Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4362/02

APPLICATIONS OF MATHEMATICS

UNIT 2: Financial, Business and Other Applications

HIGHER TIER

P.M. TUESDAY, 22 January 2013

2 hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **7***(a)*.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**5**	
2	**4**	
3	**8**	
4	**3**	
5	**7**	
6	**7**	
7	**12**	
8	**5**	
9	**11**	
10	**4**	
11	**4**	
12	**7**	
13	**11**	
14	**12**	
TOTAL MARK		

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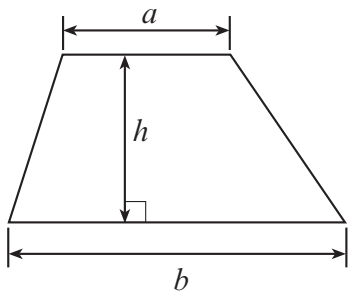
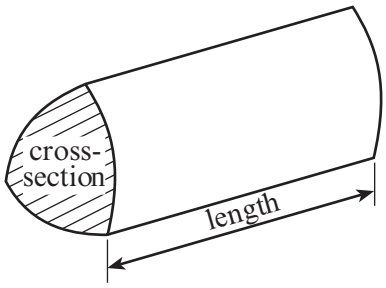
Formula List

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

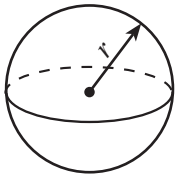


Volume of prism = area of cross-section × length



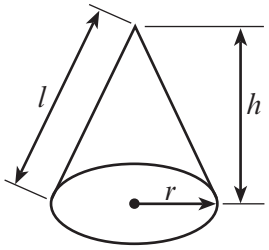
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone = $\pi r l$

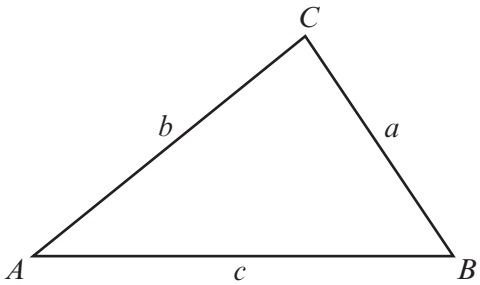


In any triangle ABC

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 = $\frac{1}{2}ab \sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

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

Examiner only

1. Kitchen cupboards and worktops are measured in mm.

(a) A worktop is 4500 mm long.
How much is this in metres?

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[1]

(b) A rectangular worktop measures 3200 mm long by 750 mm wide.
Calculate the area of the top surface of the worktop in m^2.

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[2]

(c) A kitchen cupboard is in the shape of a cuboid.
Its capacity is 405 000 000 mm^3.
Internally, the cupboard measures 600 mm wide and 750 mm deep.
Calculate the internal height of the cupboard in mm.

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[2]

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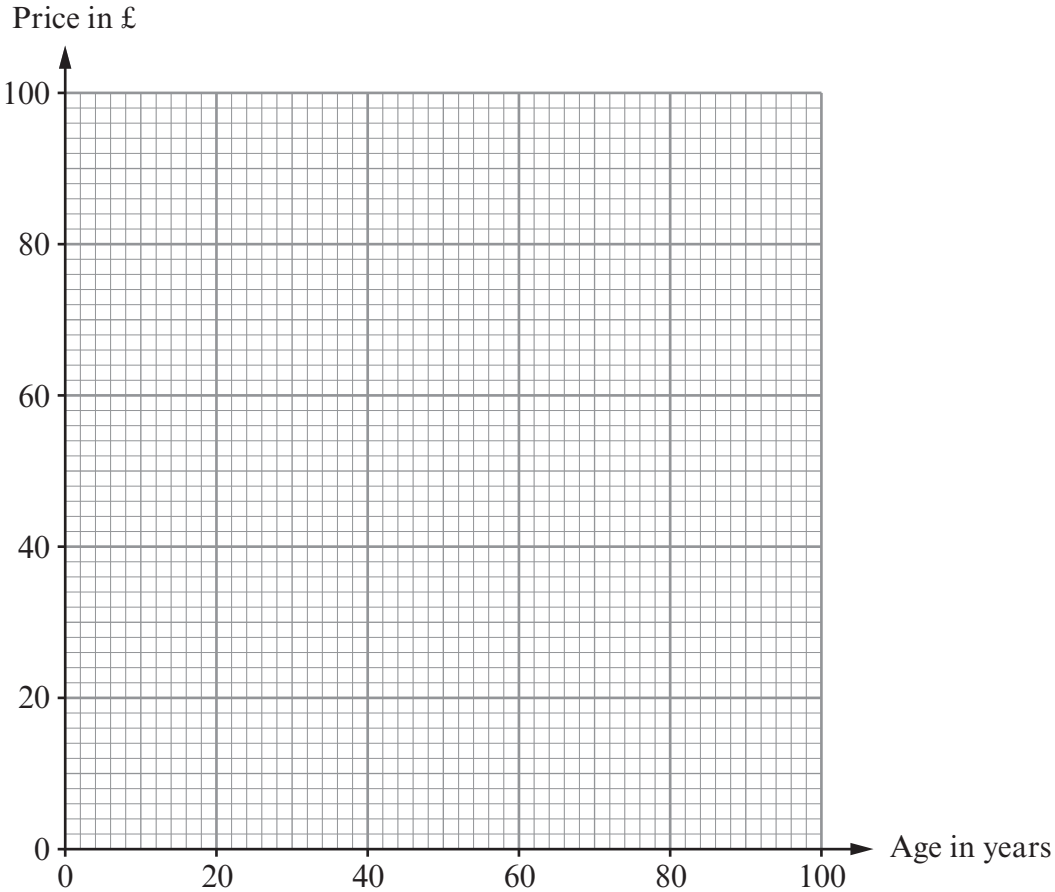
Examiner only

