Version 1.1

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 – 5	
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24 – 25	
TOTAL	

General Certificate of Secondary Education
Higher Tier

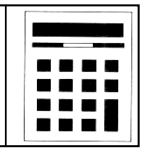
Mathematics (Linear) B 4365/2H

Paper 2 Calculator

Specimen Paper 2012 Specification

H

For this paper you must have:
- a calculator
- mathematical instruments.



Time allowed
- 2 hours

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.

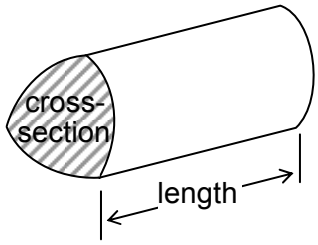
Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 105.
- The quality of your written communication is specifically assessed in questions 5, 13, 17 and 23.
  These questions are indicated with an asterisk (✳)
- You may ask for more answer paper and graph paper.
  These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

Formulae Sheet: Higher Tier

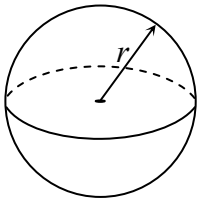
Area of trapezium = $\frac{1}{2}(a+b)h$

Volume of prism = area of cross-section × length



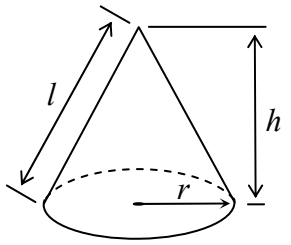
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

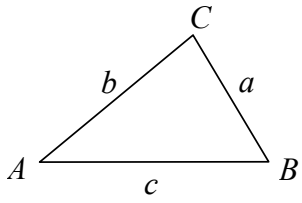


In any triangle ABC

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

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

Cosine rule $a^2 = b^2 + c^2 - 2cb\cos A$



The Quadratic Equation

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

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

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

1 The ratio of boys to girls in a class is 2 : 3

Which of the following statements is True (T), False (F) or could be true (C).

Put a tick in the appropriate box.
The first one is done for you.

Statement	T	F	C
There are 13 boys in the class		✓	
There are 30 students in the class			
The fraction of boys in the class is $\frac{2}{3}$			
The percentage of girls in the class is 60%			
The number of girls in the class must be a multiple of 3			

(3 marks)

2 The sum of the two digits of the number 18 is 9 because $1 + 8 = 9$

How many whole numbers from 10 to 99 inclusive have the sum of their digits equal to 9?

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Answer ..... *(3 marks)*

6

3 Mr Jones buys a new car for £18245 in June 2004.
He sold it for £8500 in June 2009.

He uses a formula to work out the annual depreciation.

$$\text{Annual depreciation} = \frac{\text{Original price (£)} - \text{Final price (£)}}{\text{Number of years}}$$

3 (a) Use the formula to work out the annual depreciation of the car.
Give your answer to the nearest £10.

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Answer £ ..... *(3 marks)*

3 (b) Estimate the value of the car in June 2010.

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Answer £ ..... *(2 marks)*

4 Use your calculator to evaluate $\dfrac{6.1 \times 5.9}{8.7 - 3.4}$

4 (a) Write down your full calculator display.

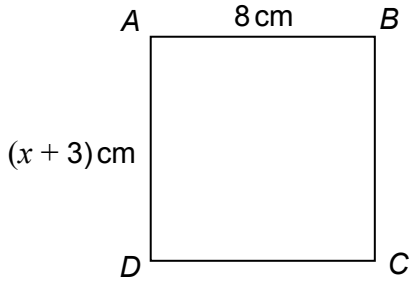
Answer ..... *(1 mark)*

4 (b) Write down your answer to a suitable degree of accuracy.

Answer ..... *(1 mark)*

✳ **5** *ABCD* is a square.

PQRS is an oblong.



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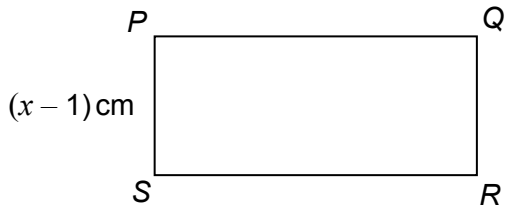

The oblong and the square have the same perimeter.

Work out the length of *PQ*.

Show clearly how you work out your answer.

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Answer ..... cm *(4 marks)*

Turn over for the next question

11

6 Ronan is designing a game.
He has two sets of discs laid face down on a table.
The first set of five discs are labelled 1, 3, 5, 7, 9
The second set of four discs are labelled 2, 4, 6, 8

Players turn over one disc, at random, from each set and add the numbers together.

Ronan uses the game to raise money for charity.
Each player pays 20 p to play the game.
If a player gets a total of exactly 13 they win a bar of chocolate.
It costs Ronan 50 p for each bar of chocolate.

If 100 people play the game, show that Ronan should expect to raise £ 12.50 for charity.
You may find the grid below useful.

	1	3	5	7	9
2	3				
4					
6					
8					

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(4 marks)

7 In a science experiment Sita adds weights to a spring.
Each time she adds a weight she measures the length of the spring.
Her results are shown in the table.

Weight (g)	**Length of Spring** (cm)
20	165
30	180
40	195
50	210

7 (a) What is the length of the spring for a weight of 45 g?

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Answer ..... cm *(2 marks)*

7 (b) Work out the length of the spring with no weight on it.

