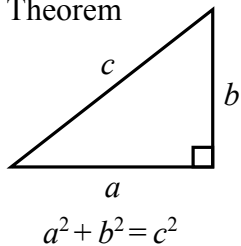




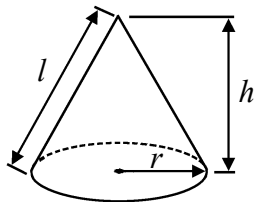
**IGCSE MATHEMATICS 4400  
FORMULA SHEET – HIGHER TIER**

Pythagoras' Theorem



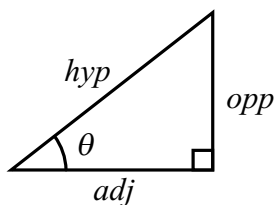
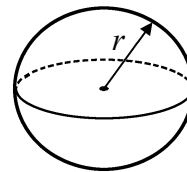
Volume of cone =  $\frac{1}{3} \pi r^2 h$

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



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

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



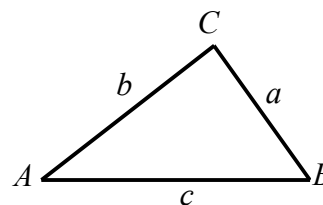
adj = hyp  $\times$  cos  $\theta$   
opp = hyp  $\times$  sin  $\theta$   
opp = adj  $\times$  tan  $\theta$

or  $\sin \theta = \frac{\text{opp}}{\text{hyp}}$

$\cos \theta = \frac{\text{adj}}{\text{hyp}}$

$\tan \theta = \frac{\text{opp}}{\text{adj}}$

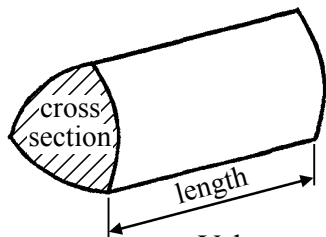
In any triangle ABC



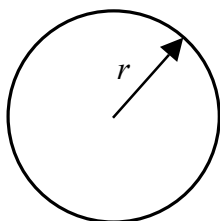
Sine rule  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



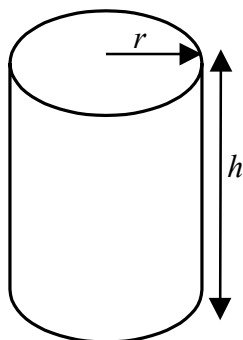
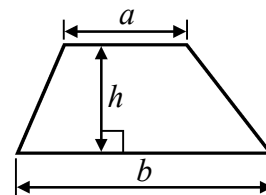
Volume of prism = area of cross section  $\times$  length



Circumference of circle =  $2\pi r$

Area of circle =  $\pi r^2$

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



Volume of cylinder =  $\pi r^2 h$

Curved surface area of cylinder =  $2\pi r h$

The Quadratic Equation

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

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



Leave  
blank

**Answer ALL TWENTY-FIVE questions.**

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

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

1. Work out the value of  $\frac{6.46}{1.8+1.6}$

.....

**Q1**

**(Total 2 marks)**

2. (a) Expand  $3(2t + 5)$

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

(b) Expand  $y(y^2 - 3y)$

.....  
**(2)**

(c) Expand and simplify  $(x + 3)(x + 7)$

.....  
**(2)**

(d) Simplify  $p^4q^2 \times p^3q^6$

.....  
**(2)**

**(Total 7 marks)**

**Q2**



Leave blank

3. The total of Kim's age and Pablo's age is 45 years.  
The ratio of Kim's age to Pablo's age is 1 : 4

Work out Kim's age.

..... years

**(Total 2 marks)**

**Q3**

4. Here is a pattern of shapes made from centimetre squares.



Shape  
number 1



Shape  
number 2



Shape  
number 3

This rule can be used to find the perimeter of a shape in this pattern.

Add 1 to the Shape number and then multiply your answer by 2

$P$  cm is the perimeter of Shape number  $n$ .

