

Write your name here

Surname

Other names

**Pearson**  
**Edexcel GCSE**

Centre Number

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Candidate Number

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# Applications of Mathematics

## Unit 1: Applications 1

*For Approved Pilot Centres ONLY*

**Higher Tier**

Wednesday 5 November 2014 – Morning

**Time: 1 hour 45 minutes**

Paper Reference

**5AM1H/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  $\pi$  button, take the value of  $\pi$  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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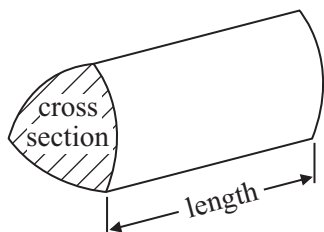
**PEARSON**

## GCSE Mathematics 2AM01

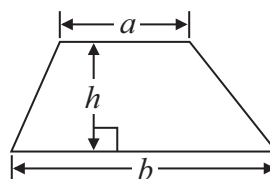
Formulae: Higher Tier

**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  $\times$  length

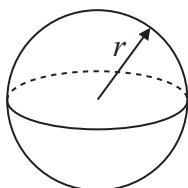


**Area of trapezium** =  $\frac{1}{2} (a + b)h$



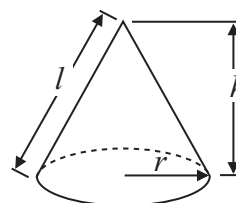
**Volume of sphere** =  $\frac{4}{3} \pi r^3$

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

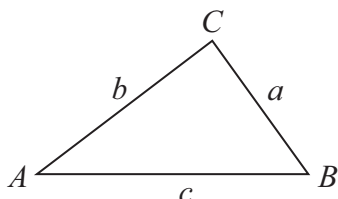


**Volume of cone** =  $\frac{1}{3} \pi r^2 h$

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



**Answer ALL questions.**

**Write your answers in the spaces provided.**

**You must write down all stages in your working.**

- 1 Jane has to work out the cross-sectional areas of some circular containers.

She uses the expression  $\frac{C^2}{4\pi}$  where  $C$  is the circumference of the container.

Work out the cross-sectional area when  $C$  is 65 cm.

.....cm<sup>2</sup>

**(Total for Question 1 is 2 marks)**

---



2 Julie is going on holiday to France.

She changes £400 into euros (€).

The exchange rate is £1 = €1.20

(a) How many euros does Julie get?

€ .....  
(2)

Julie brings back 150 euros (€) from her holiday in France.

She changes the euros into dollars (\$).

The exchange rates are

$$£1 = €1.20$$

$$£1 = \$1.56$$

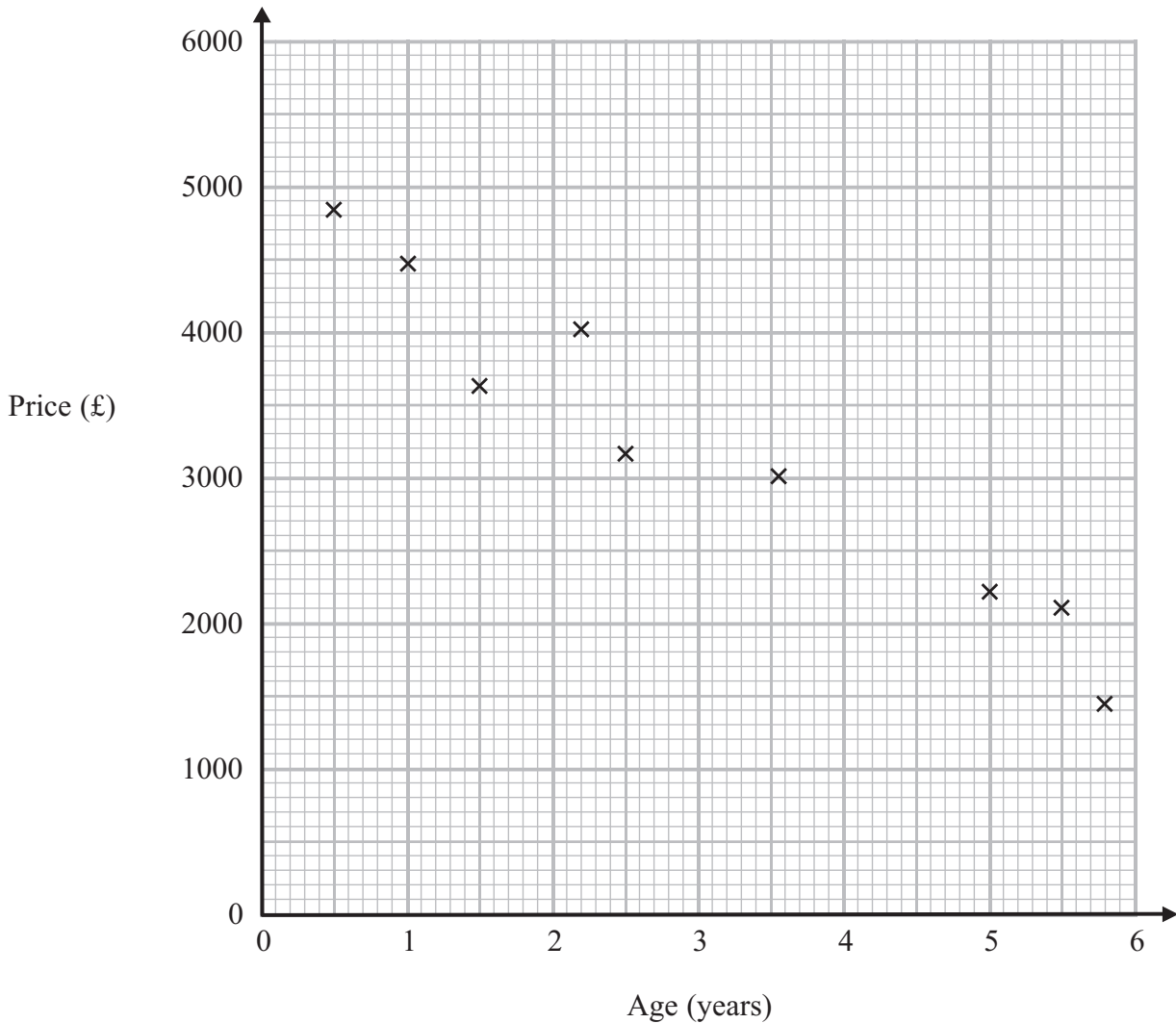
(b) How many dollars does Julie get?

