

MATHEMATICS
INTERMEDIATE TIER PAPER 2

A.M. TUESDAY, 15 June 1999

(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.

Take π as 3.14 or use the π button on your calculator.

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.

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	7	
3	5	
4	3	
5	4	
6	5	
7	6	
8	3	
9	6	
10	5	
11	3	
12	3	
13	6	
14	3	
15	3	
16	4	
17	2	
18	4	
19	3	
20	6	
21	6	
22	2	
23	6	
24	3	
TOTAL		

1. A bag contains 3 red beads, 2 blue beads and 5 yellow beads. A bead is taken from the bag at random. What is the probability that it is a blue bead?

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[2]

2. The diagram below is drawn accurately. It shows part of the net of a triangular prism. Two of the faces are missing.

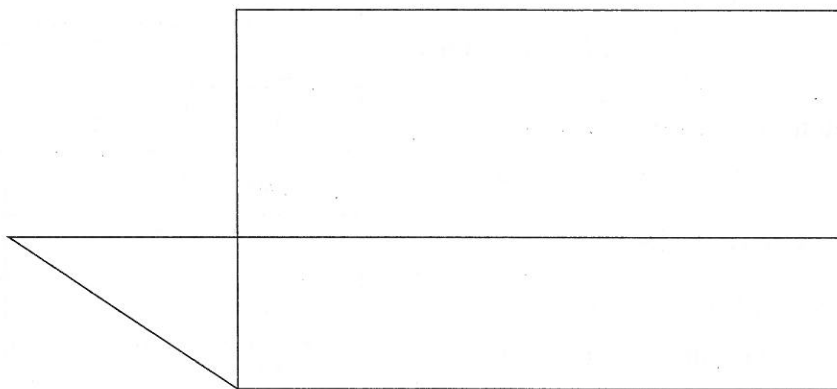
- (a) By taking suitable measurements, calculate the volume of the prism. State clearly the units of your answer.

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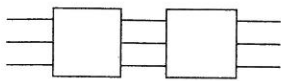
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[4]

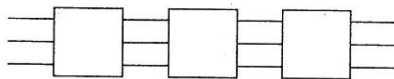


- (b) Complete the net by drawing the two missing faces in the correct places accurately. [3]

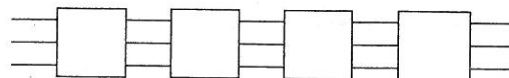
3. Philipa makes some patterns by linking squares with rods. Here are some of the patterns she makes.



1st pattern.
2 squares.
9 rods.



2nd pattern.
3 squares.
12 rods.



3rd pattern.
4 squares.
15 rods.

- (a) How many squares are in the 40th pattern?

[1]

- (b) How many squares are in the n th pattern?

[1]

- (c) How many rods are in the 40th pattern?

[1]

- (d) How many rods are in the n th pattern?

[2]

4. Solve the following equations.

(a) $\frac{x}{2} = -10$

[1]

(b) $4x - 11 = 1$

[2]

Turn over.

5. In a game at a fête a player rolls a coin onto a squared board. The squares on which the coin may land are coloured red, blue, green, yellow or orange. If the coin lands completely on one of the coloured squares the player wins. If it does not land completely on one of the coloured squares the player loses.

The table below shows the probabilities of the coin landing completely on the winning colours.

Colour	Red	Blue	Green	Yellow	Orange
Probability	0.23	0.15	0.06	0.03	0.20

- (a) 400 people each have one turn on the game.
About how many coins would you expect to land on a blue square?

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[2]

- (b) What is the probability that the coin does not land completely on one of the coloured squares?

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.....

[2]

6. (a) Complete the table below which gives the values of $y = x^2 + 3$ for values of x from -4 to 4 .

