

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

A.M. THURSDAY, 19 June 2014

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.

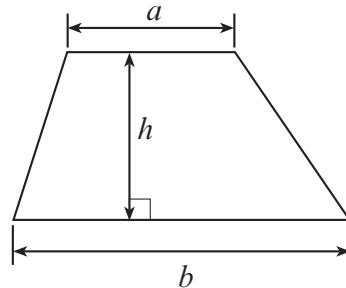
The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question 2(b).

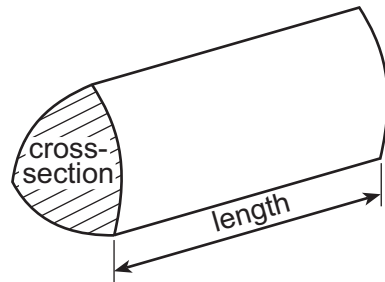
For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	4	
2.	11	
3.	7	
4.	9	
5.	8	
6.	9	
7.	12	
8.	4	
9.	4	
10.	3	
11.	11	
12.	7	
13.	11	
Total	100	

Formula List

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

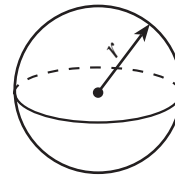


Volume of prism = area of cross-section $\times$ length



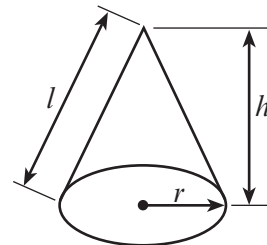
Volume of sphere $= \frac{4}{3} \pi r^3$

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



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

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

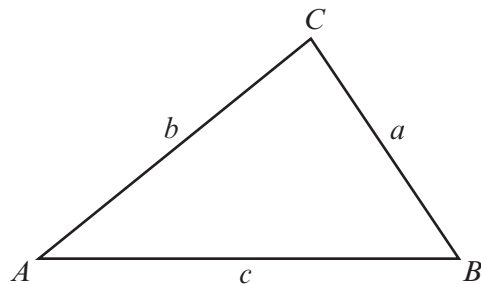


In any triangle ABC

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

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

1.



At the time when the pyramids were built, the Egyptians used different measures from those we use today.

It is believed that

1 pyramid inch = 1.0010846752 inches
1 pyramid cubit = 25 pyramid inches.

We also know that

1 inch = 2.54 cm.

Complete the following table.

[4]

Measure	Equivalent to
1 pyramid cubit	 inches, correct to 3 decimal places
1 pyramid inch	 cm, correct to 4 significant figures

.....

.....

.....

.....

.....

.....

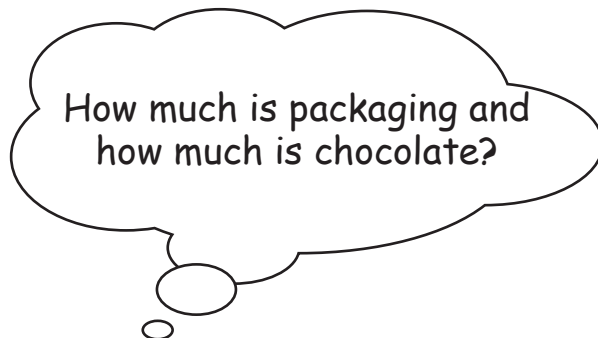
.....

.....

.....

.....

2. (a) Frankie has a number of chocolate bars that are wrapped in colourful packaging.



Frankie asked herself the question shown above.
A section of the spreadsheet that Frankie created is shown below.

	A	B	C	D	E
1	Name of chocolate bar	Chocolate bar weight (g)	Packaging weight (g)	Total weight (g)	Chocolate bar weight as a percentage of the total weight
2	Chokkie Dream	345	165		67.65
3	Air Bubbly	235	140	375	
4	Dark Bite	200	120	320	62.50

Frankie has written some of the formulae to complete the spreadsheet, but some are missing.

Write down the formulae that are needed to complete the following cells.

(i) **D2**

[1]

.....

(ii) **E3**

[2]

.....

.....

.....

.....

Examiner
only

The table below shows the carbohydrate content of *Crackly Bars*.

Crackly Bars		
	per 100 g	per bar
Carbohydrate	64.5g	15.48 g

Crackly Bars are sold in 360 g packs.
Calculate how many bars there are in a pack.
You must show all your working.

[5]

(c) Snack size *Crackly Bars* are made using the same recipe. Snack size *Crackly Bars* are sold in 85 g packs.

Complete the table for 85g packs of snack size *Crackly Bars*.
Give your answer **correct to an appropriate degree of accuracy**.

[3]

<i>Crackly Bars</i>		
	per 100 g	per 85 g pack
Carbohydrate	64.5 g	 g

3.

