 1.2)$ or $1.5 \times 1.8 - 1.5 \times (1.8 - 1.2)$) M1 for "2.25" × 2 A1cao **SC**: B2 for answer of 9 if this method is used **OR Volume from cuboid volume + triangular prism volume** M1 for $1.2 \times 2 \times 1.5$ or 3.6 given as volume of cuboid M1 for $\frac{1}{2} \times 1.5 \times (1.8 - 1.2) \times 2$ or 0.9 given as volume of triangular prism M1 for "3.6" + "0.9" where "3.6" and "0.9" are volumes A1cao **SC**: B2 for answer of 5.4 if this method is used **OR Volume from cuboid volume − triangular prism volume** M1 for $2 \times 1.5 \times 1.8$ or 5.4 given as volume of outer cuboid M1 for $\frac{1}{2} \times 1.5 \times (1.8 - 1.2) \times 2$ or 0.9 given as volume of triangular prism M1 for "5.4" − "0.9" where "5.4" and "0.9" are both volumes A1 cao **SC**: B2 for answer of 3.6 if this method is used

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7			$T = 36x + 24y$	3	B3 for $T = 36x + 24y$ oe (B2 for $36x + 24y$ or $T = Ax + By$ with A and B > 1) (B1 for T = an expression in x and/or y eg $T = x + y$ or $36x$ or $24y$ seen)
8	(a)	$16^2 - 13^2 = 256 - 169 = 87$ $\sqrt{87} = 9.327379...$	9.33	3	M1 for $16^2 - 13^2$ (= 87) M1 for $\sqrt{'87'}$ A1 for 9.327...
	(b)	$28 \div \sqrt{87} = 3$ $16 \div 8 = 2$ $26 \div 13 = 2$ $3 \times 2 \times 2 \times 2$ **OR** Big V = $26 \times 16 \times 28 = 11648$ Small V = $\frac{1}{2} \times 13 \times 8 \times \sqrt{87} = 485.0237...$ $11648 \div 485.0237... = 24.01532...$	24	3	M1 for two of $16 \div 8$ $26 \div 13$ $28 \div$ 'x' or '3' $\times 2 \times 2$ M1 for ('3' $\times$ '2' $\times$ '2') $\times 2$ A1 cao **OR** M2 for $26 \times 16 \times 28 \div \frac{1}{2} \times 13 \times 8 \times \sqrt{'87'}$ (M1 for $26 \times 16 \times 28$ or 11648 or $\frac{1}{2} \times 13 \times 8 \times \sqrt{'87'}$ or 485. ...) A1 cao

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	Notes
9		$4 \rightarrow 80$ $5 \rightarrow 145$ $4.5 \rightarrow 109.125$ $4.4 \rightarrow 102.784$ $4.3 \rightarrow 96.707$ $4.35 \rightarrow 99.712...$	4.4	4	B2 for a trial between 4 and 5 exclusive (B1 for any correct trial $x \neq 0$) B1 for a different trial between 4.3 and 4.4 exclusive B1 (dep on at least one previous B1) for 4.4 only **NB** Trials where x has 1 dp or more should be rounded or truncated to at least 3 s.f.
10		$D = 1.25 \times 0.4 \quad = 0.5$ $h = 1.5 \times 0.4 \quad = 0.6$ $V = [2(0.6)(0.5)^2 - 0.6(0.4)^2] \div 4$ $= [0.3 + 0.096] \div 4$ **OR** $V = \frac{2(1.5d)(1.25d)^2 + (1.5d)d^2}{4}$ $= [4.6875d^3 + 1.5d^3] \div 4$ $= 6.1875d^3 \div 4$ $= 1.546875 \times 0.4^3 \div 4$	0.099	4	M3 for $\{ 2(1.5\times0.4)(1.25 \times 0.4)^2 + (1.5 \times 0.4)\,0.4^2 \} \div 4$ (M2 for $2(1.5 \times 0.4)(1.25 \times 0.4)^2$ or 0.3 or $(1.5 \times 0.4)\,0.4^2$ or 0.096 or 0.396) (M1 for $h = 1.5 \times 0.4$ or 0.6 or $D = 1.25 \times 0.4$ or 0.5) A1 cao (accept 99000 cm^3 with m^3 crossed out) **OR** M2 for ['$2(1.5d)(1.25d)^2$' + '$(1.5d)\,d^2$'] ÷ 4 (M1 for $2(1.5d)(1.25d)^2$ or $(1.5d)\,d^2$) M1 dep on M1 for substituting $d = 0.4$ eg 1.25×0.4 or 0.5 or 1.5×0.4 or 0.6 A1 cao (accept 99000 cm^3 with m^3 crossed out)

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	Notes
*11	(a)	$3 + 1 + 3 + 2 + 1 = 10$ $3 \div 10 \times 50$	15	2	M1 for $\frac{3}{'3+1+3+2+1'} \times 50$ oe or $\frac{3}{10}$ oe A1 cao
	(b)	$3\times20 + 10 + 3\times5 + 2\times2 + 1$ = 90p $90 \div 10 = 9$p 9p < 10p **OR** Loses 10p + 10p + 10p = 30p Gains 5p+5p+5p+8p+8p+9p = 40p 30p < 40p **OR** In : 50 people = 500p Out: $\frac{3}{10}\times50\times20 + \frac{1}{10}\times50\times10 + \frac{3}{10}\times50\times5$ $+\frac{2}{10}\times50\times2 + \frac{1}{10}\times50\times1$ = 300 + 50 + 75 + 20 + 5 = 450p 450p < 500p **OR** In: 10 people = 10 × 10p = 100p Out: each prize happens once $= 3\times20 + 10 + 3\times5 + 2\times2 + 1$ = 90p 90p < 100p	Yes reason	3	M1 for $f\times$ prize value oe (at least 3 correct) M1 for $\sum$ ($f\times$ prize value) ÷ 10 (= 9) C1 for Yes with a reason from correct calculations eg 9p < 10p **OR** M1 for $f\times$ (prize value – 10) oe (at least 3 correct) M1 for $\sum$ [$f\times$ (prize value − 10)] ÷ 10 (= 10) C1 for Yes with a reason from correct calculations eg makes 10p every 10 goes; eg 30p < 40p **OR** M1 for $\frac{f}{10}\times 50\times$ prize value for *out* (at least 3 correct) M1 for $\sum$ ($\frac{f}{10}\times 50\times$ prize value) (= 450 or 4.5) C1 for Yes with a reason from correct calculations eg 450p < 500p **OR** M1 for $f\times$ prize value oe (at least 3 correct) M1 for $\sum$ ($f\times$ prize value) (= 90) C1 for Yes with a reason from correct calculations eg 90p < 100p

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
12		425 ÷ 17 = 25 Flour : 8 × 25 = 200g Butter : 4 × 25 = 100g Jam : 5 × 25 = 125g Total weight for 200 rolls: = total grams × 200 ÷ 1000 Flour: 200 × 0.2 = 40 kg Butter : 100 × 0.2 = 20 kg Jam : 125 × 0.2 = 25 kg Total cost = 40 × 40p + 20 × £2.50 + 25 × £1 = £16 + £50 + £25 **OR** 200 × 425 (= 85000g = 85kg) 85 ÷ 17 = 5 Flour : 8 × 5 = 40 kg Butter : 4 × 5 = 20 kg Jam : 5 × 5 = 25 kg Total cost = 40 × 40p + 20 × £2.50 + 25 × £1 = £16 + £50 + £25	91	6	M1 for 425 ÷ '8+4+5' or 25 seen M1 for two of 8 × 25 (=200,) 4 × 25 (=100), 5 × 25 (=125) M1 for two of '200' × 200 (= 40 000), '100' × 200 (= 20 000) '125'× 200 (= 25 000) M1 for converting g to kg (at least two ingredients) (= 40, 20, 25) M1 for '40' × 40p + ' 20' × £2.50 + ' 25' × £1 (= £16 + £50 + £25) A1 for 91 or 91.00 **OR** M1 for 200 × 425 = 85000 (g) M1 for converting g to kg (eg 425 ÷ 1000 or 85000 ÷ 1000) M1 for 85 ÷ '8 + 4 + 5' M1 for two of 8 × '5' (= 40) 4 × '5' (= 20) 5 × '5' (= 25) M1 for '40' × 40p + '20' × £2.50 + '25' × £1 (= £16 + £50 + £25) A1 for 91 or 91.00

5AM2H_01

<table>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>13</td><td></td><td>$\frac{1}{6}\times\frac{1}{6}=\frac{1}{36}$
$1-\frac{1}{36}$

OR
$\frac{1}{6}\times\frac{5}{6}+\frac{5}{6}\times\frac{1}{6}+\frac{5}{6}\times\frac{5}{6}$
$=\frac{5+5+25}{36}$
OR
<table>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>1</td><td>1,1</td><td>1,2</td><td>1,3</td><td>1,4</td><td>1,5</td><td>1,6</td></tr>
<tr><td>2</td><td>2,1</td><td>2,2</td><td>2,3</td><td>2,4</td><td>2,5</td><td>2,6</td></tr>
<tr><td>3</td><td>3,1</td><td>3,2</td><td>3,3</td><td>3,4</td><td>3,5</td><td>3,6</td></tr>
<tr><td>4</td><td>4,1</td><td>4,2</td><td>4,3</td><td>4,4</td><td>4,5</td><td>4,6</td></tr>
<tr><td>5</td><td>5,1</td><td>5,2</td><td>5,3</td><td>5,4</td><td>5,5</td><td>5,6</td></tr>
<tr><td>6</td><td>6,1</td><td>6,2</td><td>6,3</td><td>6,4</td><td>6,5</td><td>6,6</td></tr>
</table></td><td>$\frac{35}{36}$</td><td>3</td><td>M1 for $\frac{1}{6}\times\frac{1}{6}$ oe
M1 for $1-$ ‘$\frac{1}{6}\times\frac{1}{6}$’ oe
A1 for $\frac{35}{36}$ or 0.97(2222...) oe
OR
M1 for $\frac{1}{6}\times\frac{5}{6}$ or $\frac{5}{6}\times\frac{1}{6}$ or $\frac{5}{6}\times\frac{5}{6}$ oe
M1 for ‘$\frac{1}{6}\times\frac{5}{6}$’ + ‘$\frac{5}{6}\times\frac{1}{6}$’ + ‘$\frac{5}{6}\times\frac{5}{6}$’ oe
A1 for $\frac{35}{36}$ or 0.97(2222...) oe
OR
M1 for probability space oe that can lead to the answer
M1 for $1-\frac{\text{'number of 6,6'}}{36}$ or $\frac{\text{'number of non 6,6'}}{36}$
A1 for $\frac{35}{36}$ or 0.97(2222...) oe</td></tr>
<tr><td>14</td><td></td><td>200 ÷ 7.6
= 26.31578</td><td>26.3

cm^3</td><td>3</td><td>M1 for 200 ÷ 7.6
A1 for 26.3 or better
B1 (indep) for cm^3</td></tr>
</table>

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
15	(a)		32 – 33	1	B1 for 32 – 33
	(b)		0.7 – 0.9 4.1 – 4.4	2	B2 for 0.7 − 0.9 **and** 4.1 – 4.4 (B1 for 0.7 − 0.9 or 4.1 – 4.4) OR 0.7 − 0.9 **and** 4.1 – 4.4 seen)
	(c)		4.9	3	M1 for tangent drawn at $t = 2$ M1 for $\frac{'y'}{'x'}$ A1 for 4.5 to 5.3 or f.t. from 'tangent' (dep on 1st M1)
16	(a)	sin 16° = $BC \div 12$ BC = 12 sin 16° = 3.307648	3.31	3	M1 for sin 16 = $BC \div 12$ oe M1 for 12 sin 16 oe A1 for 3.30 – 3.31 **SC:** Award B2 for an answer of ± 3.45... or 2.98...
	(b)	RQ = 27 – 3.307648 = 23.6923 tan RBQ = 23.6923 ÷ 18 = 1.31623 < QBR = inv tan 1.31623 = 52.7746	52.8	3	M1 for tan RBQ = (27 – '3.307648') ÷ 18 or tan BRQ = 18 ÷ (27 – '3.307648') M1 for inv tan '27 – 3.307648' ÷ 18' or inv tan BRQ = 18 ÷ (27 – '3.307648') A1 for 52.7 – 52.8 **SC**: Award B2 for angle BRQ = 37.2 – 37.3 **SC:** Award B2 for an answer of 0.918... or 59.05... or 59.1

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
17	(a)	<table><tr><td>***R***</td><td>2</td><td>4</td><td>6</td><td>8</td><td>10</td><td>12</td></tr><tr><td>***I***</td><td>6</td><td>**3**</td><td>2</td><td>**1.5**</td><td>1.2</td><td>**1**</td></tr></table>	3, 1.5, 1	2	B2 for all 3 correct (B1 for 1 or 2 correct)
	(b)		graph $I = \frac{12}{R}$	2	B2 for fully correct graph (B1ft for 6 'points' plotted correctly ± 1 square B1 for smooth curve plotted through all '5 or 6' plotted points provided B1 awarded in (a))

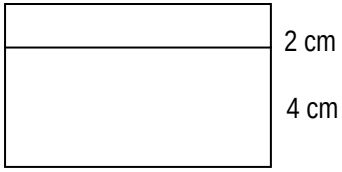
5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18		PP + YY + BB $= \frac{7}{30} \times \frac{6}{29} + \frac{13}{30} \times \frac{12}{29} + \frac{10}{30} \times \frac{9}{29}$ $= \frac{42+156+90}{870}$ **OR** PY + PB + YP + YB + BP + BY $= \frac{7}{30} \times \frac{13}{29} + \frac{7}{30} \times \frac{10}{29} + \frac{13}{30} \times \frac{7}{29}$ $+ \frac{13}{30} \times \frac{10}{29} + \frac{10}{30} \times \frac{7}{29} + \frac{10}{30} \times \frac{13}{29}$ $= \frac{91+70+91+130+70+130}{870}$	$\frac{582}{870}$	5	M1 for use of 29 as denominator for 2nd probability M1 for $\frac{7}{30} \times \frac{6}{29}$ or $\frac{13}{30} \times \frac{12}{29}$ or $\frac{'30-13-7'}{30} \times \frac{'30-13-7-1'}{29}$ oe M1 for $\frac{7}{30} \times \frac{6}{29} + \frac{13}{30} \times \frac{12}{29} + \frac{'10'}{30} \times \frac{'9'}{29}$ $(= \frac{288}{870})$ M1 for $1 - \frac{'288'}{870}$ A1 for $\frac{582}{870}$ oe (eg $\frac{97}{145}$, 0.66896..., 0.669 with method identified) **OR** M1 for use of 29 as denominator for 2nd probability M1 for $\frac{7}{30} \times \frac{13}{29}$ or $\frac{7}{30} \times \frac{10}{29}$ or $\frac{13}{30} \times \frac{7}{29}$ or $\frac{13}{30} \times \frac{10}{29}$ or $\frac{10}{30} \times \frac{7}{29}$ or $\frac{10}{30} \times \frac{10}{29}$ oe M2 for $\frac{7}{30} \times \frac{13}{29} + \frac{7}{30} \times \frac{10}{29} + \frac{13}{30} \times \frac{7}{29} + \frac{13}{30} \times \frac{10}{29} + \frac{10}{30} \times \frac{7}{29} + \frac{10}{30} \times \frac{13}{29}$ (M1 for at least 3 of these pairs added) A1 for $\frac{582}{870}$ oe (eg $\frac{97}{145}$, 0.6689 to 0.669 with method identified) **SC:** B2 for $\frac{582}{900}$ oe or for $\frac{582}{840}$ (B1 for $\frac{7}{30} \times \frac{6}{30} + \frac{13}{30} \times \frac{12}{30} + \frac{'10'}{30} \times \frac{'9'}{30}$ oe or $\frac{7}{30} \times \frac{6}{28} + \frac{13}{30} \times \frac{12}{28} + \frac{'10'}{30} \times \frac{'9'}{28}$ oe)

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
19		$\pi 76^2 - \pi 24^2$ = 18145.839...– 1809.557... 80÷360 × 16336.282... = 3630.1284... **OR** $\frac{80}{360} \times \pi 76^2 - \frac{80}{360} \times \pi 24^2$ = 4032.40.. .– 402.12... = 3630.1284...	3630	4	M1 for $\pi 76^2$ or $\pi 24^2$ or $\frac{80}{360}$ oe seen M1 dep for '$\pi 76^2$' – '$\pi 24^2$' M1 dep on M1 for $\frac{80}{360}$ × ('$\pi 76^2 - \pi 24^2$') A1 for 3630 − 3631
20 **QWC**		$\sqrt{45^2 + 20^2} = \sqrt{2425} = 49.24...$ $\sqrt{30^2 + 20^2} = \sqrt{1300} = 36.05...$ $\sqrt{45^2 + 30^2} = \sqrt{2925} = 54.08...$ $\sqrt{45^2 + 20^2 + 30^2} = \sqrt{3325}$ = 57.66281297 **OR** $30^2 + 20^2 + 45^2$ = 900 + 400 + 2025 = 3325 $\sqrt{'3325'}$ = 57.66281297	No with working	4	M1 for $45^2 + 20^2$ or $20^2 + 30^2$ or $45^2 + 30^2$ M1 for $\sqrt{'45^2 + 20^2'}$ or $\sqrt{'20^2 + 30^2'}$ or $\sqrt{'45^2 + 30^2'}$ M1 for $\sqrt{'45^2 + 20^2 + 30^2'}$ ($= \sqrt{3325}$) C1 for No AND 57.6 – 57.7 < 60 oe **OR** M2 for $30^2 + 20^2 + 45^2$ (= 900 + 400 + 2025 =3325) M1 for $\sqrt{'3325'}$ C1 for No AND 57.6 – 57.7 < 60 oe

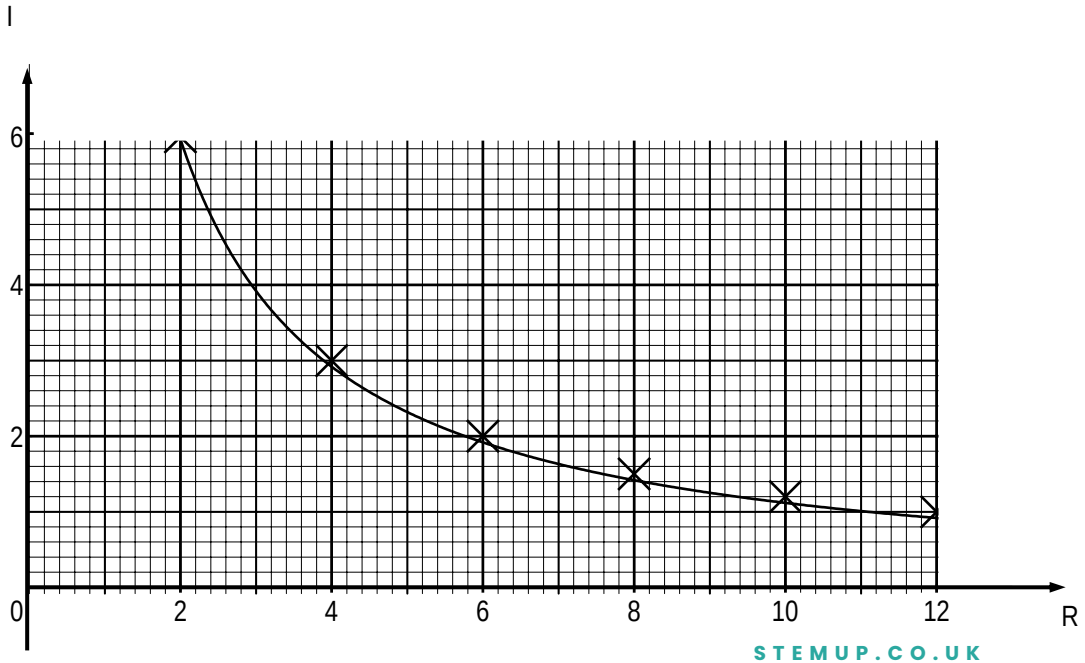
5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
21		$T = k\sqrt{L}$ $2 = k\sqrt{100}$ $k = 2 \div 10 = 0.2$ $0.2 \times \sqrt{64}$	1.6	4	M1 for $T = k\sqrt{L}$ M1 for $2 = k\sqrt{100}$ oe M1 for $(k =)\ 2 \div \sqrt{100}$ $(= 0.2)$ A1 for 1.6 cao **OR** M2 for $2 \times \frac{\sqrt{64}}{\sqrt{100}}$ or $2 \div \frac{\sqrt{100}}{\sqrt{64}}$ oe (M1 for scale factor $\frac{\sqrt{64}}{\sqrt{100}}$ or $\frac{\sqrt{100}}{\sqrt{64}}$ oe) A1 for 1.6 cao
22	(a)	5.95 × 14.5 × 60 = 86.275 × 60 = 5176.5 5176.5 ÷ 1000	5.1765	3	B1 for 5.95 or 14.5 seen M1 dep on B1 for 'LB' speed × 'LB' time eg 5.95 × 14.5 (× 60) A1 for cao
	(b)	4.65 km = 4650 m 16.5 min = 16.5 × 60 = 990 sec 4650 ÷ 990 = 4.69696969...	4.69&	3	B1 for 4.65 or 4650 or 16.5 or 990 seen M1 dep on B1 for 'UB' distance ÷ 'LB' time eg 4650 ÷ 990 eg 4.65 ÷ 16.5 A1 for 4.69& or $\frac{155}{33}$ oe (condone 4.6969...)