x	-4	-3	-2	-1	0	1	2	3	4
$y = x^2 + 3$	19		7		3		7		19

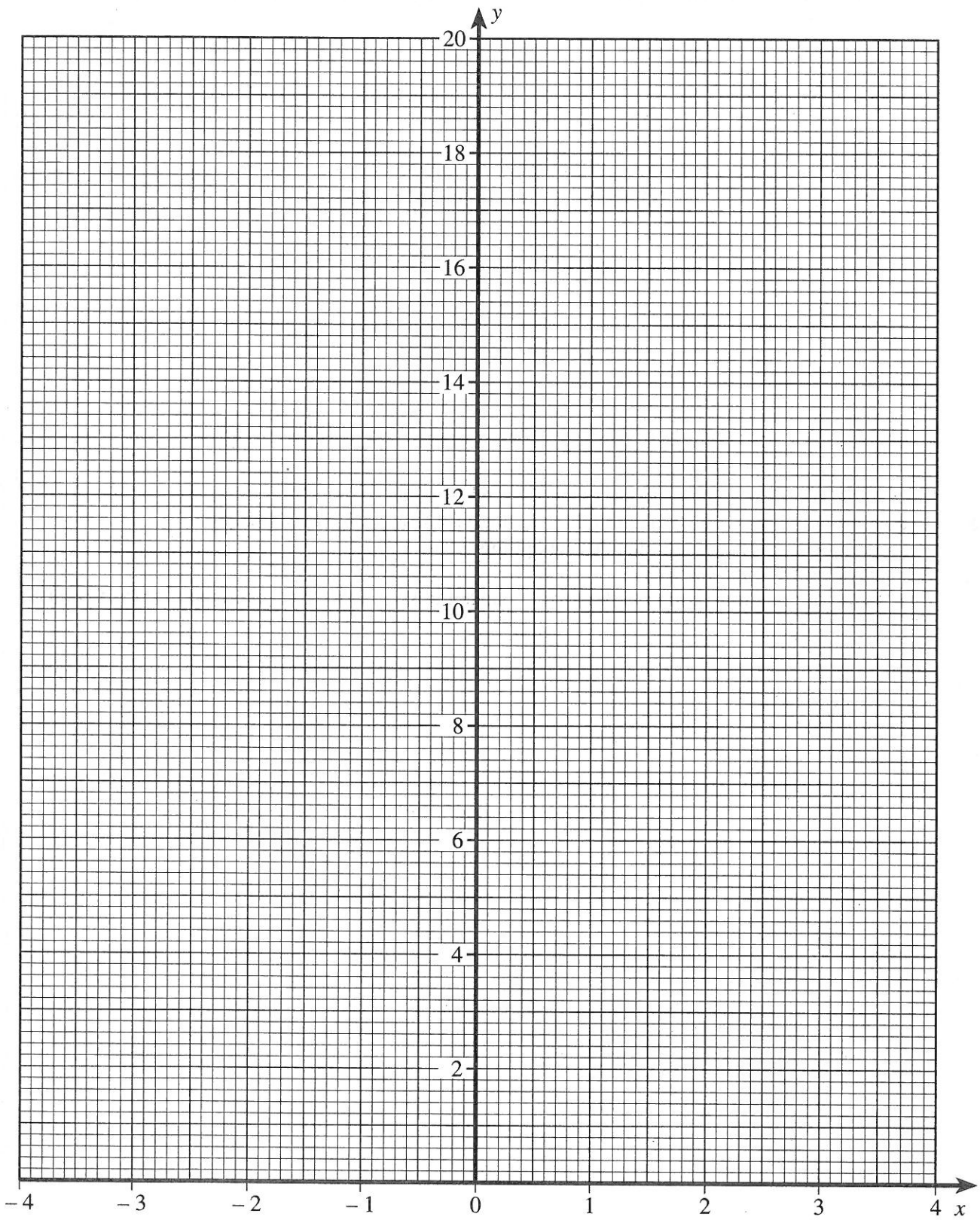
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[2]

- (b) On the graph paper provided opposite draw the graph of $y = x^2 + 3$ for values of x from -4 to 4 .

[3]

For use with Question 6.



Turn over.

7. To be on time a train must complete a journey of 210 miles in 3 hours.

(a) Calculate the average speed of the train for the whole journey when it is on time.

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[2]

(b) The train averages a speed of 56 mph over the first 98 miles of the journey. Calculate the average speed for the remainder of the journey so that the train arrives on time.

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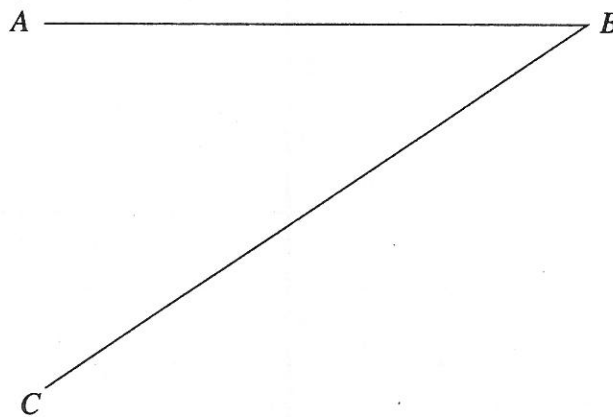
[4]

8. The diagram below is drawn accurately. It shows two straight lines AB and BC .

P is a point such that P is equidistant from points A and B .