Examiner
only

The manager of a tea-shop at a castle kept some records every day for 7 days.

The manager recorded:

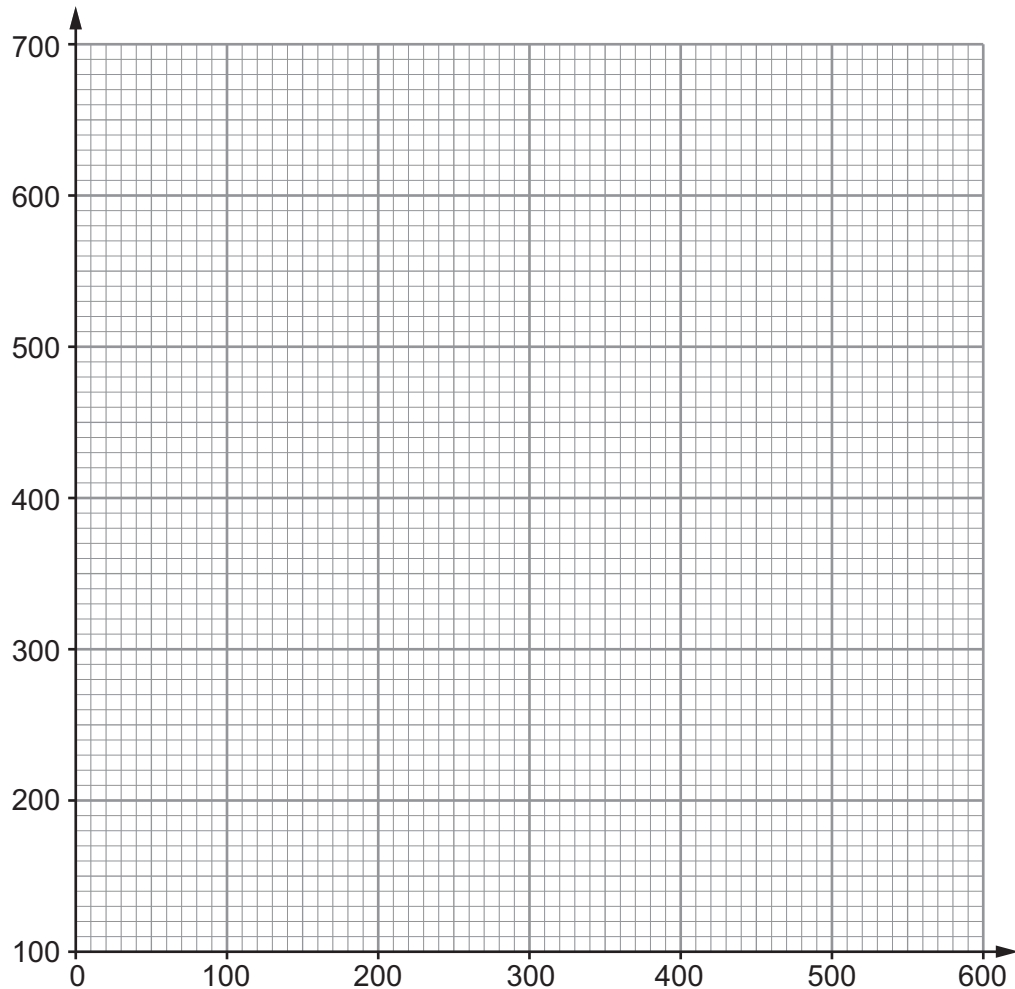
- The number of visitors to the castle.
- The total money taken at the tea-shop.

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of visitors to the castle	120	180	400	320	460	550	420
Tea-shop takings (£)	150	230	500	380	560	660	490

(a) On the graph paper provided, draw a scatter diagram of these results.

[2]

Tea-shop takings (£)



- (b) Draw, by eye, a line of best fit on your scatter diagram opposite. [1]
- (c) Describe the correlation between the number of visitors to the castle and the tea-shop takings. [1]

- (d) The manager of the tea-shop states,

'My records tell me that each visitor to the castle spends more than £1 each at the tea-shop.'

- (i) Explain why the manager might have come to this conclusion. [2]

.....

.....

.....

.....

- (ii) The statement is not necessarily true.
Explain why this statement may not be true. [1]

.....

.....

.....

.....

.....

.....

4.

Examiner
only

- (a) Selwyn used a stem-and-leaf diagram to record the prices of two makes of suitcases on display in a luggage shop. Selwyn's stem-and-leaf diagram is shown below.