- (a) Write down a formula for  $P$  in terms of  $n$ .

.....  
**(3)**

- (b) Make  $n$  the subject of the formula in part (a).

$n =$  .....  
**(3)**

**(Total 6 marks)**

**Q4**



Leave  
blank

5. Bridget flew from the UK to Dubai.  
Her flight from the UK to Dubai covered a distance of 5456 km.  
The flight time was 7 hours 45 minutes.

Work out the average speed of the flight.

..... km/h

**(Total 3 marks)**

**Q5**

6.  $\mathcal{E} = \{\text{even numbers less than 19}\}$   
 $M = \{\text{multiples of 3}\}$   
 $F = \{\text{factors of 12}\}$

- (a) (i) Explain why it is **not** true that  $9 \in M$ .

.....

- (ii) List the members of  $M$ .

.....  
**(2)**

- (b) List the members of  $M \cap F$ .

.....  
**(2)**

**(Total 4 marks)**

**Q6**



Leave  
blank

7.

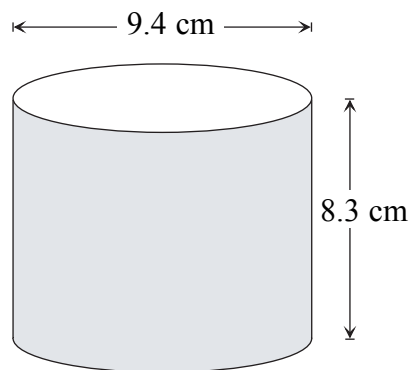


Diagram **NOT**  
accurately drawn

A solid cylinder has a diameter of 9.4 cm and a height of 8.3 cm.

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

..... cm<sup>3</sup>

**(Total 3 marks)**

**Q7**

8.  $y = 4x - 1$

Work out the value of  $x$  when  $y = -7$

$x =$  .....

**(Total 2 marks)**

**Q8**



Leave  
blank

9. There are 48 beads in a bag.  
Some of the beads are red and the rest of the beads are blue.  
Shan is going to take a bead at random from the bag.  
The probability that she will take a red bead is  $\frac{3}{8}$
- (a) Work out the number of red beads in the bag.

.....  
(2)

- Shan adds some **red** beads to the 48 beads in the bag.  
The probability that she will take a red bead is now  $\frac{1}{2}$
- (b) Work out the number of red beads she adds.

.....  
(2)

(Total 4 marks)

Q9

10. Express 225 as the product of powers of its prime factors.

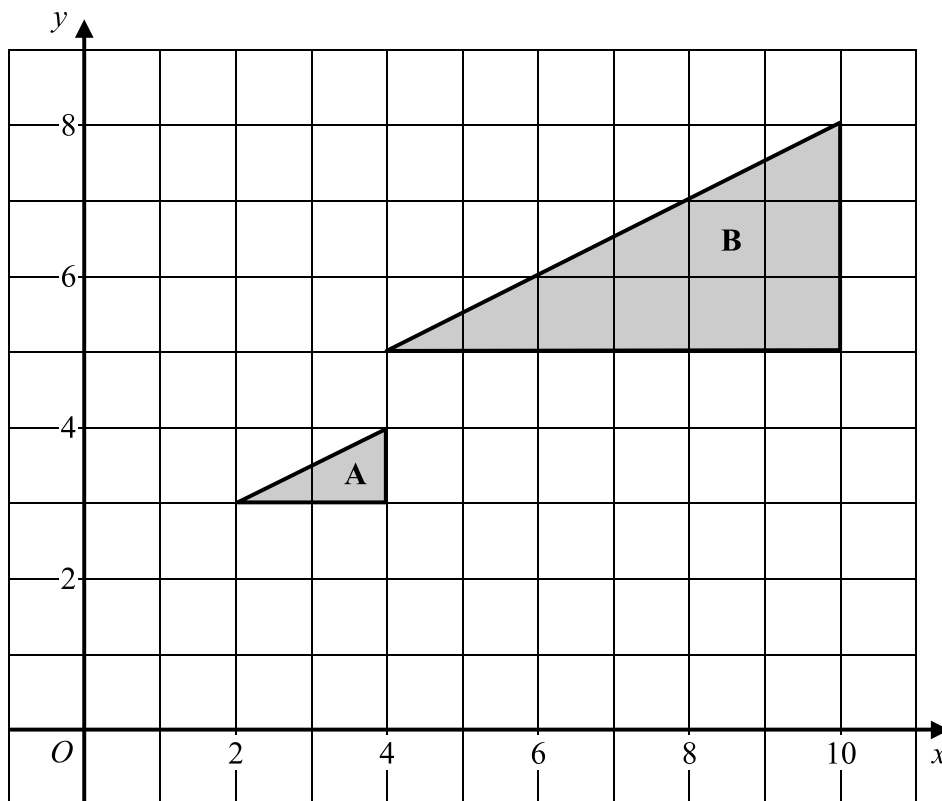
.....