P is also 4 cm from the line BC .

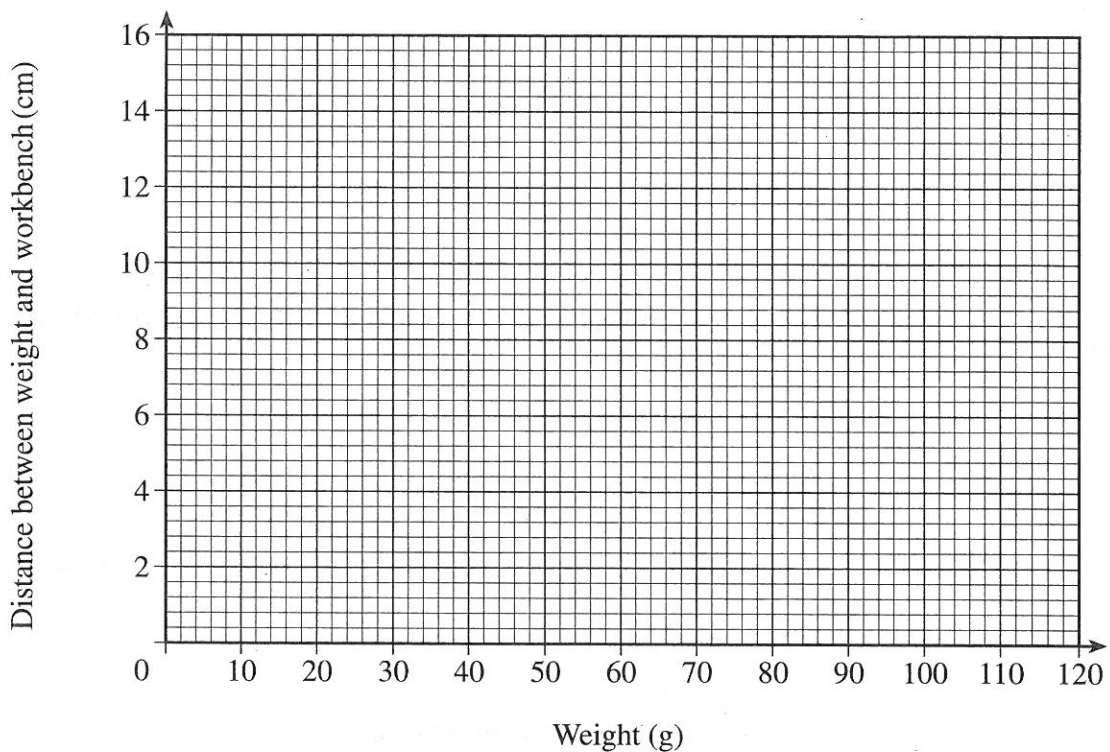
Plot the point P accurately on the diagram. You should show how you find the position of point P .



9. In a science lesson Jessica hangs some weights on an elastic band and measures the distances between the weights and the workbench. The table below shows her results.

Weight (g)	60	110	30	80	60	100	90	120	40	110
Distance between weight and workbench (cm)	12	6	16	10	14	9	5	7	13	8

- (a) On the grid below, draw a scatter diagram to show these results.



[2]

- (b) The mean of the weights is 80 g.
Calculate the mean distance of the weights from the workbench.

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[1]

- (c) Draw the line of best fit on your scatter diagram.

[2]

- (d) Which type of correlation does your scatter diagram show?

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[1]

Turn over.

10. (a) Harold invests £850 at 8% p.a. simple interest. Calculate the total amount of money he has at the end of three years.

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[3]

- (b) Katherine invests £600 in a simple interest account. At the end of two years her investment has become £684. What is the annual percentage rate of simple interest?

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[2]

11. (a) The diagram below shows 5 triangles. Which two of the triangles are congruent?

