WELSH JOINT EDUCATION COMMITTEE

General Certificate of Secondary Education

CYD-BWYLLGOR ADDYSG CYMRU

Tystysgrif Gyffredinol Addysg Uwchradd

MATHEMATICS

INTERMEDIATE TIER PAPER 1

A.M. TUESDAY, 10 November 1998

(2 hours)

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.

INFORMATION FOR CANDIDATES

An electronic calculator will be required.

A formula booklet is available and may be used.

You should give details of your method of solution, especially when a calculator is used.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

In questions where it is required, take π as 3·14 or use the π button on your calculator.

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	3	
2	4	
3	3	
4	4	
5	6	
6	6	
7	3	
8	5	
9	6	
10	4	
11	6	
12	6	
13	6	
14	4	
15	3	
16	3	
17	4	
18	6	
19	5	
20	5	
21	3	
22	5	
TOTAL		

1. A train leaves Southampton at 23.40 on Monday and arrives in London at 01.10 on Tuesday. The average speed of the train for the journey is 80 km/h.

(a) How long does the journey take?

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[1]

(b) What was the distance the train travelled from Southampton to London?

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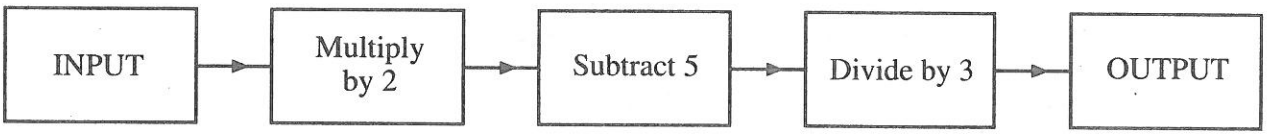
[2]

2. Look at this number machine.



(a) When the input is –2, what is the output?

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[1]

(b) When the output is 9, what was the input?

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[1]

(c) When the input is n, write down the output from the machine in terms of n.

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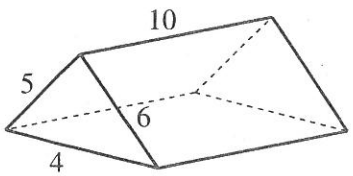
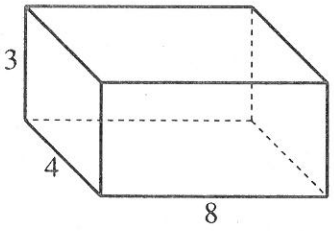
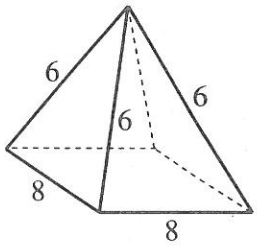
[2]

3.







Diagrams not drawn to scale.

The diagrams above show a prism, a cuboid and a right square based pyramid. All the dimensions marked are in centimetres.

(a) One of the above solids has only one plane of symmetry. Which solid is it?

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[1]

(b) Write down the names of the other two solids and the number of planes of symmetry that each one has.

The ..... has ..... planes of symmetry.

The ..... has ..... planes of symmetry.

[2]

4. *(a)* Simplify

(i) $5x - 2 + 2x - 3$,

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(ii) $2a^2 \times 3a$.

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[3]

(b) What is the value of $3x + 7$ when $x = 4$?

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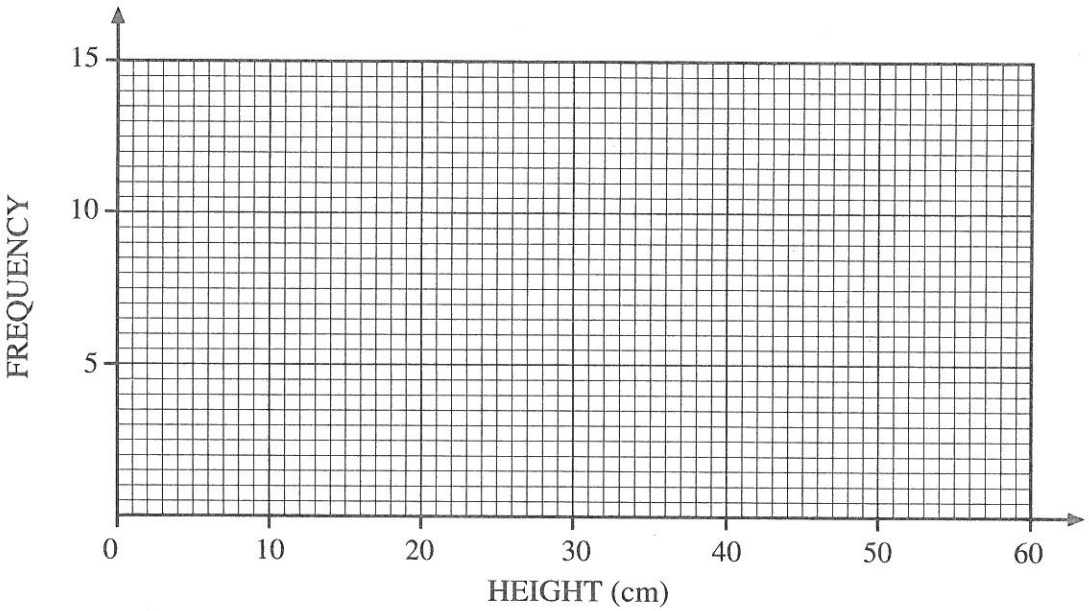
[1]