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
23		2010: 8400 2011: 8988 2012: 9617 (.16) 2013: 10290 (.36...) 2014: 11010 (.686...) 2015: 11781 (.43...) 2016: 12606 (.134...) 2017: 13488 (.564...) 2018: 14432 (.76...) 2019: 15443 (.057...)	2019	5	M1 for $\left(1+\frac{7}{100}\right)$ oe (eg 1.07 seen) or 8988 seen M1 for $8400 \times \left(1+\frac{7}{100}\right)^n$ seen or $8400 \times \left(1+\frac{7}{100}\right)^n$ where $n \geq 2$ eg 9617 seen M1 for $8400 \times \left(1+\frac{7}{100}\right)^n$ where $n \geq 5$ M1 $n = 9$ evaluated and bees = 15 443 (.067...) (or bees > 15 000) A1 for 2019

Q3.



Q17.



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Applications of Mathematics

Unit 2: Applications 2

For Approved Pilot Centres ONLY

Higher Tier

Wednesday 13 June 2012 – Morning
Time: 1 hour 45 minutes

Paper Reference
5AM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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6/6/7/3/3/3/3/

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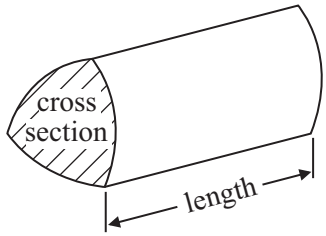
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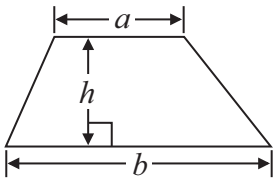
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

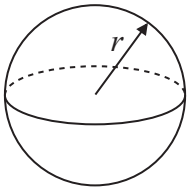


Area of trapezium = $\frac{1}{2}(a + b)h$



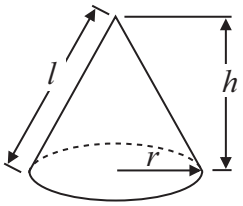
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

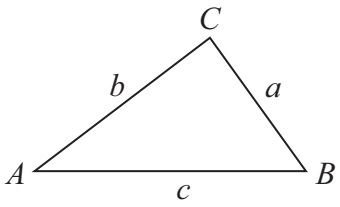


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



The Quadratic Equation
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 Jim buys 3 portions of chips.
The total cost is £2.85

Emma buys fish and 2 portions of chips.
The total cost is £4.80

(a) Work out the cost of the fish.

£ .....

(3)

Emma and Dan share the cost of £4.80 in the ratio 5 : 3

(b) Work out how much Emma and Dan each pay.

Emma £ .....

Dan £ .....

(3)

(Total for Question 1 is 6 marks)

***2** Tina is driving her car at a speed of 13.3 m/s.
She is at a distance of 25 m from a stop sign.

The greatest stopping distance, s metres, of Tina's car can be found using the formula

$$s = \frac{v^2}{2a}$$

where

v m/s is the speed of the car,
a m/s^2 is the deceleration of the car when braking.

The deceleration of Tina's car when braking is 3.86 m/s^2.

Will Tina be able to stop the car before the stop sign?

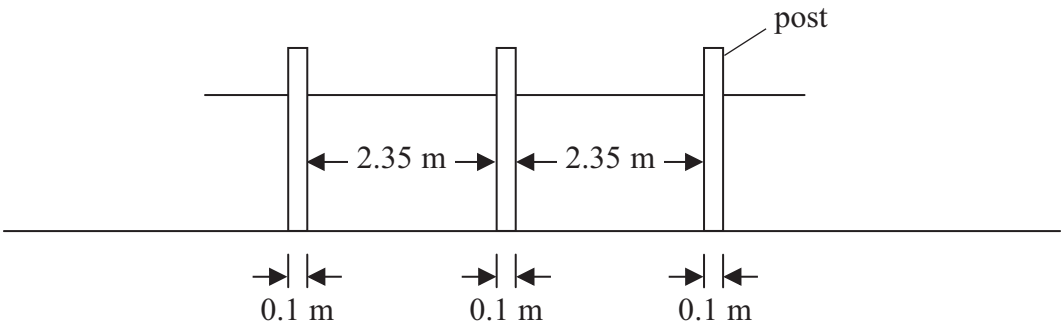
(Total for Question 2 is 3 marks)

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3 Adam is a farmer.
He is building a fence of length 250 m.

Here is a diagram showing a part of the fence.

Diagram **NOT** accurately drawn



The distance between posts is 2.35 m.
The width of each post is 0.1 m.

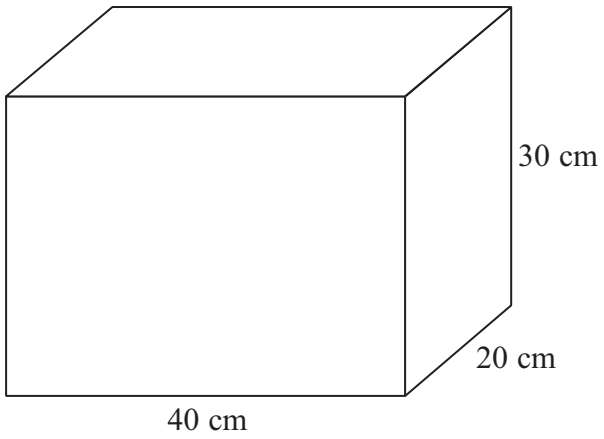
Work out the total number of posts needed to build the fence of length 250 m.

.....

(Total for Question 3 is 3 marks)

***4** Here is a solid wooden building block in the shape of a cuboid.

Diagram **NOT** accurately drawn



Carlo has 3 of these blocks.
He is going to paint each of the 3 blocks.

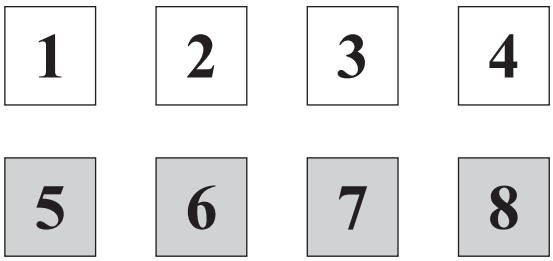
A tin of paint covers 20 000 cm^2.
Carlo has only one tin of paint.

Has Carlo got enough paint for the 3 blocks?
You must show all your working.

(Total for Question 4 is 4 marks)

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5 Mark has 4 white cards and 4 grey cards.
There is a number on each card, as shown below.



Mark mixes up the white cards.
He puts the cards on the table so that the numbers are hidden.

Mark mixes up the grey cards.
He puts the cards on the table so that the numbers are hidden.

Mark and Jean play a game with all of these cards.

Mark asks Jean to take at random one white card and one grey card.

(a) Write down all the possible combinations of the pairs of numbers that Jean can take.

.....

.....

.....

.....

(2)

Jean wins the game when the numbers on the two cards add up to more than 9

Mark and Jean are going to play this game 80 times.
Mark will mix up the white cards and mix up the grey cards after each game.

(b) Estimate the number of games that Jean will win.

.....

(3)

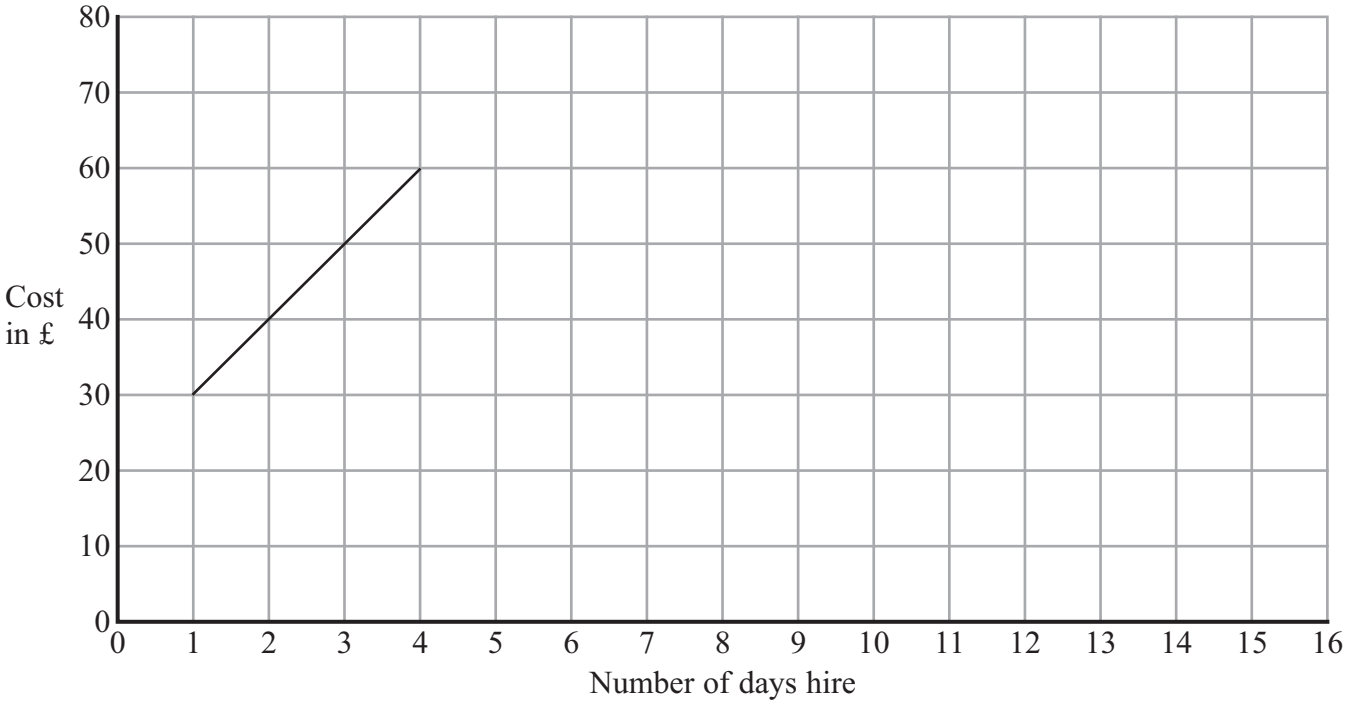
(Total for Question 5 is 5 marks)

6 Bob's Shop has cement mixers for hire.
Here are the costs of hiring a cement mixer from Bob's Shop.

Bob's Shop

1 to 4 days hire:	a fixed charge of £20 + £10 per day
More than 4 days hire:	a fixed charge of £60 + £1.25 per day after the first 4 days

The graph shows some information about the cost of hiring a cement mixer from 1 to 4 days.



(a) On the grid, complete the graph to show the cost of hiring a cement mixer for up to 16 days.

(2)

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Fred's Shop also has cement mixers for hire.
Here are the costs of hiring a cement mixer from Fred's Shop.

Fred's Shop

a fixed charge of £10 + £5 per day

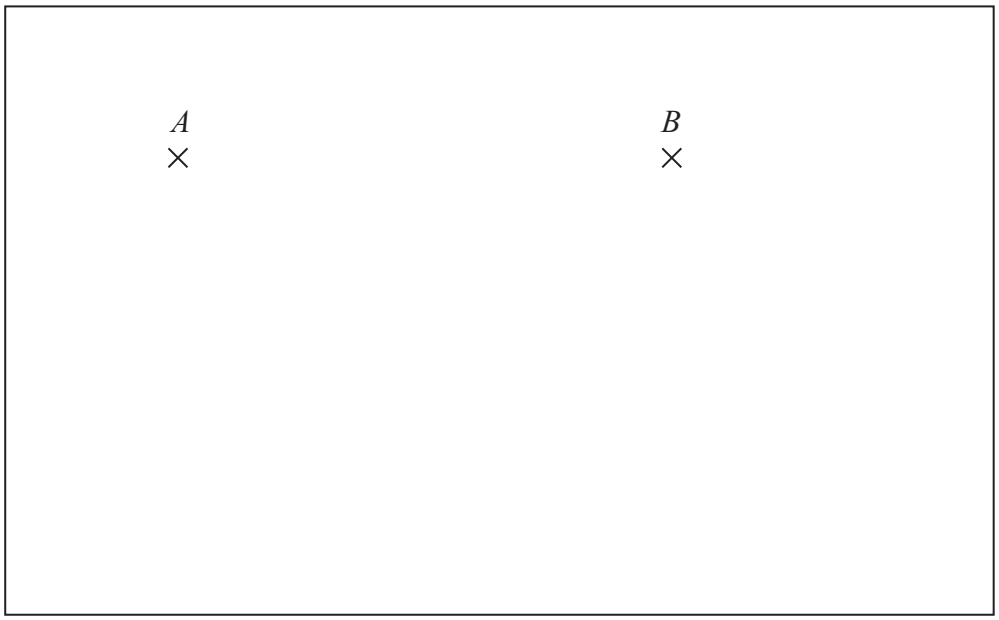
Jim is going to hire a cement mixer.

*(b) When is the cost of hiring a cement mixer the same from Bob's Shop and from Fred's Shop?

(3)

(Total for Question 6 is 5 marks)

***7** The diagram shows a map of a field.
The scale of the map is 1 cm represents 20 m.



Wind turbines



A and *B* are two wind turbines in the field.

A third wind turbine is to be put in this field.
There must be at least 100 m between wind turbines.

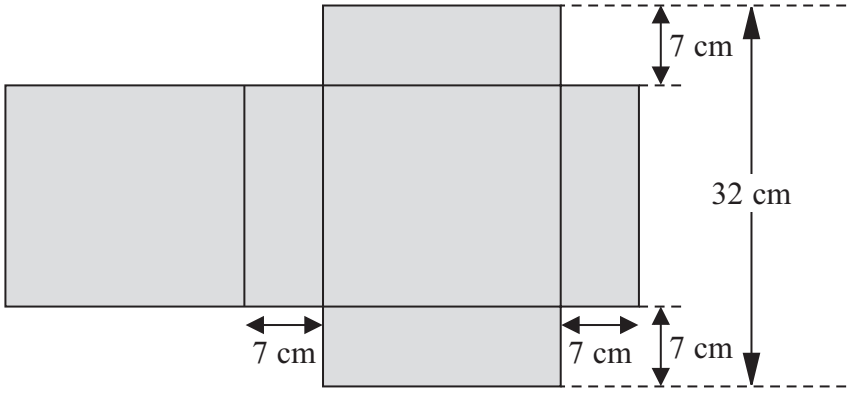
Show, by shading, where the third wind turbine can be put.

(Total for Question 7 is 3 marks)

8 A cardboard box is in the shape of a cuboid.
The box has a square base and a square lid.

The diagram shows a net of this box.

Diagram **NOT** accurately drawn



Peter makes nets of this box from cardboard.
He has a square piece of cardboard of side 1 m.

(a) Work out the greatest number of these nets Peter can make.

.....

(3)

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Each net is folded to make a box.

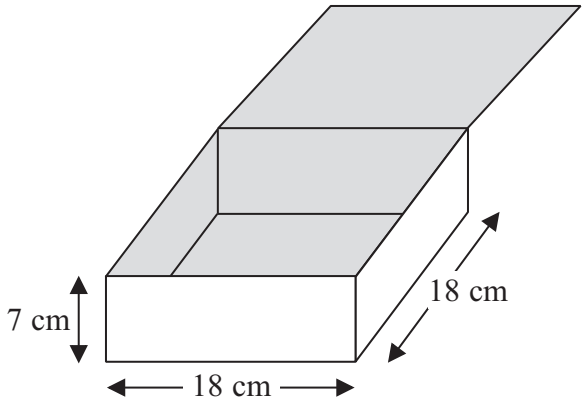


Diagram **NOT** accurately drawn

Peter wants to put as many 2 cm cubes into the box as possible.

He needs to close the lid.

(b) Work out the greatest number of 2 cm cubes Peter can put into the box.

.....

(3)

(Total for Question 8 is 6 marks)

9 Michelle is x years old.
Angela is 5 years older than Michelle.

The sum of their ages, in years, is less than 50

(a) Write down, in terms of x, an inequality to show this information.

.....

(2)

(b) Work out the oldest age that Michelle can be.
Give your answer as a whole number of years.

..... years

(3)

(Total for Question 9 is 5 marks)

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10 In a raffle there is one winning ticket.

250 tickets are sold.
One ticket will be chosen at random.

Gemma buys one ticket.

(a) Work out the probability that Gemma will **not** win.
Give your answer as a decimal.

.....

(3)

Ellie buys some of the raffle tickets.

The probability that Ellie has the winning ticket is 0.06

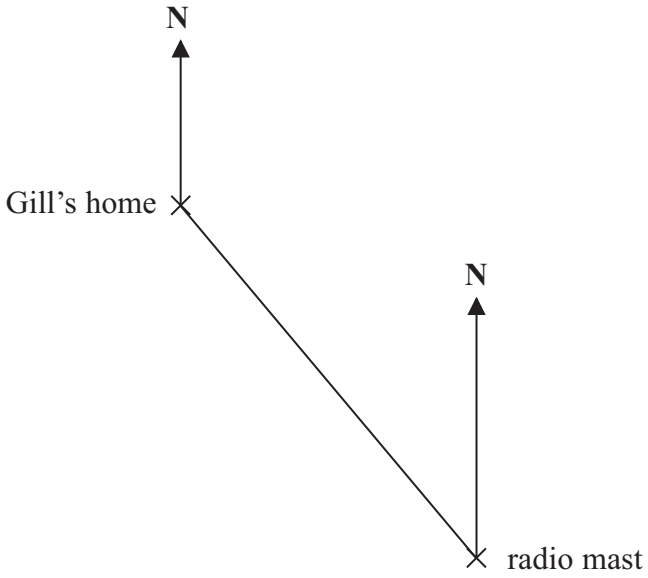
(b) How many tickets has Ellie?

.....