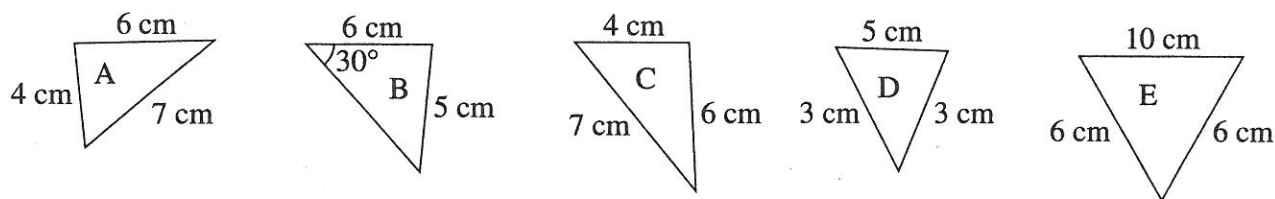


Diagram not drawn to scale.

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[1]

- (b) The diagram below shows a regular pentagon $ABCDE$ with its diagonals drawn.

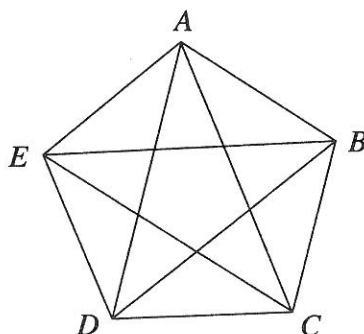
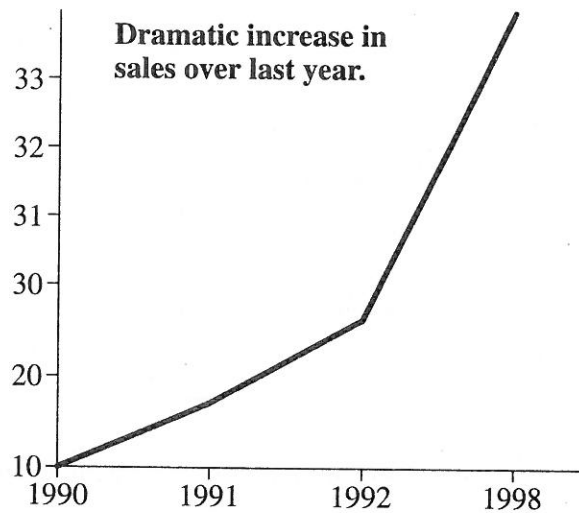


Diagram not drawn to scale.

List all the triangles which are congruent to triangle ACD .

[2]

12. (a) The diagram below is misleading. Give **two** reasons why it is misleading.

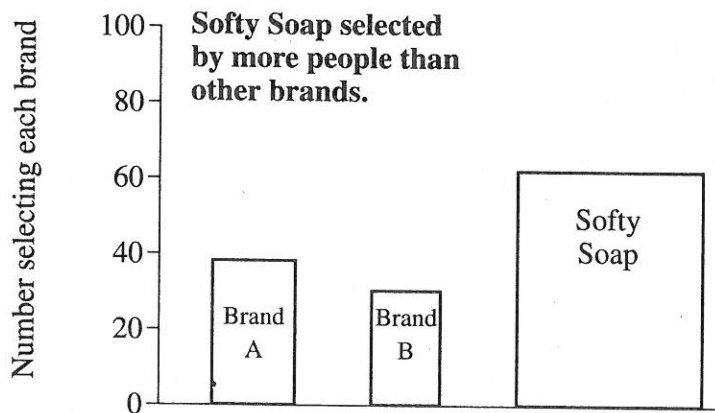


The diagram is misleading because (i)

(ii)

[2]

- (b) Give **one** reason why the diagram below is visually misleading.



It is misleading because

[1]

Turn over.

13. The diagram below shows the layout of five paths in a garden.

AB is 8.3m long. BC is 6.1m long. BD is 5.0m long. \hat{ABC} and \hat{BDA} are both right-angles.

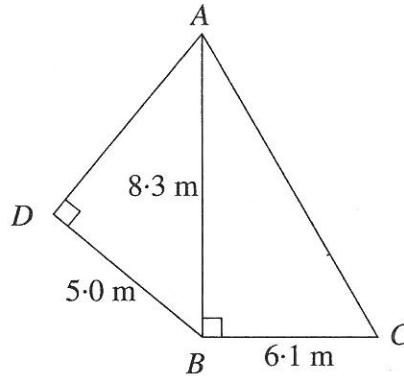


Diagram not drawn to scale.

- (a) Calculate the length of the path AC , giving your answer to a suitable degree of accuracy.