Subidas		Dinkey
7 1	8	1 5
6	7	2 5
8 7	6	1 6 7
6 3	5	4 4 4
6 2 2 1	4	5

Key: Subidas 3 | 5 means £53
 Dinkey 5 | 4 means £54

- (i) What is the price and make of the most expensive suitcase?

[1]

Price: £

Make:

- (ii) Complete the following table.

[4]

	Median in £	Range in £	Mode in £
Subidas			
Dinkey			

.....

.....

.....

.....

- (iii) On average, which make of suitcase is the more expensive?
 You must give a reason for your answer.

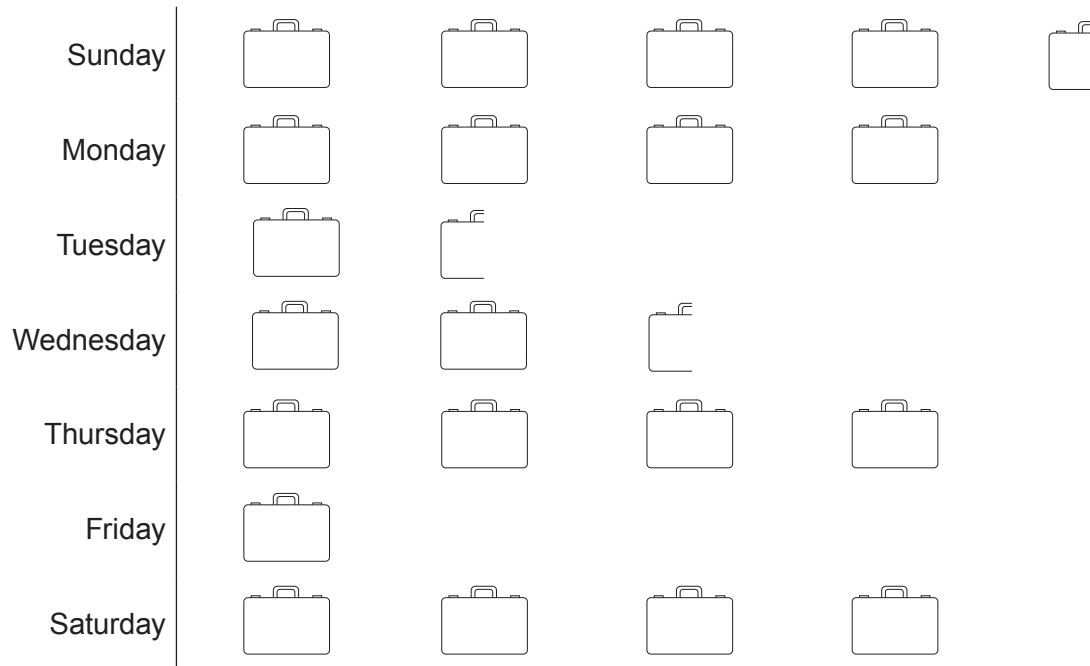
[1]

.....

.....

.....

- (b) The luggage shop owner has illustrated, in a pictogram, the number of suitcases sold in a week.



Key:  is 20 suitcases

- (i) Selwyn looks at the pictogram and says,

'The number of suitcases sold on Sunday was 40% higher than the number of suitcases sold on Wednesday.'

Is Selwyn correct?

You must show all your working to justify your answer.

[2]

.....

.....

.....

.....

.....

- (ii) Looking at the pictogram again, Selwyn says,

'More money was spent on buying suitcases in this shop on Sunday than on any other day.'

Is Selwyn correct?

You must give a reason for your answer.