(2)

(Total for Question 10 is 5 marks)

11 The accurate diagram shows the position of a radio mast and the position of Gill's home.



(a) What is the bearing of Gill's home from the radio mast?

.....°

(1)

Malcolm's home is
due East of Gill's home,
on a bearing of 040° from the radio mast.

(b) On the diagram, mark the position of Malcolm's home with a cross (**X**).

(2)

A signal from the radio mast has a range of 8 km, as shown in the diagram.

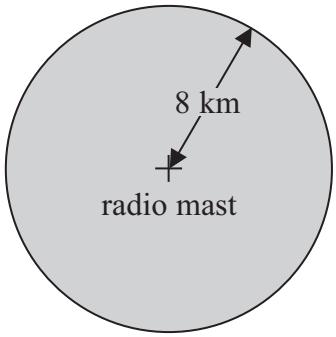


Diagram **NOT** accurately drawn

(c) Calculate the area of the shaded region.
Give your answer correct to 3 significant figures.

..... km^2

(2)

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This diagram shows the position of a church C.

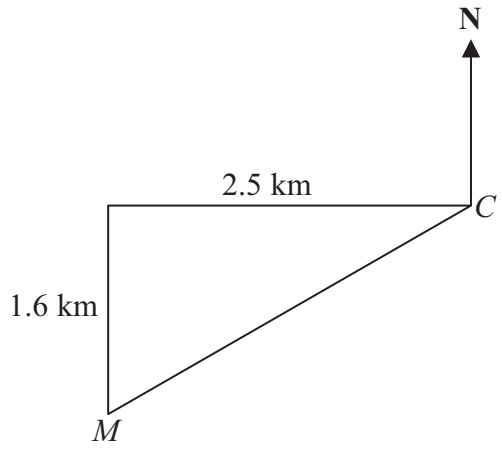


Diagram **NOT** accurately drawn

Munir's house (M) is 2.5 km West and 1.6 km South of the church.

(d) Work out the 3-figure bearing of Munir's house from the church.
Give your answer to the nearest degree.

.....°

(4)

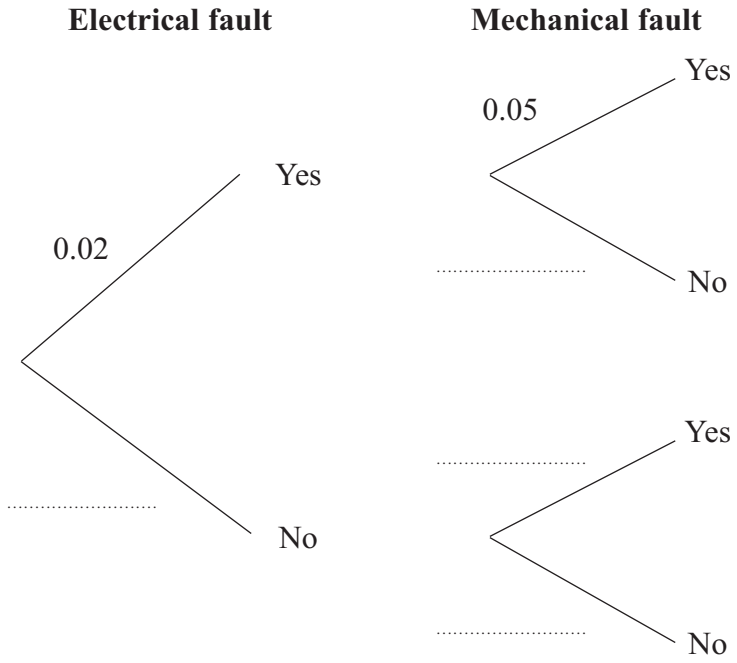
(Total for Question 11 is 9 marks)

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12 Icetown makes fridges.

The probability that an Icetown fridge will have an electrical fault is 0.02
The probability that an Icetown fridge will have a mechanical fault is 0.05

(a) Complete the decision tree diagram.



(2)

Coolbox also makes fridges.

The probability that a Coolbox fridge will have **no** electrical fault and **no** mechanical fault is 0.93

Janet wants to buy a fridge with the least risk of any fault.

*(b) Which make of fridge should Janet buy, an Icetown fridge or a Coolbox fridge?

(3)

(Total for Question 12 is 5 marks)

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13 Shane throws a ball into the air.

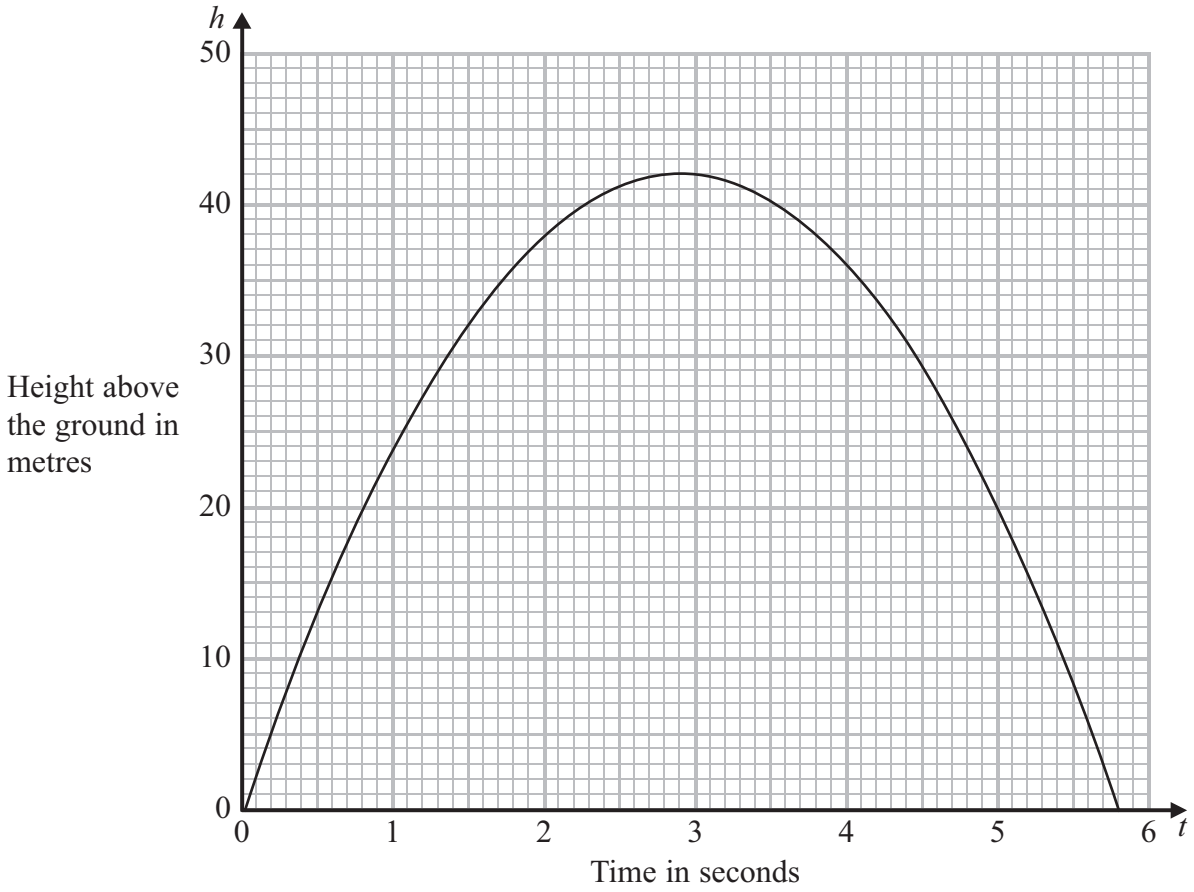
The height of the ball above the ground is given by the formula

$$h = 29t - 5t^2$$

where

h is the height, in metres, of the ball above the ground.
t is the time, in seconds, after the ball has been thrown.

The diagram shows the graph of $h = 29t - 5t^2$



Use the graph to find the length of time the ball is more than 36 metres above the ground.

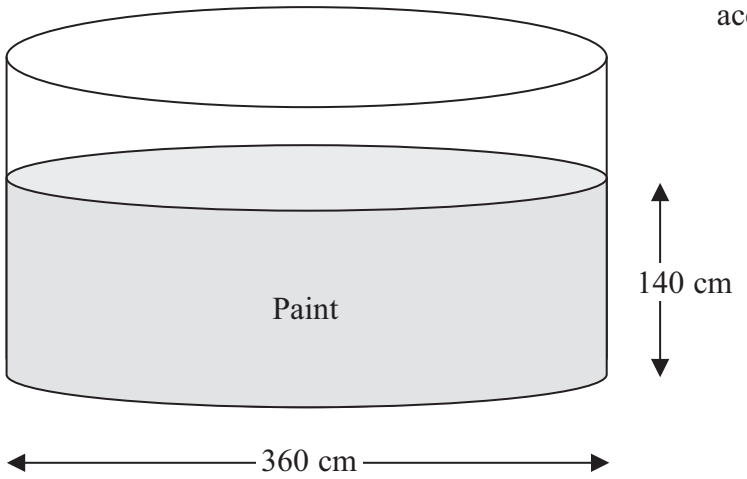
..... seconds

(Total for Question 13 is 3 marks)

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14 A paint company stores paint in a tank.
The tank is a cylinder.

Diagram **NOT** accurately drawn



The cylinder has a diameter of 360 cm.
The depth of the paint in the cylinder is 140 cm.

(a) Work out the number of litres of paint in the cylinder.
Give your answer to the nearest litre.
1 litre = 1000 cm^3.

..... litres
(3)

The paint is poured into 1 litre cans.
The mass of an empty can of paint is 350 grams.

The density of the paint is 0.58 grams/cm^3.

(b) Work out the mass of a 1 litre can when full with paint.

..... grams
(2)

(Total for Question 14 is 5 marks)

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15 The diagram shows the position of a hot air balloon (B) and a man.
The man is standing at the point O.

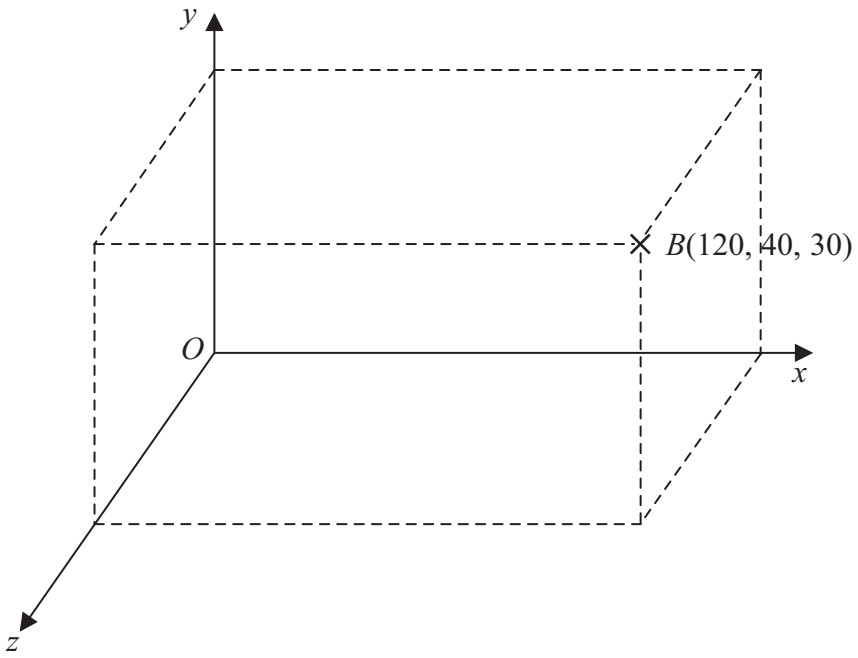


Diagram **NOT** accurately drawn

The point O has coordinates (0, 0, 0).
The point B has coordinates (120, 40, 30).

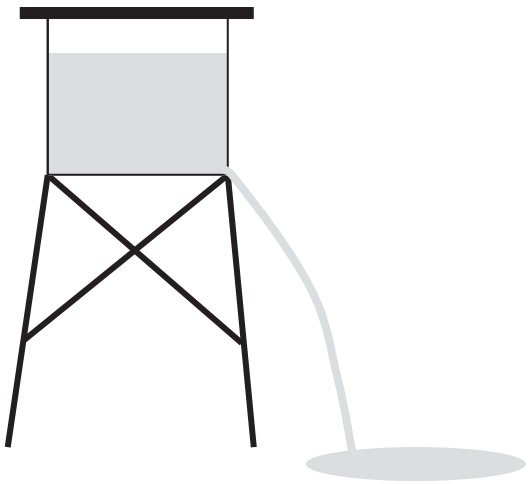
Work out the shortest distance of the hot air balloon from the man.

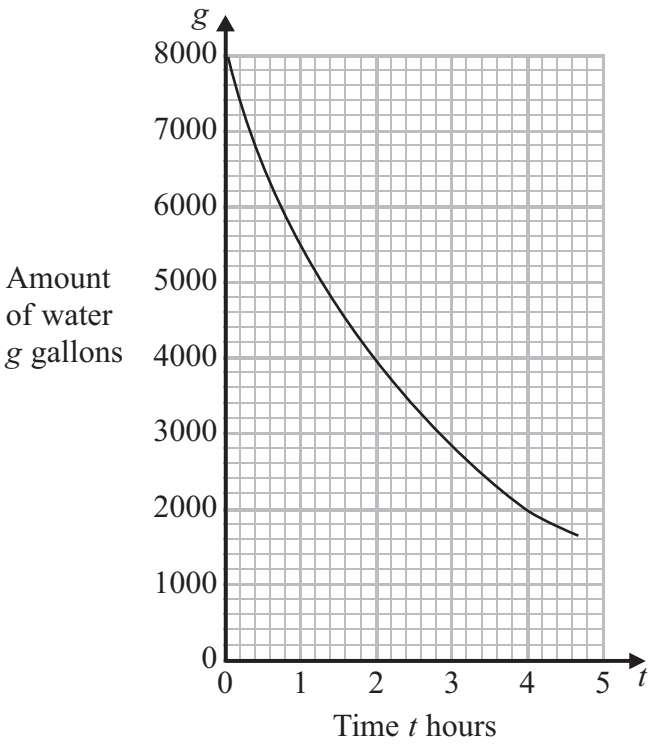
..... m

(Total for Question 15 is 4 marks)

16 The diagram shows a tank of water.
Water is leaking out of the bottom of the tank.

The graph shows the amount of water, g gallons, in the tank at time, t hours.





There are 8000 gallons of water in a full tank.

(a) Estimate the amount of water that leaked out of the tank in the first hour.

..... gallons
(1)

(b) After how many hours was the tank half full?

..... hours
(1)

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The number of gallons of water in the tank at time, t hours, is modelled by the formula

$$g = ka^{-t}$$

where k and a are positive constants.

(c) Work out the value of k and the value of a.

$k =$ ..... $a =$ .....

(4)

(Total for Question 16 is 6 marks)

17 Finlay has 16 model racing cars.

7 racing cars are red,
5 racing cars are green,
4 racing cars are yellow.

Finlay takes at random one of the racing cars.
Jack then takes at random one of the remaining cars.

Work out the probability that Finlay and Jack take different coloured cars.

.....

(Total for Question 17 is 5 marks)

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18 The time period, T, of a simple pendulum is directly proportional to the square root of the length, d, of the pendulum.

When $d = 2.25$
$T = 3$

(a) (i) Find a formula for T in terms of d.

.....

(ii) Work out the value of T when $d = 5.76$

$T =$ .....

(4)

(b) Work out the value of d when $T = 1.2$

$d =$ .....

(2)

(Total for Question 18 is 6 marks)

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19 Gina wants to find the height, h metres, of a pylon.

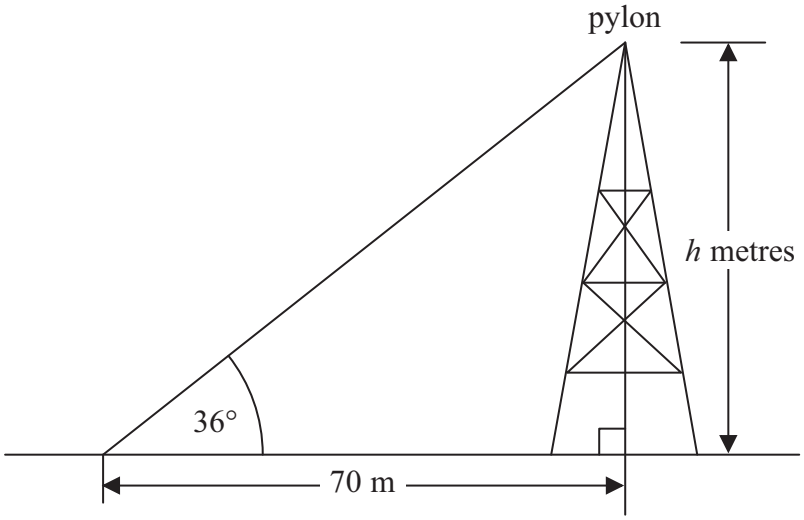


Diagram **NOT** accurately drawn

Gina measures the angle of elevation of the top of the pylon to be 36°, to the nearest 2 degrees.
She measures the horizontal distance from the foot of the pylon to be 70 m, to the nearest metre.

(i) Work out the upper bound and the lower bound for the height of the pylon.
Give your answers correct to 3 significant figures.

Upper bound = ... m

Lower bound = ... m

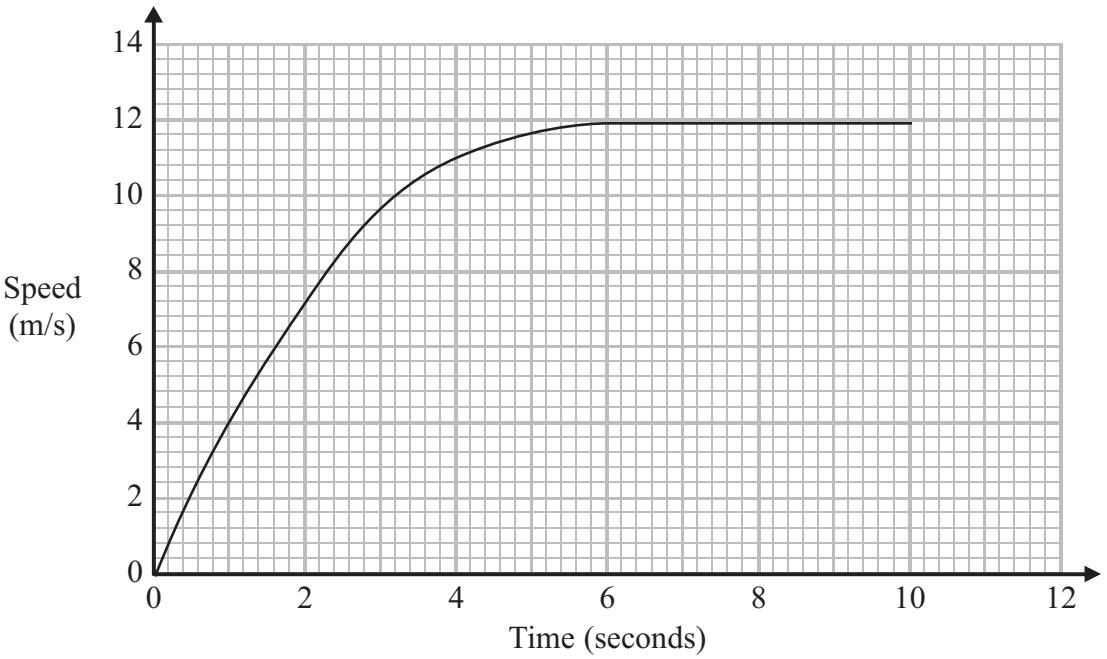
(ii) Write down the height of the pylon to an appropriate degree of accuracy.

