

184/05

**MATHEMATICS**

**INTERMEDIATE TIER PAPER 1**

P.M. WEDNESDAY, 7 June 2000

(2 Hours)

**CALCULATORS ARE  
NOT TO BE USED  
FOR THIS PAPER**

Centre Number .....

Candidate's Name (in full) .....

Candidate's Examination Number .....

**INSTRUCTIONS TO CANDIDATES**

Write your centre number, name and candidate number in the spaces provided above.

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

Take  $\pi$  as 3.14.

**INFORMATION FOR CANDIDATES**

A formula booklet is available and may be used.

You should give details of your method of solution.

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.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	2	
2	3	
3	2	
4	4	
5	4	
6	10	
7	5	
8	3	
9	2	
10	3	
11	5	
12	4	
13	4	
14	3	
15	3	
16	6	
17	3	
18	3	
19	3	
20	3	
21	4	
22	5	
23	4	
24	3	
25	3	
26	6	
TOTAL		

1. Think of a cuboid.

(a) How many faces has it got?

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(b) What is the shape of each of its faces?

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[2]

2. Tickets for a Theme Park cost £3.45 each. The organiser of a school trip buys 26 tickets. Calculate the total cost of the tickets.

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[3]

3. (a) Write down 45 3476 correct to 3 significant figures.

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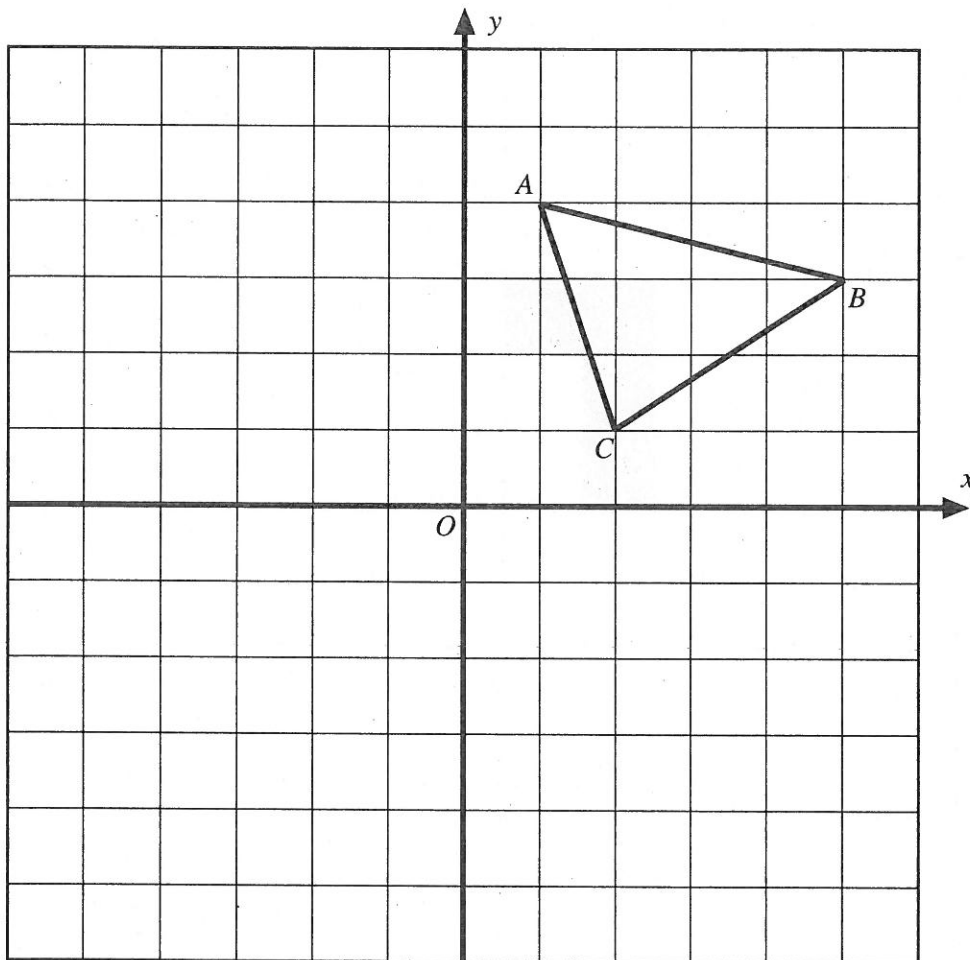
[1]

(b) Write down 7462 correct to 2 significant figures.