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Answer ..... cm *(2 marks)*

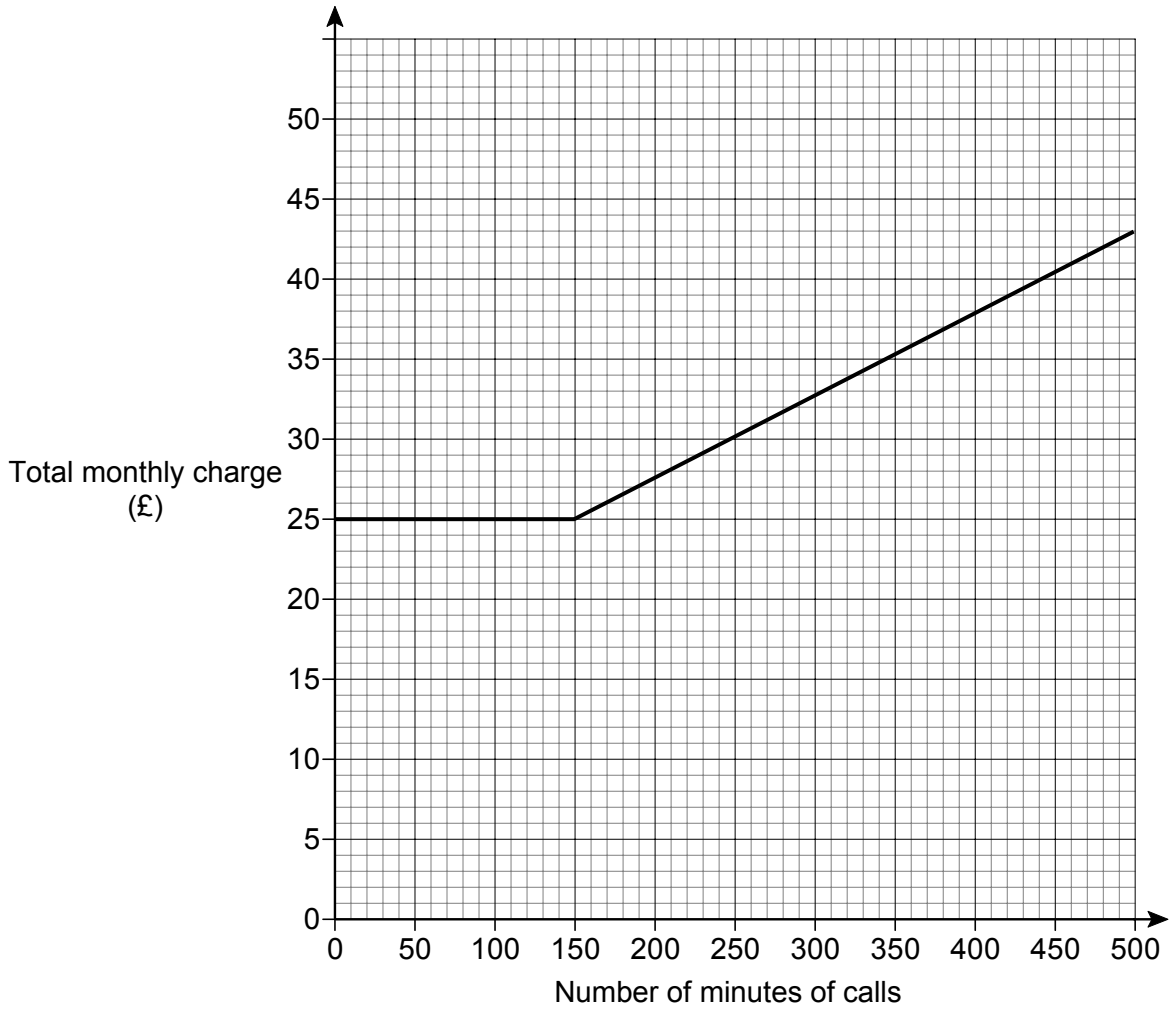
Turn over for the next question

8

8 Viki has a mobile phone contract.

She never sends texts.

The graph shows how the total monthly charge is calculated for her mobile phone contract for up to 500 minutes of calls.



8 (a) (i) Write down the basic monthly charge.

Answer £ ..... *(1 mark)*

8 (a) (ii) Write down the number of minutes of free calls

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Answer ..... minutes *(1 mark)*

8 (b) Work out the charge per minute for the other calls.

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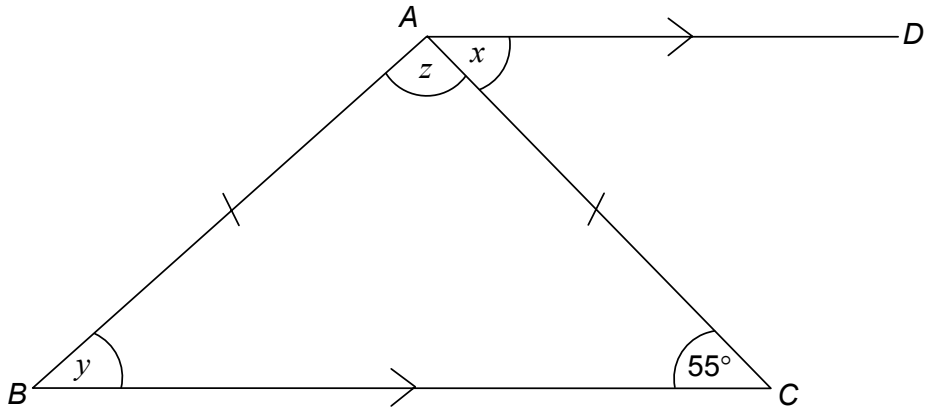
Answer ..... pence *(3 marks)*

9 *ABC* is an isosceles triangle with $AB = AC$.
BC is parallel to *AD* and angle $BCA = 55°$



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Work out the sizes of the angles marked x, y and z.