(Total 3 marks)

Q10



11.



(a) Describe fully the **single** transformation which maps triangle **A** onto triangle **B**.

.....  
 .....

(3)

(b) On the grid, translate triangle **A** by the vector  $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$ .

Label the new triangle **C**.

(2)

(Total 5 marks)

Q11



Leave  
blank

12. Solve the simultaneous equations

$$6x + 5y = 5$$

$$3x - 10y = 15$$

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

**(Total 3 marks)**

**Q12**

13. (a) Write the number 78 000 000 in standard form.

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

(b) Write  $4 \times 10^{-3}$  as an ordinary number.

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

(c) Work out the value of  $\frac{3 \times 10^{-2}}{8 \times 10^9}$

Give your answer in standard form.

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

**(Total 3 marks)**

**Q13**



14.

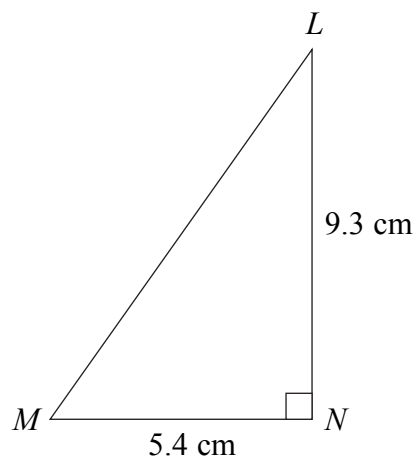


Diagram **NOT** accurately drawn

Triangle  $LMN$  is right-angled at  $N$ .  
 $MN = 5.4$  cm and  $LN = 9.3$  cm.

- (a) Work out the size of angle  $LMN$ .  
 Give your answer correct to 1 decimal place.

.....<sup>o</sup>  
**(3)**

The length of  $MN$  is 5.4 cm, correct to 2 significant figures.

- (b) (i) Write down the upper bound of the length of  $MN$ .

..... cm

- (ii) Write down the lower bound of the length of  $MN$ .

..... cm  
**(2)**



Leave  
blank

The length, 5.4 cm, of  $MN$  and the length, 9.3 cm, of  $LN$ , are each correct to 2 significant figures.

The line  $MN$  is horizontal and the line  $LN$  is vertical.

(c) Work out the upper bound for the gradient of the line  $LM$ .

.....  
(2)

Q14

(Total 7 marks)

15.

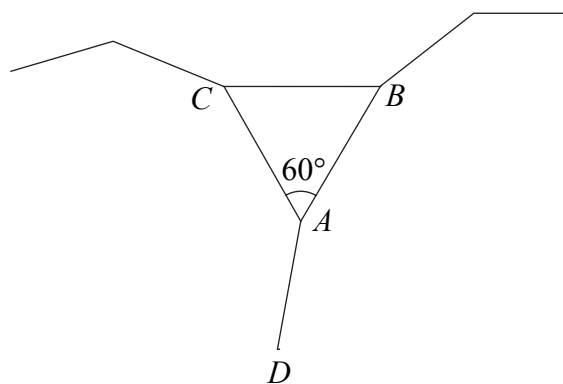


Diagram **NOT**  
accurately drawn

The sides of an equilateral triangle  $ABC$  and two **regular** polygons meet at the point  $A$ .  
 $AB$  and  $AD$  are adjacent sides of a regular 10-sided polygon.  
 $AC$  and  $AD$  are adjacent sides of a regular  $n$ -sided polygon.