5. A nurseryman measures the heights of some shrubs correct to the nearest centimetre. This table shows his results.

Height (cm)	1 to 10	11 to 20	21 to 30	31 to 40	41 to 50
Frequency	2	3	9	12	4

(a) On the grid below, draw a grouped frequency diagram to show these results.



[2]

(b) One shrub is selected at random. What is the probability that its height, correct to the nearest cm, is between 11 cm and 20 cm?

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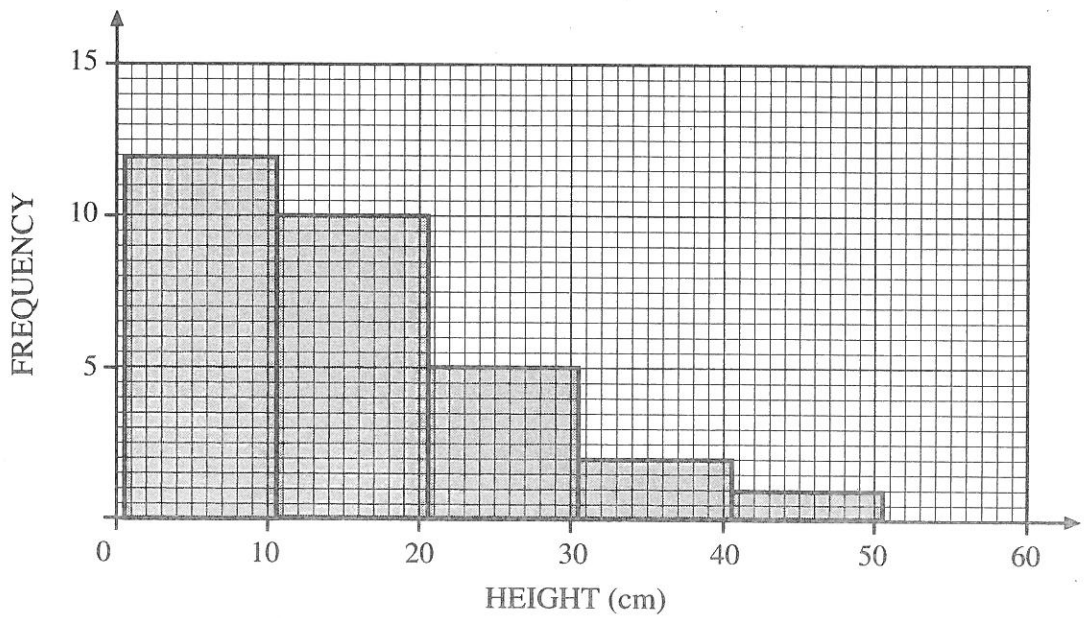
[2]

This grouped frequency diagram shows the distribution of the heights of a different sample of shrubs.



(c) Which sample of shrubs, the first or the second, was taller on average? You must give a reason for your answer.

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[2]

6. John is an insurance salesman and his wife Denise works in the main office of the company. In one week, John was paid £85 plus 8% commission on his insurance sales of £3700. For the same week, Denise was paid £8.42 an hour for a 35 hour week plus 5 hours at time and a half.
Calculate the difference in their earnings for the week.

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[6]

7. Solve the following equation.

$$7x + 8 = 5(x + 3)$$

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[3]

8. *(a)* Write down the sizes of the angles marked x and y in the following diagram.

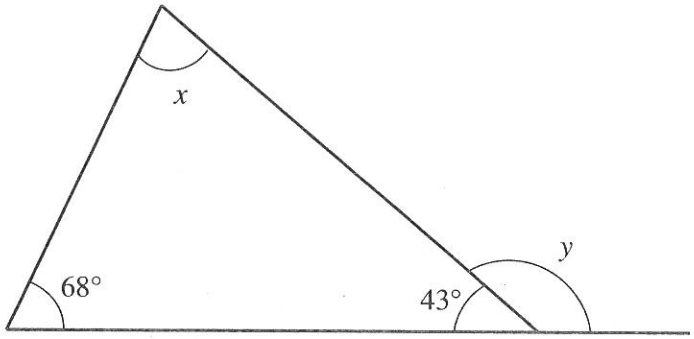

Diagram not drawn to scale.