2. The age and price of each of 8 clocks in an antique shop are recorded in the table.

Age in years	12	40	70	50	46	80	62	32
Price in £	90	60	80	50	20	40	20	28

(a) Draw a scatter diagram to display these ages and prices.

[2]



(b) Write down the price of the oldest clock.

Price £ .....

[1]

(c) Does the scatter diagram indicate that there is a correlation between the age and price of the clocks? You must give a reason for your answer.

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[1]

Examiner only

3. Jona went on holiday to Poland.
Before going, she went into her local travel money exchange shop to buy some Polish zloty.

Jona only had £250 to spend on buying zloty.
She wanted to buy as many zloty as possible.
Unfortunately, the travel money exchange shop only had 50 zloty notes.
The exchange rate to buy zloty was £1 = 4.37 zloty.

(a) (i) How many zloty did Jona buy?

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[3]

(ii) How much did she pay for the zloty?

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[2]

(b) Whilst in Poland, Jona spent 340.40 zloty.
On returning from her holiday, Jona changed her zloty back to pounds.
Unfortunately, the money exchange shop would only buy back a whole number of zloty.
The exchange rate used for changing zloty back to pounds was £1 = 4.43 zloty.
Calculate how much Jona received back from the money exchange shop.
Give your answer to the nearest penny.

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[3]

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Examiner only

4. Airlines publish flight records showing the percentage of flights that arrived on time at their destinations.

An extract from these flight records is shown below.

Flights from Cardael to Belslow Autumn 2012			
Airline	**Flight number**	**Percentage of flights arriving on time**	**Average ticket price including taxes, in £**
Far Flung	FF4356	74%	£100
Celtic Flights	CF3967	99%	£65
Roly Air	RA2099	96%	£65

Holly intends to fly from Cardael to Belslow to go to an appointment in Belslow city centre.
If her flight arrives on time, she can catch the free bus to the city centre.
If her flight arrives late, then she must take a taxi to the city centre costing £25.

Which airline should Holly choose to fly with?

You must
- consider each of the airlines,
- give a reason for your choice of airline **and** also reasons for not choosing each of the other two airlines.

Write your answers in the table opposite.

Examiner only

Airline	Choice, Yes or No?	Reasons
Far Flung	.....	....
Celtic Flights	.....	....
Roly Air	.....	....

[3]

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Examiner only

5. The spreadsheet below gives details of the hours worked and the rate of pay for three of the employees who work in a supermarket.

	A	B	C	D	E
1	Employee	Hourly rate in £	Weekday hours worked	Weekend hours worked	Total week's pay in £
2	Erica	9.50	22	3	266
3	Georgie	12.80	20	5	384
4	Ranj	9.80	17		245

All employees earn double the hourly rate for any weekend hours worked.

(a) Use the entries in the spreadsheet to calculate the hidden value of cell **D4**.