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Answer $x =$ ..... degrees

$y =$ ..... degrees

$z =$ ..... degrees

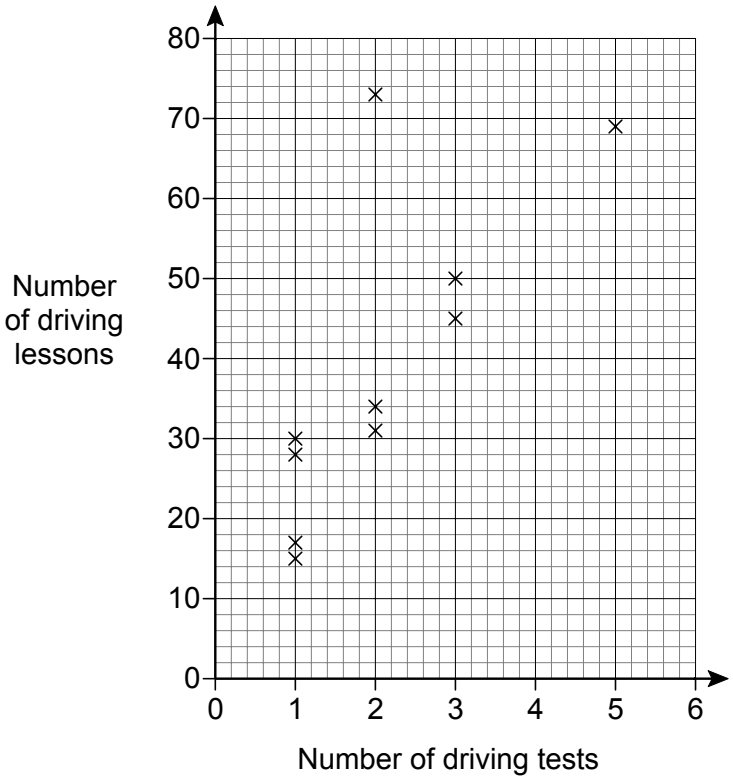
(4 marks)

9

10 Rio wants to know the number of driving lessons he might need before he passes his driving test.

He also wants to know the number of times he might have to take his driving test before he passes.

He collects some data and shows it on this scatter graph.



10 (a) Rio ignores one of the points on the scatter graph.

Circle this point and give a reason why it should be ignored.

Reason .....

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(2 marks)

10 (b) Draw a line of best fit on the scatter graph.

(1 mark)

Do not write outside the box

10 (c) Rio has already failed his driving test three times after a total of 40 driving lessons.

10 (c) (i) Estimate how many **more** driving lessons Rio needs if he is to pass his driving test on the fourth attempt.

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Answer ..... *(2 marks)*

10 (c) (ii) Give a reason why this estimate might be unreliable.

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(1 mark)

11 Becky has a collection of 210 DVDs.
The width of each DVD is 14 millimetres.
She keeps her DVDs on five shelves.
Each shelf is 70 centimetres long.

How many more DVDs does she have space for?

Show clearly how you work out your answer.