..... m

(Total for Question 19 is 6 marks)

20 An athlete is running in a race.

The diagram shows a speed-time graph for the athlete.



(a) Work out an estimate for the acceleration of this athlete at 3 seconds.

..... m/s^2

(3)

The athlete ran the race in 10 seconds.

The area under the graph gives the distance the athlete ran in the 10 seconds.

*(b) Show that this race could have been a 100 metre race.

(3)

(Total for Question 20 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS

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edexcel

Mark Scheme (Results)

Summer 2012

GCSE Mathematics Linked Pair Pilot
Application of Mathematics (2AM01)
Higher (Calculator) Paper 2H

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June 2012

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

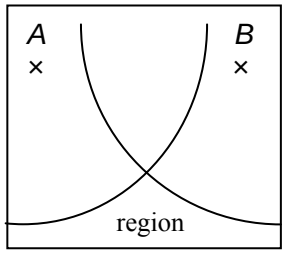
Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	2.85 ÷ 3 = 0.95 4.80 – (0.95 ×2)	2.90	3	M1 for 2.85 ÷ 3 or 285÷3 or sight of 0.95 or 95 M1 for 4.80 – (‘0.95’ ×2) oe A1 for 2.90 accept 2.9
	(b)	480 ÷ (5 + 3) = 60 3 × 60 5 × 60	3.00 1.80	3	M1 for 4.8 ÷ (5 + 3) or 60 seen or at least three multiples of 5:3 M1 for ‘60’ × 3 or ‘60’ × 5 A1 for 3.00 and 1.80 accept 3 and 3.0 and 1.8
*2		$13.3^2 \div (2 \times 3.86) = 22.9\ldots\ldots$ **OR** $\sqrt{(2 \times 3.86 \times 25)} = 13.89\ldots..$	yes with reason	3	M1 for $13.3^2 \div (2 \times 3.86)$ A1 for 22.9… C1 (dep on M1) for correct decision based on their figures and comparison with 25, eg yes and ‘22.9’ < 25 oe **OR** M1 for $\sqrt{(2 \times 3.86 \times 25)}$ A1 for 13.8 – 13.9 C1 (dep on M1) for correct decision based on their figures and comparison with 13.3, eg yes and ‘13.8(9)’ > 13.3 oe

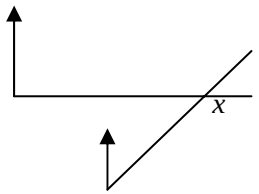
5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
3		250 ÷ (2.35 + 0.1) = 102.04… 102 × (2.35 + 0.1) = 249.9 249.9 + 0.1 = 250 **OR** 250 – 0.1 = 249.9 249.9 ÷ (2.35 + 0.1) = 102 **OR** (2.35 + 0.1) × 100 = 245 245 + 2.45 = 247.45 247.45 + 2.45 = 249.9 249.9 + 0.1 = 250 **OR** 0.1n + 2.35(n – 1) = 250 2.45n = 252.35 252.35 ÷ 2.45	103	3	M1 for 250 – 0.1 or 2.35 + 0.1 or 2.45 seen or 250÷(a combination of fences and posts) M1 for 250÷(2.35+0.1) or (250–0.1)÷(2.35+0.1) or 102 seen A1 cao **OR** (build-up method) M2 for a combination of at least 100 fences and at least 100 posts, eg (2.35 + 0.1) × 100 (=245) (M1 for a combination of at least 10 fences and at least 10 posts) A1 cao **OR** (algebraic method) M1 for 0.1n or 2.35(n – 1) M1 for 0.1n + 2.35(n – 1) = 250 A1 cao

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4		$2 \times (40 \times 30) + 2 \times (30 \times 20) + 2 \times (40 \times 20) = 5200$ $5200 \times 3 = 15\ 600$	yes with reason	4	M1 for an attempt to add the areas of 5 or 6 correct faces M1 for 3 × 'surface area' or 20 000 ÷ 'surface area' A1 for 15 600 or 3.8 or better C1 (dep on M1) for correct decision based on their figures and a comparison with 20 000, eg yes and '15 600' < 20 000 or can paint more than '3' blocks oe
5	(a)		1,5 1,6 1,7 1,8 2,5 2,6 2,7 2,8 3,5 3,6 3,7, 3,8 4,5 4,6 4,7 4,8	2	B2 for all 16 combinations (accept 1,5 etc, ignore repeats) (B1 for at least 4 correct combinations)
	(b)	P(Jean wins) = $\frac{6}{16}$ $\frac{6}{16} \times 80$	30	3	B1 for $\frac{6}{16}$ oe M1 for '$\frac{6}{16}$'× 80 A1 cao SC B2 for $\frac{30}{80}$

5AM2H_01						
Question		**Working**			**Answer**	**Mark**	**Notes**
6	(a)				single line from (4, 60) through (12, 70)	2	B2 for a single line from (4, 60) through (12, 70) ignore any lines drawn to the left of (4, 60) (B1 for a line with positive gradient from (4, 60) or a line with gradient 1.25)
	*(b)	days	Bob	Fred	number of days with the same cost	3	M1 for a single line with positive gradient A1 for two graphs intersecting at (12, 70) C1 (dep on M1) for 12 days or ft from their line stating number of days **OR** M1 for an attempt to find a cost in Fred's shop for any number of days, eg 5×10 + 10 (=60) A1 for correctly identifying two costs with equal value, ie (£) 30, 40, 50, 60, 65, 70 C1 (dep on M1) for stating the correct number of days in each shop with the same cost, eg (£)30 Bob 1 day, Fred 4 days (£)40 Bob 2 days, Fred 6 days (£)50 Bob 3 days, Fred 8 days (£)60 Bob 4 days, Fred 10 days (£)65 Bob 8 days, Fred 11 days (£)70 12 days
		1	30	15			
		2	40	20			
		3	50	25			
		4	60	30			
		6	62.5	40			
		8	65	50			
		10	67.5	60			
		11		65			
		12	70	70			

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*7				3	M1 for an arc drawn, centre *A* or *B*, radius 5 cm M1 for two intersecting correct arcs drawn A1 for identifying the correct region SC B2 for two hand drawn arcs within tolerance and region identified SC B1 for two hand drawn arcs within tolerance only
8	(a)	length of net = 18 + 7 + 18 + 7 = 50 100 ÷ 50 = 2 100 ÷ 32 = 3.125 2 × 3 OR 10000÷(50×30) = 6.25	6	3	M1 for 32 – 2 × 7 or 18 or 50 seen M1 for 100 ÷ '18+7+18+7'oe and 100 ÷ 32 oe (=3.125) or 10000÷('18+7+18+7'×32) oe or 6.25 seen A1 cao SC B1 for drawing of 2 or more connecting nets or rectangles with width 32cm if M0 scored
	(b)	layer = (18 ÷ 2) × (18 ÷ 2) = 81 3 layers = 81 × 3 **OR** (18 × 18 × 6) ÷ (2 × 2 × 2) = 1944 ÷ 8	243	3	M1 for 18 ÷ 2 or 9 seen or 7 ÷ 2 or 3.5 or 3 seen M1 for ('9' × '9') × 3 or ('9' × '9') × 3.5 A1 cao **OR** M1 for 18 × 18 × 6 (=1944) or 18 × 18 × 7 (=2268) or 2 × 2 × 2 (=8) M1 for (18 × 18 × 6) ÷ (2 × 2 × 2) or (18 × 18 × 7) ÷ (2 × 2 × 2) A1 cao

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9	(a)	A = x + 5	2x + 5 < 50	2	M1 for $x + x + 5$ or $x + 5 < 50$ A1 for $x + x + 5 < 50$ or better
	(b)	2x < 50 – 5 x < 22.5	22	3	M1 for an attempt to isolate x, or a term in x, on one side of 'equation' or 'inequality', eg 2x+5–5=50–5 M1 for $x < 22.5$ oe A1 cao SC B2 for 44 from $x + 5 < 50$ in (a)
10	(a)	$1 - \frac{1}{250}$ **OR** 1 – 0.004	0.996	3	M1 for $1 - \frac{1}{250}$ or $\frac{250-1}{250}$ M1 for 249÷250 or $\frac{249}{250}$ seen A1 cao **OR** M1 for $\frac{1}{250}$ or 1÷250 or 0.004 seen M1 for 1 – '1÷250' A1 cao
	(b)	0.06 × 250 **OR** 0.06 ÷ 0.004	15	2	M1 for 0.06 × 250 oe or 0.06 ÷ '0.004' A1 cao SC B1 for $\frac{15}{250}$

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)	360 – 40	320	1	B1 for an answer in range 318 to 322
	(b)			2	M1 for an angle of 40° from radio mast A1 for position of *x*, east of Gill's house
	(c)	$\pi \times 8^2$	201	2	M1 for $\pi \times 8^2$ A1 for an answer in the range 199 to 202
	(d)	$\tan^{-1}(2.5 \div 1.6) = 57.38..$ OR $\tan^{-1}(1.6 \div 2.5) = 32.61$ OR (cosine formula) $\cos^{-1}[(2.5^2 + h^2 - 1.6^2) \div (2 \times 2.5 \times h)]$ where $h^2 = 2.5^2 + 1.6^2$ OR (sine ratio) $\sin^{-1}(1.6 \div h)$ where $h^2 = 2.5^2 + 1.6^2$ $h = 2.96(8\ldots)$	237	4	M1 for (tan =) 2.5 ÷ 1.6 (=1.5625) M1 (dep) for $\tan^{-1}(2.5 \div 1.6)$ A1 for 57° or better A1 for 237 or ft 180 + '57' **OR** M1 for (tan =) 1.6÷2.5 (=0.64) M1 (dep) for $\tan^{-1}$ (1.6 ÷ 2.5) A1 for 33° or better A1 for 237 or ft 270 – '33' **OR** M1 for (cos =) $[(2.5^2 + h^2 - 1.6^2) \div (2 \times 2.5 \times h)]$ M1 (dep) for $\cos^{-1}[(2.5^2 + h^2 - 1.6^2) \div (2 \times 2.5 \times h)]$ where $h = \sqrt{(2.5^2 + 1.6^2)}$ A1 for 57° or better A1 for 237 or ft 180 + '57' **OR** M1 for (cos =) $(1.6 \div h)$ M1 (dep) for $\cos^{-1}(1.6 \div h)$ where $h = \sqrt{(2.5^2 + 1.6^2)}$ A1 for 57° or better A1 for 237 or ft 180 + '57'

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		0.95 0.98 0.05 0.95	2	M1 for 1 – 0.02 (= 0.98 oe) or 1 – 0.05 (= 0.95) A1 for all 4 correct probabilities shown
	*(b)	0.98 × 0.95 = 0.931	Icetown	3	M1 for '0.98' × '0.95' A1 for 0.931 C1 (dep on M1) for correct comparison, selecting their greater probability of no faults and naming company
13		4 – 1.8 **OR** $5t^2 - 29t + 36 = 0$ $(5t - 9)(t - 4) = 0$ 4 – 1.8	2.2	3	M1 for $h = 36$ line drawn or point(s) marked on graph or 1.8 or 4 seen M1 for the difference of two values of t for their $h = 36$ A1 for 2 – 2.4 **OR** M1 for $36 = 5t^2 - 29t + 36$ M1 for '4' – '1.8' A1 cao
14	(a)	$\pi \times 180^2 \times 140 \div 1000$	14 250	3	M1 for $\pi \times 180^2 \times 140$ M1 for $\pi \times$ 'r'$^2 \times 140 \div 1000$ oe A1 for 14 243 – 14 253
	(b)	350 + 0.58 × 1000	930	2	M1 for 0.58 × 1000 or 580 A1 cao
15		$\sqrt{(302 + 402 + 1202)}$	130	4	M2 for 302 + 402 + 1202 or 16 900 seen (M1 for 302 + 402 (=2500) or 1202 + 402 (=16 000) or 302 + 1202 (=15 300)) M1 for $\sqrt{(302 + 402 + 1202)}$ A1 cao

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)		2500	1	B1 for 2400 – 2600
	(b)		2	1	B1 cao
	(c)	eg $8000 = k \times 1$ $4000 = 8000 \times a^{-2}$ $\frac{1}{2} = 2^{-1} = a^{-2}$ **OR** $5500 = k \times a^{-1}$ $4000 = k \times a^{-2}$ (dividing equations) $1.375 = a$ so, $5500 = k \times (1.375)^{-1}$ $k = 7562.5$ Common substitutions for (t, g): (0, 7800−8000) (1, 5400−5600) (2, 3800−4000) (3, 2800−3000) (4, 1800−2000)	eg (k=) 8000, (a=) $\sqrt{2}$	4	M1 for substituting a value of g and a corresponding value of t M1 for substituting a different value of g and t M1 (dep on M2) for correct attempt to solve the equations to find a value for a A1 for 8000 and $\sqrt{2}$ (=1.4…or better) or ft their values of t and g, eg for (1, 5500) and (2, 4000), k = 7562.5 and a = 1.375

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
17		$1-\frac{7}{16}\times\frac{6}{15}-\frac{5}{16}\times\frac{4}{15}-\frac{4}{16}\times\frac{3}{15}$ $=1-\frac{74}{240}$ **OR** $\frac{7}{16}\times\frac{5}{15}+\frac{7}{16}\times\frac{4}{15}+\frac{5}{16}\times\frac{7}{15}$ $+\frac{5}{16}\times\frac{4}{15}+\frac{4}{16}\times\frac{7}{15}+\frac{4}{16}\times\frac{5}{15}$ $=\frac{35+28+35+20+28+20}{240}$	$\frac{83}{120}$	5	M1 for use of 15 as denominator for 2nd probability M1 for $\frac{7}{16}\times\frac{6}{15}$ or $\frac{5}{16}\times\frac{4}{15}$ or $\frac{4}{16}\times\frac{3}{15}$ M1 for $\frac{7}{16}\times\frac{6}{15}+\frac{5}{16}\times\frac{4}{15}+\frac{4}{16}\times\frac{3}{15}$ M1 for $1-\frac{74}{240}$ A1 for $\frac{166}{240}$ or 0.69… oe **OR** M1 for use of 15 as denominator for 2nd probability M1 for $\frac{7}{16}\times\frac{5}{15}$ or $\frac{7}{16}\times\frac{4}{15}$ or $\frac{5}{16}\times\frac{4}{15}$ oe M2 for $\frac{7}{16}\times\frac{5}{15}+\frac{7}{16}\times\frac{4}{15}+\frac{5}{16}\times\frac{7}{15}+\frac{5}{16}\times\frac{4}{15}+\frac{4}{16}\times\frac{7}{15}+\frac{4}{16}\times\frac{5}{15}$ (M1 for the sum of at least 3 correct products from no more than 6 products) A1 for $\frac{166}{240}$ or 0.69… oe SC B3 for $2\times(\frac{7}{16}\times\frac{7}{16}+\frac{5}{16}\times\frac{5}{16}+\frac{4}{16}\times\frac{4}{16})$ or $\frac{180}{256}$ oe or $1-(\frac{7}{16}\times\frac{6}{16}+\frac{5}{16}\times\frac{4}{16}+\frac{4}{16}\times\frac{3}{16})$ or $\frac{182}{256}$ oe or $1-(\frac{7}{16}\times\frac{7}{16}+\frac{5}{16}\times\frac{5}{16}+\frac{4}{16}\times\frac{4}{16})$ or $\frac{166}{256}$ oe B2 for $\frac{7}{16}\times\frac{7}{16}+\frac{5}{16}\times\frac{5}{16}+\frac{4}{16}\times\frac{4}{16}$ or $\frac{90}{256}$ oe or $\frac{7}{16}\times\frac{6}{16}+\frac{5}{16}\times\frac{4}{16}+\frac{4}{16}\times\frac{3}{16})$ or $\frac{74}{256}$ oe B1 for $\frac{7}{16}\times\frac{7}{16}$ or $\frac{5}{16}\times\frac{5}{16}$ or $\frac{4}{16}\times\frac{4}{16}$ or $\frac{7}{16}\times\frac{6}{16}$ or $\frac{5}{16}\times\frac{4}{16}$ or $\frac{4}{16}\times\frac{3}{16}$

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18	(a)(i)	$3 = k \times \sqrt{2.25}$, $3 = k \times 1.5$, $k = 2$ $T = 2\sqrt{d}$	$T = 2\sqrt{d}$	4	B2 for $T = 2\sqrt{d}$ oe (B1 for T α $\sqrt{d}$ or T = '2'$\sqrt{d}$ or $T = k\sqrt{d}$ oe)
	(ii)	$2 \times \sqrt{5.76}$	4.8		M1 for '2'×$\sqrt{5.76}$ A1 cao
	(b)	$1.2 = 2\sqrt{d}$ $d = (1.2 \div 2)^2$	0.36	2	M1 for $(1.2 \div$ 'k'$)^2$, $k \neq 1$ A1 for 0.36 or ft their k
19	(i)	h (ub) = $70.5 \times \tan 37 = 53.1255...$ h (lb) = $69.5 \times \tan 35 = 48.6644…$	(UB =) 53.1 (LB =) 48.7	6	B1 for 69.5 or 70.5 seen or 35 or 37 seen M3 for h (ub) = $70.5 \times \tan 37$ and h (lb) = $69.5 \times \tan 35$ (M2 for h (ub) = $70.5 \times \tan 37$ or h (lb) = $69.5 \times \tan 35$ M1 for h (ub) = 'ub of 70' × tan ('ub of 36') or h (lb) = 'lb of 70' × tan ('lb of 36')) A1 for 53.1… or better and 48.6… or better
	(ii)		50		A1 (dep on M2) for 50

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
20	(a)		1.6 − 2.4	3	M1 for tangent drawn at time = 3 M1 (dep) for 'diff *y*' ÷ 'diff *x*' A1 for 1.6 − 2.4
	*(b)	Example: 2(0 + 7) ÷ 2 = 7 2(7 + 11) ÷ 2 = 18 2(11 + 12) ÷ 2 = 23 2(12 + 12) ÷ 2 = 24 2(12 + 12) ÷ 2 = 24 Total = 96 **OR** Area ≈ 50 squares 1 square = 2 × 1 = 2 m 50 × 2 = 100	96 – 102 plus comparison	3	M1 for division of area into trapezia or counting squares M1 for use of at least one trapezium (oe) to calculate area or totalling all squares and part squares C1 (dep on M1) for answer in range 96 − 102 and positive comment to compare 'area' with 100 (SC B1 for area of 84 if M1 not scored)

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Edexcel GCSE

Centre Number	Candidate Number

Applications of Mathematics

Unit 2: Applications 2

For Approved Pilot Centres ONLY

Higher Tier

Monday 14 November 2011 – Morning
Time: 1 hour 45 minutes

Paper Reference
5AM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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6/6/6/3

P 4 0 6 0 9 A 0 1 2 8

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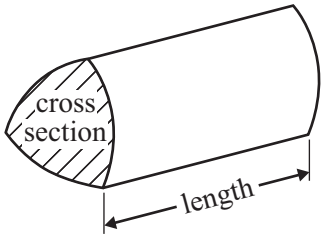
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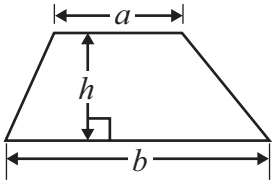
Formulae – Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

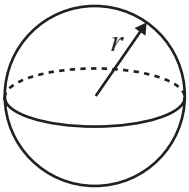


Area of trapezium $= \frac{1}{2}(a + b)h$



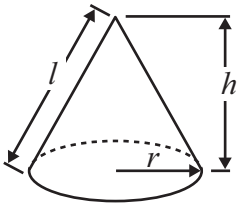
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$

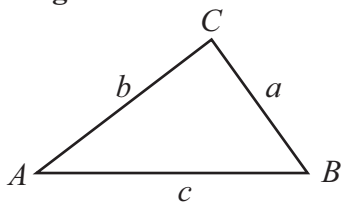


Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$



In any triangle ABC



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle $= \frac{1}{2}ab \sin C$

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 $T = \frac{kx}{a}$ is a formula used to work out the tension T in a spring.