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[3]

(b) Write down the formula, using cell references, used to calculate the entry for cell **E3**.

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[4]

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Examiner only

6. Tanya used a stem-and-leaf diagram to record the prices of two makes of mobile phone on display in a supermarket.
Tanya's stem-and-leaf diagram is shown below.

NewKey		eLime
1	5	0 2
	4	2 3
8 7	3	1 1 6 8
3 3	2	3
8 6 2 1	1	5

Key: NewKey 1 | 5 means £51
eLime 1 | 5 means £15

(a) Tanya has forgotten to record a £45 NewKey phone and a £25 eLime phone.
Complete the stem-and-leaf diagram above by entering this extra data for Tanya.

[2]

(b) Including the extra data you have entered for Tanya, complete the following table.

	Median in £	Range in £	Mode in £
NewKey			
eLime			

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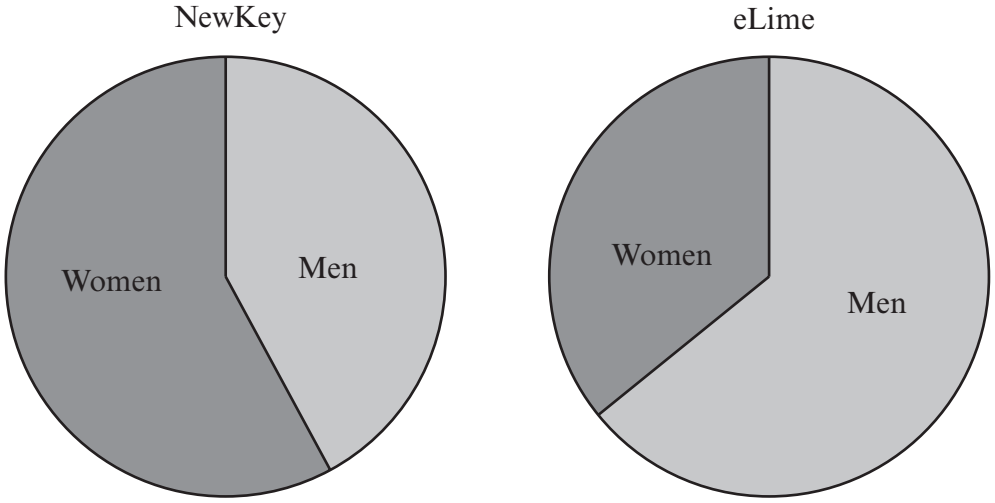
[4]

Examiner only

(c) Tanya has been given two pie charts, by the supermarket manager, comparing the sales of the two makes of phones.



The supermarket manager says,

"More men buy NewKey phones than eLime phones".

Explain how this could be true.

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[1]

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Examiner only

7. Sammy-Jo is thinking of setting up a business to sell hand-knitted scarves.

(a) *You will be assessed on the quality of your written communication in this part of the question.*

In order to set up her business, she needs to arrange a loan of £2000.
She is offered two different options for a loan.

Loan company	Repayment terms for a £2000 loan
Driftwood loans	£68 a month for 3 years
Grain Bank	First payment is 10% of the loan and then 15 monthly payments of £146

To compare these two different loans, Sammy-Jo decides to calculate how much extra she would have to pay back as a percentage of the original £2000 loan offered by each company.

- Calculate these percentages so that Sammy-Jo can make this comparison.
- Explain why this is not the only comparison Sammy-Jo should consider when deciding which loan to accept.

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[8]

Examiner only

(b) Sammy-Jo provides the wool for people to knit scarves.
All the scarves have the same width and all the scarves have the same length.

It takes 3 hours and 30 minutes to knit a scarf.
Sammy-Jo decides to pay each person the same amount.
She thinks that a payment of £26.60 per scarf is fair.

(i) Calculate the rate of pay per hour for the people knitting the scarves.

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[2]

(ii) Each scarf is 1·3 m long.
Calculate the rate of pay per metre knitted, correct to the nearest penny.

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[2]

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Examiner only

8. David is a scientist.
As a result of an experiment, he finds connections between two variables f and g.
In order to write the conclusion he needs to find the values of f and g.

These are the connections that David finds:

- Twice f added to three times g gives a total of 5
- Three times f added to four times g gives a total of 4

Form a pair of simultaneous equations and solve them to find the values of f and g.