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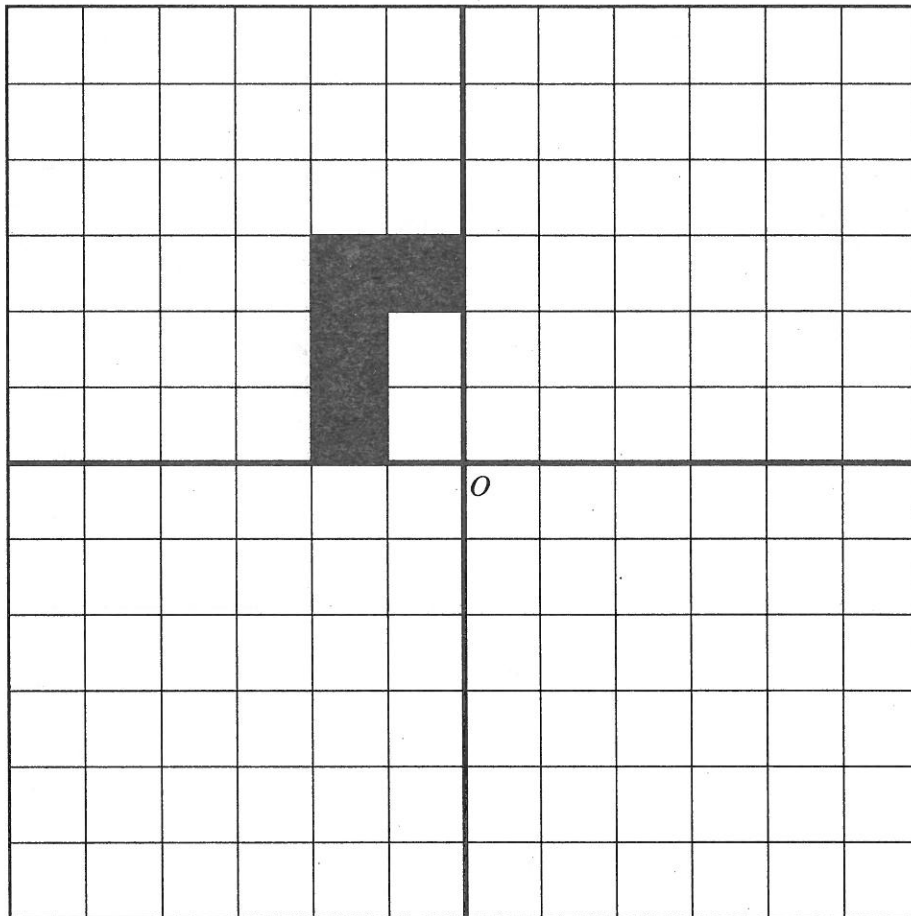
[1]

4. (a) Reflect the triangle  $ABC$  in the  $x$ -axis.



[1]

- (b) Draw three shapes like the given one, so that the completed pattern has rotational symmetry of order 4 about  $O$ .



[3]

5. (a) Simplify  $3 + 6x - 8 - 4x$ .

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[2]

- (b) What is the value of  $4a - 6b$  when  $a = -5$  and  $b = 2$ ?

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[2]

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6. A red bag contains five balls numbered as shown.



A blue bag contains six balls numbered as shown.



In a game a player chooses a ball from the red bag and then a ball from the blue bag. The numbers on the two balls are added together to obtain a total score.

- (a) Complete the following table to show all the possible total scores.

Blue bag	8	9	-----	-----	-----	-----
	7	8	-----	-----	-----	-----
	6	7	-----	-----	-----	-----
	4	5	-----	-----	-----	-----
	3	4	5	7	9	10
	1	2	3	5	7	8
		1	2	4	6	7
		Red bag				

[2]

- (b) (i) What is the probability that a player gets a total score of 14?

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[1]

- (ii) What is the probability that a player does not get a total score of 14?

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[1]

A player wins a prize by getting a total score of 5 or less.

- (c) (i) Tim plays the game once.  
What is the probability that he wins a prize?

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[2]

- (ii) 150 people each play the game once.  
Approximately how many would you expect to win a prize?

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[2]

- (iii) It costs 20p to play the game once. The prize for scoring 5 or less is 40p. If the 150 people each play the game once, approximately how much profit do you expect the game to make?

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[2]

7. A model of a new hotel is made to a scale of 1:250.

- (a) The length of the front wall of the model hotel is 30cm long. Calculate the real-life size of the length of this front wall in metres.

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[3]

- (b) The height of the real-life hotel will be 50m. What is the height, in cm, of the model of the hotel?

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[2]

**Turn over.**

8.  $A$  and  $B$  are two ports with  $A$  due West of  $B$ . A ship is at a point  $C$  on a bearing of  $148^\circ$  ( $S32^\circ E$ ) from  $A$  and  $220^\circ$  ( $S40^\circ W$ ) from  $B$ . By drawing suitable lines, mark the position of  $C$  on your diagram. [3]

 $A$  $B$



9. ESTIMATE the value of  $\frac{614 \times 27}{88}$  .

Show clearly how you obtain your answer.

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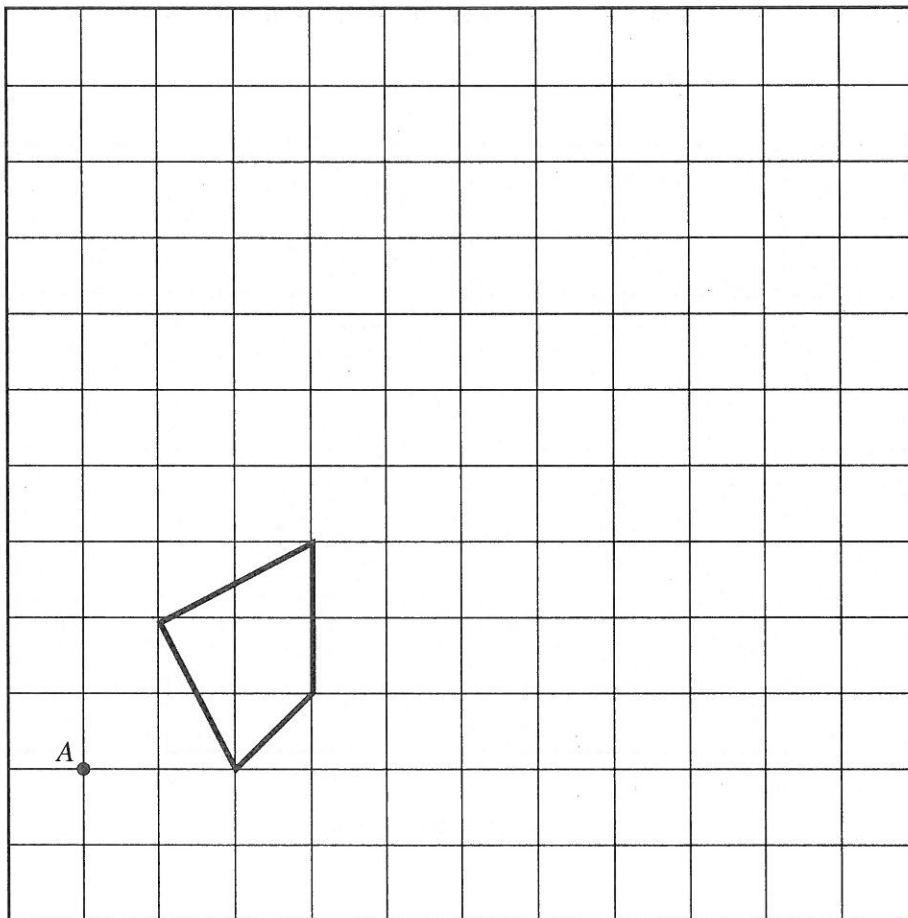
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[2]