\$ .....  
(3)

**(Total for Question 2 is 5 marks)**



3 Jason sells cars.  
 Last month he sold 9 cars.  
 All the cars he sold were the same make and model.  
 The scatter graph shows the ages and prices of the cars.



Jason also sold a 4 year old car of the same make and model for £2300

(a) Show this information on the scatter graph. (1)

A car of the same make and model is 3 years old.

(b) Estimate the price of this car. £ .....  
(2)

**(Total for Question 3 is 3 marks)**



4 Here is a diagram of two shelf supports.

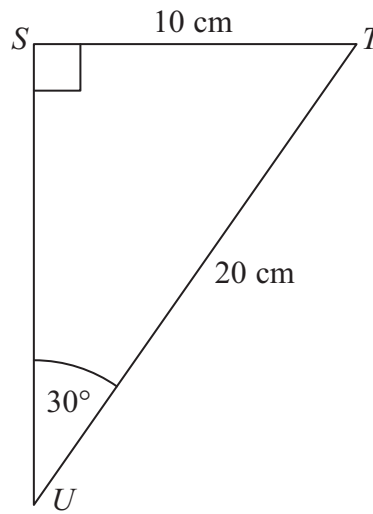
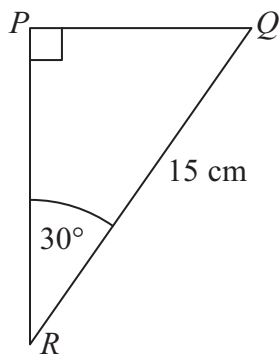


Diagram **NOT** accurately drawn

Triangle  $PQR$  is similar to triangle  $STU$ .

\*(a) Why?

.....  
.....  
(1)

(b) Work out the length of  $PQ$ .

.....cm  
(2)

(Total for Question 4 is 3 marks)



5 Chris has two children, Beth and Amy.  
Beth is 10 years older than Amy.

Chris says,

“I am twice as old as the sum of Beth’s age and Amy’s age.”

Chris is 40 years old.

How old is Amy?