Work out the value of  $n$ .

$n =$  .....

Q15

(Total 5 marks)



16. The grouped frequency table gives information about the time spent on the Internet last week by each of 80 students.

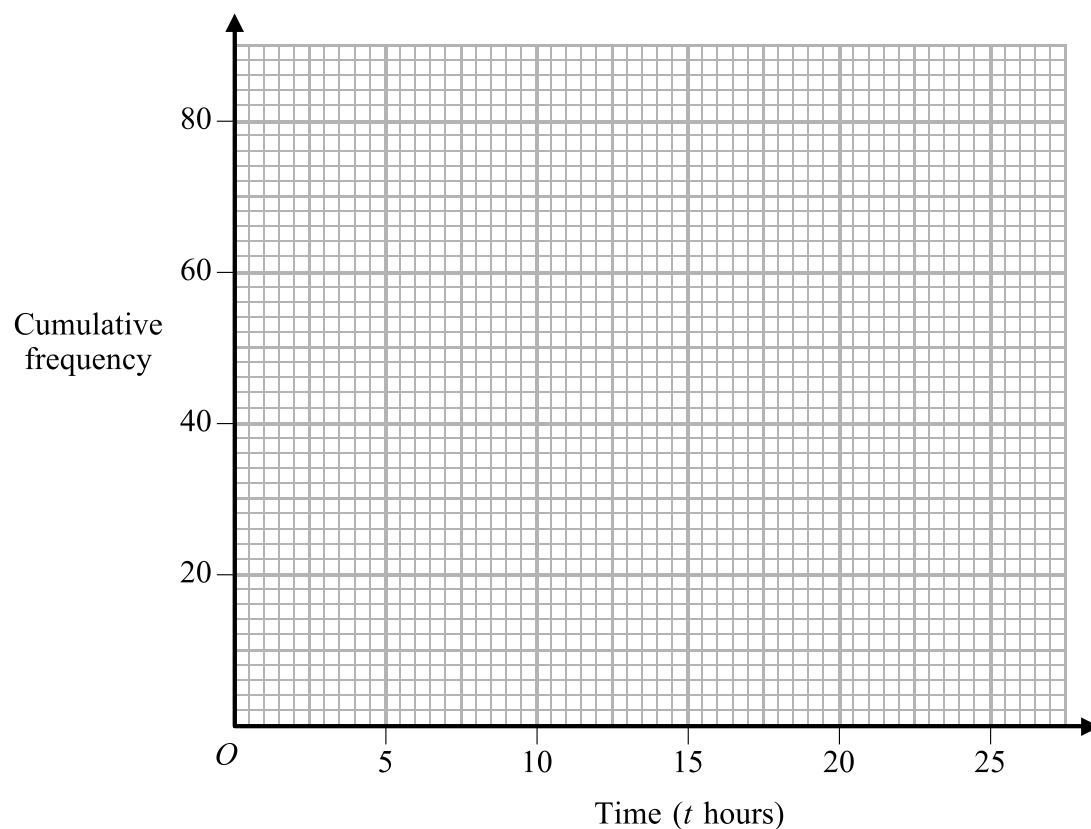
Time ( $t$ hours)	Frequency
$0 < t \leq 5$	28
$5 < t \leq 10$	22
$10 < t \leq 15$	14
$15 < t \leq 20$	10
$20 < t \leq 25$	6

(a) Complete the cumulative frequency table.