10. Draw, on the grid below, the enlargement of the given shape, using a scale factor of 3 and centre A. [3]

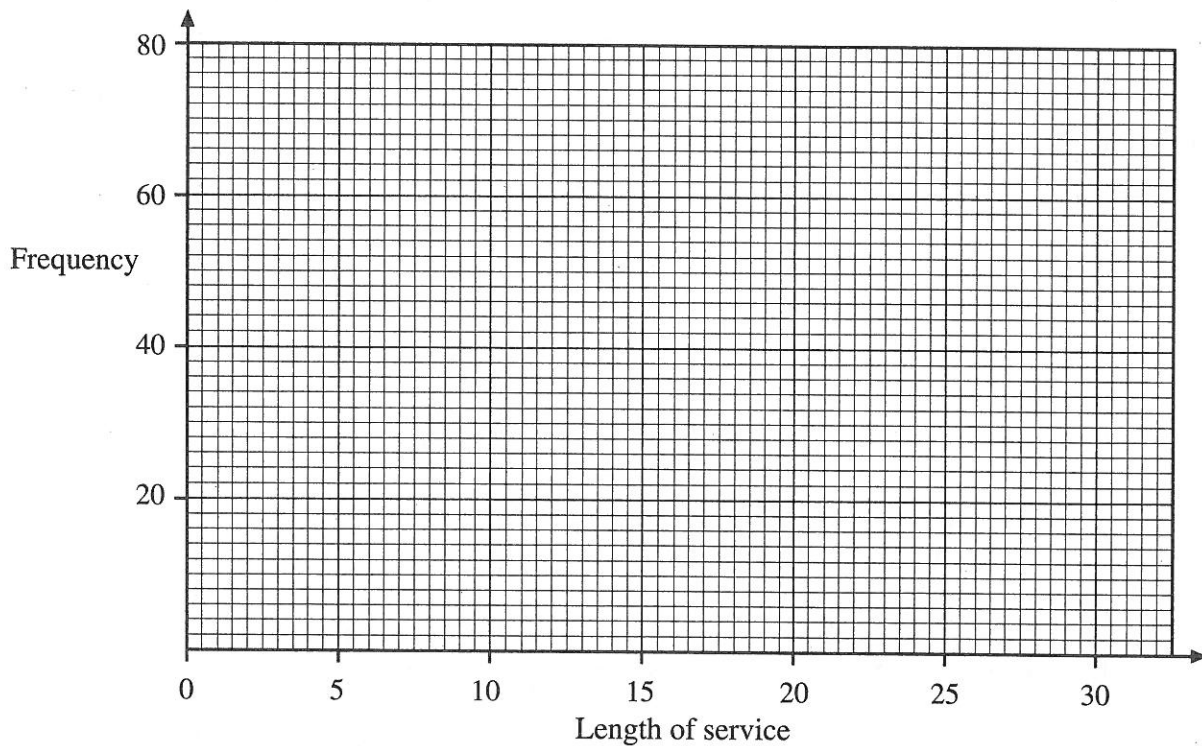


Turn over.

11. A college employs 150 staff. The time that a member of staff has worked at the college is called their length of service. The table below shows a grouped frequency distribution of the length of service of the staff.

Length of service	Frequency
Up to and including 5 years.	68
Over 5 years, up to and including 10 years.	33
Over 10 years, up to and including 15 years.	24
Over 15 years, up to and including 20 years.	12
Over 20 years, up to and including 25 years.	9
Over 25 years, up to and including 30 years.	4

- (a) On the graph paper below, draw a grouped frequency diagram for this distribution.