.....years old

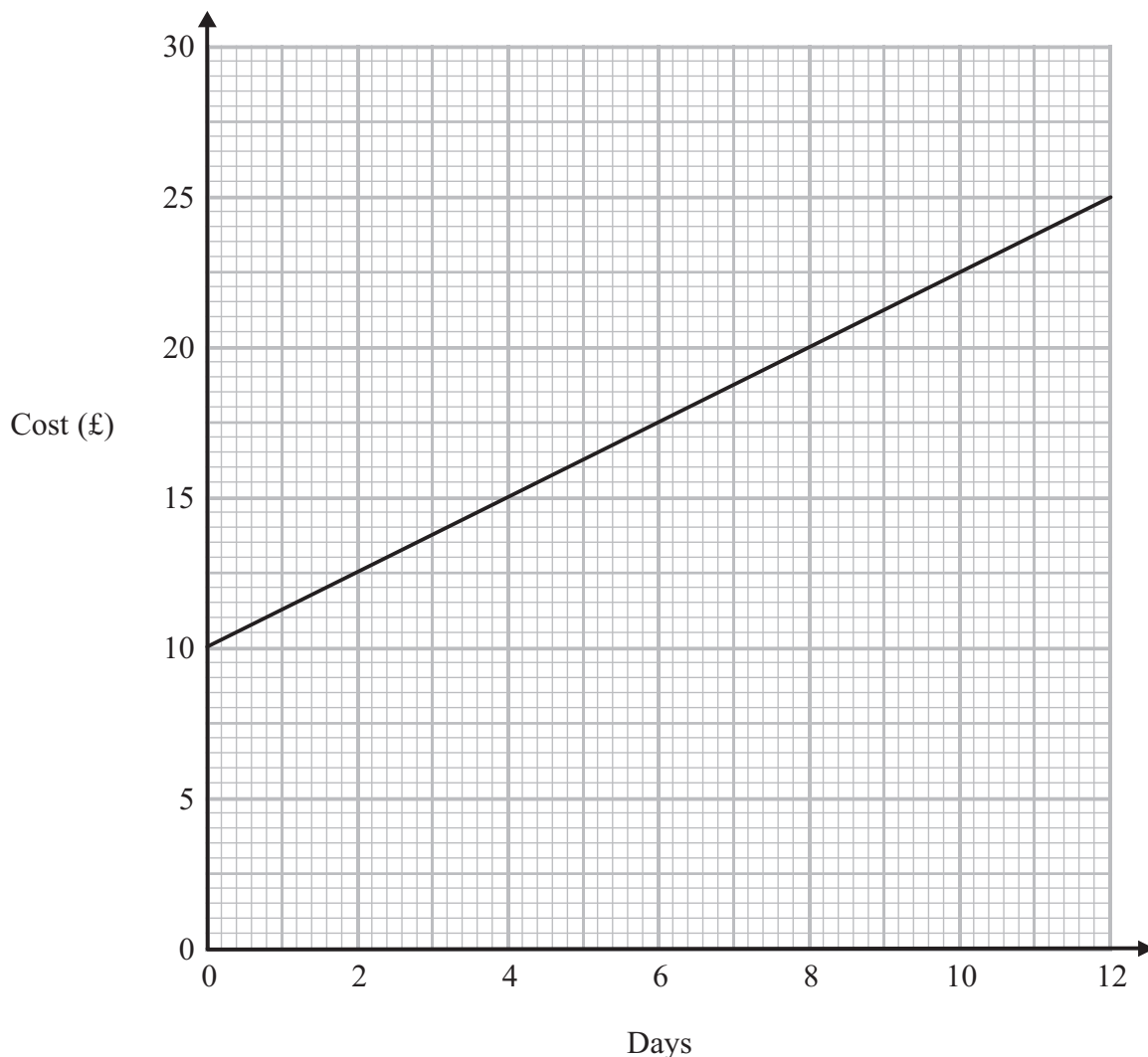
**(Total for Question 5 is 4 marks)**

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6 Salome hires a chainsaw from the **Saws are Us** company.

This graph shows the cost of hiring a chainsaw from **Saws are Us** for up to 12 days.



(a) Find the cost of hiring the chainsaw for 6 days from **Saws are Us**.

£ .....  
(1)

The cost of hiring a chainsaw from **Saws are Us** is £10 plus a daily rate.

(b) Work out the daily rate.

£ .....  
(1)





Salome wants to compare the cost of hiring a chainsaw from **Saws are Us** and from **Saws to You**.

**Saws to You** charge £3 for each day of hire.

Salome hires chainsaws for different periods of time.  
She wants to use the cheaper company.

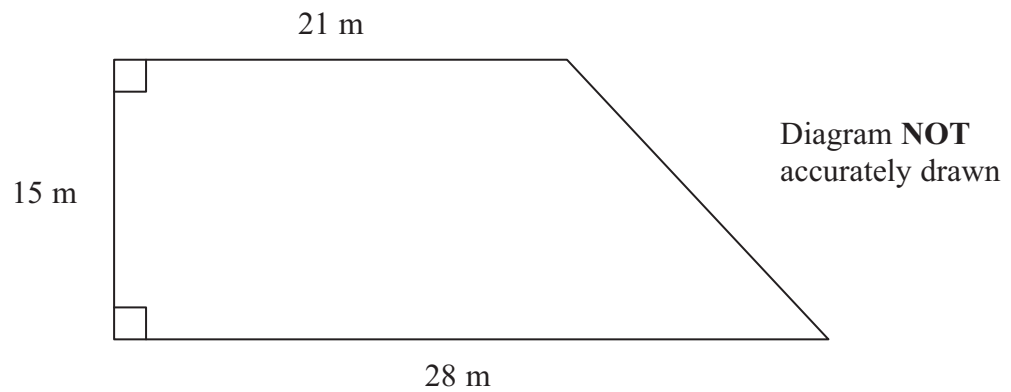
- (c) Which of these two companies is the cheaper to hire the chainsaw from?  
You must show your working and explain your answer.

.....  
(3)

**(Total for Question 6 is 5 marks)**



7 The lawn in Jamie's garden is in the shape of a trapezium.



Jamie needs to put fertiliser on the lawn.  
One kilogram of fertiliser covers 25 square metres.

Bags of fertiliser are sold in 3 sizes 2 kg, 5 kg and 10 kg.  
Jamie wants to buy the least number of bags of fertiliser.

Work out this number of bags of fertiliser.  
You must show all your working.

.....  
(Total for Question 7 is 4 marks)



8 Stefan buys his gas and electricity from the same company.

The cost of the gas he used is £128.50

The cost of the electricity he used is £172.70

Stefan gets a discount of 15% off these costs.

He pays VAT at 5% on these costs after getting the discount.

Work out the total amount Stefan has to pay.

£ .....