$x =$ ..... °

$y =$ ..... °

[2]

(b) $ABCD$ is a square. DCE is an isosceles triangle in which $DC = CE$ and $\widehat{DCE} = 130°$.

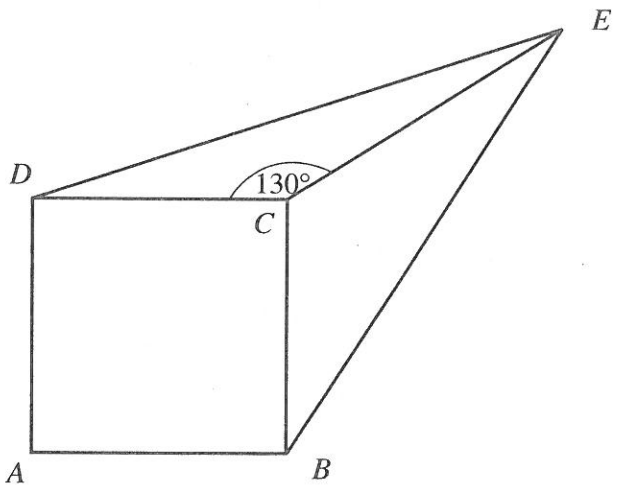

Diagram not drawn to scale.

(i) Calculate the size of $\widehat{BCE}$.

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(ii) Calculate the size of $\widehat{CDE}$.

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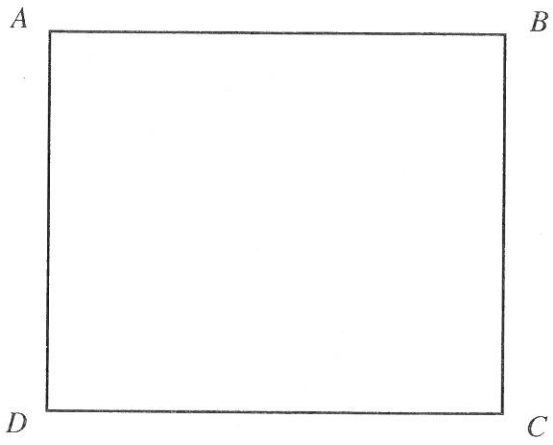
[3]

9. This diagram is drawn accurately using a scale 1 : 50. It shows a plan of a bedroom.



(a) What is the actual (real-life) length of the wall *AB*? Give your answer in metres.

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[2]

(b) A bed 2 metres long by 1 metre wide is placed along the wall *AB*, with the head of the bed against the wall *AD*. Draw the bed accurately on the above plan of the bedroom.

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[2]

(c) The room is 2·5 m high. The chart below shows how many rolls of wallpaper are required to paper the walls of rooms of different sizes.

		Perimeter of room (up to)				
		7 m	8·5 m	10 m	11·5 m	13 m
Height of room (up to)	2·5 m	4	5	5	6	6
	3·5 m	5	6	7	8	9
	4·5 m	7	9	10	12	14

Circle the entry in the table which gives the number of rolls of wallpaper that will be needed for this bedroom.
Explain how you obtained your answer.

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[2]

10. *(a)* Martin has been on a diet. At the start of the diet he weighed 75 kg and at the end of the diet he weighed 64·5 kg. Calculate his final weight as a percentage of his weight at the start of the diet.

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[2]

(b) Miranda was given a rise in salary of 3%, after which her salary became £8858. What was her salary before the rise?

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[2]

11. Obi uses a computer program to simulate throwing a biased dice 100 times and recording the number of times the score is 6. The program was run 10 times with the following results.