Time ( $t$ hours)	Cumulative frequency
$0 < t \leq 5$	
$0 < t \leq 10$	
$0 < t \leq 15$	
$0 < t \leq 20$	
$0 < t \leq 25$	

(1)

(b) On the grid, draw the cumulative frequency graph for your table.



(2)



Leave  
blank

- (c) Use your graph to find an estimate for the number of students who spent more than 17 hours on the Internet last week.  
Show your method clearly.

.....  
(2)

Q16

(Total 5 marks)

17.

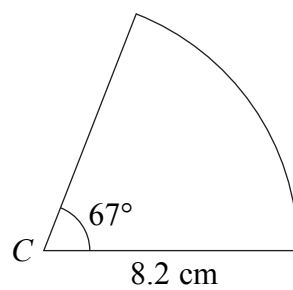


Diagram **NOT**  
accurately drawn

The diagram shows a sector of a circle, centre  $C$ .  
The radius of the circle is 8.2 cm.  
The angle at the centre of the circle is  $67^\circ$ .

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

.....  $\text{cm}^2$

Q17

(Total 3 marks)

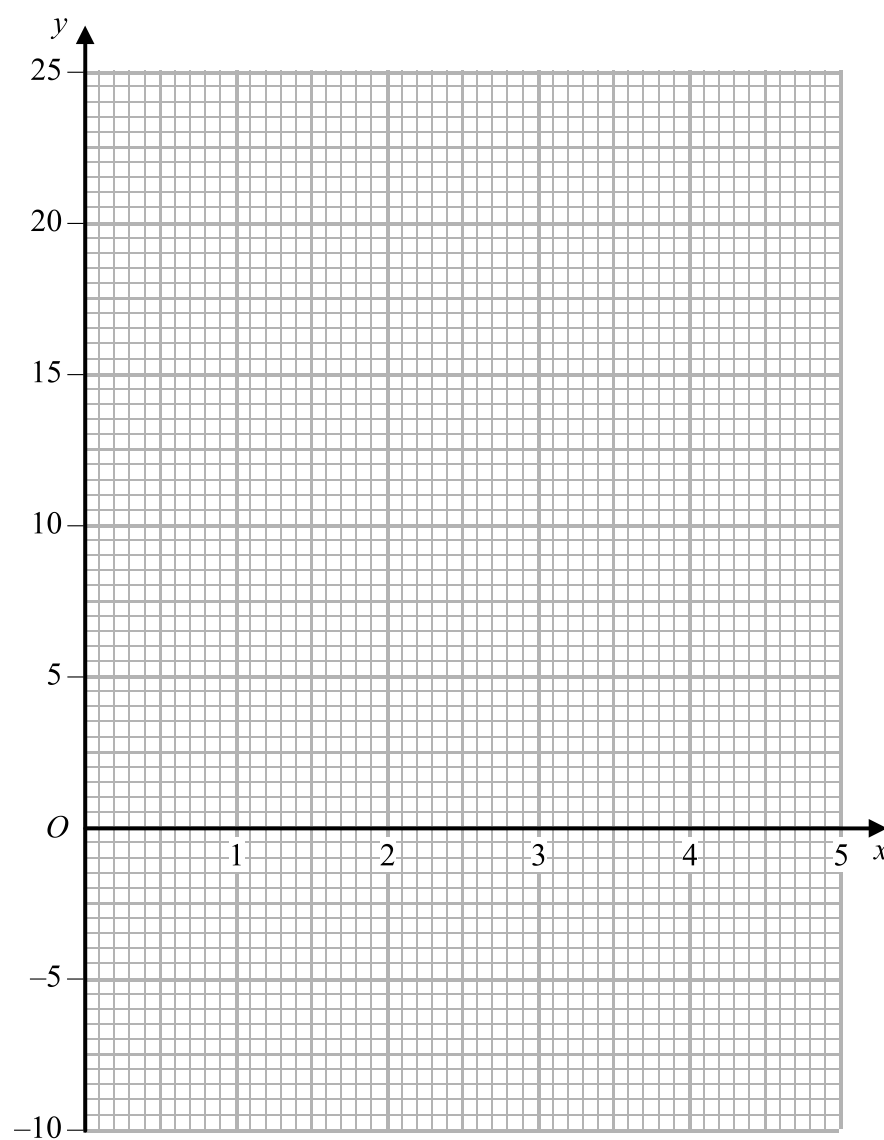


18. (a) Complete the table of values for  $y = x^2 - \frac{3}{x}$

$x$	0.5	1	1.5	2	3	4	5
$y$	-5.75	-2					24.4

(2)