**(Total for Question 8 is 5 marks)**

---



P 4 4 5 7 7 A 0 1 1 3 2

- 9 This grouped frequency table gives information about the heights of some students when they were in Year 9

Height ( $h$ cm)	Frequency
$120 < h \leq 130$	2
$130 < h \leq 140$	5
$140 < h \leq 150$	10
$150 < h \leq 160$	8
$160 < h \leq 170$	5

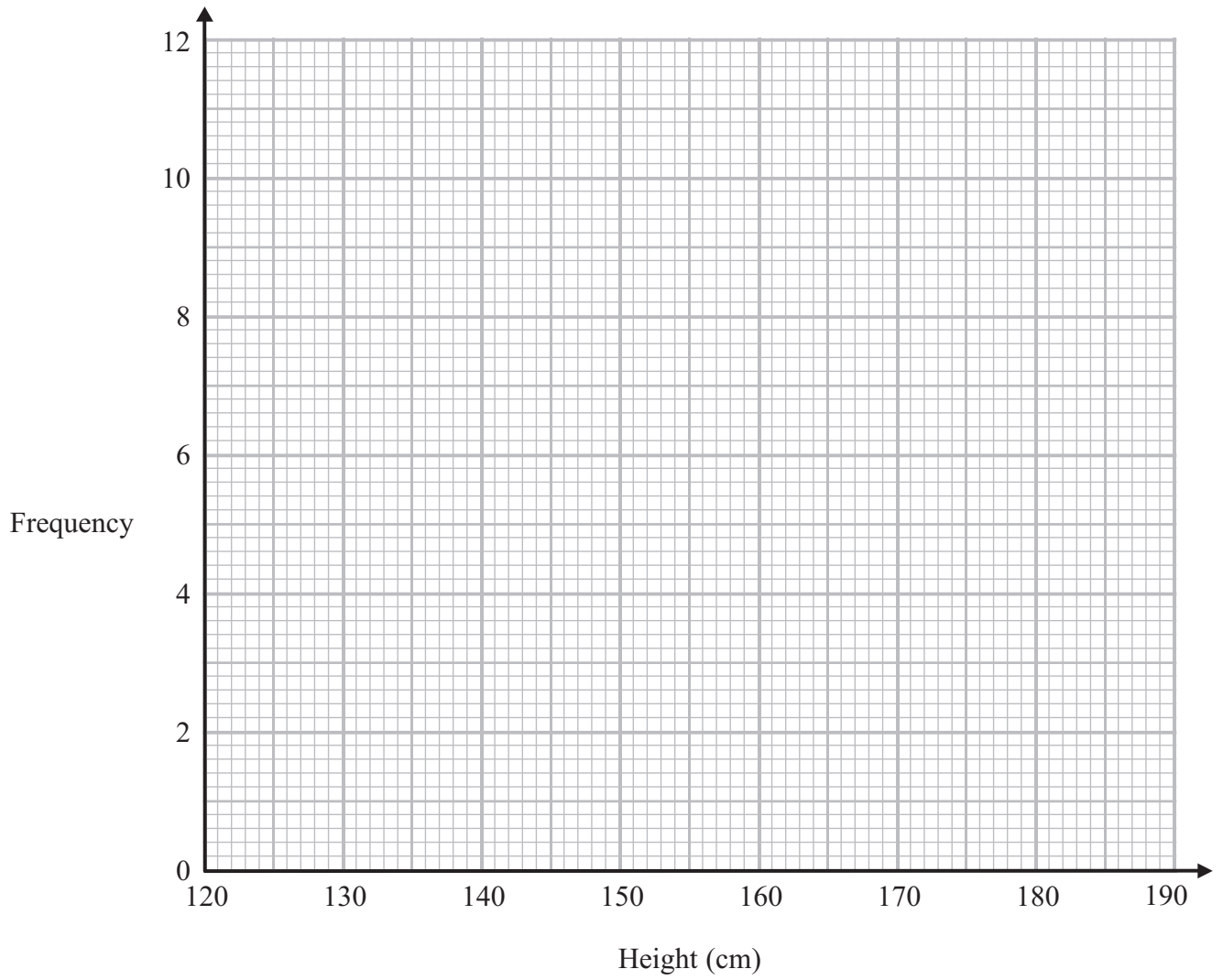
- (a) Work out an estimate for the mean height.

.....cm  
(4)

This grouped frequency table gives information about the heights of the same students when they were in Year 11

Height ( $h$ cm)	Frequency
$130 < h \leq 140$	1
$140 < h \leq 150$	7
$150 < h \leq 160$	8
$160 < h \leq 170$	10
$170 < h \leq 180$	4





(b) Draw a frequency polygon for the heights of the students in Year 11

(2)

**(Total for Question 9 is 6 marks)**

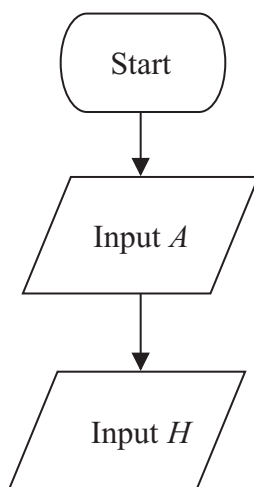


10 The table shows information about the pay of workers in a factory.

Age of worker	Pay per hour
Less than 20 years	£5.03
20 years or older	£6.31

A worker aged  $A$  years works for  $H$  hours.  
The worker is paid  $P$  pounds.

Complete the flow chart for working out the pay for any worker.