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[3]

- (b) Calculate the length of the path AD , giving your answer to a suitable degree of accuracy.

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[3]

14. Kylie, Lucas and Daniel share £972 in the ration of 11 : 9 : 7. How much does each one get?

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[3]



15. Do not use a calculator when answering this question. Show all your working.

Estimate the value of $\frac{(4.768)^3 \times 0.42}{18.6 \times 0.037}$.

Show clearly how you obtain your answer.

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[3]

16. A solution to the equation $x^3 + 7x - 40 = 0$ lies between 2 and 3.
Use the method of trial and improvement to find this solution correct to one decimal place.

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The solution correct to 1 decimal place is

[4]

17. Find an expression, in terms of n , for the n th term of **each** of the following sequences.

(a) $1^2, 2^2, 3^2, 4^2, \dots$

[1]

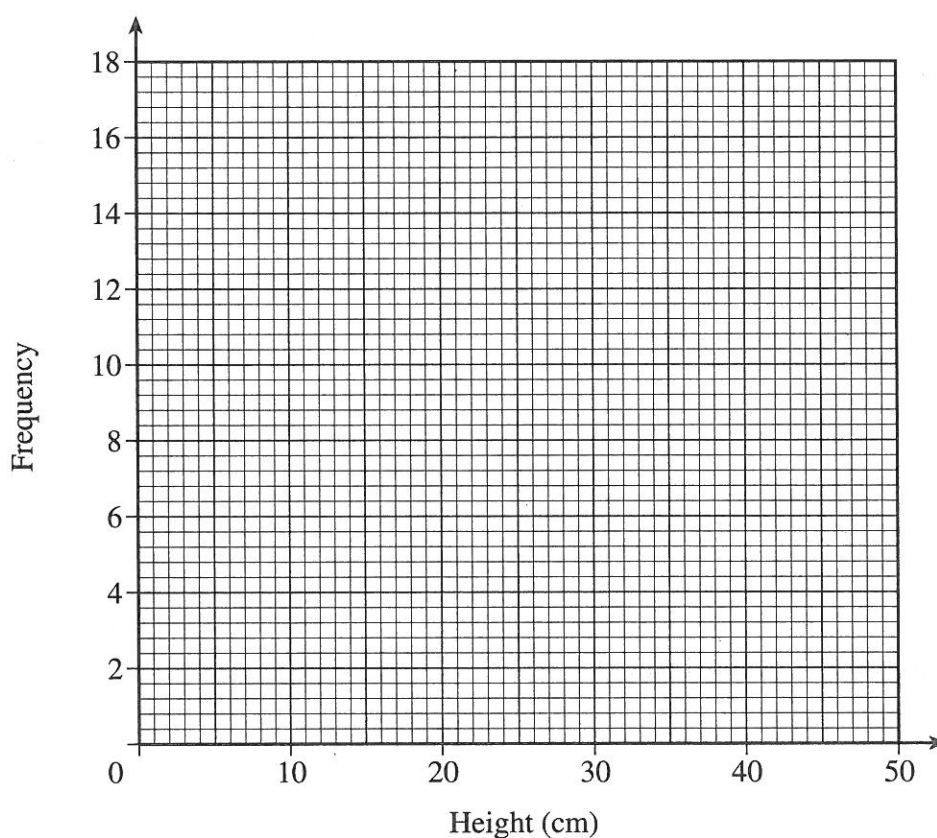
(b) $2^2, 3^2, 4^2, 5^2, \dots$

[1]