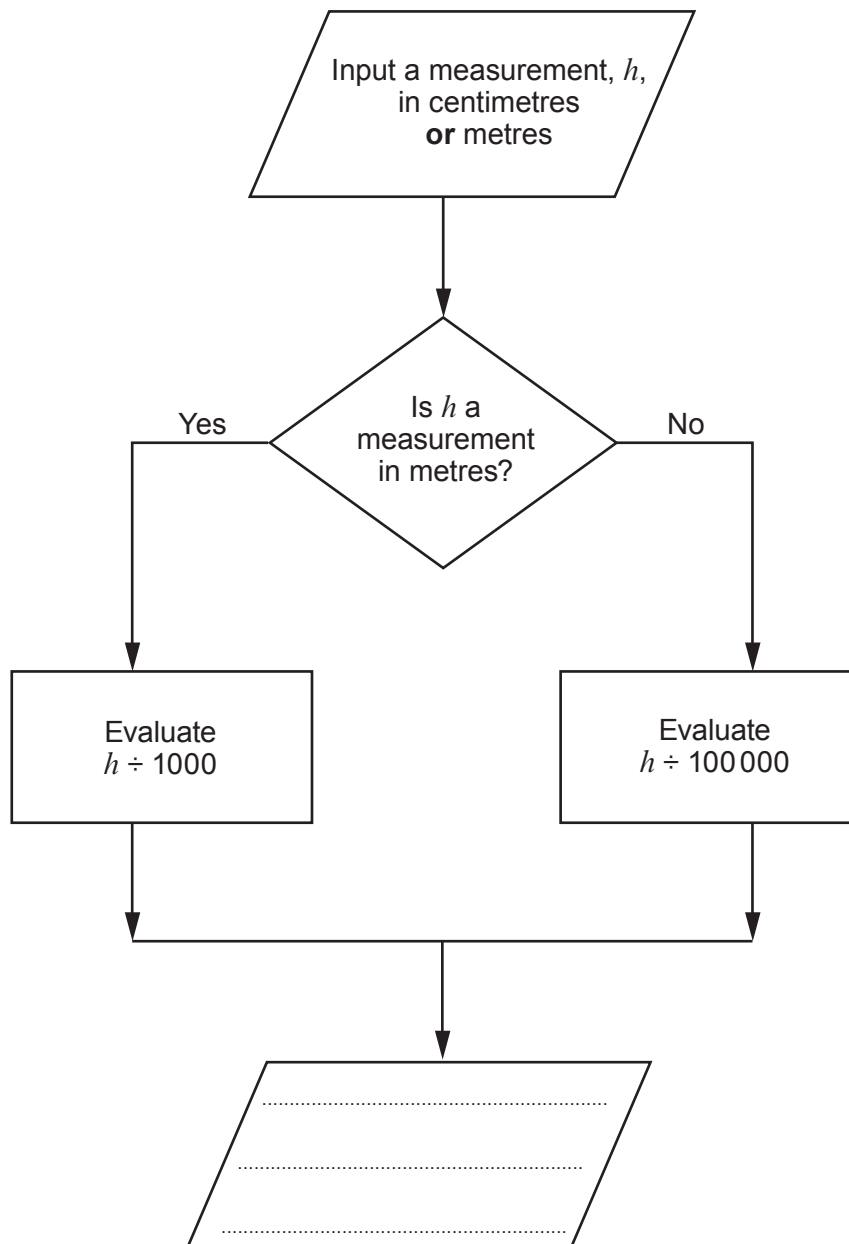
[1]

.....

.....

.....

5. (a) The following is a section of a flowchart.



What would this section of the flowchart be used for?
Give an example of what might be written in the output box.

[2]

.....

.....

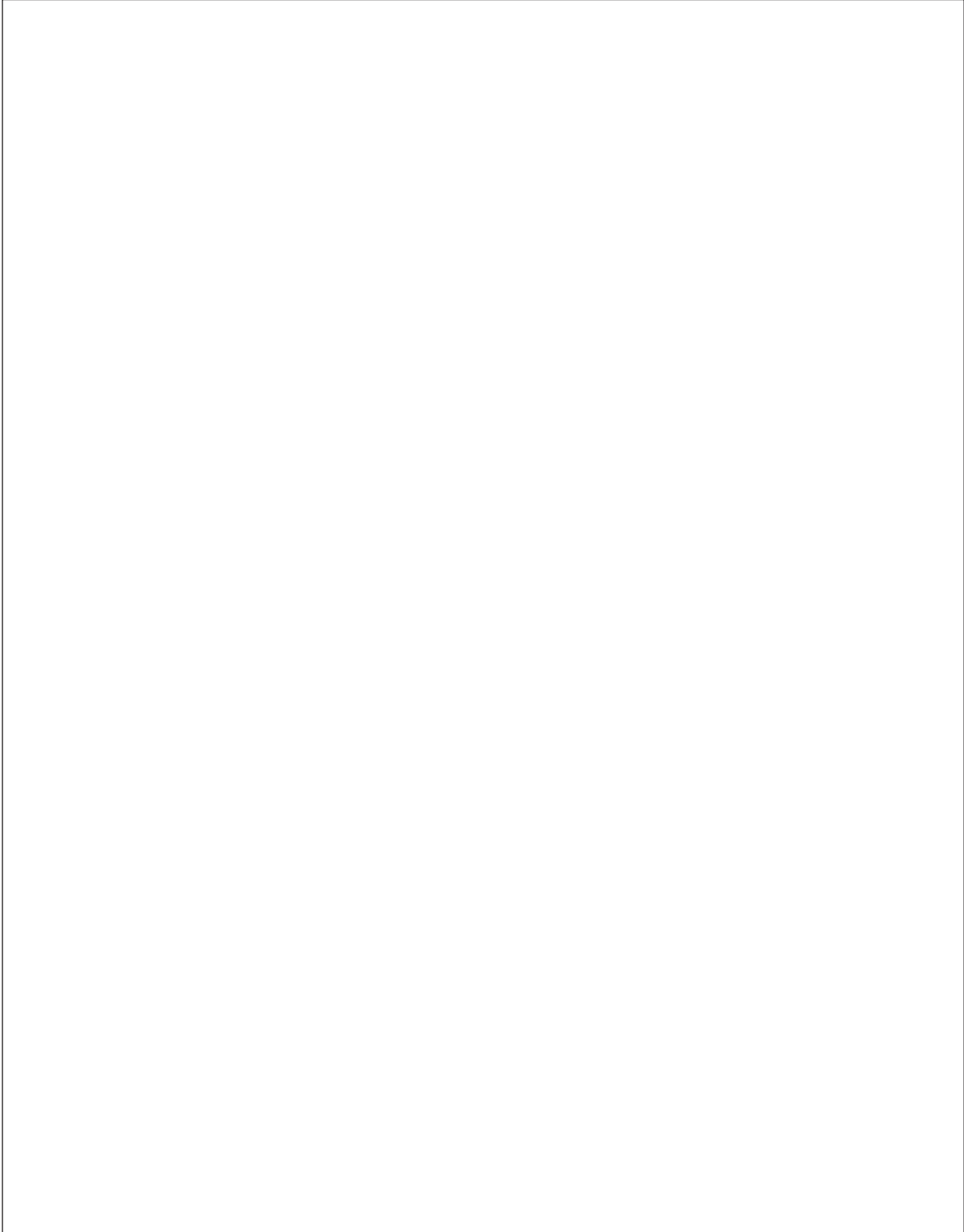
.....