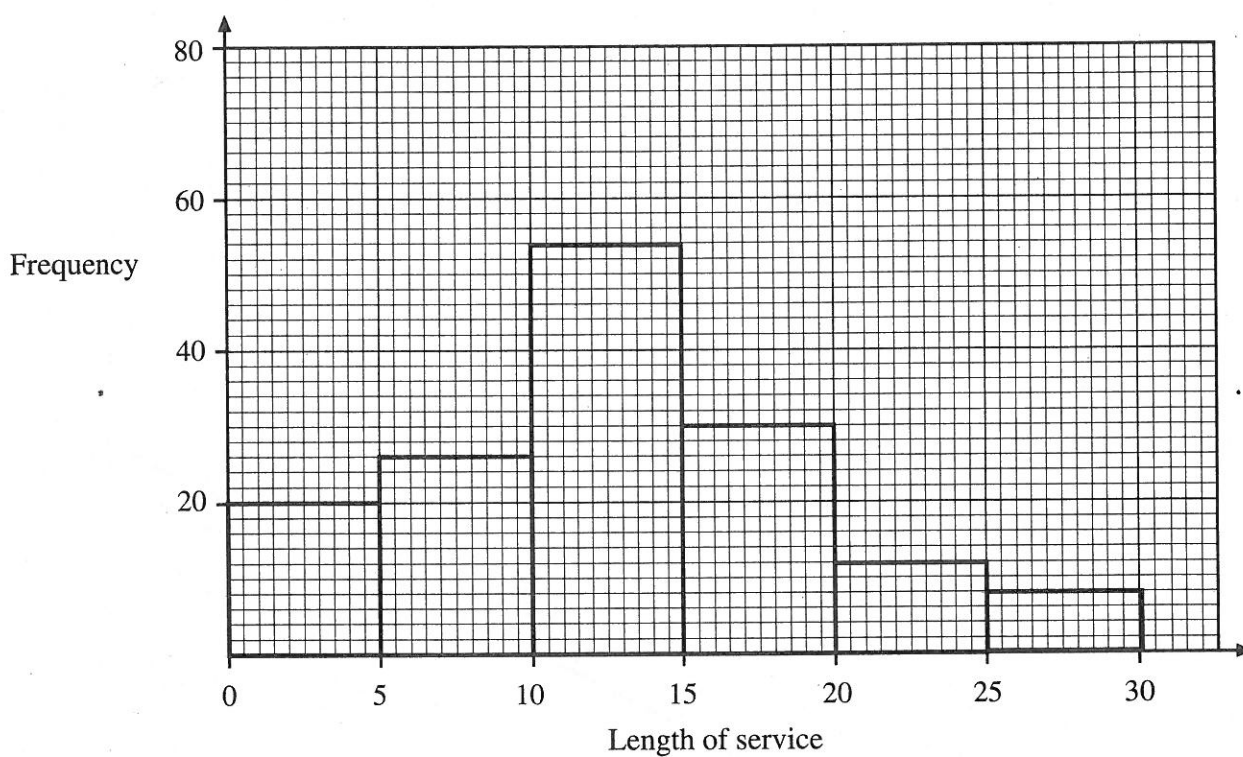


[2]

- (b) Write down the modal class.

[1]

- (c) The following grouped frequency diagram shows the distribution of the lengths of service of the 150 staff in another college.



The staff of which college, the first or the second, has on average, the longer lengths of service? **You must give a reason for your answer.**

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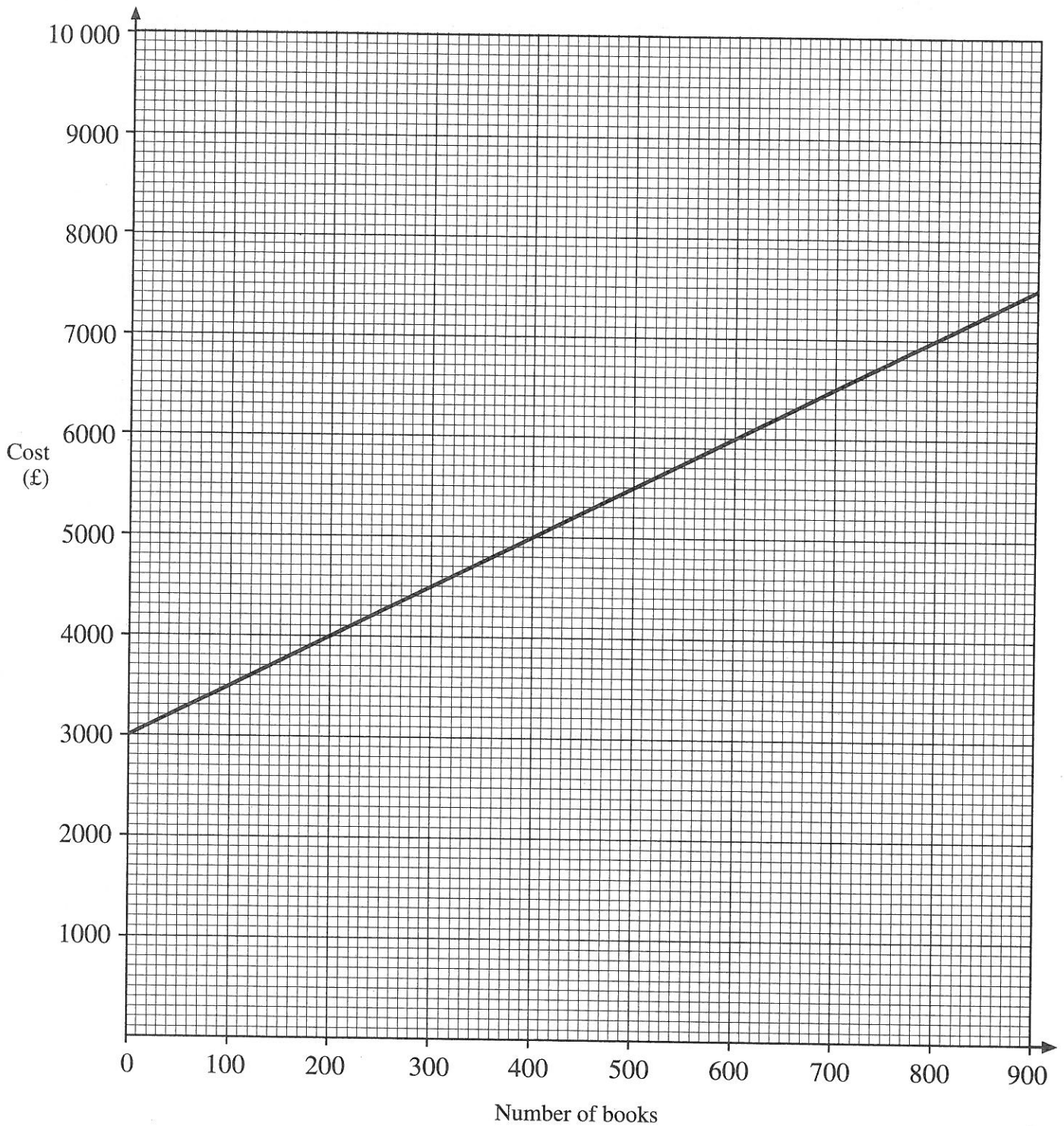
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[2]