(Total for Question 10 is 4 marks)



**11** Sally is designing a question for a questionnaire to find out how much time people spend cycling.

(a) Design a question that Sally could use.

(2)

Sally lives in a small town.

She wants to make sure that the sample of people she asks is representative of the people living in the town.

(b) Write down the name of a sampling method she could use.

.....  
(1)

**(Total for Question 11 is 3 marks)**

---



**12** On Monday Barry buys 320 kg of gravel.

On Tuesday he buys some more of the gravel.

The amount of gravel he buys on Tuesday is 30% of the amount he buys on Monday.

(a) How many kilograms of gravel does Barry buy in total?

.....  
(3)

In a sale the price of paving slabs is reduced by 70%.

Josie buys some paving slabs at the sale price of £90

(b) What was the original price of the paving slabs?

£ .....  
(3)

**(Total for Question 12 is 6 marks)**





- 13 The table shows the number of cruises a travel agent sold from July 2012 to June 2014. It also shows some of the 4-point moving averages.

Time period	Number of cruises sold	4-point moving average
Jul 2012 – Sep 2012	2	
Oct 2012 – Dec 2012	8	
Jan 2013 – Mar 2013	12	8.25
Apr 2013 – Jun 2013	9	8.75
Jul 2013 – Sep 2013	4	9.5
Oct 2013 – Dec 2013	10	9.75
Jan 2014 – Mar 2014	15	
Apr 2014 – Jun 2014	10	

- (a) Work out the missing 4-point moving average.

.....  
(2)

- (b) What do the moving averages show about the trend in the number of cruises the travel agent sold?

.....  
(1)

**(Total for Question 13 is 3 marks)**



14 The distance of the Earth from Mars is  $5.5 \times 10^7$  kilometres.

(a) Write  $5.5 \times 10^7$  as an ordinary number.

.....  
(1)

The diameter of Jupiter is 143 000 kilometres.

(b) Write 143 000 in standard form.

.....  
(1)

One light year is the distance travelled by light in one year.

One astronomical unit (au) is the average distance from the Sun to the Earth.

One light year =  $9.461 \times 10^{12}$  km

One astronomical unit (au) =  $1.496 \times 10^8$  km

(c) How many astronomical units are there in a light year?

Give your answer in standard form correct to 3 significant figures.

.....  
(2)

**(Total for Question 14 is 4 marks)**

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- 15 Here is a rectangular sheet of metal.  
A square hole is cut out of the metal.

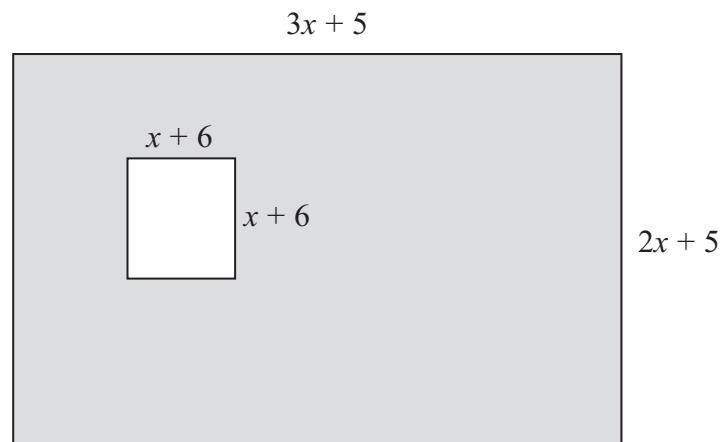


Diagram **NOT**  
accurately drawn

The length of the rectangle is  $3x + 5$   
The width of the rectangle is  $2x + 5$   
The square has sides of length  $x + 6$   
All measurements are in centimetres.

The perimeter of the square hole is  $\frac{3}{5}$  of the perimeter of the rectangle.

Work out the length of a side of the square hole.

.....cm

(Total for Question 15 is 5 marks)



16 There are 80 singers in a choir.

The cumulative frequency table gives information about the lengths of time it takes the singers to get to a rehearsal.

Time ( $t$ ) in minutes	Cumulative frequency
$0 < t \leq 10$	15
$0 < t \leq 20$	34
$0 < t \leq 30$	52
$0 < t \leq 40$	64
$0 < t \leq 50$	78
$0 < t \leq 60$	80

(a) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(b) Use your cumulative frequency graph to find an estimate for

(i) the median,

.....

(ii) the interquartile range.

.....