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[5]

Examiner only

9. *(a)* A garage in a European country has included VAT at $17\frac{1}{2}$ % in the car prices shown on the information tickets.

FireFly 2.6 litre
Sports Coupé

Price
34 990 euros including VAT

The government decides to change the rate of VAT to 24%.

Calculate the price to be displayed on the information ticket for the car shown above following the change in VAT.
Give your answer correct to the nearest ten euros.

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[4]

Examiner only

(b) The garage also provides the dimensions of all the cars they sell.

FireFly 2.6 litre
Sports Coupé

Overall width with wing mirrors folded in 1770 mm

Overall width with wing mirrors folded out 2007 mm

Height of vehicle	1447 mm
Overall length	4581 mm
Interior headroom	984 mm

Examiner only

All the measurements are given correct to the nearest 1 mm.

A wing mirror is fixed to each side of the car.
Calculate the greatest possible **increase** in the width of the car when just one wing mirror is folded out.

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[4]

(c) The satellite navigation systems for these cars are shipped in boxes.
The dimensions of the box are 12 cm by 8 cm by 6 cm, with all of these measurements given correct to the nearest centimetre.
Calculate the minimum volume of the box in cm^3, correct to 1 decimal place.

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[3]

Examiner only

10. The table below shows some information from the 1881 census.

Occurrences of the surname 'JONES' in the 1881 census	
Region	**Total number of occurrences**
Lancashire	34 724
Glamorgan	31 945
Denbighshire	19 984
London	18 538

Use this information to find in **standard form**, correct to **two significant figures**,

(a) the total number of occurrences of the surname Jones in Denbighshire,

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[2]

(b) the total number of occurrences of the surname Jones in the four regions.

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[2]

Examiner only

11. A tree surveyor is working out the height of a vertical tree.
The surveyor is able to measure the angle of elevation of the top of the tree from his measuring instrument, which is 1·8 m above ground level.
When the surveyor is standing 19 m from the base of the tree, the angle he measures is 56°.

A sketch of this situation is shown below.

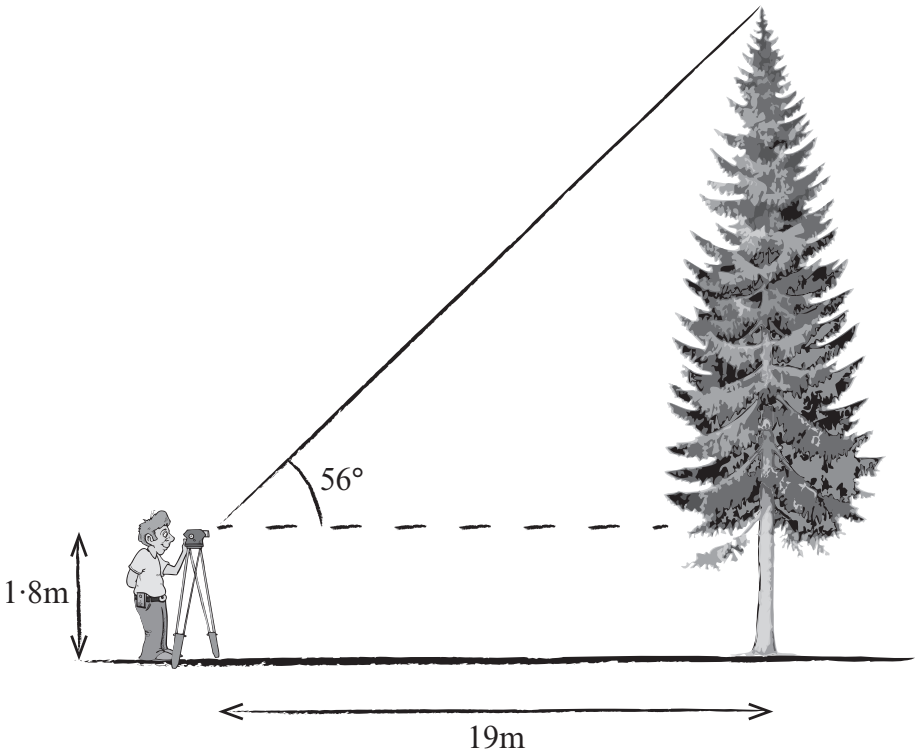

Diagram not drawn to scale

Calculate the full height of the tree.

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[4]

Examiner only

12. A large hotel is buying new sofas for the seating areas.

The sofas available for them to buy can seat either 3 people or 4 people.