.....

(b) In the box below construct a section of a flowchart that would:

- Allow input of whole numbers
- Add 1 to any odd number
- Not change even numbers
- Allow the output of only even numbers.

[6]



- 
- A black and white photograph showing a sandwich made with whole-grain bread, filled with meat, cheese, and vegetables, next to a dark-colored bottle of juice.

Levi writes down the following simultaneous equations:

(a) What do the x and y represent in Levi's equations? [2]

y represents

(c)



Levi also sells bags of crisps.
He sells a bag of crisps for £1.68.
He makes a profit of 12% on the cost price of a bag of crisps.

He buys the bags of crisps in boxes.
Each box contains 10 bags of crisps.

Calculate the cost price of a **box** of crisps.

[3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

7. Thutmose lives in Egypt and has an interest in pyramids.



- (a) The Egyptians built right pyramids. Thutmose visits a pyramid that has a square base measuring 230 metres by 230 metres. The vertical height of this pyramid is 146 metres. Thutmose makes his way up from the ground to the top of the pyramid along one of the sloping edges.

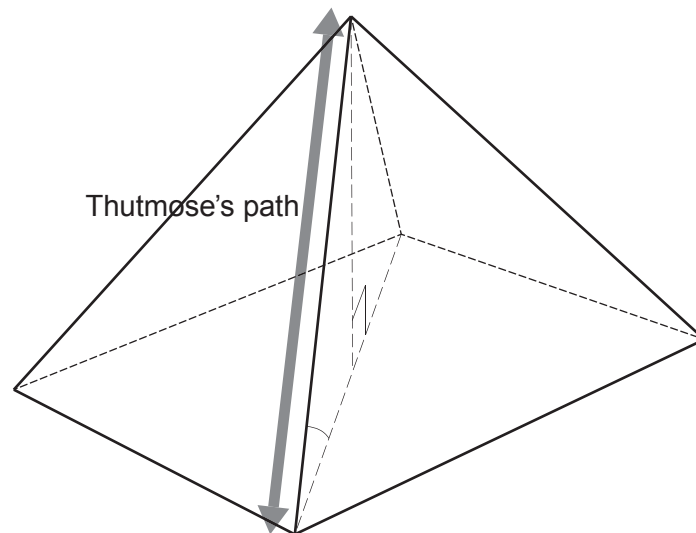


Diagram not drawn to scale

- (i) Calculate the length of Thutmose's path along the edge of the pyramid, as shown in the diagram above. [5]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (ii) Calculate the angle of elevation of Thutmose's path with the horizontal ground, as shown in the diagram opposite. [3]

.....

.....

.....

.....

.....

.....

- (b) Thutmose noticed that two different pyramids have 2 triangular faces that are **similar** when viewed from a distance.



He used a photograph to sketch the 2 similar triangles, as shown below.