12. Dylan wishes to have copies of his new book printed.  
The graph below shows the cost of printing copies of Dylan's new book.  
There is a cost for setting up the printing process and then a cost per book printed.



- (a) How many books could Dylan get printed for £5800?

[1]

- (b) What is the cost of setting up the printing process?

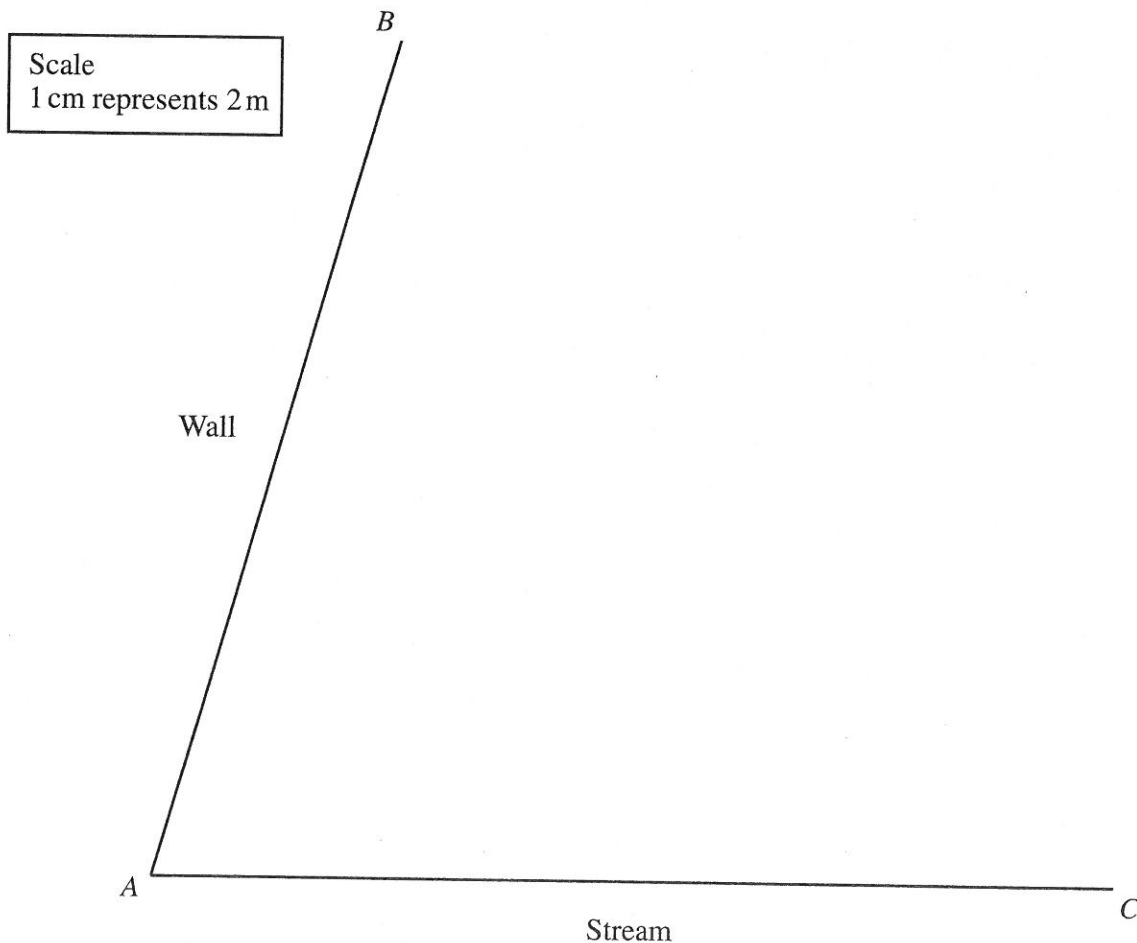
[1]

- (c) What is the cost per book that is added to the cost of setting up the printing process?

[2]

13. The diagram represents two boundaries of Mr. Lotwick's garden.  $AB$  is a wall and  $AC$  is the edge of a stream. He wants to plant some trees in the garden so that they are further than 8 metres from the stream. He also wants them nearer the wall than the stream and less than 20 metres from  $C$ . Using 1 cm to represent 2 m, show on your diagram the region in which he can plant the trees.