The hotel does not have space for more than 30 sofas.

The hotel wants to provide seating for at least 80 people.

Let t represent the number of 3-person sofas bought.
Let f represent the number of 4-person sofas bought.

(a) Write down two inequalities that satisfy the conditions that the hotel has given.

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[3]

(b) Use the graph paper opposite to find the region that is satisfied by your inequalities.

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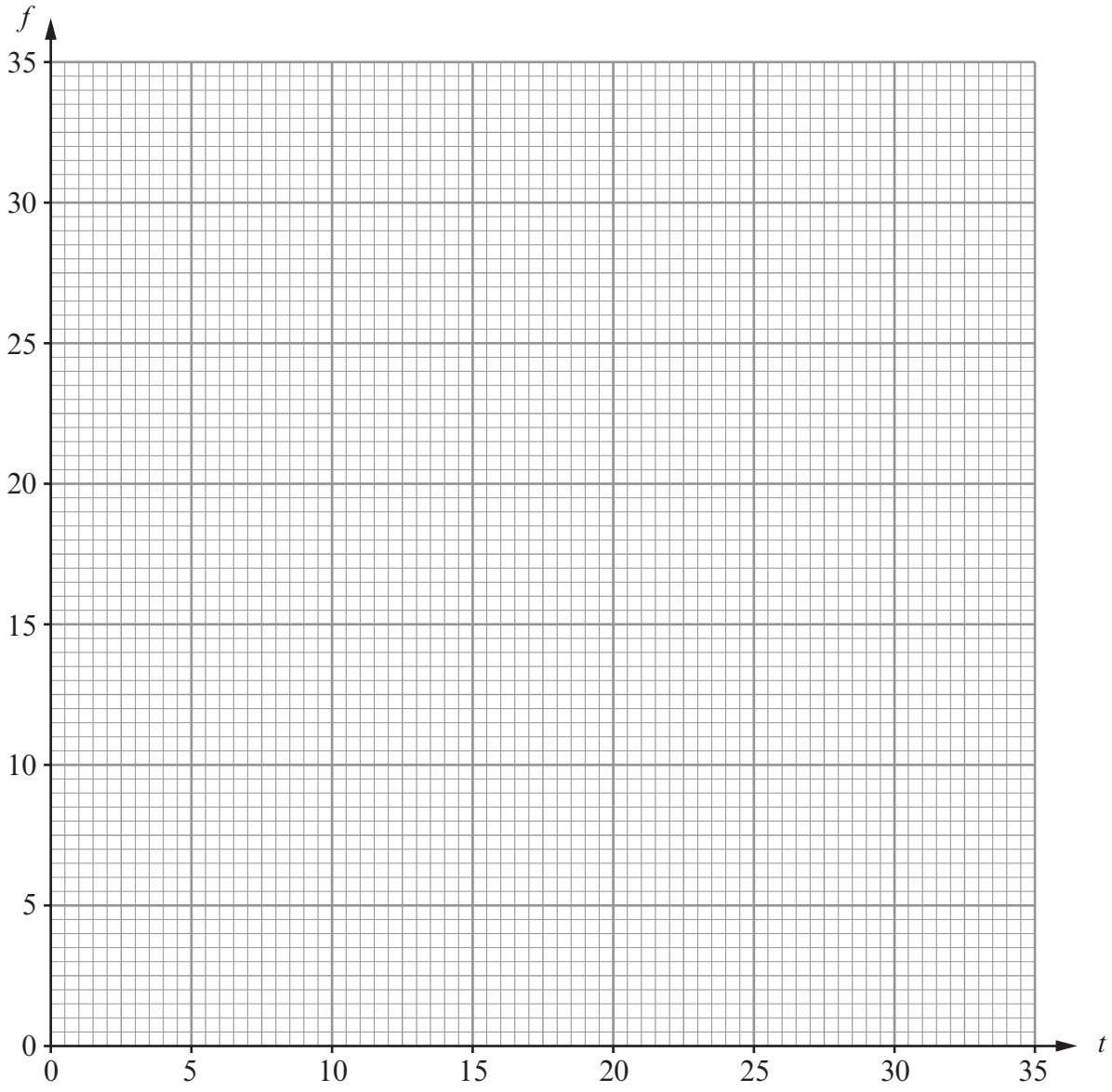
[3]

Examiner only



(c) Complete the order form below by selecting a suitable number of 3-person and 4-person sofas for the hotel to buy.