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Answer ..... *(5 marks)*

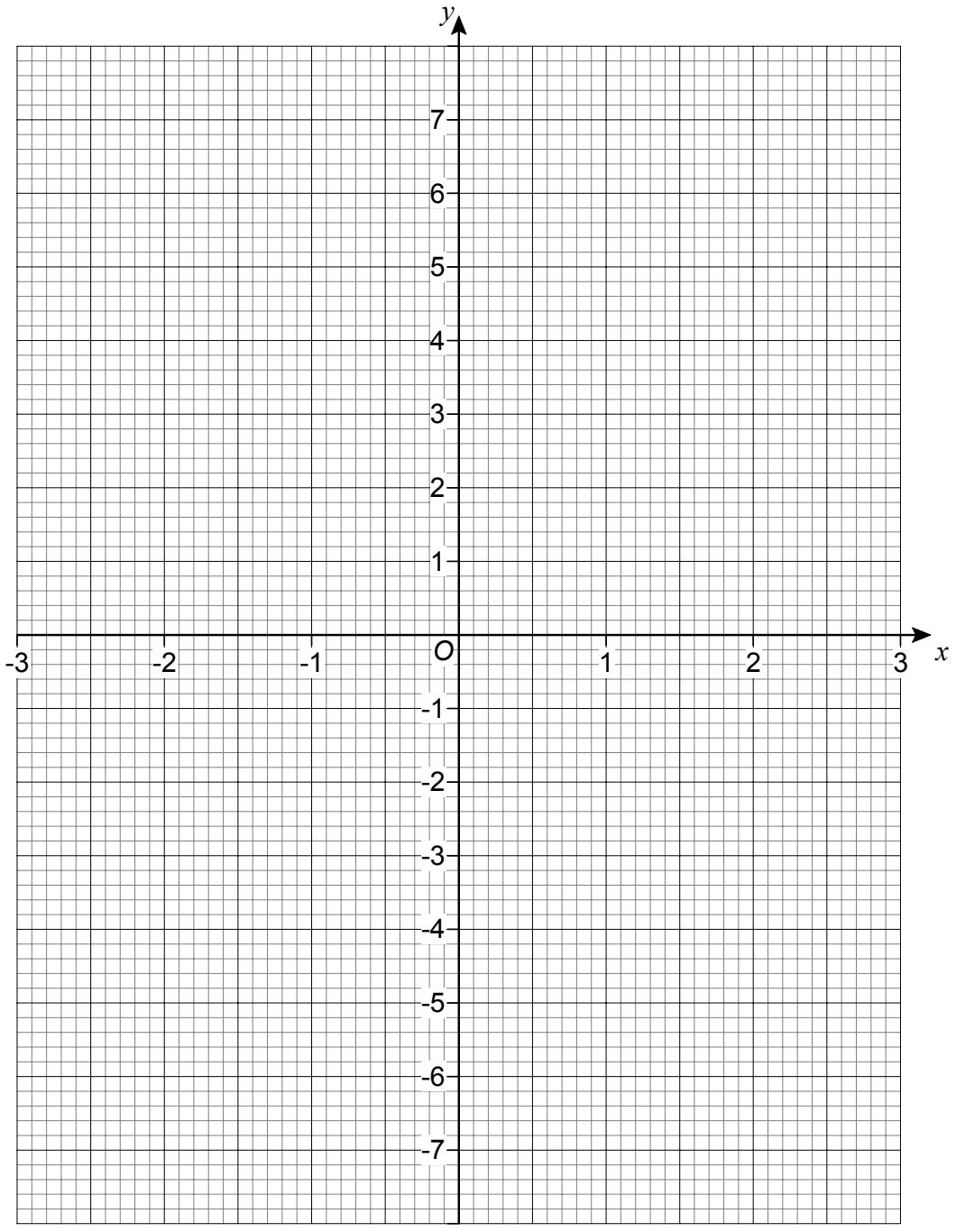
Turn over for the next question

11

12 This is a table of values for $y = x^2 - 3$

x	–3	–2	–1	0	1	2	3
y	6	1	–2	–3	–2	1	6

12 (a) On the grid, draw the graph of $y = x^2 - 3$ for values of x from –3 to +3



(2 marks)

12 (b) Use your graph to write down the **positive** solution to the equation $x^2 - 3 = 0$

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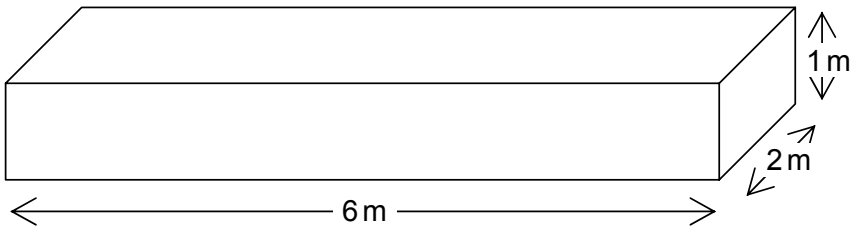
Answer ..... *(1 mark)*

✶**13** The shape of a flower bed is a cuboid as shown.

Not drawn accurately



$1\,m^3$ of soil weighs 1.25 tonnes

A gardener wants to fill the flower bed with soil as cheaply as possible.

The table shows the costs for Company A and Company B.

Company A	£49.50 per tonne	Delivery £30
Company B	10 tonnes for £430 then £67.50 per extra tonne	Delivery free

Which company should she use and how much will it cost?

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Answer Company .....

£ ..... *(6 marks)*

9

14 A doctor wants to encourage her patients to take more exercise.
The doctor has approximately 500 patients.
She decides to do a survey about what exercise her patients take.

14 (a) This is a question in the survey.

Q Do you exercise?

A Tick a box

Yes ☐ No ☐ Sometimes ☐ Everyday ☐

14 (a) (i) Give a criticism of the question.

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(1 mark)

14 (a) (ii) Give a criticism of the response section.

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(1 mark)

14 (b) This is another question in the survey.

Q How many miles did you walk last week?

Give a suitable response section for this question.

(1 mark)

15 Calculate $\dfrac{9.1 \times 10^{6}}{3.5 \times 10^{-4}}$

Give your answer in standard form.

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Answer ..... *(2 marks)*

16 (a) Solve the inequality $3x + 7 > x + 8$

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Answer ..... *(2 marks)*

16 (b) Make a the subject of the formula $\sqrt{a+3} = b$

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Answer ..... *(2 marks)*

16 (c) Solve the equation $\dfrac{2x+3}{4} + \dfrac{x-5}{3} = \dfrac{3}{2}$

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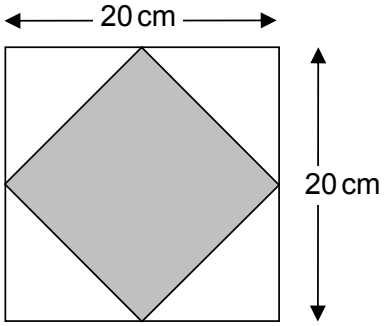
Answer $x =$ ..... *(4 marks)*

13

✳ **17** Emily is drawing and shading shapes.
Each time she starts with a square of side 20 cm.

17 (a) She draws a second square by joining the midpoints of the original one.
She shades the second square.



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Show that half of the original square is shaded.

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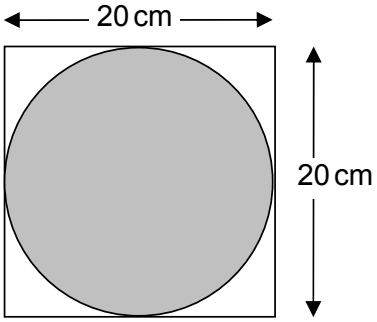
(2 marks)

17 (b) Emily now draws a circle that just touches the sides of the original square.
She shades the circle.