[4]



Turn over.

14. Solve the following equation.

$$9x - 1 = 4(x + 5)$$

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[3]

15. ESTIMATE the value of  $\frac{28.17 \times 0.48}{\sqrt{94.8}}$ , giving your answer as a decimal.

Show clearly how you obtain your answer.

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[3]

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16. The table shows some of the values of  $y = 2x^2 - 5x - 8$  for values of  $x$  from  $-2$  to  $4$ .

(a) Complete the table by finding the value of  $y$  for  $x = 3$ .

$x$	$-2$	$-1$	$0$	$1$	$2$	$3$	$4$
$y = 2x^2 - 5x - 8$	$10$	$-1$	$-8$	$-11$	$-10$		$4$

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[1]

(b) On the graph paper opposite, draw the graph of  $y = 2x^2 - 5x - 8$  for values of  $x$  between  $-2$  and  $4$ .

[2]

(c) Draw the line  $y = 3$  on your graph paper and write down the  $x$ -values of the points of intersection of your line with  $y = 2x^2 - 5x - 8$ .

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[2]

(d) Write down and simplify the equation in  $x$  whose solutions you found in (c).

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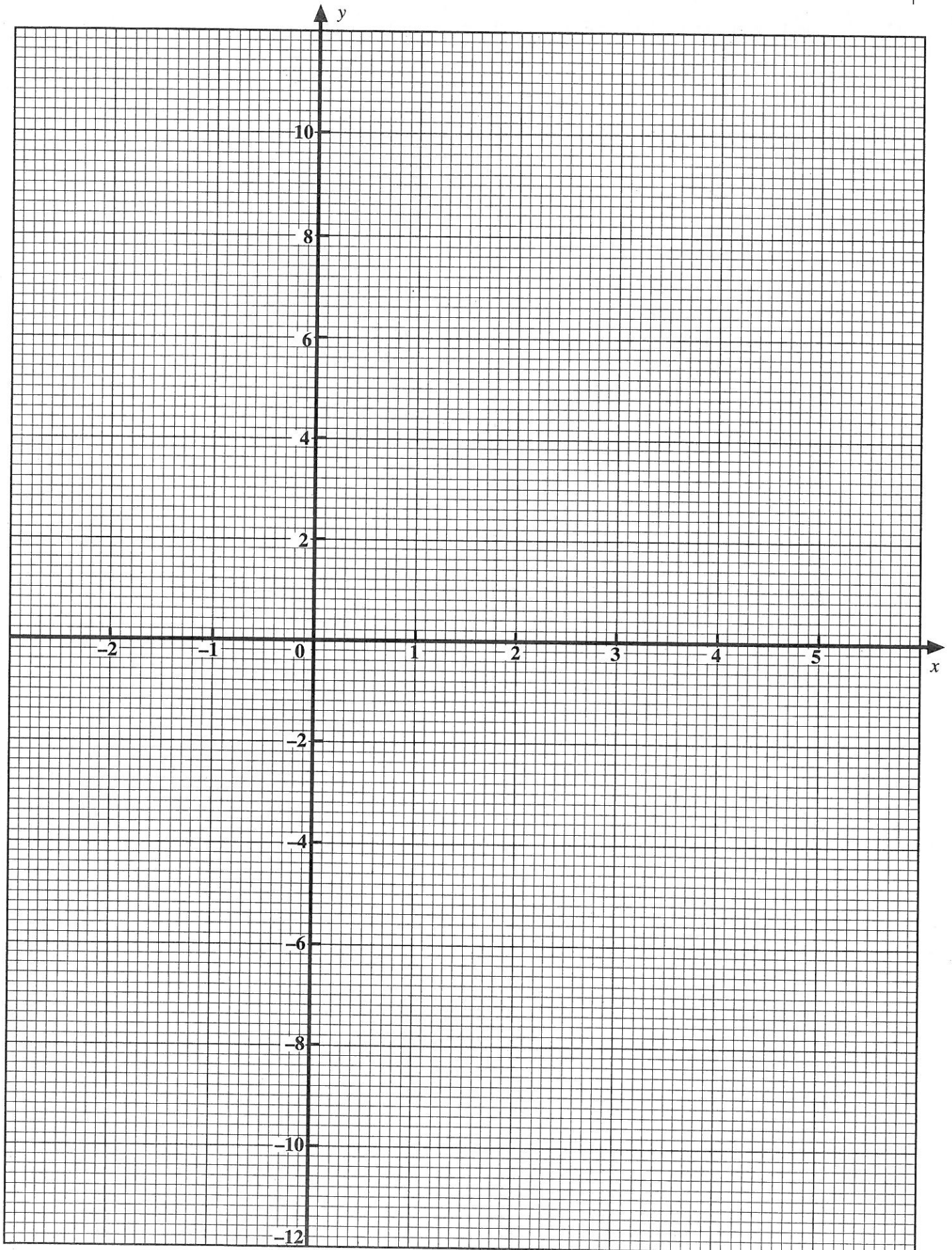
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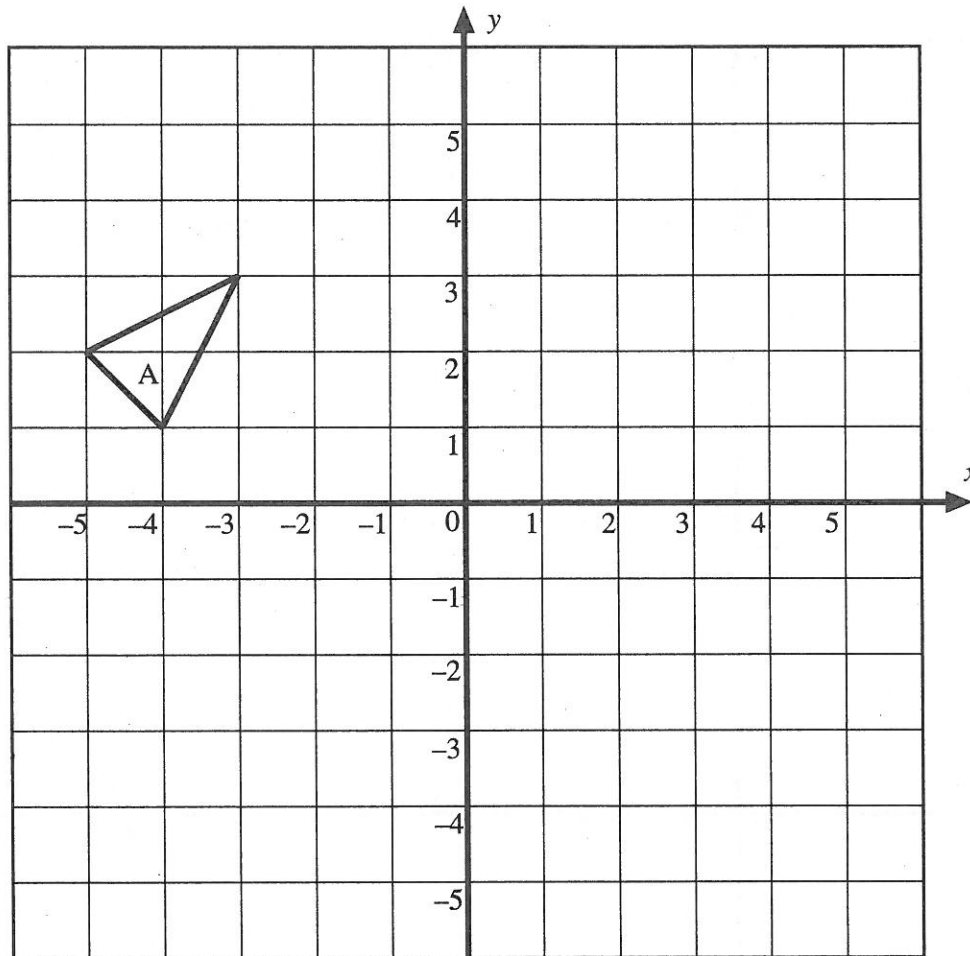
FOR USE WITH QUESTION 16