(a) Work out the value of T when k=10, x = 0.8 and a = 2

.....

(2)

$h = ut - 4.9t^2$ is a formula used to work out the height h of a ball thrown upwards.

(b) Work out the value of h when u = 30 and t = 5

.....

(2)

(Total for Question 1 is 4 marks)

2 A circular flower bed is in the shape of a circle, radius 4.5 metres.

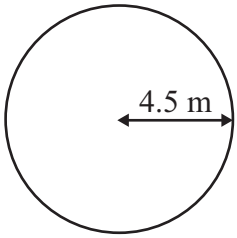


Diagram **NOT** accurately drawn

(a) Work out the area of the flower bed.
Give your answer correct to 3 significant figures.

..... m^2

(2)

The council plants 1000 flower bulbs in the flower bed.

$\frac{1}{4}$ of the bulbs are daffodil bulbs.

The other bulbs are hyacinth bulbs and tulip bulbs in the ratio 2 : 3

(b) Work out how many of each bulb the council plants.

..... daffodil bulbs

..... hyacinth bulbs

..... tulip bulbs

(4)

(Total for Question 2 is 6 marks)

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3 Jason works in a factory.
He is paid £9 per hour and also gets a bonus.

Jason works h hours in a week and gets a bonus of £60
The total pay Jason gets is £P.

Write a formula for P in terms of h.

.....

(Total for Question 3 is 2 marks)

4 Ali makes a model of a boat to a scale of 1 : 50

The model is 23 cm long.

(a) Work out the length, in metres, of the real boat.

..... m

(2)

The real boat is 2.4 m wide.

(b) Work out the width, in centimetres, of the model boat.

..... cm

(2)

(Total for Question 4 is 4 marks)

5 The diagram shows a sketch of a plastic block.

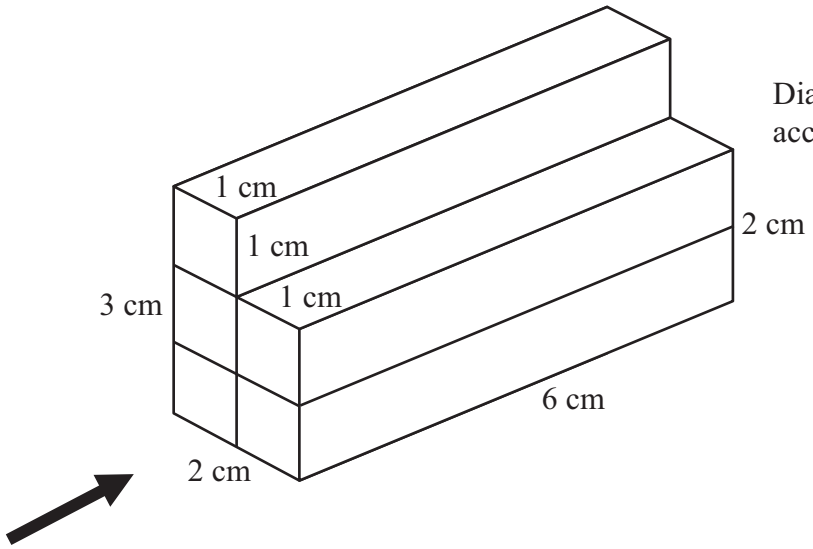


Diagram **NOT** accurately drawn

(a) Draw the side elevation of the plastic block in the direction of the arrow.

(2)

(b) Draw a plan of the plastic block.

(2)

(Total for Question 5 is 4 marks)

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6 A factory makes metal bottle tops.
When a bottle top is too big or too small it does not fit the bottle.

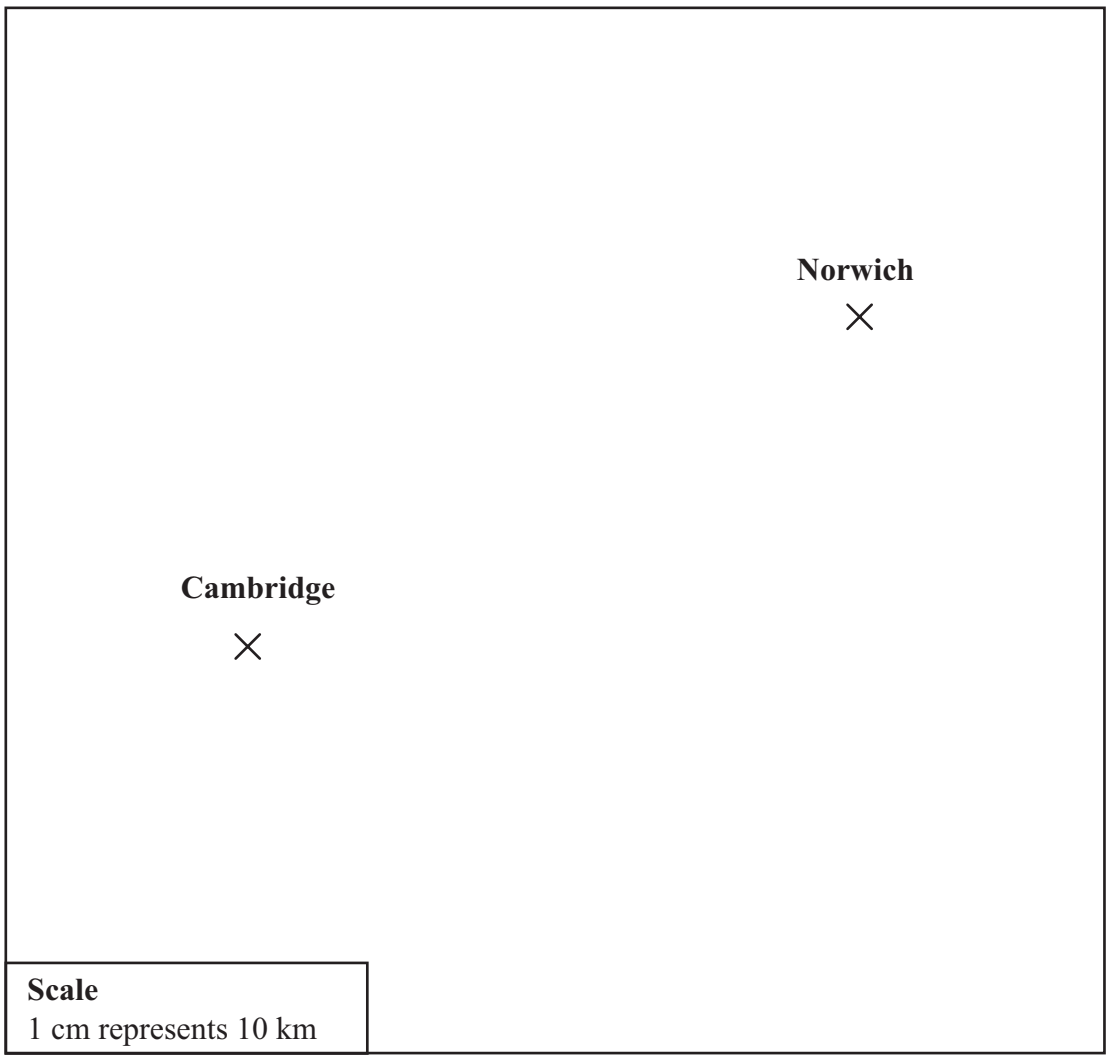
The probability that a bottle top is too big is 0.008
The probability that a bottle top is too small is 0.015

A bottle top is taken at random.
Work out the probability that the bottle top **does** fit the bottle.

.....

(Total for Question 6 is 2 marks)

7 The map shows 2 cities, Cambridge and Norwich.



A new hotel is going to be built.

The hotel will be nearer to Norwich than to Cambridge.
It will be less than 60 kilometres from Cambridge.

Shade the region on the map where the hotel could be built.

(Total for Question 7 is 3 marks)

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***8** The diagram shows a fish tank.

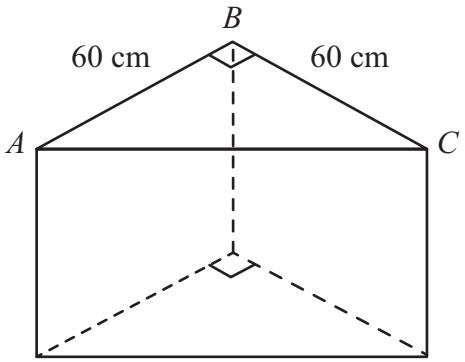


Diagram **NOT** accurately drawn

The fish tank is a triangular prism.
ABC is a right-angled triangle.
$AB = BC = 60$ cm.

Kate fills the tank with water to a depth of 50 cm.

Once a month, Kate puts water treatment tablets into the water.
She uses one tablet for every 15 litres of water.

Kate buys a pack of 100 water treatment tablets.

Work out if she will have enough tablets to last a whole year.
You must show **all** of your working.

(Total for Question 8 is 5 marks)

9 The diagram shows the position of two trees, *A* and *B*.



A mobile phone mast, *M*, has a bearing of 130° from tree *A*.
Mast *M* has a bearing 240° from tree *B*.

In the space above, draw an accurate diagram to show the position of mast *M*.
Mark the position of mast *M* with a cross (×). Label it *M*.

(Total for Question 9 is 3 marks)

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10 The diagram shows a shape made out of solid wood.

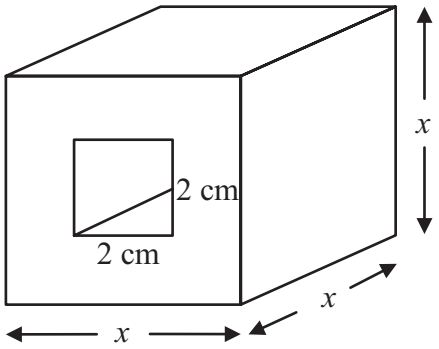


Diagram **NOT** accurately drawn

The shape is made by cutting a hole all the way through a wooden cube.

The cube has edges of length x cm.
The hole has a square cross section of side 2 cm.

The volume of the wood in the shape is 80 cm^3.

(a) Show that $x^3 - 4x = 80$

(2)

The equation $x^3 - 4x = 80$ has a solution between 4 and 5

(b) Use a trial and improvement method to find this solution.
Give your answer correct to 1 decimal place.

You must show **all** your working.

$x =$ .....

(4)

(Total for Question 10 is 6 marks)

11 Tom works in a bicycle repair shop.

He puts a strip of tape around the circumference of bicycle wheels.
Each wheel he has to tape has a diameter of 70 cm.

Tom has 10 m of tape.
What is the greatest number of wheels he can tape?

.....

(Total for Question 11 is 4 marks)

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12 Sephina threw a biased dice 500 times.
The scores are shown in the table.

Score	Frequency
1	105
2	85
3	120
4	48
5	80
6	62

Sephina then throws the same dice 80 times.

Estimate how many times Sephina will score an even number.

.....

(Total for Question 12 is 3 marks)

13 A publisher runs a competition for readers of a magazine.
Each copy of the magazine has a number printed on its front cover.
Readers can enter this number on the magazine's website to see if they have won a £15 prize.

The probability of winning a prize is $\frac{1}{40}$

The magazine publisher estimates that only 10% of the people buying the magazine will try to win a prize.

The publisher expects 350 000 copies of the magazine to be sold.
Estimate how much money the publisher will pay in prize money.

£.....

(Total for Question 13 is 3 marks)

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14 The diagram shows part of a bicycle frame.

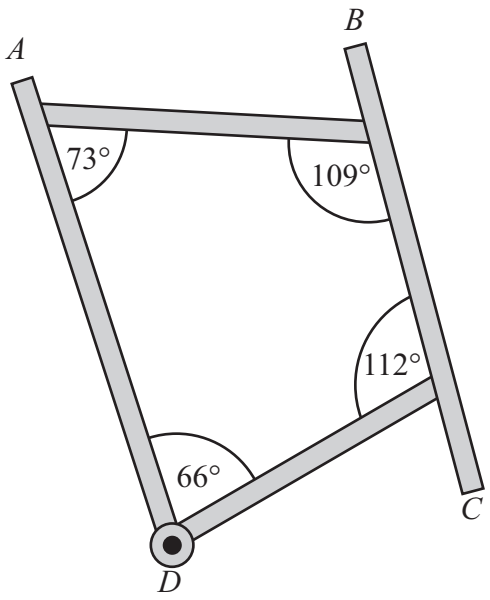


Diagram **NOT** accurately drawn

Are the lines *AD* and *BC* parallel?
You must explain your answer.

.....

.....

.....

.....

(Total for Question 14 is 2 marks)

15 The diagram shows a cheese carton in the shape of a triangular prism.
The front of the carton is an equilateral triangle of side 5 cm.

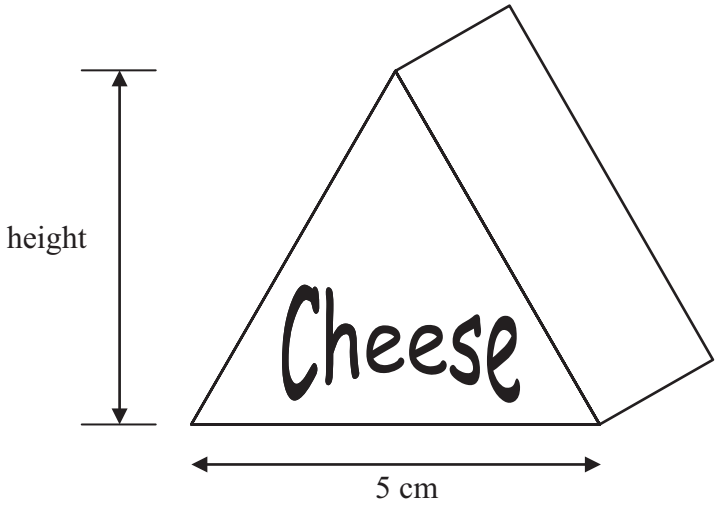


Diagram **NOT** accurately drawn

Work out the height of the carton.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 15 is 4 marks)

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***16** Frank and Steven take penalties for their football team.
The table gives information about the number of goals they scored and the number of goals they missed when taking penalties last year.

Player	Goals scored	Goals missed
Frank	17	8
Steven	21	9

Using this information, work out which player has the greater probability of scoring a goal when taking the next penalty.

(Total for Question 16 is 3 marks)

17 A company sells circular mirrors.
The price P pounds of a mirror is proportional to the square of its radius r cm.

A mirror with radius 20 cm has a price of £36

Find a formula for P in terms of r.

$P =$ .....

(Total for Question 17 is 3 marks)

18 The diagram shows a child's tent which is in the shape of a square-based pyramid.

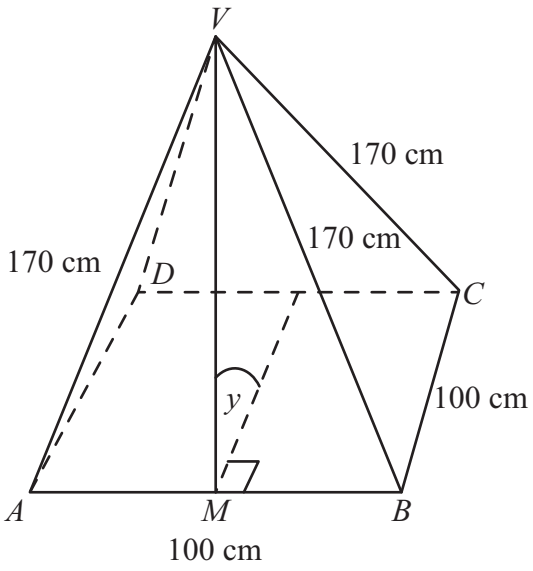


Diagram **NOT** accurately drawn

The base of the tent is a square $ABCD$ with sides of length 100 cm.
Each of the sloping edges of the tent has length 170 cm.

V is the vertex of the pyramid.
M is the midpoint of AB.
There is a straight zip along the line VM.

Work out the size of the angle marked y.
Write your answer to 3 significant figures.

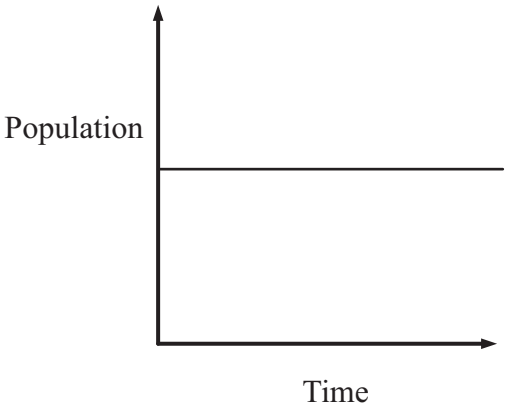
.....°

(Total for Question 18 is 5 marks)

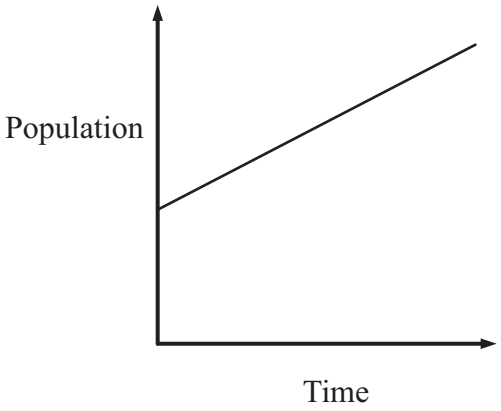
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19 Each of the 4 graphs **A**, **B**, **C** and **D** shows population plotted against time.