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Emily says that more than 80% of the original square is shaded.

Is Emily correct?

You **must** show your working.

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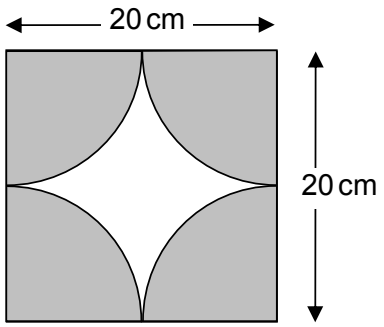
(3 marks)

17 (c) Finally Emily draws quadrants of circles and shades them.



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Explain why she does not need to do any further calculations to work out the shaded area.

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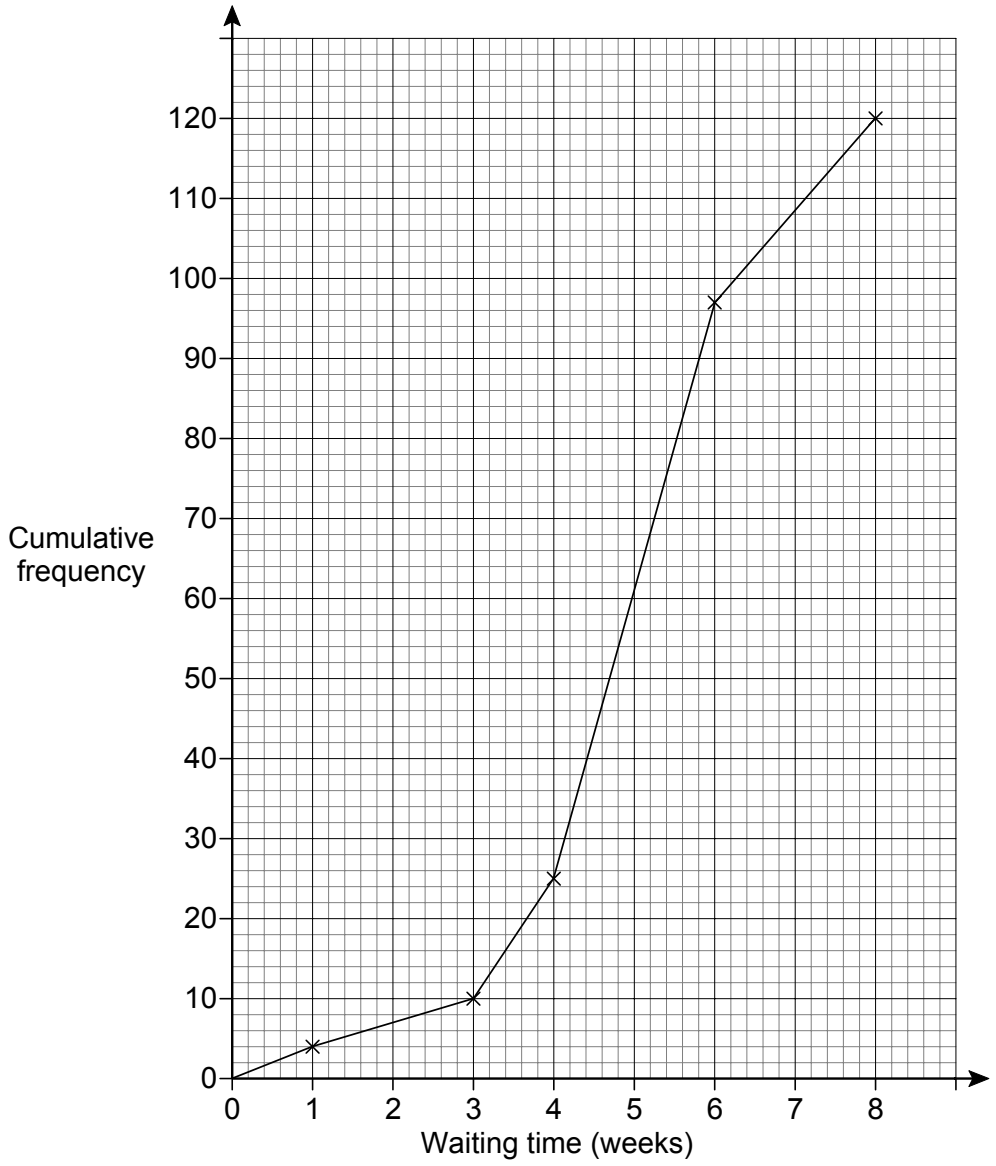
(1 mark)

Turn over for the next question

6

18 The cumulative frequency polygon shows the waiting times for 120 patients needing an operation at a hospital.



18 (a) The hospital claims that 90% of patients wait less than 7 weeks for the operation.

Comment on this claim.

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(3 marks)

18 (b) At a different hospital 746 patients had the same operation.
This table shows the age and gender of the patients.

	Age		
	Under 18	**18 – 65**	**Over 65**
Male	84	342	50
Female	39	194	37

The hospital wants to take a stratified sample of 80 patients.

Complete the table below to show how many people from each group should be sampled.