(b) On the grid, draw the graph of  $y = x^2 - \frac{3}{x}$  for  $0.5 \leq x \leq 5$



(2)



Leave  
blank

(c) Use your graph to find an estimate for a solution of the equation

$$x^2 - \frac{3}{x} = 0$$

$x = \dots\dots\dots$   
**(1)**

(d) Draw a suitable straight line on your graph to find an estimate for a solution of the equation

$$x^2 - 2x - \frac{3}{x} = 0$$

$x = \dots\dots\dots$   
**(2)**

**(Total 7 marks)**

**Q18**

**19.** Convert the recurring decimal  $0.\dot{2}\dot{3}$  to a fraction.

$\dots\dots\dots$   
**(Total 2 marks)**

**Q19**



20.

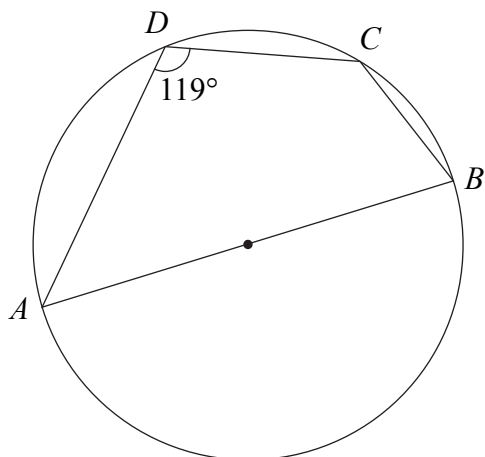


Diagram **NOT** accurately drawn

$A, B, C$  and  $D$  are points on the circumference of a circle.  
 $AB$  is a diameter of the circle.  
 Angle  $ADC = 119^\circ$ .

(a) (i) Work out the size of angle  $ABC$ .

.....<sup>o</sup>

(ii) Give a reason for your answer.

.....  
 .....

(2)

(b) Work out the size of angle  $BAC$ .

.....<sup>o</sup>

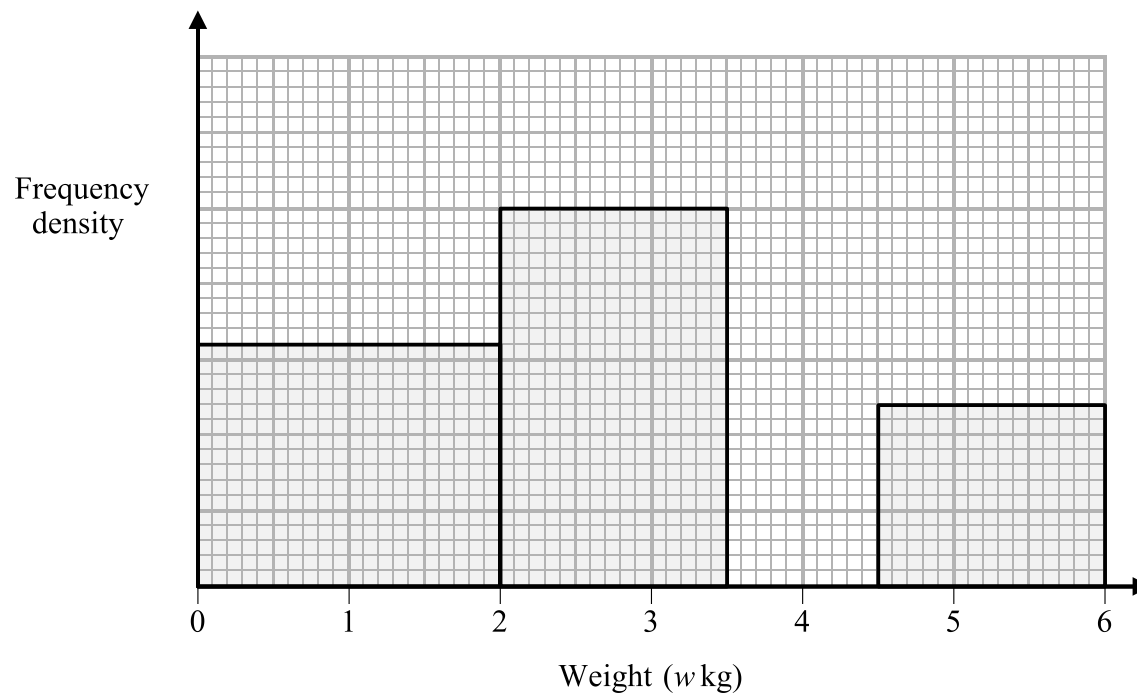
(2)