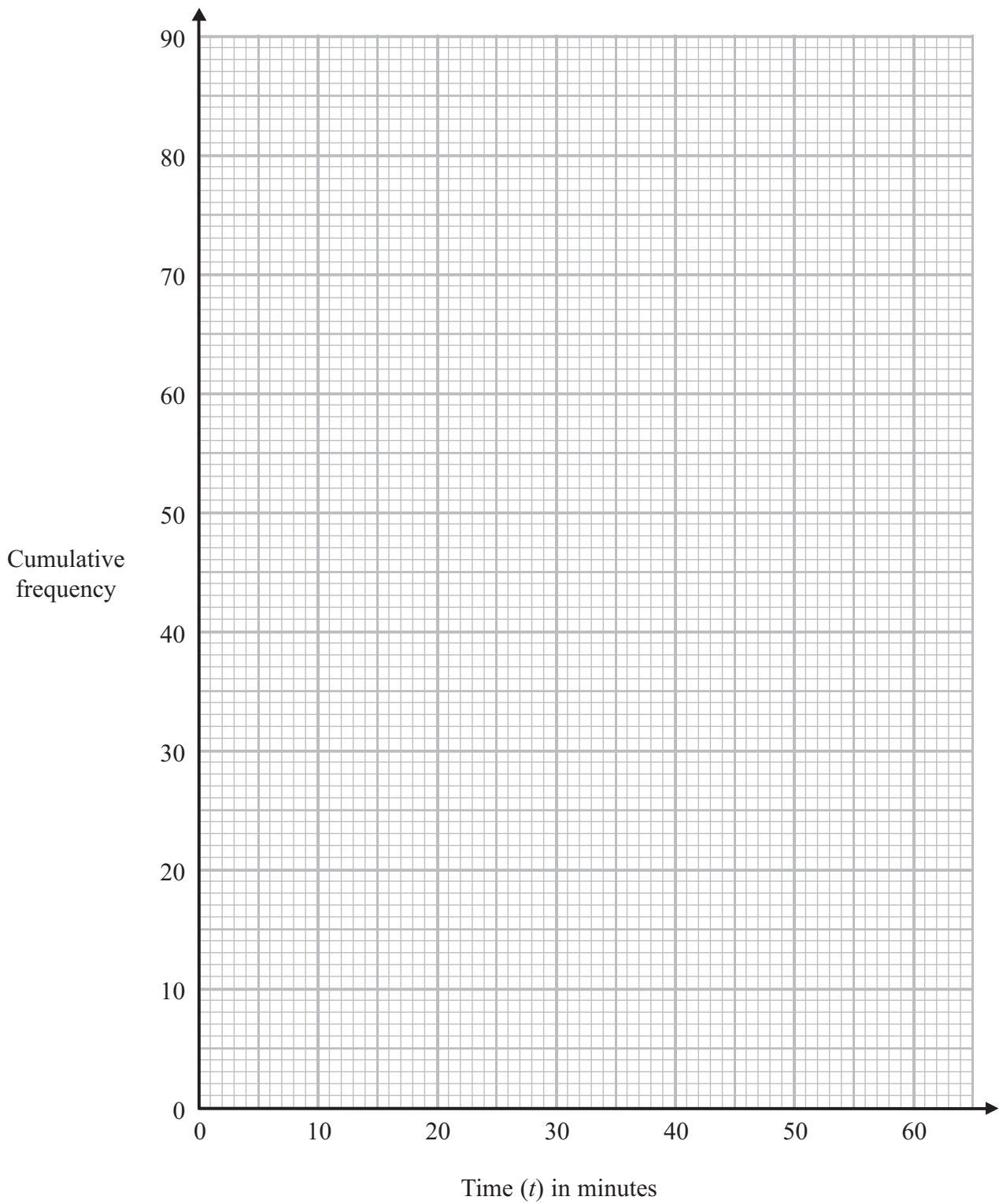
(3)

(c) Find an estimate for the number of singers who took longer than 45 minutes to get to the rehearsal.

.....

(2)





(Total for Question 16 is 7 marks)



P 4 4 5 7 7 A 0 2 1 3 2

17 Indi and Rashmi buy some pens and some notepads.

Indi buys 3 pens and 6 notepads for a total of £7.80

Rashmi buys 2 pens and 5 notepads for a total of £5.90

Find the cost of one pen and find the cost of one notepad.

pen .....

notepad .....

**(Total for Question 17 is 5 marks)**

---



18 Ellie makes statues in 3 sizes.



small



medium



large

The statues are mathematically similar.

A small statue is 10 cm high.

A medium statue is 15 cm high.

A large statue is 20 cm high.

It takes 72 ml of paint to paint the surface of a medium statue.

How much paint will be needed for a small statue?

.....ml

(Total for Question 18 is 3 marks)



P 4 4 5 7 7 A 0 2 3 3 2

**\*19** Adele grew 30 cabbages.

She gave fertiliser to 15 of the cabbages.

She did **not** give fertiliser to the other 15 cabbages.

Here are the final weights, in kilograms, of the 15 cabbages Adele gave fertiliser to.

1.5	1.5	1.6	1.6	1.6	1.7	1.8	1.8
2.0	2.0	2.0	2.0	2.2	2.5	2.6	

Here is some information about the final weights, in kilograms, of the 15 cabbages Adele did **not** give fertiliser to.

Smallest	1.0
Largest	2.1
Median	1.4
Lower quartile	1.2
Upper quartile	1.6

Compare the two distributions of weights.

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**(Total for Question 19 is 2 marks)**





20 Dave makes badges from a sheet of plastic.

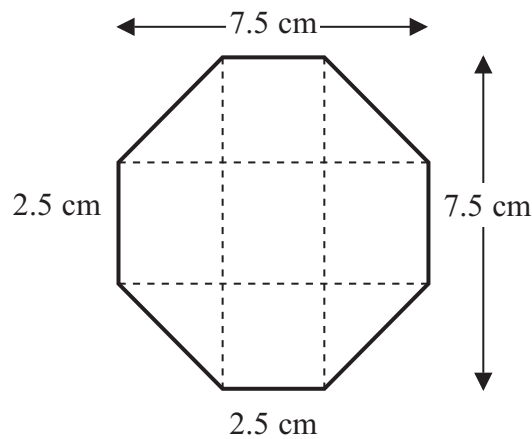


Diagram **NOT**  
accurately drawn

Each badge is in the shape of an octagon with rotational symmetry of order 4  
Each badge has a height of 7.5 cm and a width of 7.5 cm.