	Age		
	Under 18	**18 – 65**	**Over 65**
Male			
Female			

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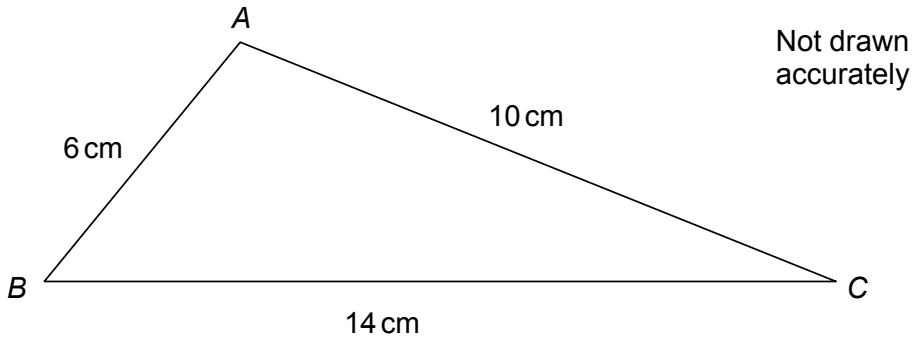
(3 marks)

Turn over for the next question

6

19 Triangle ABC has $AB = 6$ cm, $AC = 10$ cm, $BC = 14$ cm



Calculate the area of the triangle.

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Answer ..... cm^2 *(5 marks)*

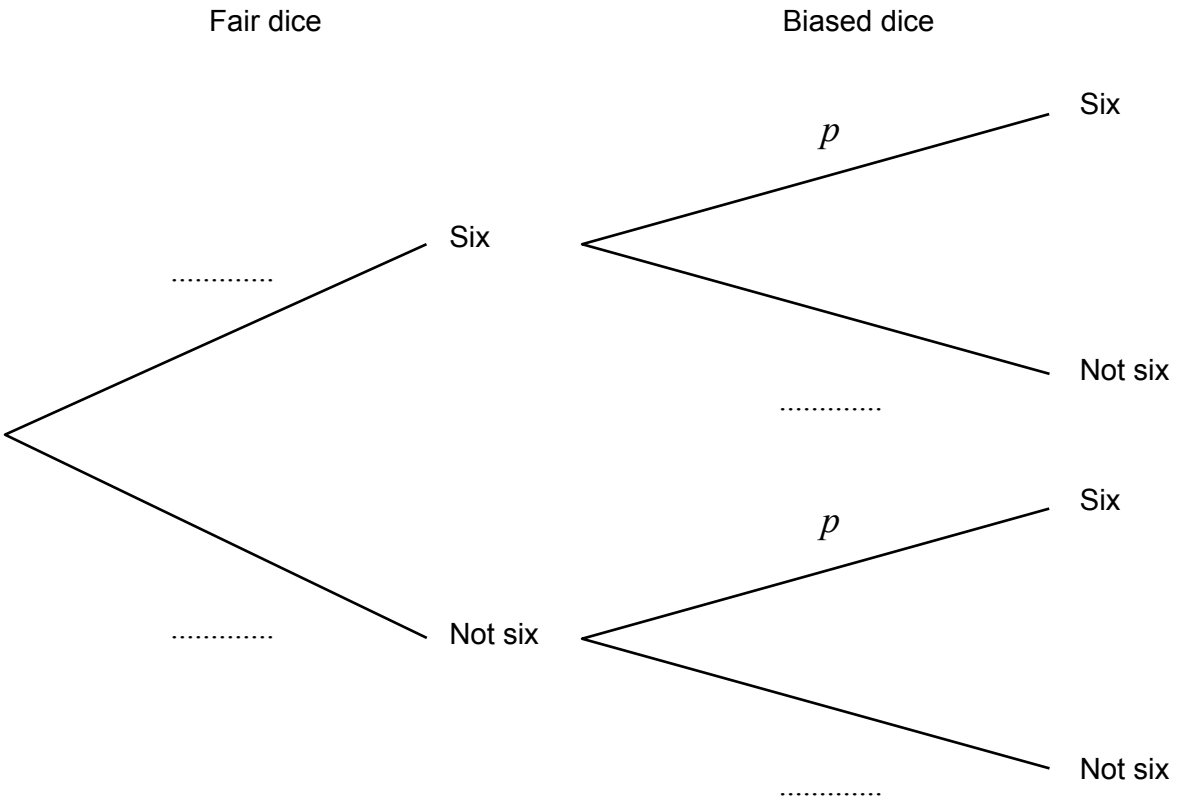
20 Two ordinary six-sided dice are used in a game.

One dice is fair, the other is biased.

The probability of throwing a six with the biased dice is p.

The two dice are thrown.

The probability of getting exactly one six is $\frac{7}{9}$



Using the tree diagram, or otherwise, work out p.

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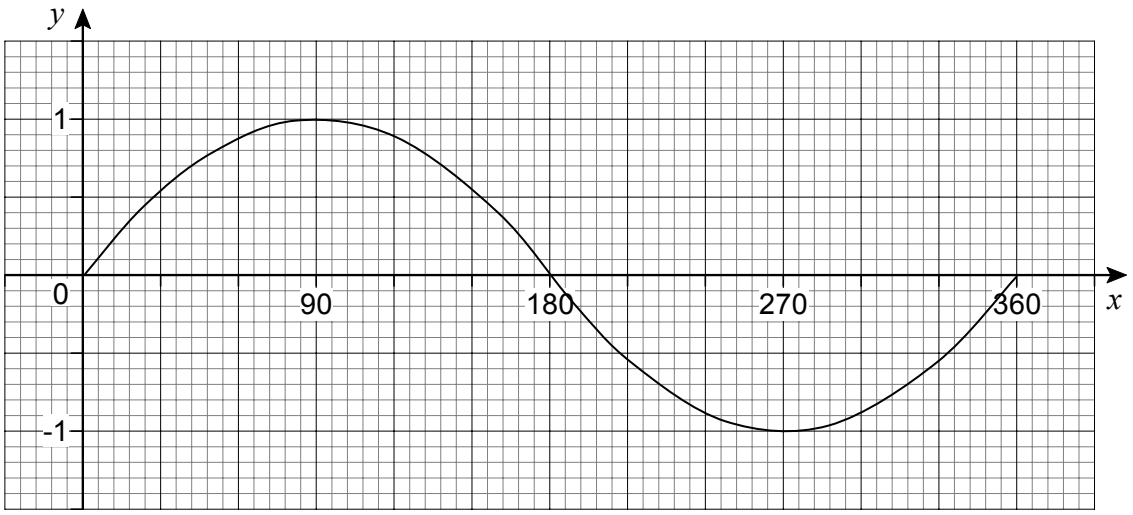
Answer ..... *(5 marks)*