Turn over.

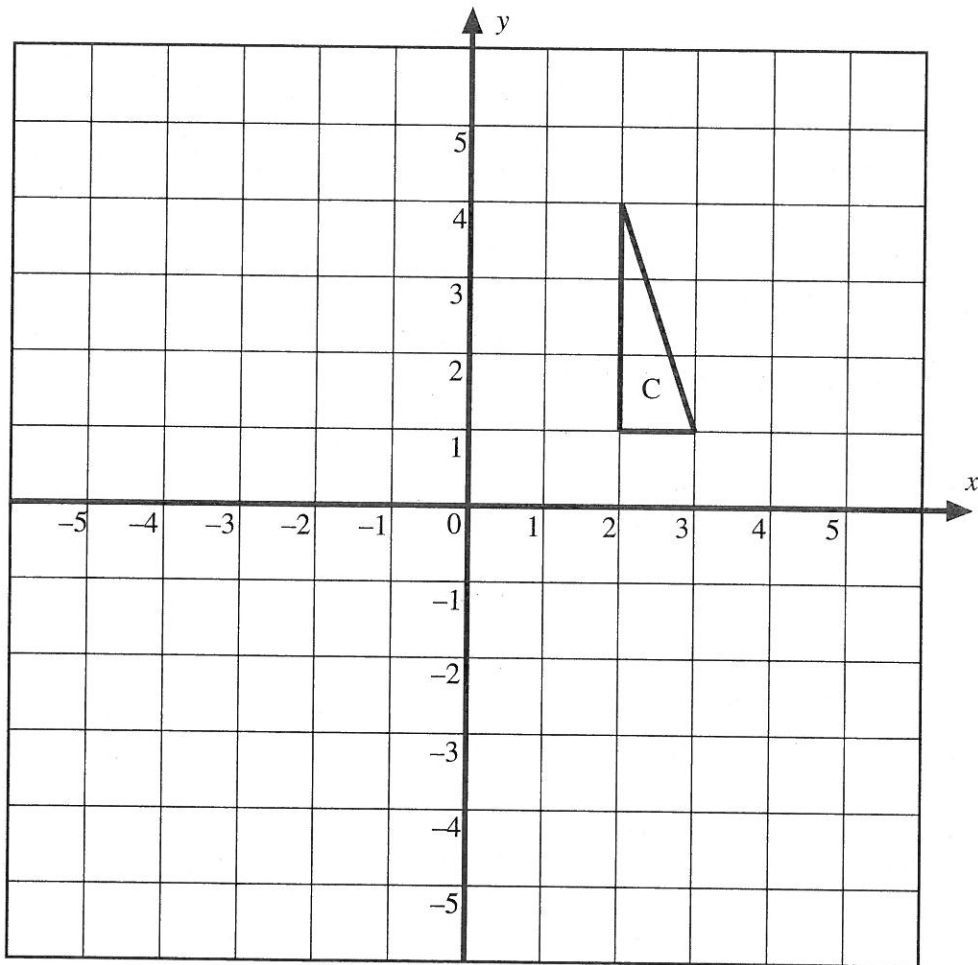
17. (a) Reflect the shape A in the line  $y = -x$ . Label the image B.