Sofa	Number to buy
3-person	
4-person	

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[1]

Examiner only

13.

Ace Clothing UK

'Ace Clothing UK' design and make T-shirts.
The company has found that sales of their T-shirts have trebled each year from 2009 to 2012.
In 2009, 'Ace Clothing UK' sold 2300 T-Shirts.

(a) Calculate the **total** number of T-Shirts sold by 'Ace Clothing UK' from the start of 2009 to the end of 2012.

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[3]

(b) At the end of 2009, 'Ace Clothing UK' decided that each year they would increase the price they would charge for their T-shirts.
It was decided that the increase each year would be 12% of the **previous year's price**.
This would continue for the next 3 years.
'Ace Clothing UK' charged £3.60 for each of their T-shirts during 2012.

Calculate the price that 'Ace Clothing UK' charged for each of their T-shirts during 2009, correct to the nearest penny.

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Examiner only

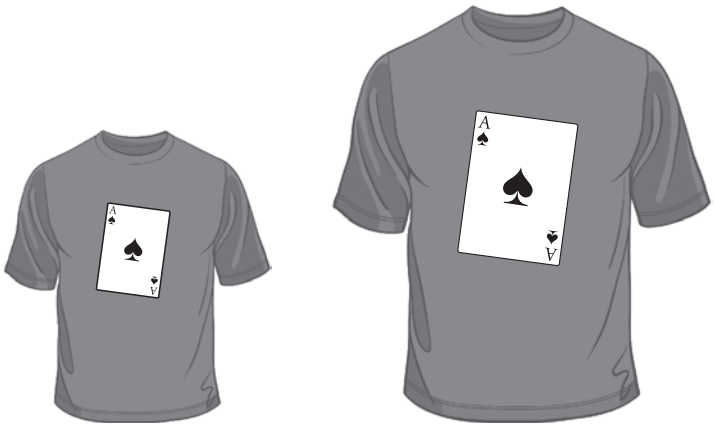

Diagram not drawn to scale

(c) For 2013, 'Ace Clothing UK' is considering charging extra for the size XXXXL T-shirts. They are thinking of basing the charge for their T-shirts on the area of cotton used to make the T-shirt.

The size L and size XXXXL T-shirts are mathematically similar.
The size L measures 50 cm across and the size XXXXL measures 70 cm across.

'Ace Clothing UK' is considering charging £4.62 for each of their size L T-shirts in 2013.

Calculate how much 'Ace Clothing UK' is now considering charging for their size XXXXL T-Shirt in 2013.

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[4]

Examiner only

14. The company 'Graham Design' manufactures parts for water tanks.
These parts are always 3D solids.

(a) The part shown below is a cuboid with a square based pyramid fitted exactly onto one of its faces.

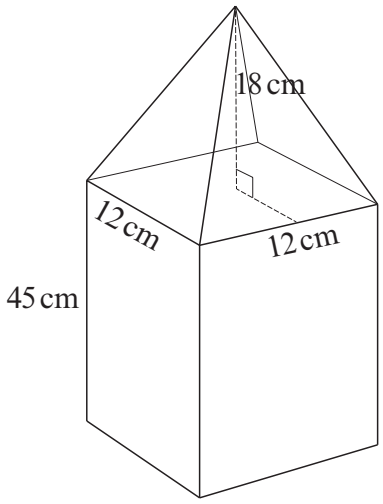

Diagram not drawn to scale

The cuboid has dimensions 12 cm by 12 cm by 45 cm.
The square based pyramid has a perpendicular height of 18 cm.
The square based pyramid is fixed exactly onto one of the 12 cm by 12 cm faces of the cuboid.
The part has 9 faces.
The faces of the part are treated with a water-proofing product.
The water-proofing product costs 4.5p per cm^2.
Calculate the cost of water-proofing the 9 faces of the part.

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[6]

Examiner only

(b) 'Graham Design' also manufactures a different part, which is also a 3D solid.
Fixing a cone exactly on to the uniform cross section of a cylinder forms this 3D solid.
The radius of the cylinder and cone is 6 cm.
The overall length of the part is 22 cm.
The volume of the cylinder is 1018 cm^3.
Calculate the volume of the 3D solid giving your answer to the nearest $\frac{1}{2}$ litre.

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[6]

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