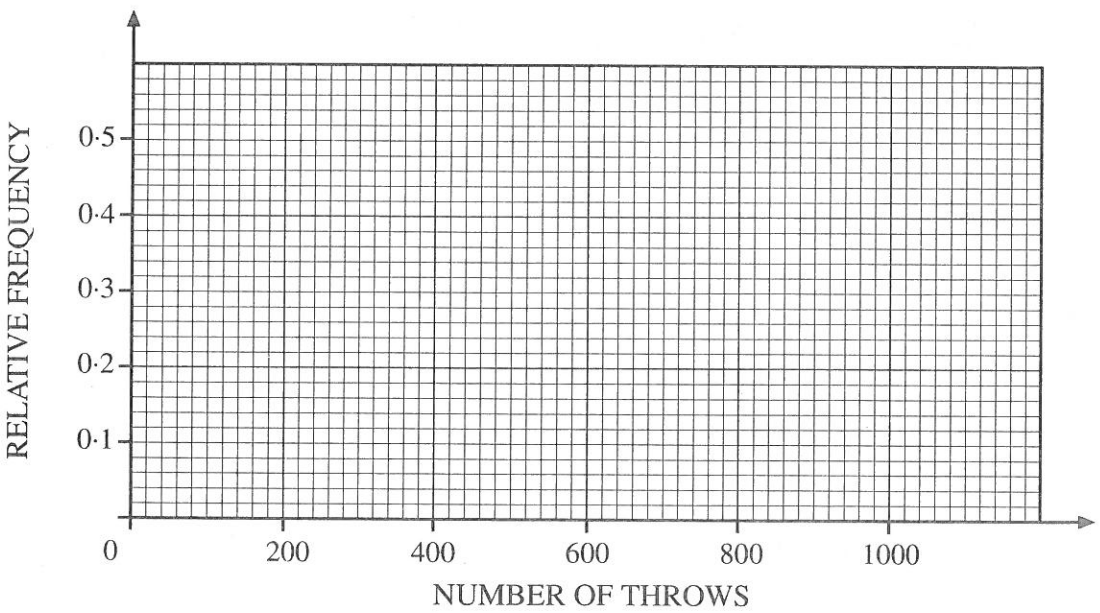
Number of throws	100	100	100	100	100	100	100	100	100	100
Number of sixes	30	50	13	39	38	10	51	17	49	23

(a) Complete this table to show the relative frequency of a score of 6.

Number of throws so far	100	200	300	400	500	600	700	800	900	1000
Number of sixes so far	30	80	93	132	170	180	231			
Relative frequency	0·30	0·40	0·31	0·33	0·34	0·30				

[3]

(b) On the grid below, draw a graph to show the relative frequency of scoring a six against the number of throws.



[2]

(c) Estimate the probability of scoring a six with this biased dice.

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[1]

12. The length of a desk is measured as 180 cm, correct to the nearest cm.

(a) Write down the least and greatest values of the length of the desk.

Least ..... Greatest .....

[2]

(b) Three of these desks are laid end to end along their lengths. What is the least value that the total length of the three desks can be?

Least .....

[1]

(c) The distance between two walls is measured as 3 metres correct to the nearest centimetre.

(i) Write down, in centimetres, the least and greatest values of the distance between the two walls.

Least ..... Greatest .....

[1]

(ii) One desk is placed lengthwise between the two walls and in contact with the left hand wall, as shown in the diagram.

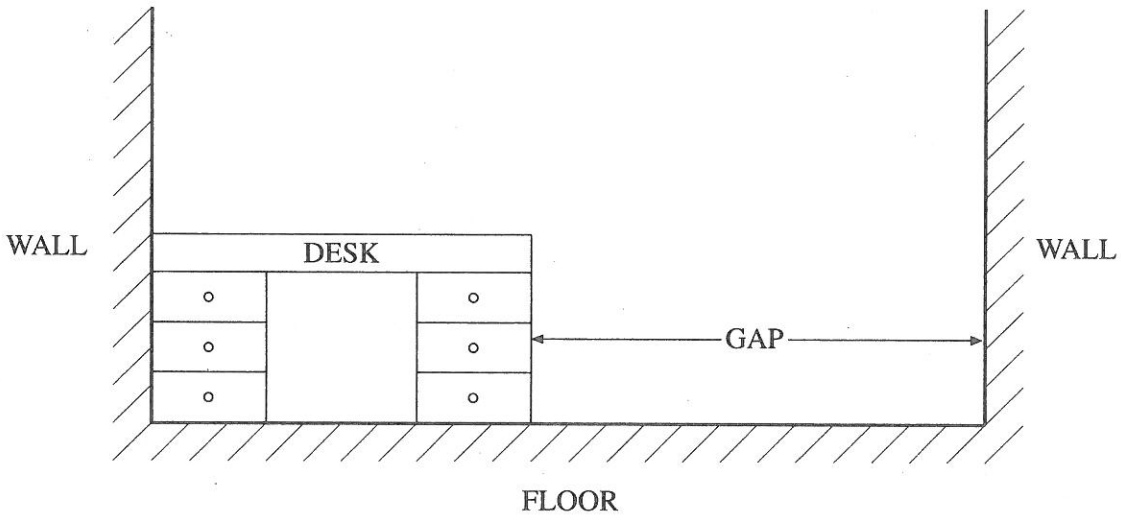

Diagram not drawn to scale.