(Total 4 marks)

Q20



21. The unfinished table and histogram show information about the weights, in kg, of some babies.



Weight ( $w$ kg)	Frequency
$0 < w \leq 2$	
$2 < w \leq 3.5$	150
$3.5 < w \leq 4.5$	136
$4.5 < w \leq 6$	

(a) Use the histogram to complete the table.

(2)

(b) Use the table to complete the histogram.

(1)

Q21

(Total 3 marks)



Leave  
blank

22. Younis spins a biased coin twice.  
The probability that it will come down heads both times is 0.36
- Calculate the probability that it will come down tails both times.

.....  
(Total 3 marks)

Q22

23. Simplify fully  $\frac{2x^2 - 5x - 12}{4x^2 - 9}$

.....  
(Total 3 marks)

Q23



Leave  
blank

24.

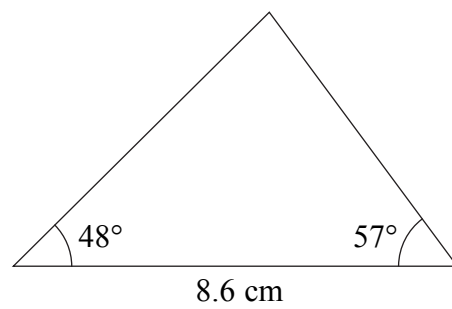


Diagram **NOT**  
accurately drawn

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

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

(Total 4 marks)

Q24

**TURN OVER FOR QUESTION 25**



25.

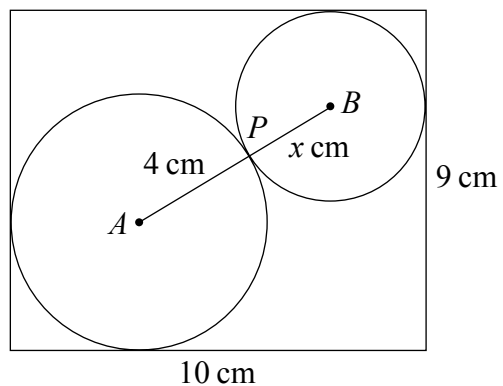


Diagram **NOT** accurately drawn

The diagram shows one disc with centre  $A$  and radius 4 cm and another disc with centre  $B$  and radius  $x$  cm.  
 The two discs fit exactly into a rectangular box 10 cm long and 9 cm wide.  
 The two discs touch at  $P$ .  
 $APB$  is a straight line.

(a) Use Pythagoras' Theorem to show that  $x^2 - 30x + 45 = 0$

(4)

(b) Find the value of  $x$ .  
 Give your value correct to 3 significant figures.

$x = \dots\dots\dots$   
 (3)

(Total 7 marks)

Q25

TOTAL FOR PAPER: 100 MARKS

END