18. The table below shows the distribution of the heights, correct to the nearest centimetre, of 40 plants.

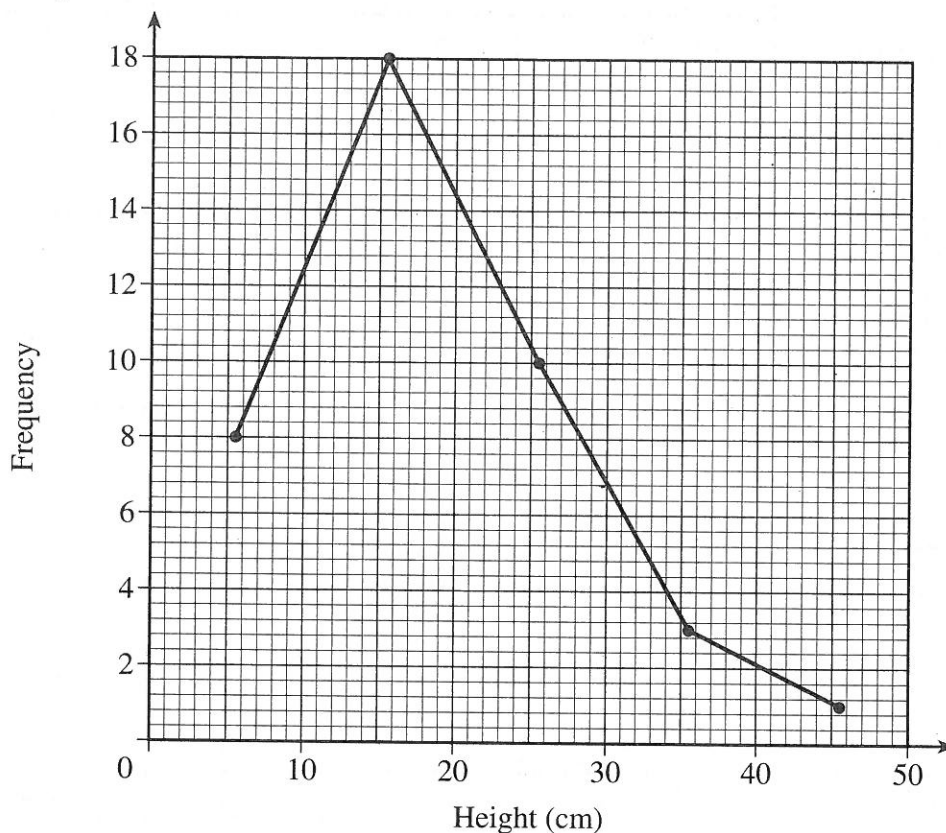
Height (cm)	1 to 10	11 to 20	21 to 30	31 to 40	41 to 50
Frequency	6	4	8	14	8

(a) On the grid below, draw a frequency polygon to show the distribution of these heights.



[2]

- (b) The frequency polygon below shows the distribution of the heights of a different sample of 40 plants.



Which of the samples, the first or the second, has the greater mean height? Give a reason for your answer.

[2]

19. The diagram below shows two **similar** triangles ABC and DEC .
The lines AB and DE are parallel. AB is 10 cm, DE is 8 cm, DC is 5 cm and EC is 6 cm.

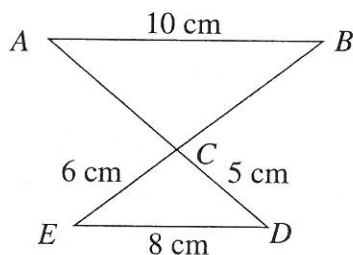


Diagram not drawn to scale.

Calculate the length of the side BC .

[3]

Turn over.