[1]



- (b) Rotate the shape C through  $90^\circ$  anti-clockwise about the point  $(1, -2)$ .  
Label the image D.

[2]



18. A survey of cars was carried out. It was noted whether the cars were up to 3 years old inclusive or over 3 years old. It was also noted whether the cars had a diesel engine or a petrol engine. The results of the survey were as follows.

	Diesel engine	Petrol engine
Up to 3 years old (inclusive)	190	650
Over 3 years old	260	900

Use this information to estimate how many cars with diesel engines you would expect to find in a county known to have 40 000 cars.

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[3]

19. (a) Write 600 as the product of its prime factors in index form.

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[2]

- (b) What is the smallest number that 600 must be multiplied by so that the answer is a square number?

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[1]

20. Find all integer values of  $n$  that satisfy the inequality

$$-10 < 5n \leq 17.$$

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[3]

21. Solve the following simultaneous equations by an algebraic (not graphical) method.

$$\begin{aligned} 3x - 2y &= 16 \\ x + 3y &= -2 \end{aligned}$$

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[4]

22. (a) Write **each** of the following numbers in standard form.

(i) 3 895 584

..... [1]

(ii) 0.0000002567

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- (b) Find, in standard form, the value of:

(i)  $(4 \times 10^{-4}) \times (1.2 \times 10^{-5})$

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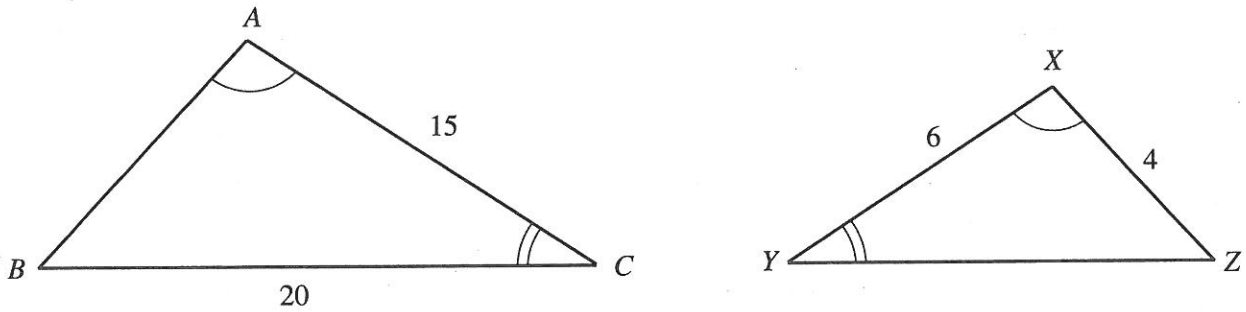
(ii)  $\frac{3 \times 10^3}{4 \times 10^{-6}}$

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..... [2]

Turn over.

23. The diagram shows two similar triangles in which  $\widehat{BAC} = \widehat{YXZ}$ ,  $\widehat{ACB} = \widehat{XZY}$ ,  $AC = 15$ ,  $BC = 20$ ,  $XY = 6$  and  $XZ = 4$ .



Calculate the length of

- (a)  $YZ$ ,

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[2]

- (b)  $AB$ .

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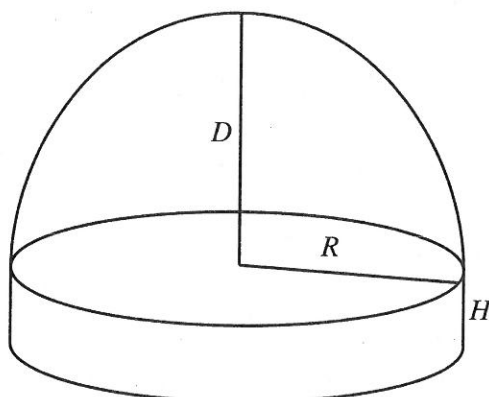
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[2]

24. The diagram shows a solid. The lengths  $D$ ,  $R$  and  $H$  are as shown.



One of the following formulae may be used to estimate  $V$ , the volume of the solid.

$$V = 3H + 2R + 5D$$

$$V = 3R + 5DR$$

$$V = 3R^2H + 2R^2D$$

$$V = 3R(4D + 5H)$$

- (a) Explain why the formula  $V = 3H + 2R + 5D$  cannot be used to estimate the volume of the solid.

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[1]

- (b) State, with a reason, which of the above formulae may be used to estimate the volume of the solid.

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[2]

Turn over.

25. Solve the following equation.

$$5x + 6 - \frac{4x - 1}{2} = 8$$

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[3]

26. At a certain driving test centre a record was kept of the gender and age of each driving test candidate.

On the basis of these records, the probability of a randomly selected driving test candidate being a male under 25 is estimated to be 0.6.

It was also estimated that the probability of a randomly selected driving test candidate being a female under 25 is 0.3.

(a) Using these estimates, calculate the probability that a randomly selected driving test candidate is not a male under 25.

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[1]

(b) Consider the next two driving test candidates.  
Calculate the probability that

(i) both are females under 25,

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[2]

(ii) only one of them is a male under 25.

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[3]