The sheet of plastic has a length of 90 cm and a width of 60 cm.

Dave cuts as many badges as possible from the sheet of plastic.

What percentage of the sheet of plastic is not used?  
You must show all your working.

.....%

(Total for Question 20 is 5 marks)



**21** Brad owns a company that makes bikes.  
He has a total of £4000 of materials for making bikes each week.  
He wants to make at least 20 town bikes and at least 20 sports bikes each week.

The materials to make a town bike cost £50  
The materials to make a sports bike cost £80

Let  $t$  represent the number of town bikes made each week.  
Let  $s$  represent the number of sports bikes made each week.

(a) Explain why

(i)  $t \geq 20$  and  $s \geq 20$

(ii)  $50t + 80s \leq 4000$

(2)

Brad employs 20 workers.  
Each worker works for at least 30 hours each week.

It takes 10 hours to make a town bike.  
It takes 15 hours to make a sports bike.

(b) Write down an inequality, in terms of  $t$  and  $s$ , for the time constraint.

(2)

(c) On the grid, show by shading, the feasible region that satisfies all the conditions in parts (a) and (b).

(2)

Brad makes a profit of

£60 when he sells a town bike,  
£80 when he sells a sports bike.

Brad wants to maximise his profit each week.  
He uses the objective function  $3t + 4s = k$

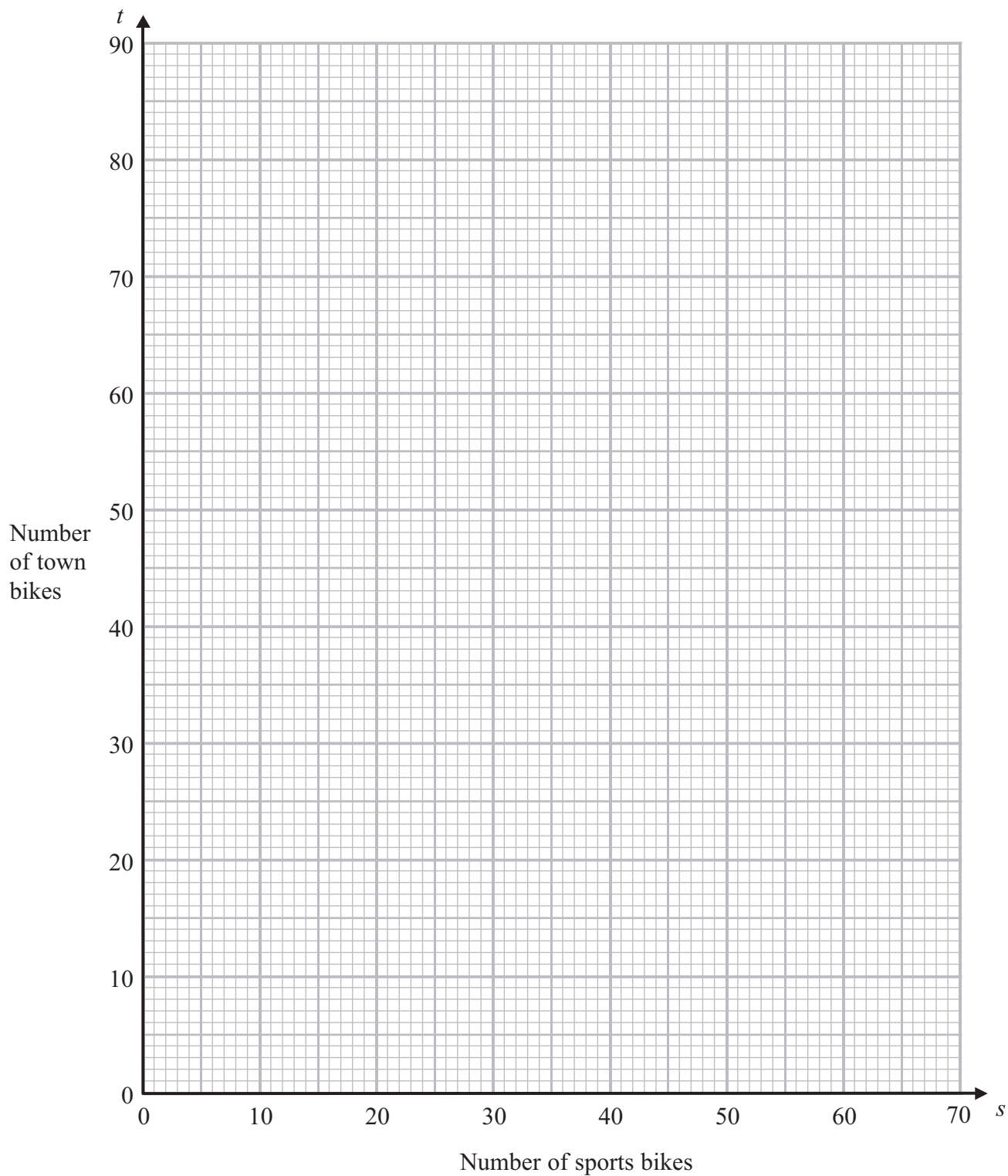
(d) How many town bikes and how many sports bikes does he need to make each week to maximise his profit?

town bikes .....

sports bikes .....