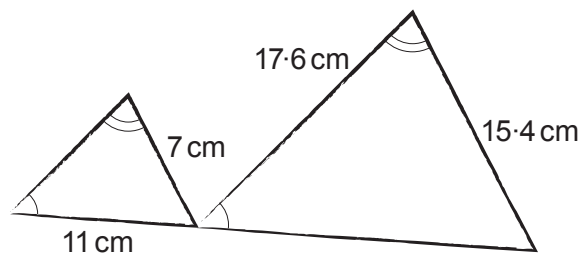


Diagram not drawn to scale

Calculate the missing lengths on the smaller and on the larger triangle.

[4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

8. A restaurant needs some new pieces of crockery.
The crockery the restaurant needs are dishes and plates.



The dishes and plates are available to buy in packs.
There are 3 dishes or 2 plates in each pack.
The restaurant cannot afford to buy more than 25 packs altogether.
The restaurant wants to buy at least 60 new pieces of crockery.

The information given can be represented by the inequalities,

$$\begin{aligned}d + p &\leq 25 \\ 3d + 2p &\geq 60\end{aligned}$$

where,

- d represents the number of packs of new dishes bought, and
- p represents the number of packs of new plates bought.

- (a) Use the graph paper opposite to find the region that is satisfied by the inequalities. [3]

.....

.....

.....

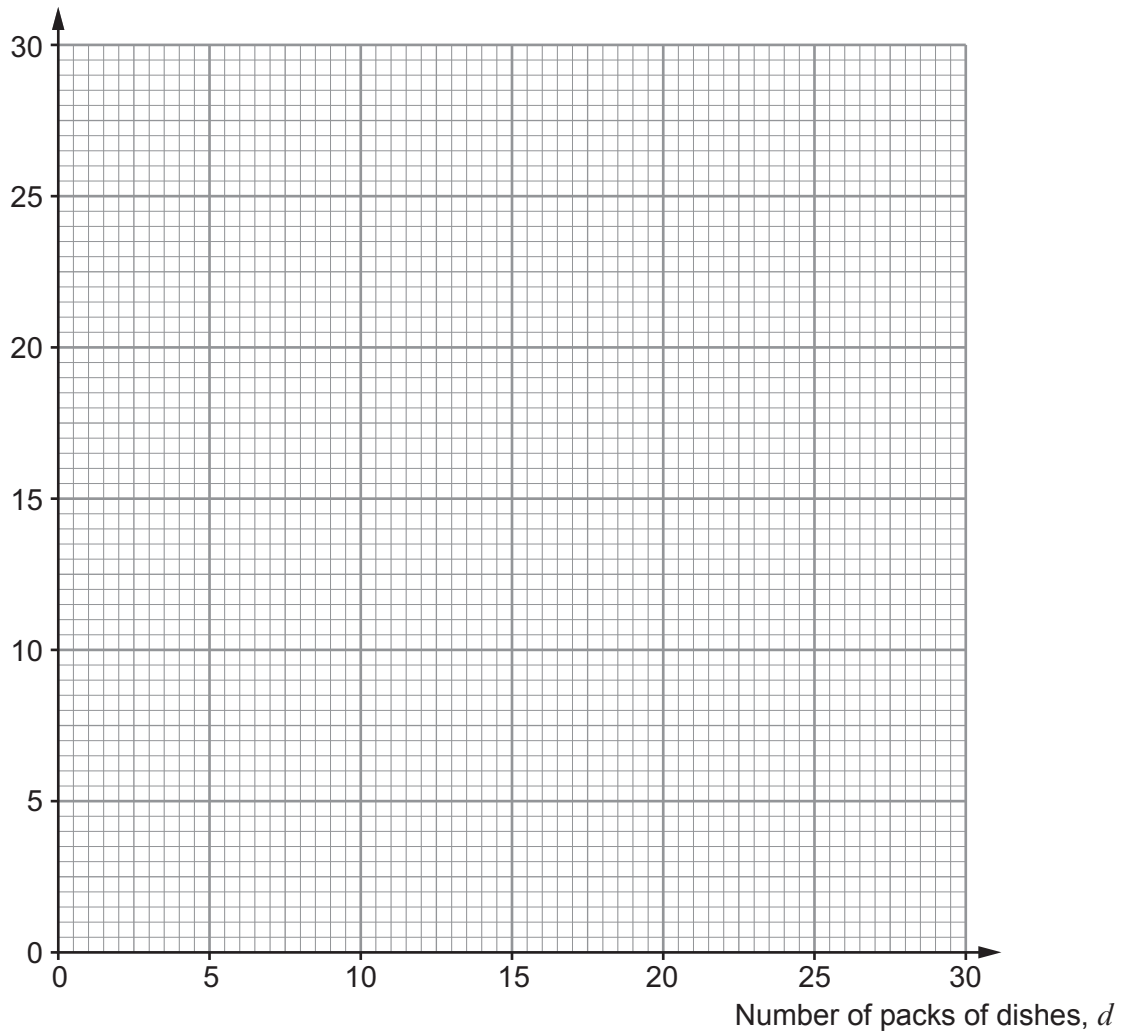
.....