20. The table below shows the distribution of the ages, in complete years, of the 60 people on a train.

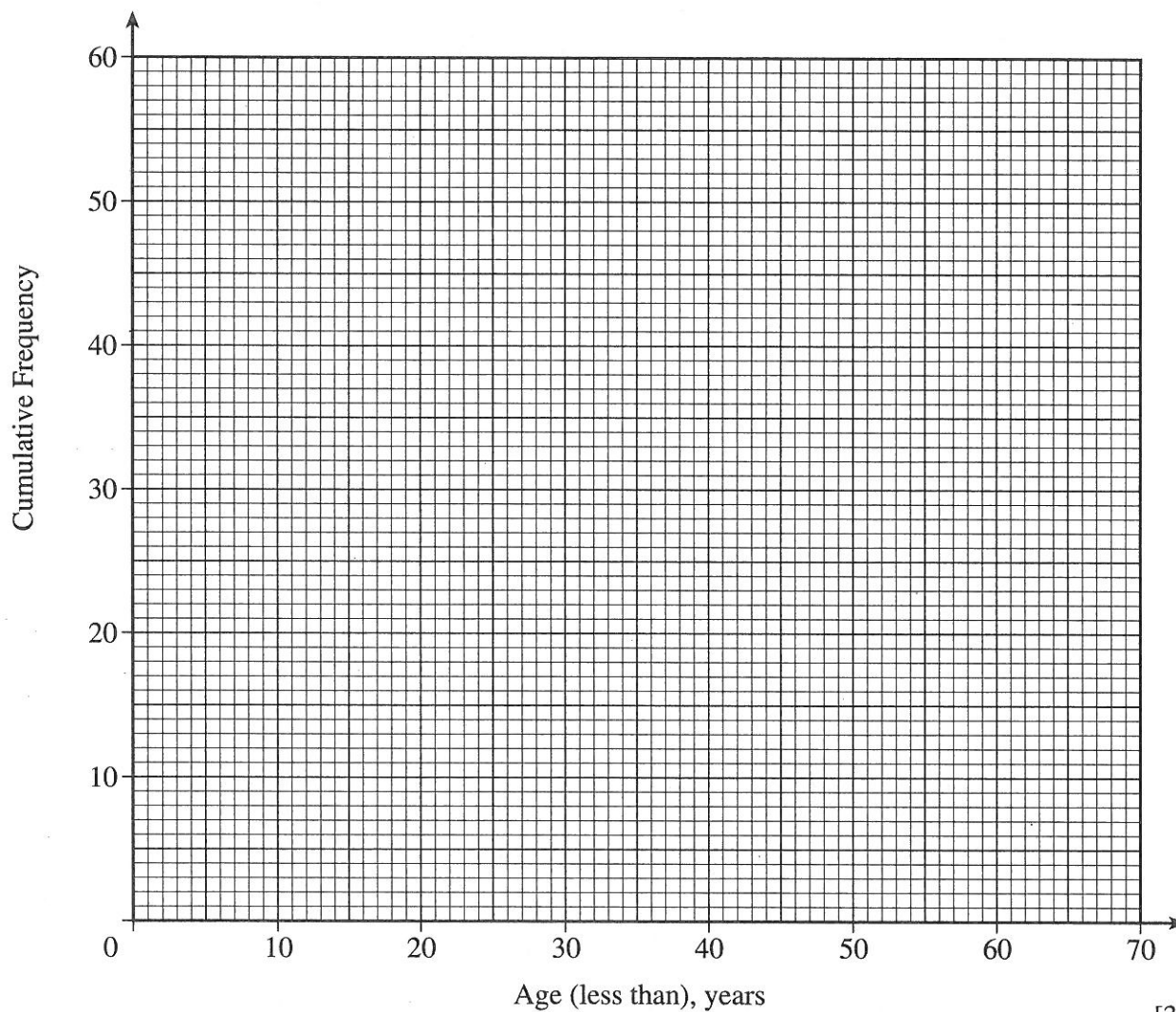
Age (years)	0 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69
Frequency	18	10	12	8	5	7

- (a) Complete the cumulative frequency table below.

Age (less than) years	20	30	40	50	60	70
Cumulative frequency						

[1]

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



[3]

- (c) Use your cumulative frequency diagram to find the interquartile range. You must show your working.

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[2]

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

(i) 734 800 000

(ii) 0.00057

[2]

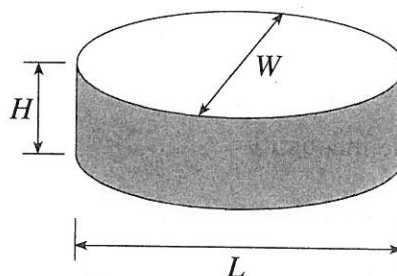
(b) Find, in standard form, the value of **each** of the following.

(i) $(3.42 \times 10^4) \times (5.91 \times 10^{-11})$

(ii) $\frac{4.69 \times 10^{-6}}{7.45 \times 10^4}$

[4]

22. Some pills are in the form of elliptical prisms, L mm long, W mm wide and H mm thick.



(a) Explain why the formula $V = 0.8(L + W + H)$ cannot be used to estimate the volume of a pill.

[1]

(b) One of the following formulae may be used to estimate the volume of a pill.

$$V = 0.8LWH$$

$$V = 0.8LW + H$$

$$V = 0.8(L + W)H$$

$$V = 0.8L + WH$$

Ring the correct formula.

[1]

Turn over.

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

$$(3x - 4)(2x + 3)$$

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[3]

- (b) Make c the subject of the following equation.

$$\frac{bc^2}{d} = 6$$

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[3]

24. (a) The inequality

$$7 - 3n < 12 - 5n$$

can be rearranged into one of the following forms:

EITHER the form $n < \text{a number}$

OR the form $n > \text{a number}$

Rearrange the inequality into whichever form is correct.

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[2]

- (b) Write down the least or greatest whole number value of n which satisfies your inequality.
State whether it is the least or the greatest.

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[1]