What is the greatest possible length of the gap between the desk and the right hand wall?

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Greatest possible length of gap ..... cm

[2]

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13. *(a)* Complete the table to give the values of

$$y = 4 + \frac{12}{x}$$

for values of x ranging from 1 to 6.

x	1	2	3	4	5	6
$y = 4 + \frac{12}{x}$	16		8		6·4	6

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[1]

(b) On the graph paper opposite, draw the graph of $y = 4 + \frac{12}{x}$ for values of x between 1 and 6. [3]

(c) Draw the line $y = 2x$ on the same graph paper and write down the value of x at the point where your two graphs intersect.

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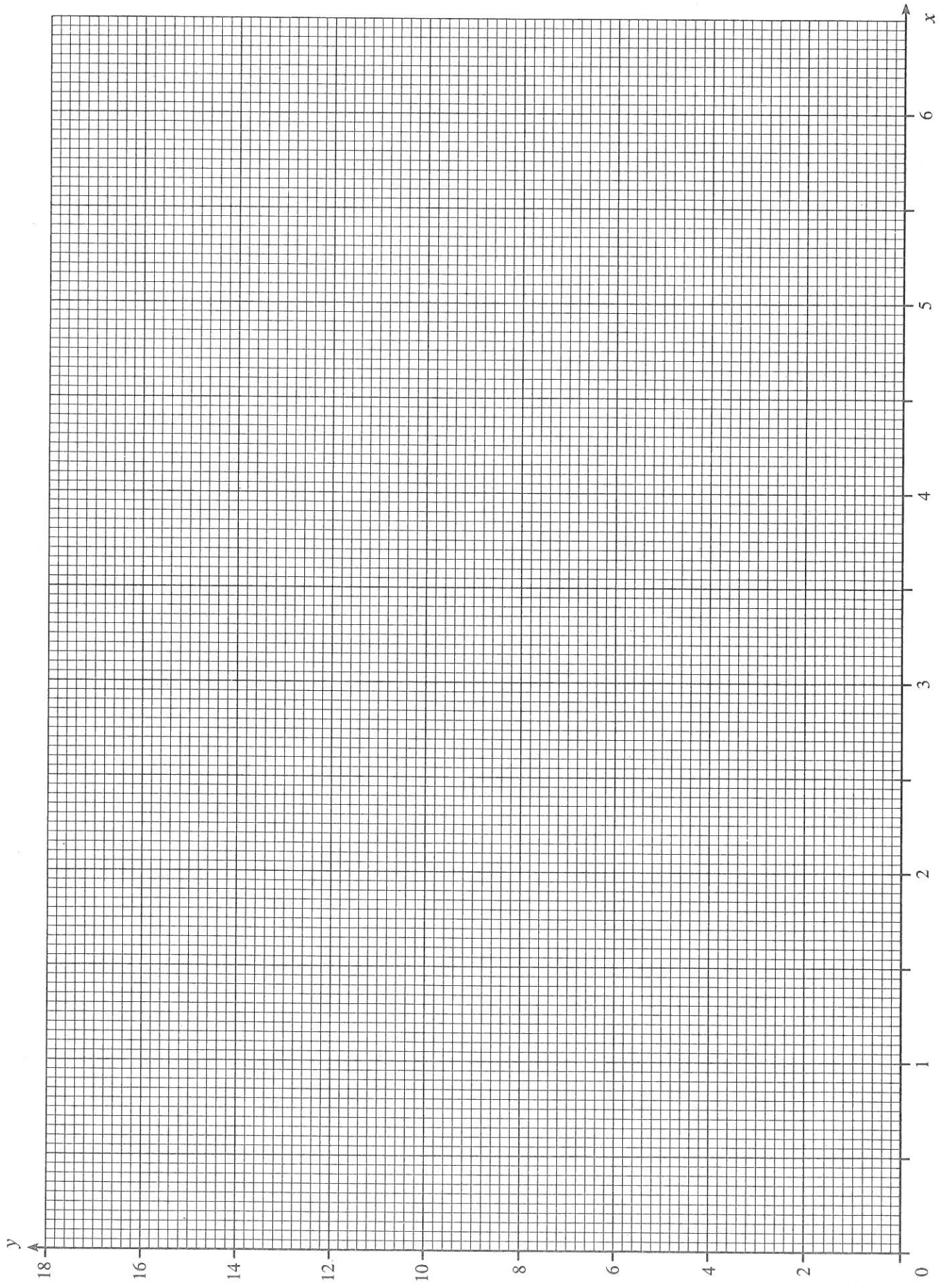
[2]

FOR USE WITH QUESTION 13



14.