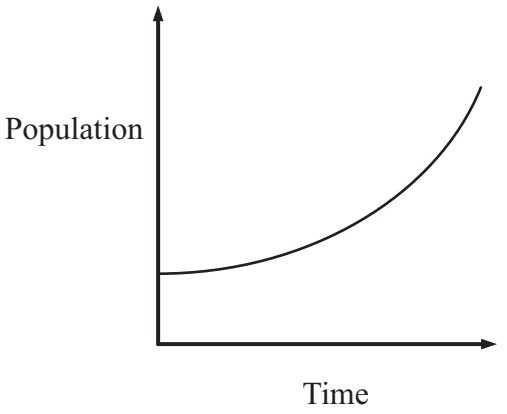
Graph A



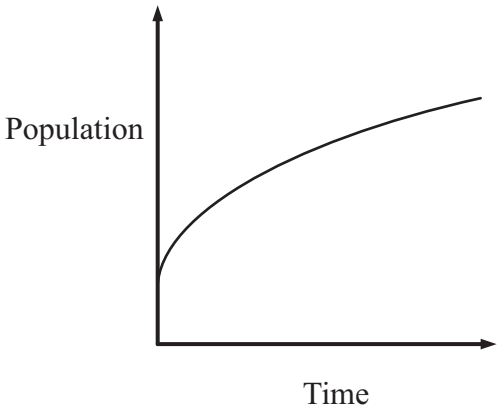
Graph B



Graph C



Graph D



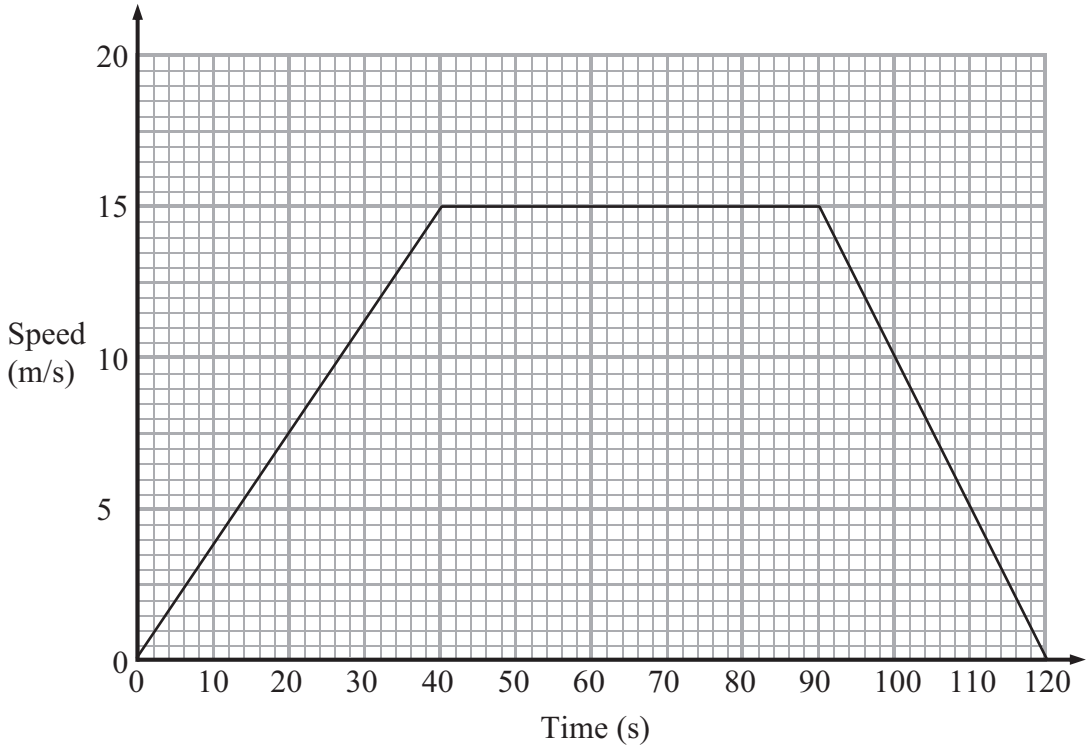
Match the correct graph to each description of the rate of population growth.

Rate of population growth	Graph
Zero	.....
Increasing	.....
Decreasing	.....
Constant	.....

(Total for Question 19 is 2 marks)

20 A car travels along a straight road between 2 sets of traffic lights.

Here is the speed time graph for this journey.



(a) Work out the acceleration of the car during the first 40 seconds.

..... m/s^2

(2)

(b) Describe what happens to the speed of the car between the times of 40 s and 120 s.

.....

.....

(2)

(c) Find the total distance, in metres, that the car travels between the two sets of traffic lights.

..... m

(2)

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(d) Work out the average speed of the car in kilometres per hour between the two sets of traffic lights.

..... km/h

(3)

(Total for Question 20 is 9 marks)

21 The table shows information about the carbohydrate content of Choco Crunch biscuits.

	per 100 g	per biscuit
Carbohydrate	62.1 g	10.8 g

Choco Crunch biscuits are sold in 400 g packs.

(a) Work out how many biscuits there are in a pack.

.....

(2)

Snack size Choco Crunch biscuits are made with the same recipe.
Snack size biscuits are sold in 120 g packs.
There are 18 biscuits in each pack.

(b) Complete the table for snack size biscuits.

	per 100 g	per snack size biscuit
Carbohydrate	62.1 g	..... g

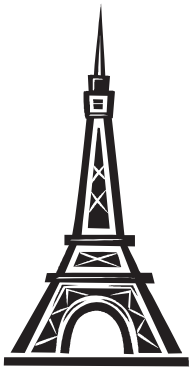
(3)

(Total for Question 21 is 5 marks)

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22 Two metal models of the Eiffel Tower are mathematically similar.

Model A has a height of 12 cm.
Model B has a height of 18 cm.



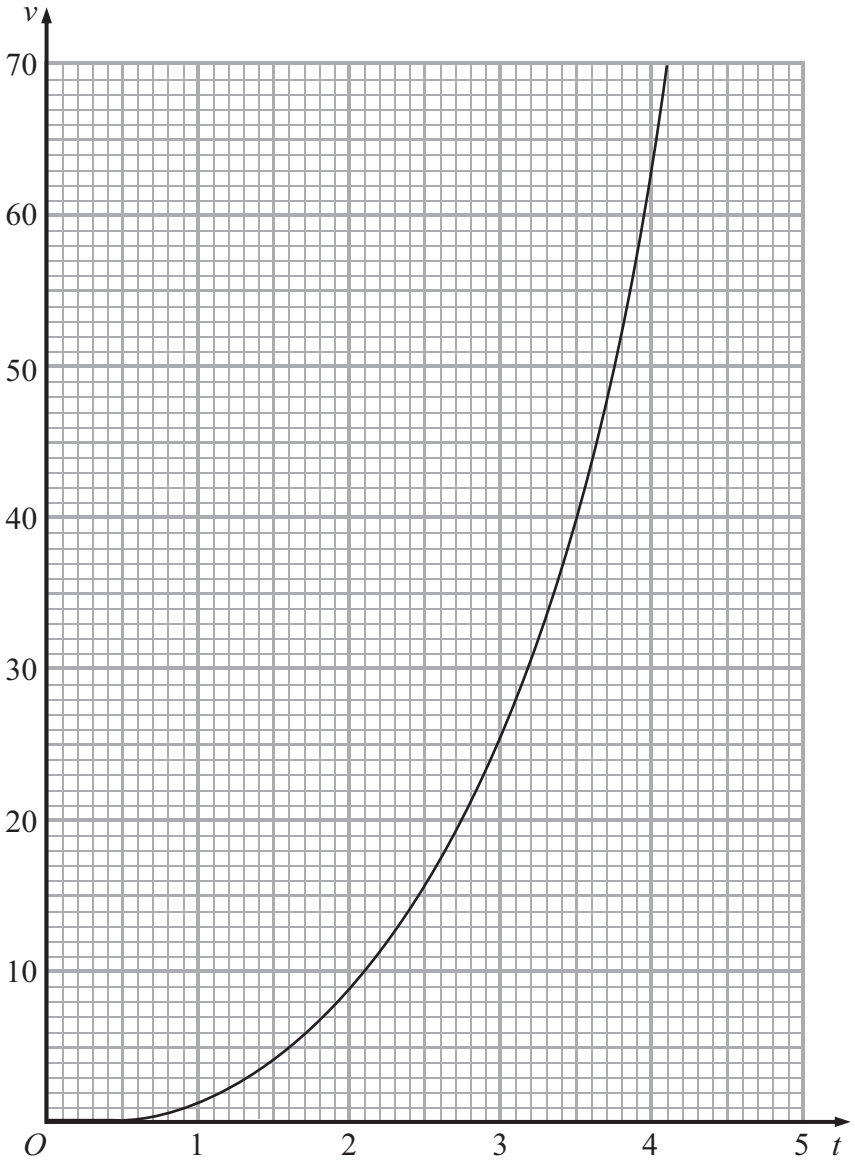
Model A and model B are made of the same metal.
Model A has a weight of 80g.

Work out the weight of model B.

..... g

(Total for Question 22 is 3 marks)

23 The graph shows the velocity, v metres per second, of a rocket at time t seconds.



Find an estimate for the rate of change of the velocity of the rocket at $t = 2$

..... m/s^2

(Total for Question 23 is 3 marks)

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24 Hayley ran a distance of 400 m in a time of 52.64 seconds.

The distance of 400 m was measured to the nearest metre.
The time of 52.64 seconds was measured to the nearest one hundredth of a second.

(a) (i) Write down the upper bound for the distance 400 m.

..... m

(ii) Write down the lower bound for the time 52.64 seconds.

..... s

(iii) Work out the upper bound for Hayley's average speed.

..... m/s

(4)

(b) Work out the lower bound for Hayley's average speed.

..... m/s

(2)

(c) Write down an appropriate estimate for Hayley's average speed.

..... m/s

(1)

(Total for Question 24 is 7 marks)

25 A new shopping centre is opened and 500 new jobs are created.
After 2 years, the number of jobs has increased to 700

Assuming that the number of jobs in the shopping centre increases exponentially, work out how many jobs there will be 5 years after the shopping centre first opened.

.....

(Total for Question 25 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

November 2011

Applications of Mathematics (GCSE)
Unit 2: 5AM2H_01 (Higher)

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November 2011

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

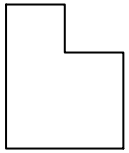
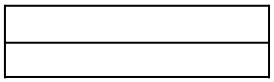
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	$\frac{10\times 0.8}{2}$	4	2	M1 for $\frac{10\times 0.8}{2}$ oe A1 cao
	(b)	$30 \times 5 - 4.9 \times 5^2$	27.5	2	M1 for 30×5 and 4.9×5^2 or 150 and 122.5 A1 cao
2	(a)	$\pi \times 4.5^2$	63.6	2	M1 for $\pi \times 4.5^2$ A1 for 63.5 – 63.7
	(b)	$1000 \div 4$	250	4	M1 for $1000 \div 4$ or 250 or 750 seen
		$1000 - 250 = 750$ $\frac{750}{(2+3)} \times 2$	300		M1 for $(1000 - 250) \div (2 + 3)$ oe or $\frac{2}{5}$ or $\frac{3}{5}$ oe or 150 seen
		$\frac{750}{(2+3)} \times 3$	450		M1 (dep) for '150'×2 or '150'×3 or $\frac{2}{5}\times 750$ or $\frac{3}{5}\times 750$ A1 for 250, 300 and 450 in correct places (SC: B2 for 250, 450, 300, i.e. tulips and hyacinths transposed)
3			$P = 9h + 60$	2	M1 for $9\times h + k$ ($k\neq 0$) or $m \times h + 60$ ($m \neq 9$) or $9\times h + 60$ A1 for $P = 9h + 60$ condone inclusion of money notation
4	(a)	$23 \times 50 \div 100$	11.5	2	M1 for 23×50 or 1150 seen or 0.23×50 or 23×0.5 A1 cao
	(b)	$2.4 \div 50 \times 100$	4.8	2	M1 for $2.4 \div 50$ or 0.048 seen or $240 \div 50$ or $2.4 \div 0.5$ A1 cao

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5	(a)		Correct elevation 	2	B2 for correct elevation in correct orientation (B1 for incorrect orientation)
	(b)		Correct plan 	2	B2 for correct plan with internal line shown (B1 for internal line missing or for rectangle with one incorrect dimension)
6		1 – (0.008 + 0.015)	0.977	2	M1 for 1 – (0.008 + 0.015) oe A1 for 0.977 oe
7			Correct region shaded	3	B1for perpendicular bisector within guidelines B1 for arc of circle within guidelines B1 for correct region shaded or otherwise indicated
*8		$\frac{60\times60\times50}{2}$ = 90 000 90 000 ÷ 1000 = 90 90 ÷ 15 = 6 6 × 12 =72, 72<100 OR 100 ÷ 6 = 16.66..., 16.66...> 12 OR 100 ÷ 12 = 8.33..., 8.33 > 6	Yes with full supporting working	5	M1 for $\frac{60\times60\times50}{2}$ or 90 000 M1 for ’90 000’÷1000 or ’90 000’÷15 or 90 or 6000 seen M1 for ’90’÷15 or ’6000’÷1000 oe A1 for 6 or 72 C1 for correct decision with appropriate comparison

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9			Point marked	3	M1 for line drawn or point marked within guidelines from A M1 for a line drawn or a point marked within guidelines from B A1 for a point marked within region where guidelines intersect
10	(a)	$(x \times x - 4) \times x$ $x \times x \times x - 4 \times x$		2	M1 for showing $(x \times x - 4) \times x$ or $x \times x \times x - 4 \times x$ A1 (dep on M1)for simplifying and equating to 80
	(b)	4 48 5 105 4.5 73.125 4.6 78.936 4.7 85.023 4.8 91.392 4.9 98.049 4.61 79.53218 4.62 80.13113 4.63 80.73285 4.64 81.33734 4.65 81.94463	4.6	4	B2 for trial $4.6 \le x \le 4.7$ evaluated (B1 for trial $4 \le x \le 5$ evaluated) B1 for different trial $4.6 \le x \le 4.65$ evaluated B1 (dep on at least one previous B1) for 4.6 Values evaluated can be rounded or truncated, but to nearest whole number when x has 1 dp or less and to 1 dp when x has 2 dp

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11		$70 \times \pi = 219.9$ $1000 \div 219.9 = 4.55$	4	4	M1 for $70 \times \pi$ or $0.7 \times \pi$ or 219(.9) or 2.1(9) M1 for using 1000 or '$70 \times \pi$' ÷ 100 oe M1 for $1000 \div (70 \times \pi)$ or $10 \div (70 \times \pi \div 100)$ A1 cao
12		$\frac{85+48+62}{500} \times 80$	31 or 32	3	M1 for $\frac{85+48+62}{500}$ or $\frac{195}{500}$ oe or 0.39 M1 for $\frac{85+48+62}{500} \times 80$ oe or 31.2 A1 for 31 or 32
13		$\frac{1}{40} \times \frac{1}{10} \times 350\,000 \times 15$	13125	3	M1 for $\frac{1}{40} \times \frac{1}{10} \times 350\,000$ oe or 875 seen M1 for '875'×15 A1 cao
14		$109 + 73 \neq 180$ or $66 + 112 \neq 180$ $180 - 109 \neq 73$ $180 - 73 \neq 109$ $180 - 66 \neq 112$ $180 - 112 \neq 66$	No with reasoning given	2	M1 for finding total of an appropriate pair of angles A1 for stating total of co-interior angles is not 180 OR M1 for stating an appropriate pair of alternate angles 71, 107, 114 or 68 A1 for stating that alternate angles are not equal

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
15		$5^2 - 2.5^2 = 18.75$ $\sqrt{18.75} = 4.33$ OR $5 \times \cos 30$ OR $5 \times \sin 30$ OR $\frac{2.5}{\tan 30} \times 2$	4.33	4	B1 for a right-angled triangle shown or 2.5 or 30° or 60° seen. M1 for $5^2 - 2.5^2$ M1 for $\sqrt{18.75}$ or $\sqrt{5^2 - 2.5^2}$ A1 for 4.33 or better OR M1 for $\frac{x}{5} = \cos 30$ M1 for $5 \times \cos 30$ A1 for 4.33 or better OR M1 for $\frac{2.5}{x} = \tan 30$ M1 for $(x =) \frac{2.5}{\tan 30}$ A1 for 4.33 or better
*16		$\frac{17}{25} = 0.68$ $\frac{21}{30} = 0.7$	Steven with explanation	3	M1 for either probability $\frac{17}{25}$ or $\frac{21}{30}$ oe seen A1 for both converted correctly to a comparable form C1 for identification of Steven with explanation based on correct comparison, e.g. '0.7 > 0.68'

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
17		$P = kr^2$ $36 = k \times 20^2$ $P = 0.09\ r^2$ OR $\frac{20^2}{r^2} = \frac{36}{P}$ $P = \frac{36}{20^2} r^2$	$P = 0.09\ r^2$	3	M1 for $P = kr^2$ (accept any $k \neq 0$ or 1) M1 (dep) for $36 = k \times 20^2$ A1 for $P = 0.09\ r^2$ oe OR M2 for $\frac{20^2}{r^2} = \frac{36}{P}$ oe, e.g. $20^2 : r^2 = 36 : P$ A1 for $P = \frac{36}{20^2} r^2$ oe
18		$\sqrt{170^2 - 50^2} = 162.48$ $\cos^{-1} \frac{50}{162.48}$ OR $\sqrt{100^2 + 100^2} = 141.42$ $141.42 \div 2 = 70.71$ $\sqrt{170^2 - 70.71^2} = 154.59$ $\tan^{-1} \frac{154.59}{50}$	72.1	5	M1 for $\sqrt{170^2 - 50^2}$ or $\sqrt{26\ 400}$ A1 for 162.4(8) M1 for $\cos y = \frac{50}{162.4(8)}$ M1 for $\cos^{-1} \frac{50}{162.4(8)}$ A1 for 72.0 – 72.1 OR M1 for $\sqrt{100^2 + 100^2}$ or 141.4(2) or $\sqrt{170^2 - 70.7(1)^2}$ or $\sqrt{23\ 900}$ A1 for 154.5(9) M1 for $\tan y = \frac{154.5(9)}{50}$ M1 for $\tan^{-1} \frac{154.5(9)}{50}$ A1 for 72.0 – 72.1

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
19			A C D B	2	B2 for 4 correct (B1 for 2 or 3 correct)
20	(a)	15 ÷ 40	0.375	2	M1 for $\frac{15}{40}$ oe or sight of right-angled triangle against line A1 0.375 or 0.38
	(b)		Describes motion	2	B1 for constant speed oe for 50 seconds oe B1 for slows down (to stop) for 30 seconds oe
	(c)	$\frac{40\times15}{2} + 50\times15 + \frac{30\times15}{2}$	1275	2	M1 for $\frac{50+120}{2}\times15$ or correct area for at least one of 3 sections 300, 750 or 225 seen A1 cao
	(d)	$\frac{1275 \div 1000}{120 \div 3600}$	38.25	3	M1 for attempt to find $\frac{\text{'totaldistance'}}{\text{'total time'}}$ M1 for '1275' ÷ 1000 or 120 ÷ 3600 oe A1 for 38 − 38.3 or ft '1275'
21	(a)	4 × 62.1 ÷ 10.8	23	2	M1 for 4 × 62.1 or 62.1÷ 10.8 A1 cao
	(b)	1.2 × 62.1 ÷ 18	4.14	3	M1 for use of 1.2 or $\frac{120}{100}$ oe or $\frac{20}{100}\times 62.1$ M1 for 1.2 × 62.1 or 62.1 ÷ 18 A1 for 4.14

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
22		$\frac{18}{12} = 1.5$ 80×1.5^3	270	3	M1 for $\frac{18}{12}$ or $\frac{12}{18}$ oe or $\left(\frac{18}{12}\right)^3$ or $\left(\frac{12}{18}\right)^3$ oe or 18:12 or 12:18 or $18^3 : 12^3$ or $12^3 : 18^8$ oe M1 for 80×1.5^3 oe A1 cao (SC B1 for 120)
23			11	3	M1 for tangent drawn at t=2 M1 (dep) for $\frac{diff.\ y}{diff.\ x}$ ft from tangent A1 for 9 – 14
24	(i)		400.5	4	B1 for 400.5 accept 400.4$\dot{9}$ and 400.499(...)
	(ii)		52.635		B1 cao
	(iii)	400.5 ÷ 52.635	7.609		M1 for '400.5' ÷ '52.635' A1 for 7.60(9...) rounded or truncated
	(b)	399.5 ÷ 52.645	7.589	2	M1 for 399.5 ÷ 52.645 A1 for 7.58(85...) rounded or truncated
	(c)		7.6	1	B1 cao

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
25		Growth factor = $\frac{100+n}{100}$ $500 \times \frac{100+n}{100} \times \frac{100+n}{100} = 700$ $(100+n)^2 = 14000$ $100 + n = 118.32$ $n = 18.32$ After 5 years, 500×1.1832^5 OR $500 \times 1.1 \times 1.1 = 605$ too low $500 \times 1.2 \times 1.2 = 720$ too big $500 \times 1.18 \times 1.18 = 696.2$ too low $500 \times 1.19 \times 1.19 = 708.05$ too big $500 \times 1.183 \times 1.183 = 699.745$ too low $500 \times 1.184 \times 1.184 = 700.9$ too big $500 \times 1.1832 \times 1.1832 = 699.98$ After 5 years, 500×1.1832^5	1159 or 1160	5	M1 for introducing growth factor M1 for $500 \times \frac{100+n}{100} \times \frac{100+n}{100} = 700$ A1 for 18.32 or 118.32 M1 for 500×1.1832^5 A1 for 1158 or 1159 or 1160 (accept 1143 or 1144) OR M1 for any trial evaluated and compared with 700 M1 for trials above and below A1 for 1.1832 or better M1 for 500×1.1832^5 A1 for 1158 or 1159 or 1160 (accept 1143 or 1144) OR M1 for introducing a growth factor M1 for $500r^2 = 700$ A1 for (r=) $\sqrt{\frac{700}{500}}$ oe or 1.18(3) M1 for $500 \times \left(\sqrt{\frac{700}{500}}\right)^5$ oe A1 for 1158 or 1159 or 1160 (accept 1143 or 1144) (B2 for 2689 or 2690)

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Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Applications of Mathematics

Unit 2: Applications 2

For Approved Pilot Centres ONLY

Higher Tier

Friday 10 June 2011 – Morning
Time: 1 hour 45 minutes

Paper Reference
5AM2H/01

You must have:
Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions



- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P38954A

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6/6/6/6/6/6

P 3 8 9 5 4 A 0 1 2 4

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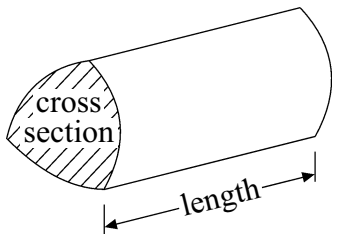
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GCSE Mathematics 2AM01

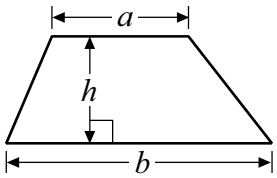
Formulae – Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of a prism = area of cross section × length

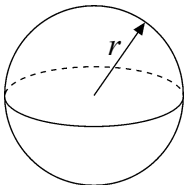


Area of trapezium $= \frac{1}{2}(a+b)h$



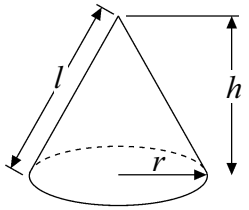
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$

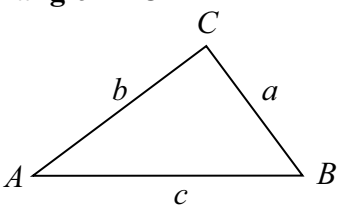


Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$



In any triangle *ABC*



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 £2450 is shared between Bill and Maggie in the ratio 5 : 2

Bill gets more money than Maggie.
Work out how much more.