(2)



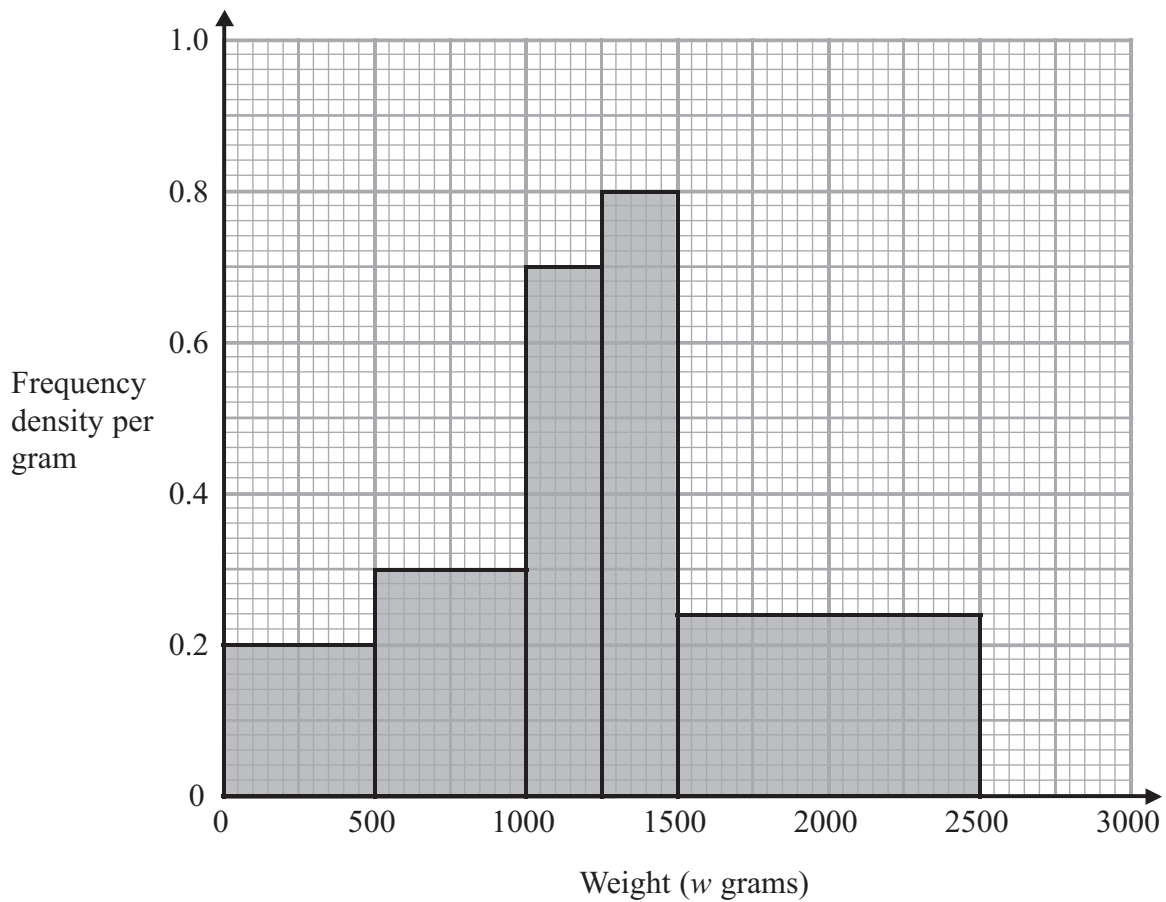


(Total for Question 21 is 8 marks)



22 Jim works for a courier company.

The histogram shows some information about the weights of the parcels he delivered last week.



(a) Use the histogram to complete the frequency table.

Weight ( $w$ grams)	Frequency
$0 < w \leq 500$	
$500 < w \leq 1000$	
$1000 < w \leq 1250$	
$1250 < w \leq 1500$	
$1500 < w \leq 2500$	

(2)



(b) Find an estimate of the median.

.....  
(2)

**(Total for Question 22 is 4 marks)**

---

**23** Sonia is going to carry out a survey of people in her village who are aged 15 – 34

The table shows information about these people.

Age	Male	Female
15 – 19	60	50
20 – 24	52	48
25 – 29	50	60
30 – 34	44	36
<b>Total</b>	<b>206</b>	<b>194</b>

Sonia is going to take a sample of 30 people stratified by age and gender.

How many males aged 20 – 24 should be in the sample?

.....  
**(Total for Question 23 is 2 marks)**

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24 Gail invests in an account that pays compound interest of 5% per annum.

How many years does it take to double the money in her investment?

.....  
**(Total for Question 24 is 2 marks)**

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**TOTAL FOR PAPER IS 100 MARKS**



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