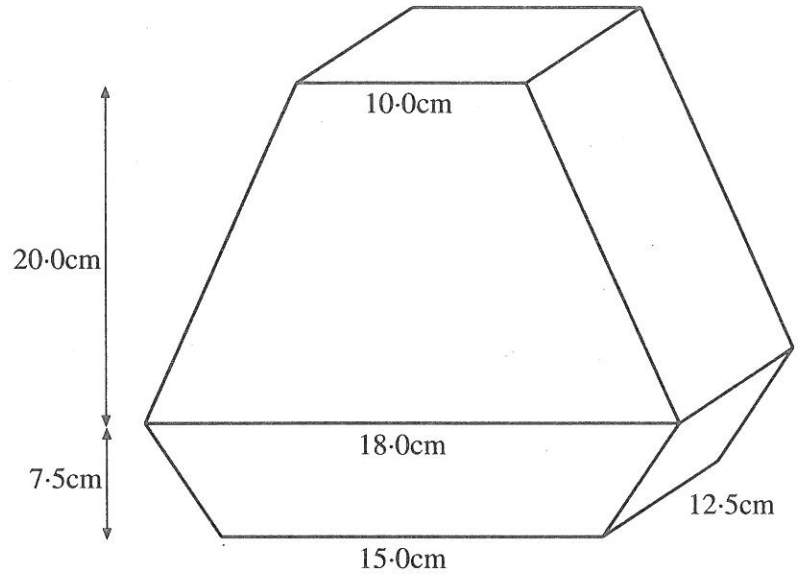


Diagram not drawn to scale.

This diagram shows a concrete block.
The block is a prism, 12·5 cm long, and the cross-section of the prism is two trapeziums. The parallel sides of the upper trapezium are 18·0 cm and 10·0 cm long and the distance between them is 20·0 cm. The parallel sides of the lower trapezium are 15·0 cm and 18·0 cm long and the distance between them is 7·5 cm.
The density of the concrete from which the concrete block is made is 2·4 g/cm^3.

Calculate the weight, in kilograms, of the concrete block, giving your answer to an appropriate degree of accuracy.

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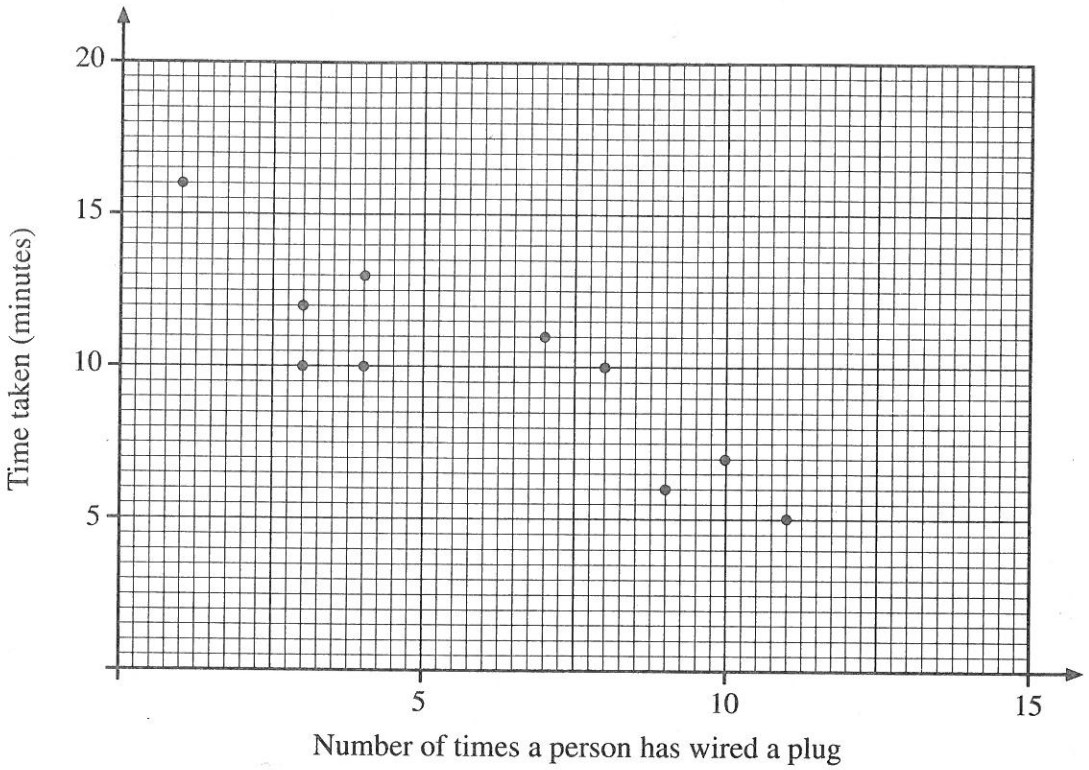
[4]

15. A psychologist asks some people how many times they have wired a plug. Each person is then asked to wire a plug and the time taken is recorded. The mean number of times people have wired a plug is 6. The mean time taken to wire a plug is 10 minutes.
The scatter diagram below shows the number of times a person has wired a plug and the time taken to wire a plug for each of 10 people.