£ .....

(Total for Question 1 is 4 marks)

2 Here is a diagram of Brian's garage.

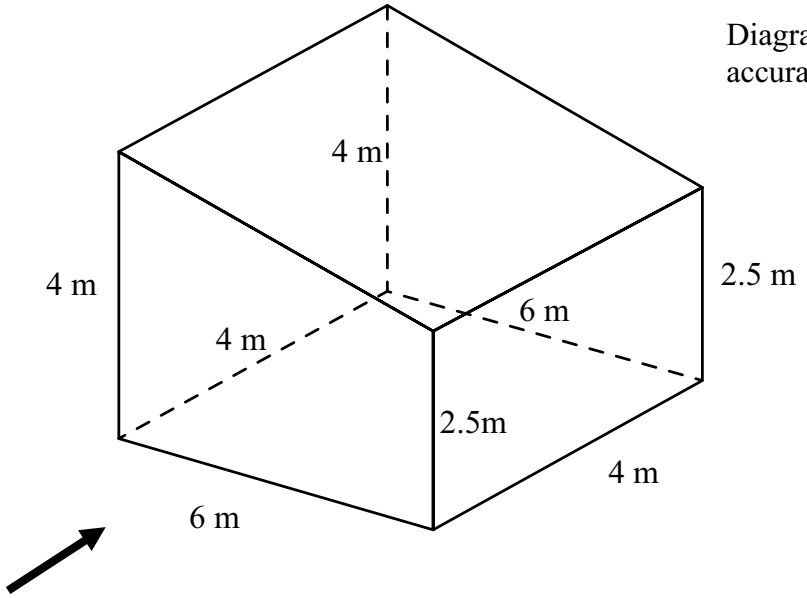


Diagram **NOT** accurately drawn

The floor of the garage is horizontal.
All the walls are vertical.

(a) Draw the front elevation of the garage from the direction of the arrow.
Use a scale of 1 cm to 1 m.

(2)

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(b) Work out an estimate for the total surface area of the garage.

..... m^2

(5)

(Total for Question 2 is 7 marks)

3 Gemma plays a game by moving a counter over a board.

Gemma must throw 2 fair dice.
She must get the same number on each dice to start moving the counter.

Gemma throws the 2 fair dice.

(a) Show that the probability she will start moving the counter is $\frac{1}{6}$

You may use this table.

		First dice					
		1	**2**	**3**	**4**	**5**	**6**
Second dice	**1**						
	2						
	3						
	4						
	5						
	6						

(2)

(b) Work out the probability that Gemma will not start moving the counter.

.....

(2)

(Total for Question 3 is 4 marks)

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4 Here is the list of materials for making concrete for 20 m^2 of floor.

Concrete for covering 20 m^2 of floor	
Sand	50 kg
Cement	25 kg
Aggregate	100 kg

The floor of a room is a rectangle with length 5 m and width 10 m.

Work out how much of each of these materials is needed to cover this floor with concrete.

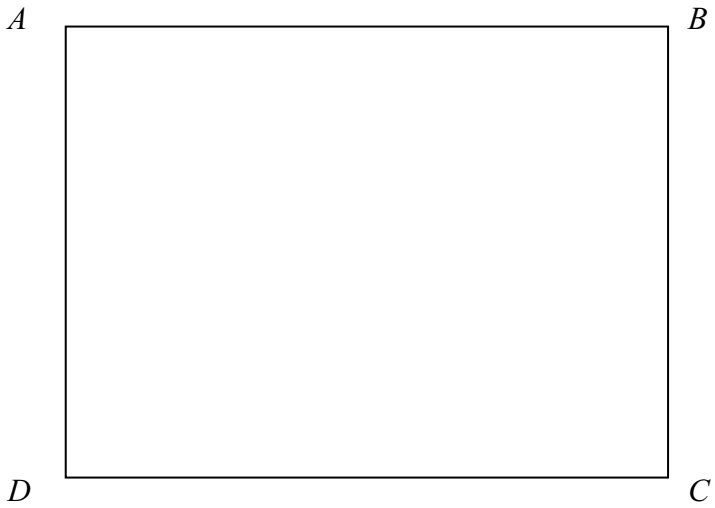
Sand .....

Cement .....

Aggregate .....

(Total for Question 4 is 5 marks)

5 Here is an accurate scale diagram of a car park in the shape of a rectangle.



The scale is 1 cm to 10 m.

Cars must **not** be parked

within 20 m of the centre of the rectangle

or

within 20 m of the side *BC*.

On the diagram, show accurately by shading, the regions where cars must not be parked.

(Total for Question 5 is 4 marks)

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6 Keith, Ben and Liz tested a coin to find out if it was biased.
They each threw the coin a number of times.
They counted the number of heads and the number of tails they each got.

The table below gives information about their results.

	Keith	**Ben**	**Liz**
Number of heads	12	34	57
Number of tails	28	66	243

(a) Which person, Keith, Ben or Liz, will have the best estimate for the probability of getting a head on this coin? Explain your answer.

.....

.....

(1)

(b) Using all the results in the table, work out an estimate for the probability that the next throw of the coin will be a head.

.....

(2)

(Total for Question 6 is 3 marks)

7 Here is a sketch of the floor of a room.

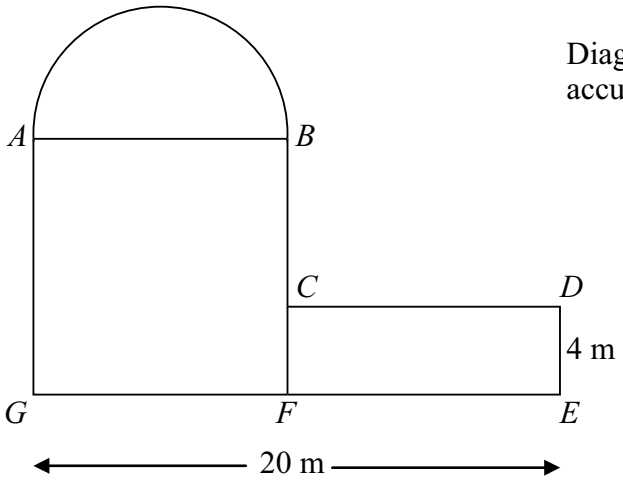


Diagram **NOT** accurately drawn

The room has three parts.
The first part is the square *ABFG*.
The second part is the rectangle *CDEF*.
The third part is the semicircle with *AB* as diameter.

The length of the rectangle is the same as the length of the square.

GE = 20 m
DE = 4 m

(a) Work out the area of the rectangle *CDEF*.

..... m^2

(3)

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Jenny is going to cover the floor with varnish.
1 litre of varnish will cover an area of 20 m^2.

(b) Work out the number of litres of varnish that Jenny will need.

.....

(5)

(Total for Question 7 is 8 marks)

8 The police use the following formula to investigate how fast a car was travelling.

$$v^2 = u^2 + 2as$$

$u = 12$

$a = -2$

$s = 11$

(a) Work out a value of v.

$v =$ .....

(2)

$v = 20$

$u = 10$

$s = 25$

(b) Work out the value of a.

$a =$ .....

(2)

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When

u = 12.0 correct to 1 decimal place

a = –1.9 correct to 1 decimal place

s = 11 correct to 2 significant figures,

(c) calculate the upper bound of v.

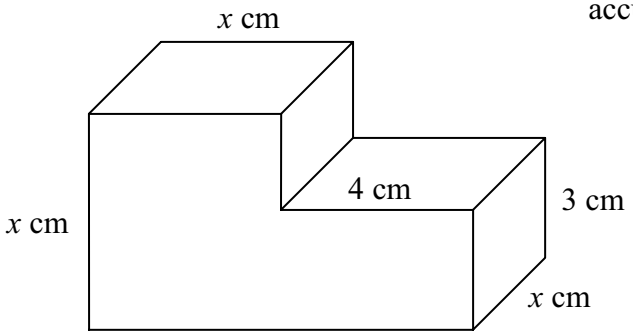
.....

(3)

(Total for Question 8 is 7 marks)

9 Dave has to make a metal shape.

Diagram **NOT** accurately drawn



The diagram represents the metal shape.
The shape is a prism.
The measurements of the prism are shown on the diagram.
The prism must have a volume of 100 cm^3.

(a) Show that $x^3 + 12x = 100$

(2)

(b) Use trial and improvement to find the value of x.
You must show **all** your working.
Give your answer correct to 1 decimal place.

$x =$ .....

(5)

(Total for Question 9 is 7 marks)

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10 Peter has x pence.
Anni has three times as much money as Peter.
Eri has 24 pence more than Peter.

The total money they have is more than twice the amount of money that Eri has.

Work out the least amount of money Peter could have.

..... p

(Total for Question 10 is 5 marks)

11 The diagram shows a vertical building $ABCD$ on horizontal ground.

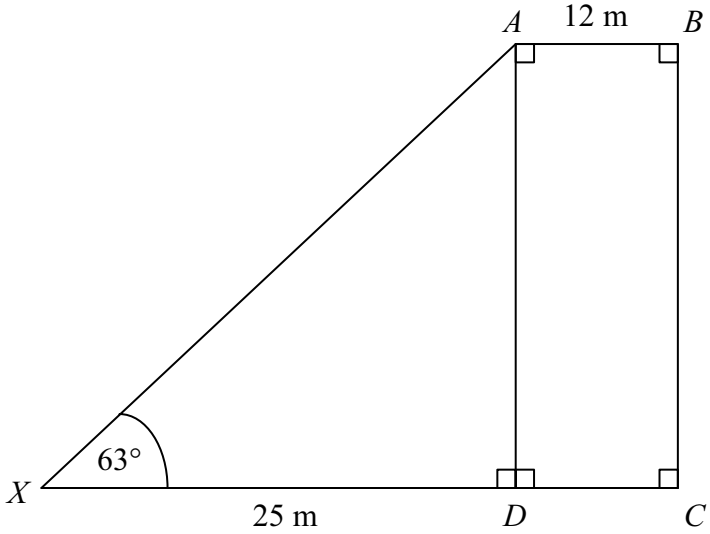


Diagram **NOT** accurately drawn

The angle of elevation of A from X is 63°.
X is 25 metres from D.

Calculate the size of the angle of elevation of B from X.
Give your answer correct to 3 significant figures.

.....°

(Total for Question 11 is 5 marks)

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12 The diagram shows a framework of straight rods in the shape of a cuboid.

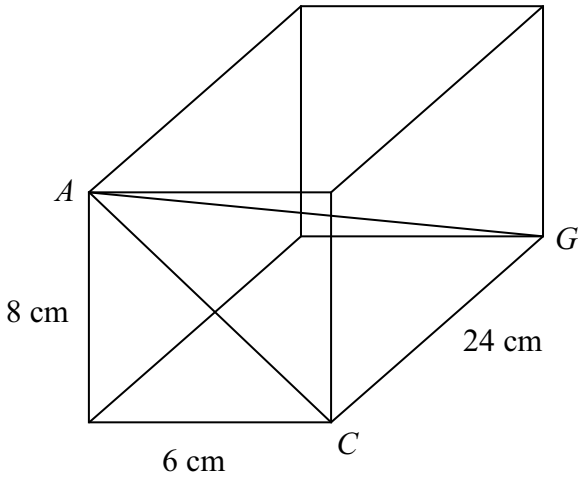


Diagram **NOT** accurately drawn

Two straight rods AC and AG are used to strengthen the framework.

Work out the total length of all the rods in the diagram.

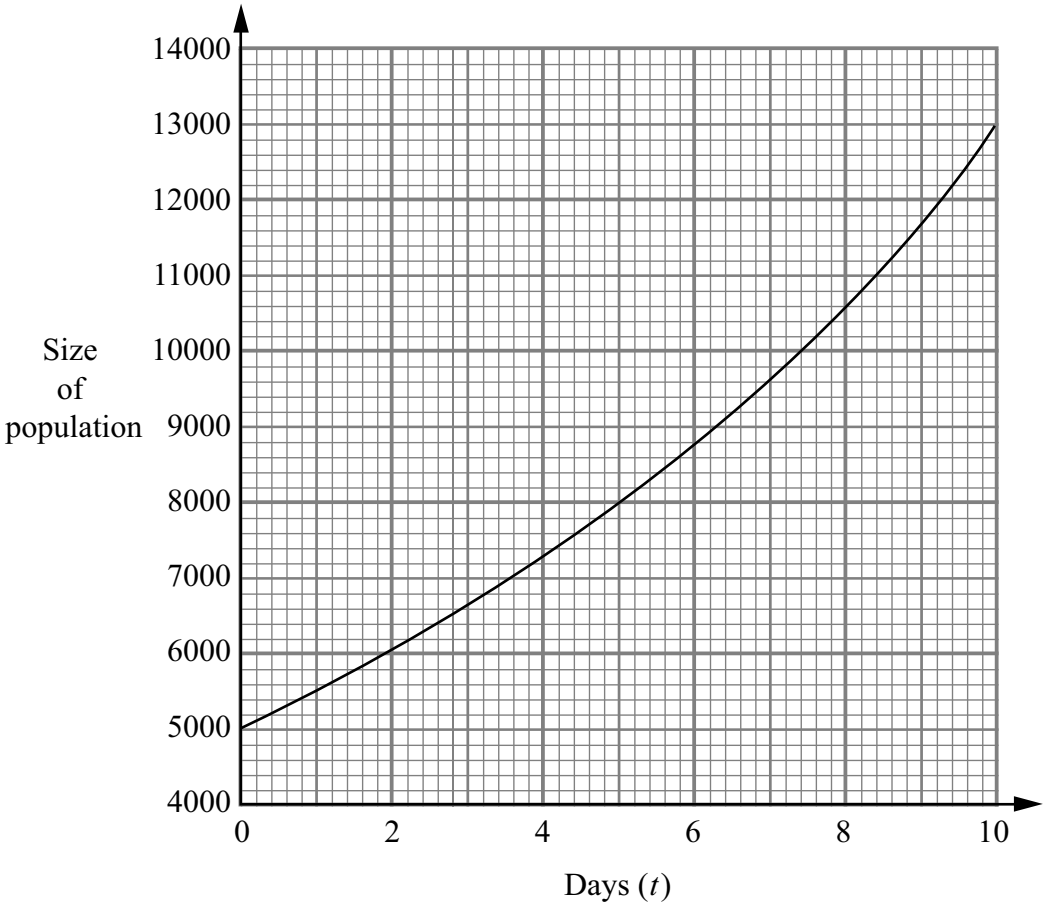
..... cm

(Total for Question 12 is 5 marks)

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13 A scientist is studying a population of fruit flies in an experiment.

The graph gives information about the size of the population t days after the start of the experiment.



(a) By how much did the population grow during the 4th day?

.....

(2)

(b) Estimate the value of the multiplier.

.....

(2)

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An initial population of size P, grows exponentially at a rate of r% per day.
The size of the population, A, after n days is given by

$$A = P\left(\frac{100+r}{100}\right)^n$$

$P = 20\,000$

$r = 3$

$n = 10$

(c) Find the value of A.
Give your answer correct to 3 significant figures.

.....

(2)

The size of a different population of fruit flies is growing at a rate of x% per day.
The size of this population doubles after 8 days.

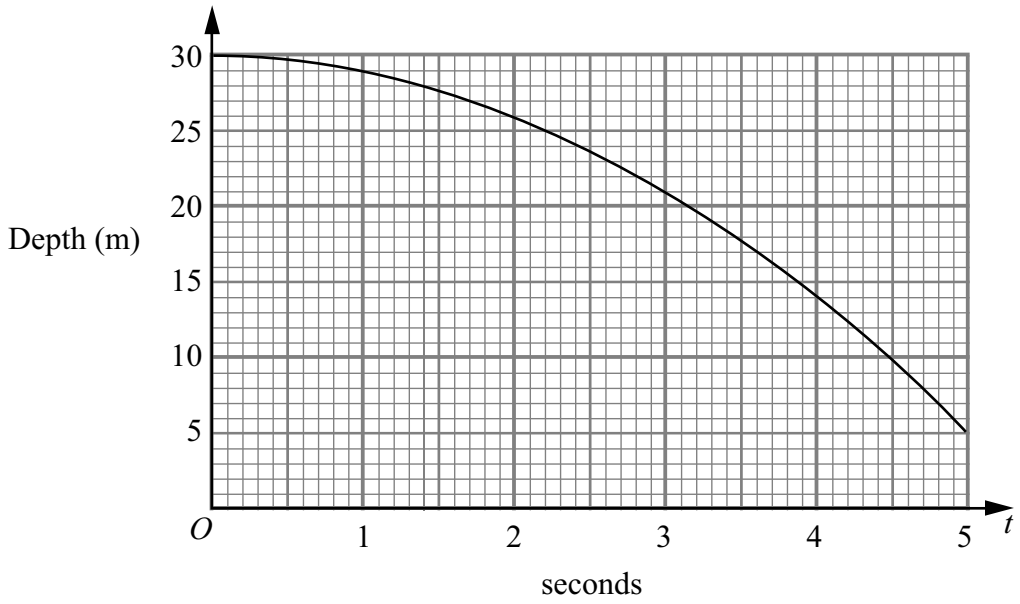
(d) Work out the value of x.