.....

.....

.....

.....

Number of packs of plates, p 

- (b) The restaurant decides to order some dishes **and** some plates.
Complete the order form below by selecting a suitable number of packs of dishes and packs of plates for the restaurant to buy. [1]

Crockery	Number of packs to buy
Dishes	
Plates	

.....

.....

.....

9. Issi lives in the UK.
Her friend Thierry lives in France.
They are both going on holiday to America.

Thierry is offered an exchange rate of 1 euro to 1.29 dollars.
Issi is offered an exchange rate of £1 to 1.61 dollars.

Issi states

'Using these exchange rates, £1 is worth euros.'

Complete Issi's sentence.
You must show all your working.

[4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

10. An engineering company makes metal parts for engines. The diagram below shows the design for a split-disc. The split-disc is drawn as two concentric circles, each with centre O . Both OAB and ODC are straight lines.

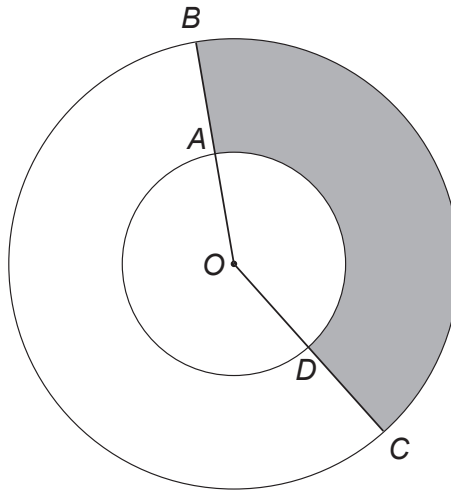


Diagram not drawn to scale

It is known that $\widehat{AOD} = 142^\circ$ and $OA = AB = 1.8 \text{ cm}$.
The company needs to know the area of the shaded surface $BCDA$.
Calculate this area.

[3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Account	AER Annual Equivalent Rate
<i>Eagle Saver</i>	5.2%

[4]

- (b) Cledwyn is also interested in opening a savings account.
Cledwyn has some details of a *Kite Saver* account.

Account	Nominal interest rate	AER Annual Equivalent Rate, correct to 2 decimal places
<i>Kite Saver</i>	6.8% p.a. paid quarterly	 %

- (i) Write 6.8% as a decimal.

[1]

- (ii) Would you expect the AER for the *Kite Saver* account to be greater than, equal to, or less than 6.8%?

Tick (✓) one of the boxes below.

Without doing any calculations, give an explanation for your answer.

[1]

Greater than 6.8% ☐ Equal to 6.8% ☐ Less than 6.8% ☐

- (iii) In the table above, complete the AER column, correct to 2 decimal places, for the *Kite Saver* account using the following information.

AER, as a decimal, is calculated using the formula $\left(1 + \frac{i}{n}\right)^n - 1$,

where

i is the nominal interest rate per annum **as a decimal** and

n is the number of compounding periods per annum.

[4]

- (iv) Explain why banks use AER.

[1]

12. (a) A substance **loses** $\frac{1}{4}$ of its mass every second.

Its initial mass is 2500 grams.