(a) Draw the line of best fit on the scatter diagram. [2]

(b) Jeremy had wired a plug 5 times. Estimate how long it will take him to wire one plug.

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[1]

16. Solve the following equation.

$$\frac{3x-1}{2} + \frac{x}{4} = 3$$

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[3]

17. A supermarket collects information about the apples supplied by two different orchards. The information is displayed in the following table.

	Mean weight (g)	Modal weight (g)	Median weight (g)	Range (g)
Orchard A	110	113	112	24
Orchard B	104	100	102	12

(a) Calculate the approximate total weight, in kilograms, of 1000 apples from orchard A. You must show all your working.

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[2]

(b) The supermarket wants all the apples it sells to be roughly the same weight as each other. Which orchard should it use? You must give a reason for your answer.

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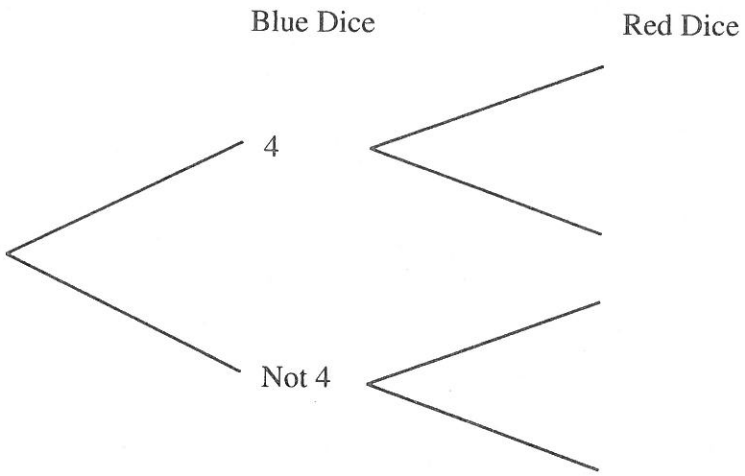
[2]

18. Charles throws two fair dice, a blue dice and a red dice. He notes the score on each dice.

(a) Complete the following probability tree diagram to show the probabilities of each dice showing or not showing a four.



[2]

(b) Calculate the probability that Charles gets

(i) two fours,

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(ii) exactly one four.

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[4]

19. *(a)* Factorise $2x^2 - 6x$.

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[2]

(b) Expand the following expression, simplifying your answer as far as possible.

$$(x - 3)(2x + 1)$$

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[2]