.....

(3)

(Total for Question 13 is 9 marks)

14 The graph below shows the depth of water, in metres, in a tank after t seconds.



(a) Work out the average rate of the change in depth from $t = 0$ to $t = 3$

..... m/s

(2)

(b) Work out an estimate for the rate of change of depth at $t = 3$

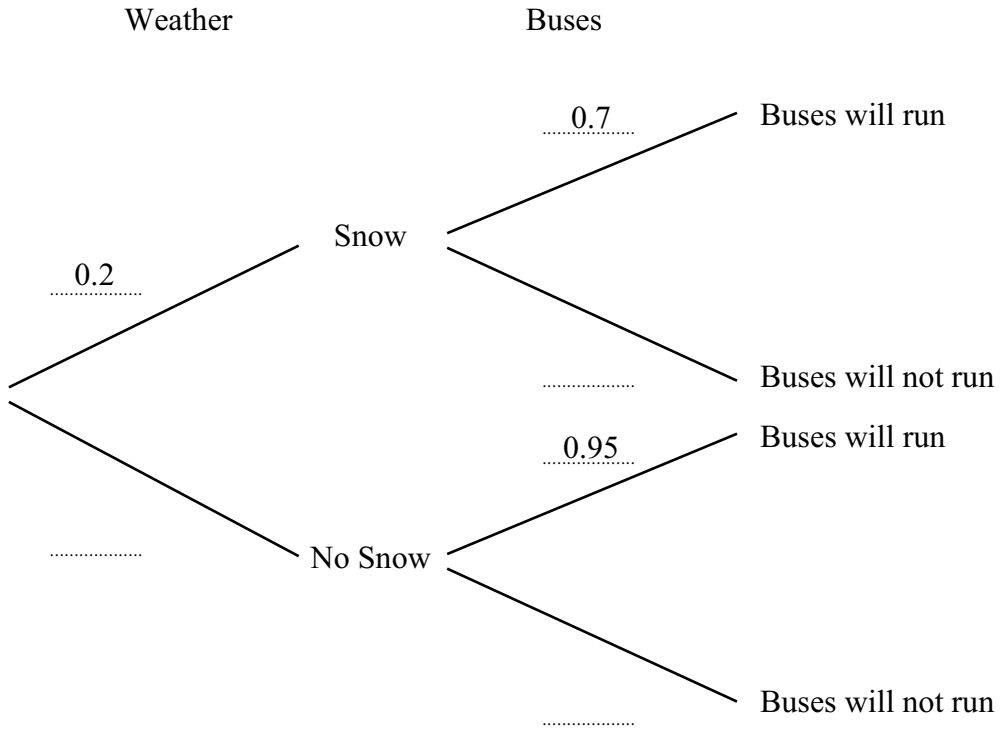
..... m/s

(3)

(Total for Question 14 is 5 marks)

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15 The decision tree diagram gives information about the probability of snow for the first 50 days in winter and the probability of whether buses will run or not run.



(a) Complete the decision tree diagram.

(2)

*(b) Show that an estimate for the number of days the buses will not run in the first 50 days is 5

(4)

(Total for Question 15 is 6 marks)

16 When a car accelerates from rest, its speed, v m/s, is proportional to the square of the time, t seconds, for which it travels.

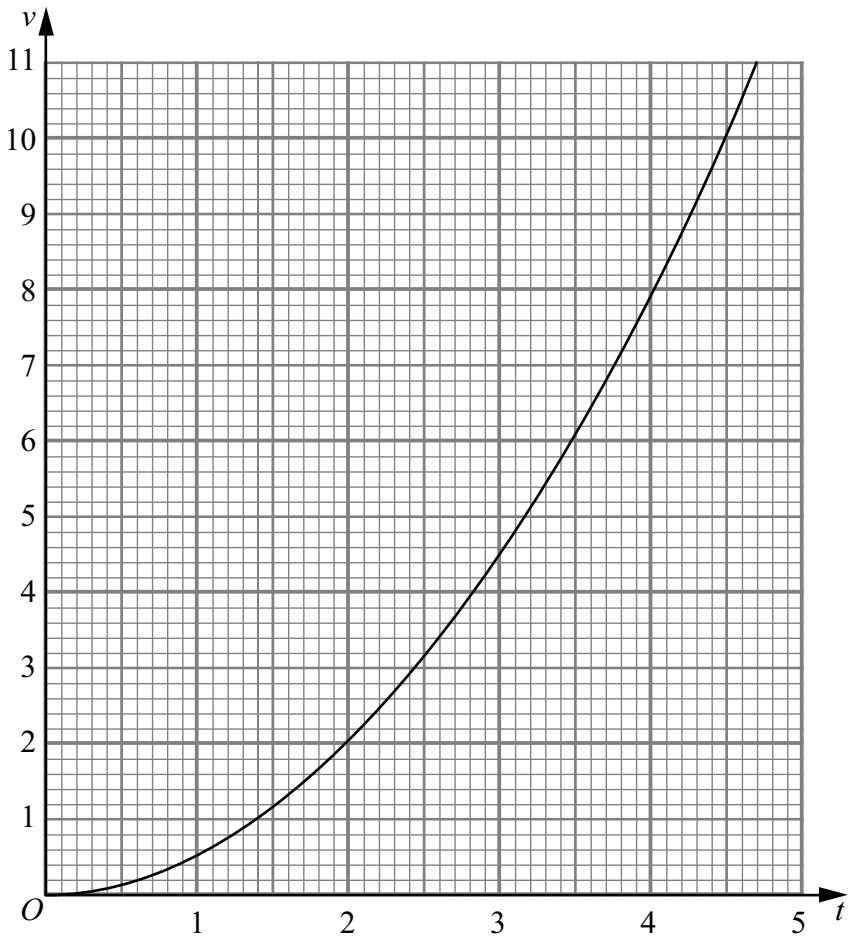
When $t = 4$, $v = 8$

(a) Work out the value of v when $t = 10$

.....

(4)

Here is the graph of v against t for the car.



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(b) Work out an estimate for the distance the car travels during the first 4 seconds.

..... m

(3)

The speed of a van is given by $v = 1 + 2t$

(c) Find the value of t for which the speed of the van is the same as the speed of the car.
Give your answer correct to 1 decimal place.

$t =$ ....

(4)

(Total for Question 16 is 11 marks)

***17** In a box there are

a 1p coin
a 2p coin
two 5p coins
and a 10p coin.

Alan, Beth and Celia are each going to take at random a coin from the box and keep their coin.

Alan wants the best chance to take the 10p coin.

Alan can decide to go first or second or third.

What should he do?
You must explain your answer.

(Total for Question 17 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

June 2011

Applications of Mathematics (GCSE)
Unit 2: Applications 5AM2H_01

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1		2450 ÷ 7 =350 Bill 5 × 350; Maggie 2 ×350 1750 – 700 = OR 2450 ÷ 7 × 3 =	1050	4	M1 2450 ÷ (5+2) M1(dep on M1) for 5 × '350' or 2 × '350' or 1750 or 700 seen M1 5 × '350' – 2 × '350' A1 cao OR M1 2450 ÷ (5+2) M2 450 ÷ '7' × 3 A1 cao
2	(a)		Diagram	2	M1 trapezium with at least one side correct A1 cao
	(b)	Length of roof = 6.2 m Area of roof = 6.2 × 4 = 24.8 Other areas are 10, 16, 19.5 and 24	113.8	5	M1 a correct method to find the area of a rectangular face **or** 10 or 24 or 16 or '24.8' seen M1 a correct method to find the area of a trapezoidal face A1 for 19.5 or for 15 and 4.5 M1 for adding areas of 5 or 6 faces A1 113 – 115 (accept 89 – 91)

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
3	(a)	Grid completed with 6 out of 36 doubles OR $\frac{1}{6}\times\frac{1}{6}=\frac{1}{36}$, $6\times\frac{1}{36}=\frac{1}{6}$	AG	2	M1 shows 6 doubles on grid A1 $\frac{6}{36}=\frac{1}{6}$ OR M1 $\frac{1}{6}\times\frac{1}{6}=\frac{1}{36}$ A1 $6\times\frac{1}{36}=\frac{1}{6}$
	(b)	Grid with 30 out of 36 identified as not doubles OR $1-\frac{1}{6}$	$\frac{5}{6}$	3	M1 grid with 30 out of 36 identified as not doubles A1 $\frac{5}{6}$ oe OR M1 $1-\frac{1}{6}$ A1 $\frac{5}{6}$ oe

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4		10 × 5 = 50 50 ÷ 20 = 2.5 50 × 2.5 = 25 × 2.5 = 100 × 2.5 = OR 10 × 5 = 50 50 ÷ 20 = 2.5 25 ÷ 20 = 1.25 100 ÷ 20 = 5 2.5 × 50 = 1.25 × 50 = 5 × 50 =	125 62.5 250	5	M1 10 × 5 (= 50) M1 '50' ÷ 20 M1 50 × '2.5' or 25 × '2.5' or 100 × '2.5' A2 all 3 correct (A1 for 2 correct) OR M1 10 × 5 (= 50) M1 50 ÷ 20 or 25 ÷ 20 or 100 ÷ 20 M1 '2.5' × '50' or '1.25' × '50' or '5' × '50' A2 all 3 correct (A1 for 2 correct)
5			Correct region	4	B4 fully correct OR B1 straight line parallel to *BC* and 2 cm (± 0.2 cm) from it B1 shading to the right of the line B1 circle radius 2 cm (± 0.2 cm) centre the centre of the rectangle B1 shading inside the circle Ignore any drawing outside the given rectangle

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6	(a)		Liz and explanation	1	B1 Liz because she carried out most trials
	(b)	12 + 34 + 57 = 103 40 + 100 +300 103 ÷ 40	0.23 or $\frac{103}{440}$	2	M1 (12 + 34 + 57)/*b* where *b* > 103 or *a*/(12 + 28 + 34 + 66 + 57 + 243) where *a* < 440 A1 0.23or 0.234(09..) or $\frac{103}{440}$ oe SC If M0 then B1 for $12 \div 40$ or $34 \div 100$ or $57 \div 300$
7	(a)	Area CDEF = 10× 4 = 40	40	3	B1 10 M1 '10' × 4 A1 cao
	(b)	Area ABFG = 10 × 10 = 100 Area semi circle = $\pi \times 5^2 \div 2$ = 39… Total area = 179 179 ÷ 20 = 8.9….	9	5	M1 area *ABFG* = '10' × '10' M1 $\pi \times \left(\frac{'10'}{2}\right)^2 \div 2$ or $\pi \times \left(\frac{'10'}{2}\right)^2$ M1 '40' + '39' + '100' dep on M1 M1 '179' ÷ 20 A1 9 cao
8	(a)	$12^2 + 2 \times (-2) \times 11 = 100$	10	2	M1 $12^2 + 2 \times (-2) \times 11$ A1 cao (accept ±10 or –10)
	(b)	$20^2 = 10^2 + 2 \times a \times 25$ $20^2 = 10^2 + 50 \times a$	6	2	M1 $20^2 = 10^2 + 50 \times a$ oe or 400 = 100 + 2 × *a* × 25 oe A1 cao
	(c)	$12.05^2 + 2 \times (-1.85) \times 10.5 =$ 145.2025 – 38.85 = 106.3525	10.3	3	B1 at least 1 out of 12.05, – 1.85, 10.5 M1 $u_{UB}^2 + 2 \times a_{UB} \times s_{LB}$ where $12 < u_{UB} \leq 12.05$ $-1.9 < a_{UB} \leq -1.85$ $10.5 \leq s_{LB} < 11$ A1 10.3 – 10.32

<table>
<tr><th colspan="5">5AM2H_01</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>9</td><td>(a)</td><td>$x \times x \times x + 3 \times 4 \times x$</td><td>AG</td><td>2</td><td>M1 split into two cuboids with at least one expression correct
A1 fully correct</td></tr>
<tr><td></td><td>(b)</td><td><table><tr><th>x</th><th>f(x)</th></tr><tr><td>1</td><td>13</td></tr><tr><td>2</td><td>32</td></tr><tr><td>3</td><td>63</td></tr><tr><td>3.1</td><td>66.(991)</td></tr><tr><td>3.2</td><td>71.(168)</td></tr><tr><td>3.3</td><td>75..(537)</td></tr><tr><td>3.4</td><td>80.(104)</td></tr><tr><td>3.5</td><td>84.(875)</td></tr><tr><td>3.6</td><td>89.(856)</td></tr><tr><td>3.7</td><td>95.(053)</td></tr><tr><td>3.8</td><td>100.(472)</td></tr><tr><td>3.75</td><td>97.7(3438)</td></tr></table></td><td>3.8</td><td>5</td><td>M1 any trial that is attempted to be evaluated for positive x
B2 trial between 3 and 4 exclusive
(B1 trial at 3 or 4)
B1 different trial between 3.7 and 3.8 exclusive. Trials must be evaluated correctly (truncated or rounded) to at least the nearest whole number if x is an integer. Otherwise evaluated correctly (truncated or rounded) to at least 1 decimal place
B1 cao</td></tr>
<tr><td>10</td><td></td><td>$x + 3x + x + 24 > 2(x + 24)$
$5x + 24 > 2x + 48$
$5x - 2x > 48 - 24$
$x > 8$</td><td>9</td><td>5</td><td>B1 sight of $3x$ and $x + 24$
B1 $x + 3x + x + 24 > 2(x + 24)$
B1 $2x + 48$
M1 correct method of rearranging an ‘inequality’ with at least one x term and one number on each side
A1 9 cao</td></tr>
</table>

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11		$\frac{AD}{25} = 63°$ $AD = 25 \times \tan 63° = 49.07$ $\tan x = \frac{49.07}{37} = 1.3261$	53.0	5	M1 $\frac{AD}{25} = \tan 63°$ M1 (AD =) $25 \times \tan 63°$ A1 49.06 – 49.1 M1 $\tan x = \frac{'49.07'}{25+12}$ A1 52.9 – 53.0
12		$4\times24 + 4\times8 + 4\times6$ $AC^2 = 8^2 + 6^2 = 100$ $AG^2 = 6^2 + 24^2 + 8^2 = 676$ 96 + 32 + 24 + 10 + 26	188 cm	5	M1 $AC^2 = 8^2 + 6^2$ M1 $\sqrt{8^2 + 6^2}$ M1 $AG^2 = 6^2 + 24^2 + 8^2$ oe or 26 seen M1 $4 \times 24 + 4 \times 8 + 4 \times 6$ A1 cao SC B3 answer of 36
13	(a)	7300 – 6600	700	2	M1 '7300' – '6600' with at least one correct A1 600 – 800
	(b)	$\frac{7300}{6600} = 1.106$	1.11	2	M1 $\frac{'7300'}{'6600'}$ oe (any pair of values which differ by one day) ft from (a) A1 1.09 – 1.17

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13	(c)	$A = 20000 \times \left(\frac{100+3}{100}\right)^{10} =$ 20000×1.03^{10}	26900	2	M1 $A = 20000\left(\frac{100+3}{100}\right)^{10}$ A1 26850 – 26900
	(d)	$2 = 1 \times \left(\frac{100+r}{100}\right)^{8}$ $\sqrt[8]{2} = \frac{100+r}{100}$ $r = \sqrt[8]{2} \times 100 - 100$ OR $2 = x^8$ $x = \sqrt[8]{2}$ $r = \sqrt[8]{2} \times 100 - 100$	9.05	3	M1 $2 = 1 \times \left(\frac{100+r}{100}\right)^{8}$ M1 $\sqrt[8]{2} = \frac{100+r}{100}$ A1 9.05 – 9.051 OR M1 $2 = x^8$ oe M1 $x = \sqrt[8]{2}$, can be implied by 1.095(...) seen A1 9.05 – 9.051
14	(a)	$\frac{30-21}{3} = 3$	– 3	2	M1 $\frac{30-21}{3}$ or $\frac{9}{3}$ A1 – 3
	(b)	Tangent at $t = 3$ Height ÷ base	– 6	3	M1 tangent drawn at $t = 3$ M1 height ÷ base for a triangle with the tangent as hypotenuse A1 – 5 to – 7

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Question		**Working**	**Answer**	**Mark**	**Notes**
15	(a)		0.8 on 1st branch 0.3 and 0.05 on 2nd branches	2	B1 0.8 oe on 1st branch B1 0.3 and 0.05 oe on 2nd branches
	(b)	0.2 ×0.3 + .8×0.05 = 0.1 50 × 0.1	Shown	4	M2 0.2 ×'0.3' + 0.8×'0.05' (M1 for 0.2 ×'0.3' or 0.8×'0.05') M1 (dep on at least M1) 50 × '0.1' C1 all working shown and fully correct with the estimate of 5 days the clear outcome of the working

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Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	$v = kt^2$ $k = \frac{8}{16} = 0.5$ When $t = 10$, $v = 0.5 \times 10^2 = 50$	50	4	M1 $v = kt^2$ or $v \propto t^2$ M1 $k = 8 \div 16$ M1 $v =$ '0.5' $\times 10^2$ A1 50 cao OR M1 $t^2 = kv$ or $t^2 \propto v$ M1 $k = 16 \div 8$ M1 $v = \frac{10^2}{'2'}$ A1 50 cao OR M1 $\frac{v_2}{v_1} = \frac{t_2^2}{t_1^2}$ M1 $\frac{v_2}{8} = \frac{10^2}{4^2}$ M1 $v_2 = 8 \times 6.25$ A1 50 cao
	(b)	Values of s are 0, .5, 2, 4.5 , 8 Area $= \frac{0+.5}{2} + \frac{.5+2}{2} + \frac{2+4.5}{2} + \frac{4.5+8}{2}$ .25 + 1.25 + 3.25 + 6.25	11	3	M1 attempts to find area under curve M1 $\frac{0+.5}{2} + \frac{.5+2}{2} + \frac{2+4.5}{2} + \frac{4.5+8}{2}$ oe A1 10 – 12

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(c)	Draw graph of $v = 1 + 2t$ Intersection with $v = 0.5t^2$ OR $1 + 2t = 0.5t^2$ $t = \frac{--2 \pm \sqrt{(-2)^2 - 4 \times 0.5 \times (-1)}}{2 \times 0.5}$	$t = 4.4$	4	M1 draws a straight line that is not horizontal or vertical A1 graph of $s = 1 + 2t$ correct M1 indicates intersection with $s = 0.5t^2$ A1 4.4 – 4.5 Alternative method: M1 $1 + 2t = 0.5t^2$ M1 $t = \frac{--2 \pm \sqrt{(-2)^2 - 4 \times 0.5 \times (-1)}}{2 \times 0.5}$ allow errors in the signs of b and c A1 4.4 or – 0 4 A1 4.4 – 4.5
17		Suppose A goes first: Pr(10p) = $\frac{1}{5}$ Suppose A goes second: Pr(10p) = $\frac{4}{5} \times \frac{1}{4} = \frac{1}{5}$ Suppose A goes third: Pr (10p) = $\frac{4}{5} \times \frac{3}{4} \times \frac{1}{3} = \frac{1}{5}$	It does not matter	5	B1 Suppose A goes first: Pr(10p) = $\frac{1}{5}$ M1 Suppose A goes second: Pr(10p) = $\frac{4}{5} \times \frac{1}{4}$ A1 $\frac{1}{5}$ M1 Suppose A goes third: Pr (10p) = $\frac{4}{5} \times \frac{3}{4} \times \frac{1}{3}$ C1 $\frac{1}{5}$ and full explanation in words that it does not matter whether Alan goes first, second or third

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