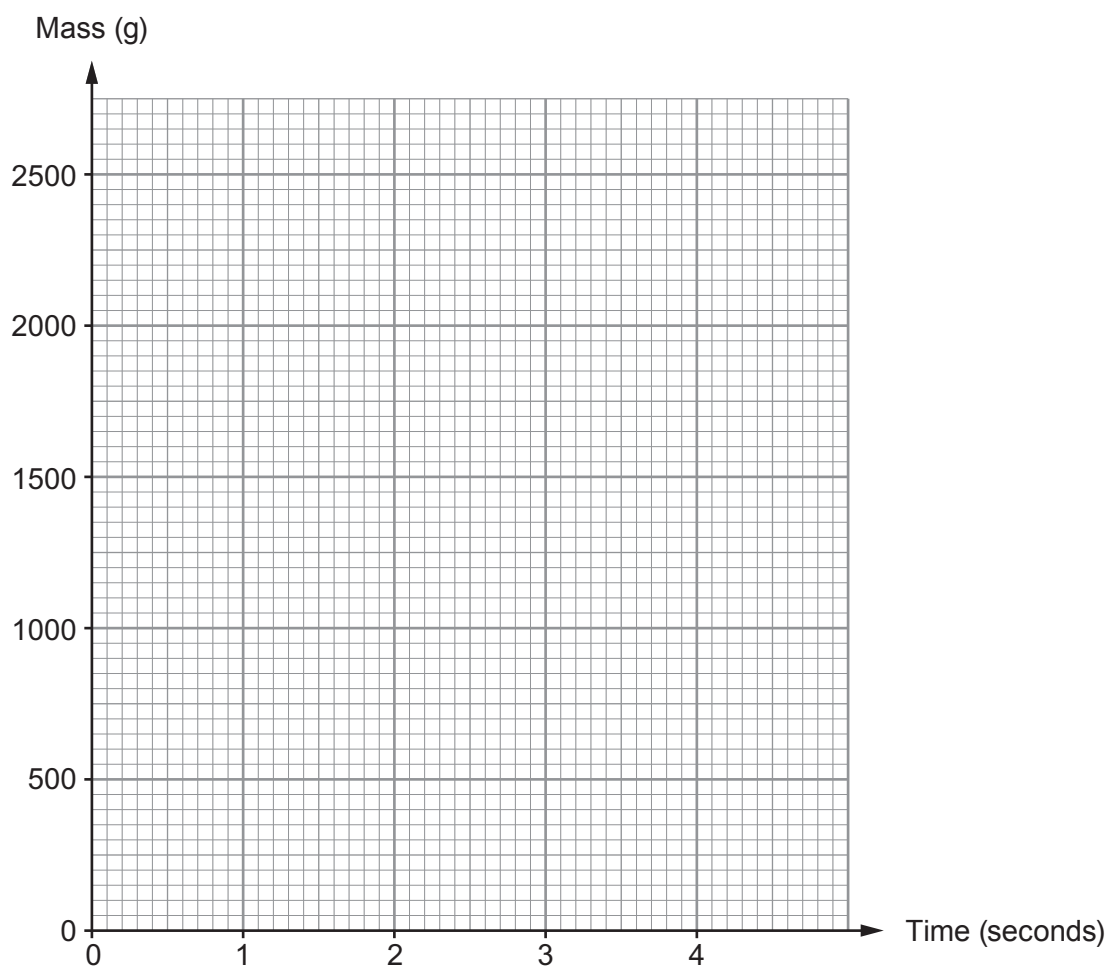
- (i) Use the graph paper below to draw a graph showing the decreasing mass during the first 4 seconds. [3]

.....

.....

.....

.....



- (ii) After how many seconds will the mass be 1500 grams?

[1]

.....

- (b) A substance has an initial mass m grams.
It loses a quarter of its mass every second.
Write down a formula for finding the final mass, f grams, of the substance after 5 seconds.

[3]

.....

.....

.....

.....

.....

.....

.....

13. (a) The company *Aqua24/7* fills plastic water bottles.



The company fills 3000 one-litre water bottles per hour.
The process is continuous for 12 hours each day.

- (i) Calculate the rate of filling water bottles per minute.
State the unit of your answer.

[2]

.....

.....

.....

- (ii) Calculate the number of water bottles filled during one working day.
You must give your answer in standard form.

[2]

.....

.....

.....

.....

- (b) Aluminium water bottles can be reused more safely than plastic water bottles.
Aqua24/7 decides to make aluminium water bottles.
The design of the aluminium water bottle is based on two parts, attaching a hemisphere onto a cylinder.



Diagram not drawn to scale

The inside diameter of the aluminium water bottle is 8 cm.
It holds 1 litre of water when filled to the top, including filling the hemispherical part.

- (i) For the aluminium water bottle, calculate
- the inside height of the cylindrical part, and
 - the overall inside height.

[6]

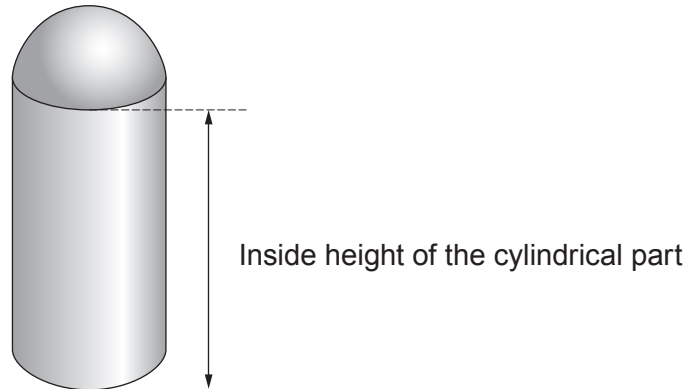


Diagram not drawn to scale

Inside height of the cylindrical part:

Overall inside height:

- (ii) In practice, do you think a bottle made with these dimensions will actually hold 1 litre of water?

You must give a reason for your answer.

[1]

END OF PAPER

BLANK PAGE

BLANK PAGE