(c) Simplify

$$\frac{12y^8}{3y^2}.$$

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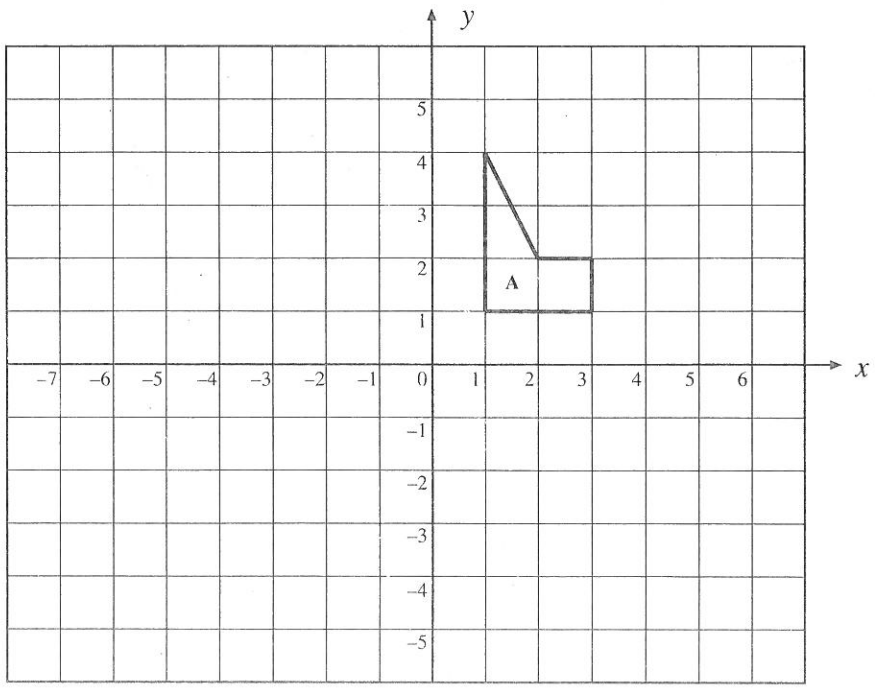
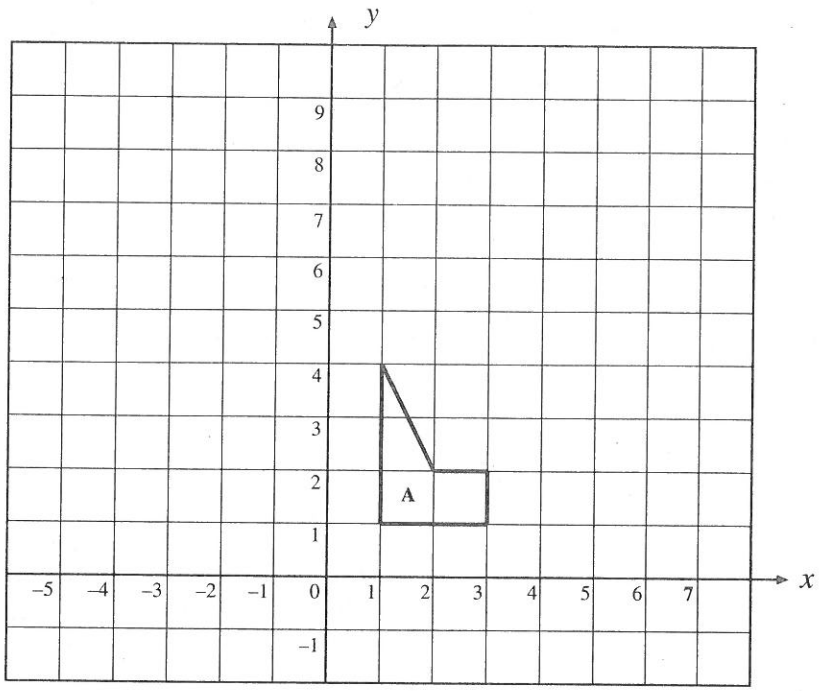
[1]

20. *(a)* The shape A is rotated through 90° anti-clockwise about the origin and then reflected in the x-axis.
Draw the resulting shape and label it B. [2]

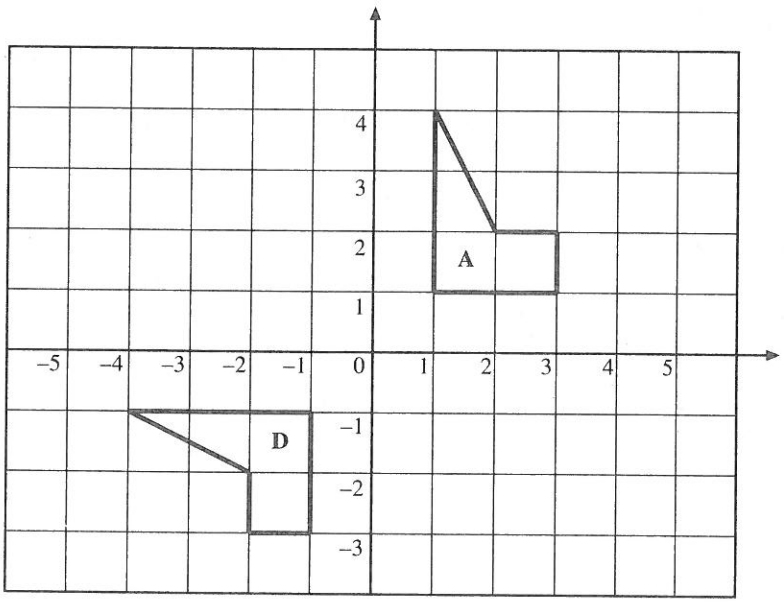


(b) Enlarge the shape A by a factor of 2 using the origin as the point of enlargement. Label the image C.



[1]

(c) Describe fully the single transformation which maps shape A onto shape D.



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[2]

21. The area of the curved surface and the two ends of a closed cylinder is given by the formula

$$A = 2\pi r\,(r + h).$$

Make h the subject of the formula.

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[3]

22. On the graph paper opposite, draw the region which satisfies all of the following inequalities.

$$\begin{aligned} x &\geqslant -1 \\ y &\leqslant 2 \\ x + y &\leqslant 4 \end{aligned}$$

Make sure that you clearly indicate the region that is your answer.

[5]

FOR USE WITH QUESTION 22