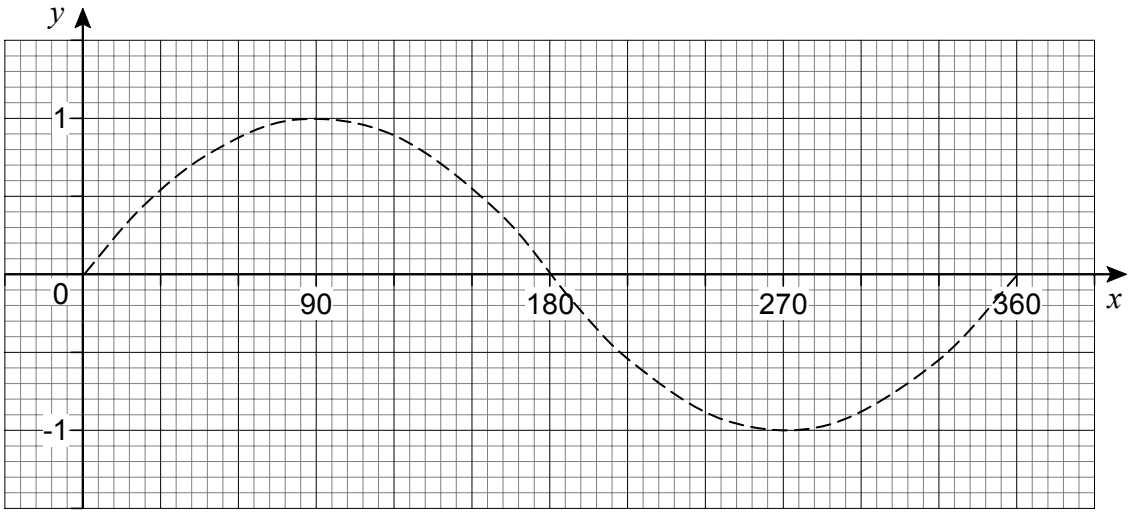
10

21 This is the graph of $y = \sin x$ for $0° \leq x \leq 360°$.



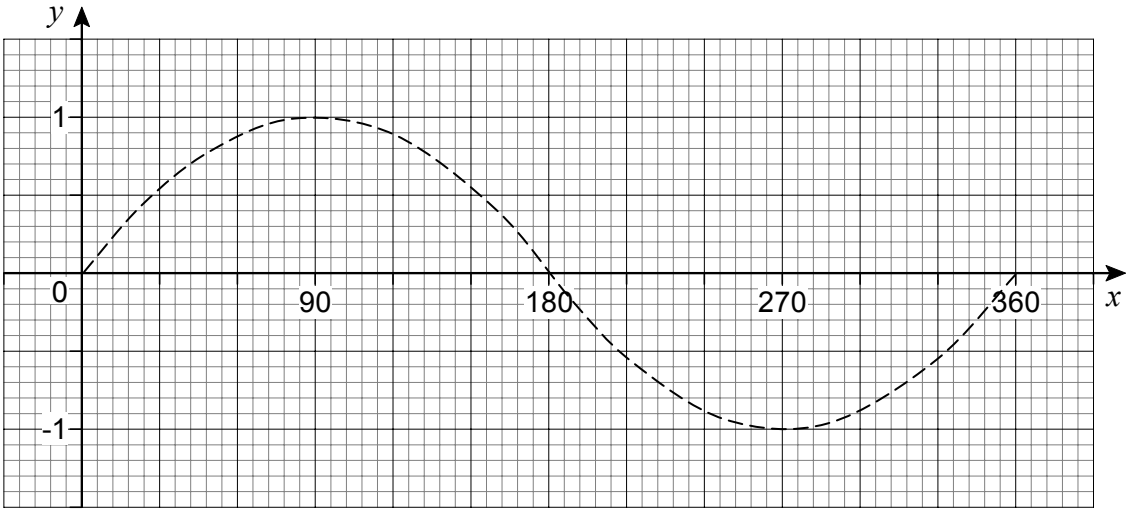
On the axes draw the following graphs for $0° \leq x \leq 360°$.
The graph of $y = \sin x$ is shown dotted to help you.

21 (a) $y = \sin (x + 90°)$



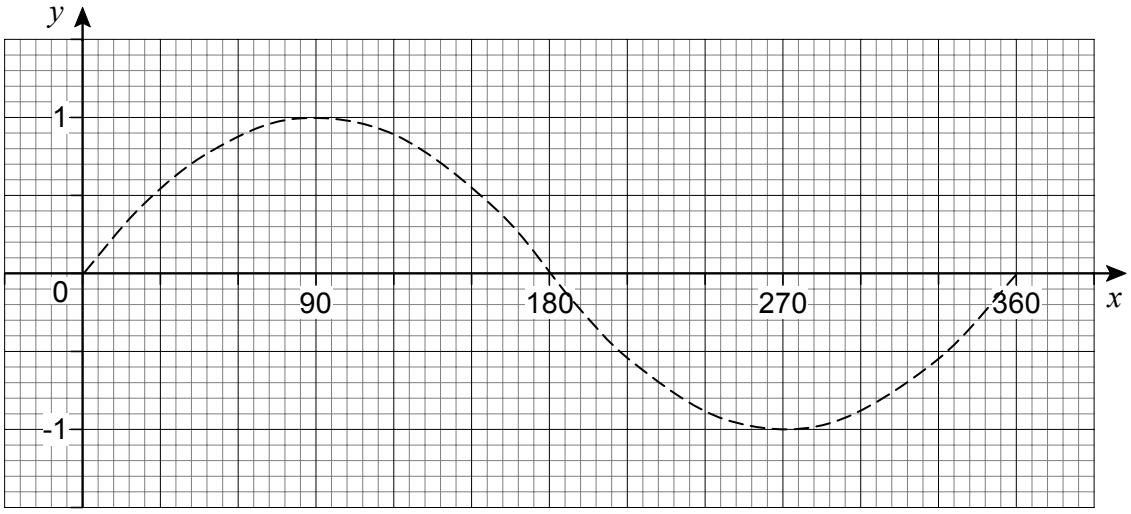
(1 mark)

21 (b) $y = \frac{1}{2}\sin x$



(1 mark)

21 (c) $y = \sin \frac{x}{2}$



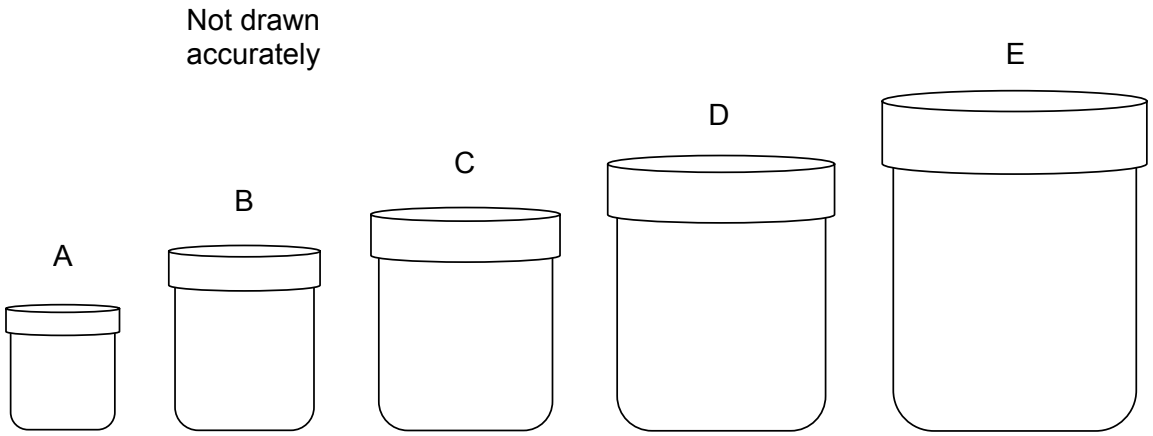
(1 mark)

3

22 Five toy beakers A, B, C, D and E are mathematically similar.

Their heights are in the ratio 2 : 3 : 4 : 5 : 6

Beaker B has height 4.2 cm and surface area 45 cm^2.



22 (a) Work out the height of beaker D.

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Answer ..... cm *(2 marks)*

22 (b) Work out the surface area of beaker C.

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Answer ..... cm^2 *(2 marks)*

22 (c) Beaker A is used to fill beaker E with sand.

How many full beakers of sand are needed to fill beaker E?

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Answer ..... *(2 marks)*

✶ **23** Prove that $(n + 5)^2 - (n + 3)^2 \equiv 4(n + 4)$

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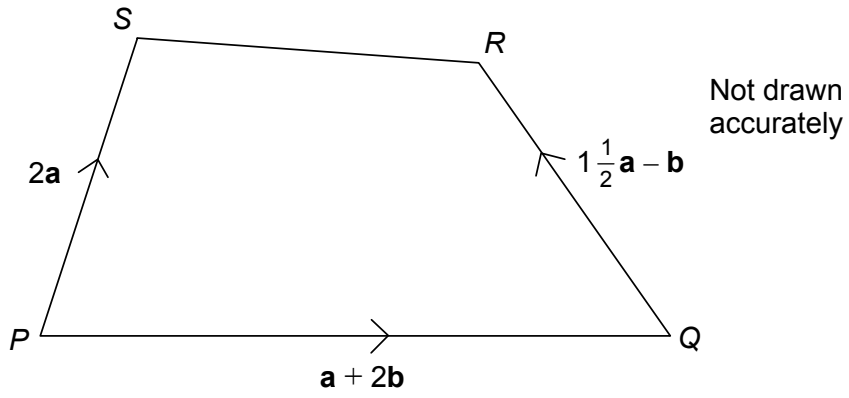
(3 marks)

24 In the diagram $PQ = \mathbf{a} + 2\mathbf{b}$, $PS = 2\mathbf{a}$, $QR = 1\frac{1}{2}\ \mathbf{a} - \mathbf{b}$



24 (a) Work out $\overrightarrow{SR}$

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Answer ..... *(2 marks)*

24 (b) What type of quadrilateral is *PQRS*?
Give a reason for your answer.

Answer .....

Reason .....

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(2 marks)

END OF QUESTIONS

13

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED