MATHEMATICS

INTERMEDIATE TIER PAPER 1

P.M. WEDNESDAY, 6 June 2001

(2 Hours)

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

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

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.

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.

1. Look at the following list of numbers.

   20, 21, 22, 23, 24, 25, 26, 27, 28.

   Using only the numbers in the list, write down

   (a) a cube number,

   ....

   [1]

   (b) a prime number.

   ....

   [1]

2. Find the value of

   (a) $3^4 \times 2^3$,

   ....

   ....

   ....

   ....

   [2]

   (b) $6 \cdot 7 - 3 \cdot 84$.

   ....

   ....

   ....

   ....

   [1]

3. Arwyn can buy plants on small trays each of which holds 4 plants and on large trays each of which holds 12 plants.

He buys x small trays.

(a) Write down, in terms of x, the total number of plants on these small trays.

....

[1]

(b) He buys 6 less of the large trays than the small trays. Write down, in terms of x, how many large trays he has bought.

....

[1]

(c) Write down, in terms of x, the total number of plants on these large trays.

....

[1]

(d) Write down, in terms of x, the total number of plants he has bought altogether. You must simplify your answer as far as possible.
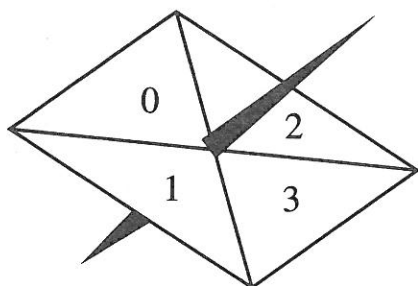
....

....

....

....

....

[3]

4. (a) Write down 74·8612 correct to 3 significant figures.

....

[1]

(b) Write down 6·0432 correct to 2 significant figures.

....

[1]

Turn over.

5. A square shaped spinner has the numbers 0, 1, 2 and 3 written on it. Another spinner, in the shape of a regular pentagon, has the numbers 1, 2, 3, 4 and 5 written on it.

Square spinner
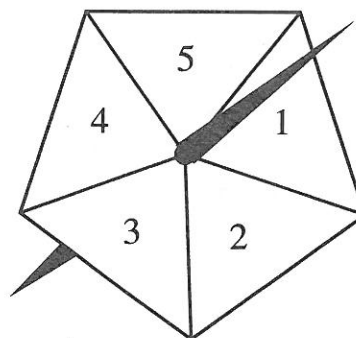
Pentagon spinner

In a game, a player spins both spinners and multiplies the two numbers showing on the spinners to get the score for the game.

For example, if the number on the square spinner is 3 and the number on the pentagon spinner is 2, the player works out $3 \times 2 = 6$ and the player scores 6.

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

Pentagon spinner				
5	0	---------	---------	---------
4	0	---------	---------	---------
3	0	---------	---------	---------
2	0	2	4	6
1	0	1	2	3
	0	1	2	3
	Square spinner			

[2]

(b) (i) What is the probability that a player scores 0?

....

[2]

(ii) What is the probability that a player does not score 0?

....

[1]

A player wins a prize by getting a score of 2 or less.

(c) Barbara plays the game once.
What is the probability that she wins a prize?

....

....

[1]

(d) (i) 600 people each play the game once.
Approximately how many would you expect to win a prize?

....

....

....

[2]

(ii) It costs 30p to play the game once. The prize for getting a score of 2 or less is 50p.
If the 600 people each play the game once, approximately how much profit do you
expect the game to make?

....

....

....

....

....

[2]

Turn over.

6. Find the angles marked x and y in the following diagrams.
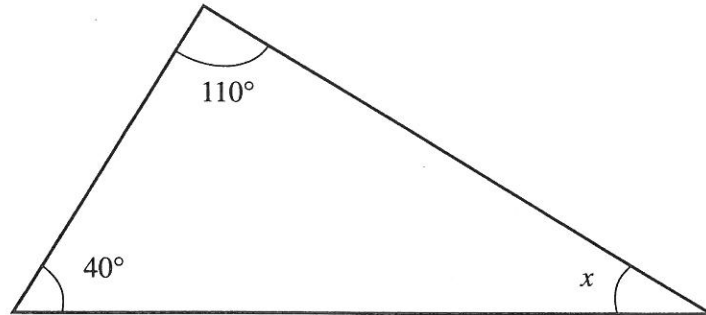
$x = $ .... $^{\circ}$

[1]
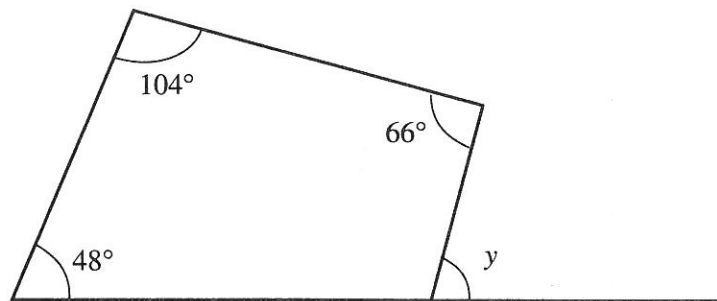
$y = $ .... $^{\circ}$

[2]

7. Draw three shapes like the given one, so that the completed pattern has rotational symmetry of order 4 about *O*. [3]
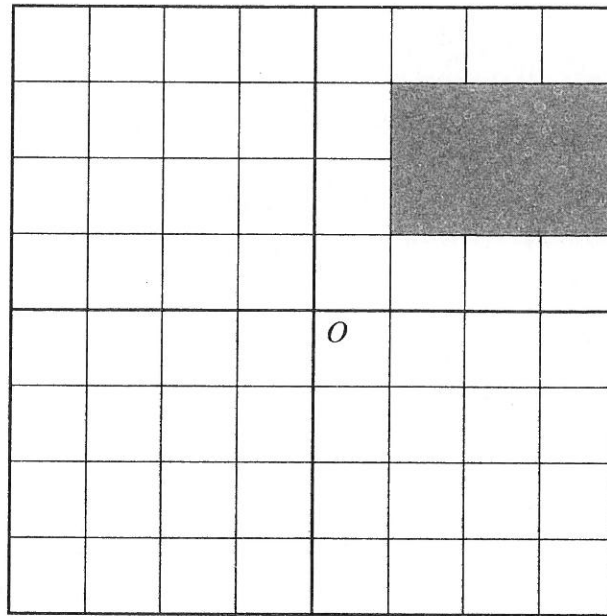
8. *ABCD* is a parallelogram. Its diagonals intersect at the point *E*.

$C\hat{D}B = 31°$, $D\hat{E}A = 67°$ and $A\hat{B}C = 125°$.
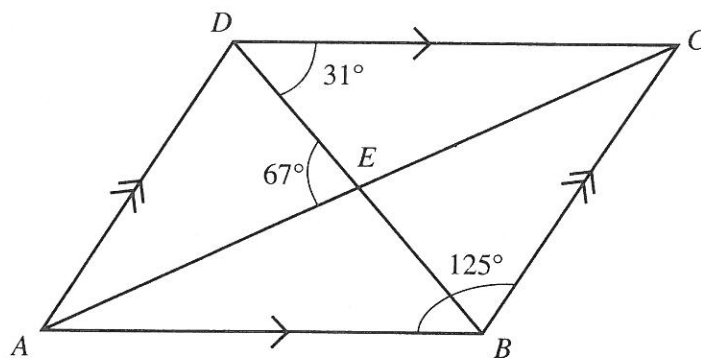
Find the value of

(a) $D\hat{B}A$,

....

[1]

(b) $D\hat{B}C$,

....

....

[1]

(c) $E\hat{A}B$.

....

....

[2]

9. Coastville and Portplace are two coastguard stations. A ship is on a bearing of 165° (S15°E) from Coastville and on a bearing of 228° (S48°W) from Portplace. Draw these bearings and mark the position of the ship.   [3]

N

N

Land

Coastville ●

● Portplace

Sea
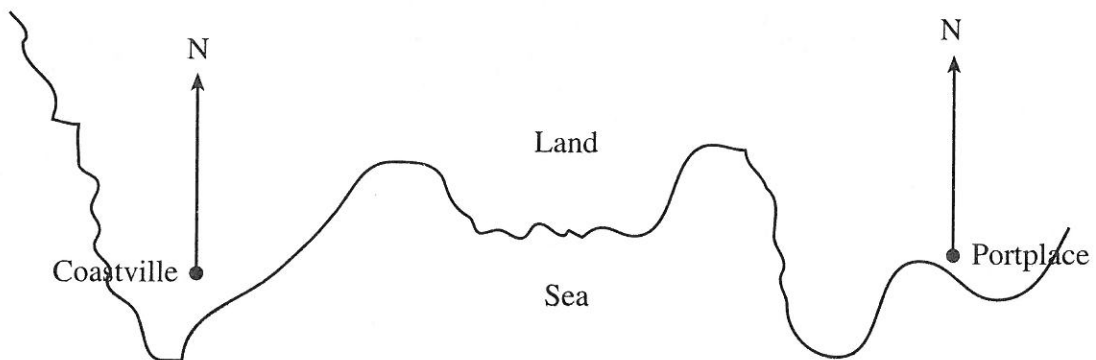
10. Write down, in terms of *n*, the *n*th term of **each** of the following sequences.

   (a)   7   14   21   28   ....

   ....

   ....

                                                                                                                                                     [1]

   (b)   3   8   13   18   ....

   ....

   ....

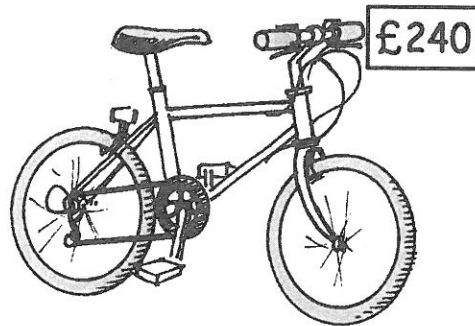   [2]

11.

£240

Sale price
15% OFF the
marked price

Calculate the sale price of the bicycle.

....

....

....

....

....

....

....

[3]

12. The manageress of a supermarket intends to carry out a survey of her customers in order to find out their opinion on the alterations she has made to the supermarket.

(a) One of the questions in her questionnaire was:

What do you think of the new improved facilities?

Very good ☐   Good ☐   Average ☐   Poor ☐

What do you see wrong with this question?

....

....

....

....

[1]

(b) Another of her questions was:

How often do you come into the supermarket?

☐ Very often   ☐ Often   ☐ Occasionally

(i) What do you see wrong with this question?

....

....

[1]

(ii) Write a better version of the question.

....

....

....

....

....

....

....

....

[2]

13. Given that $w = \dfrac{d(t-1)}{3}$, find the value of w when $t = -8$ and $d = 25$.

....

....

....

....

[3]

Turn over.

14. Express 108 as a product of prime numbers in index form.

[3]

15. Solve the following equations.
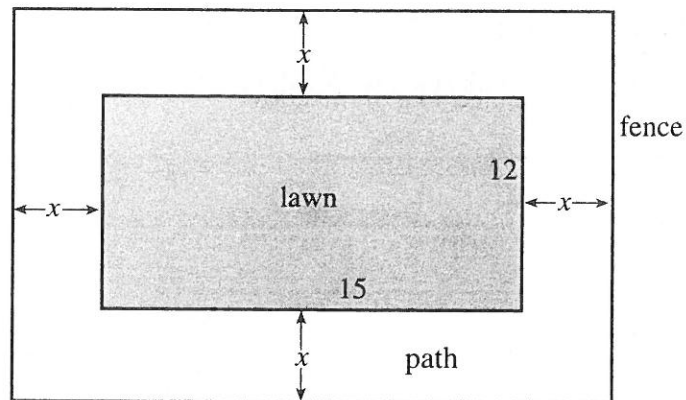
(a) $7x - 6 = 10 + 3x$

[3]

(b) $4(2x - 5) = 2x + 1$

[3]

16.

The diagram represents a rectangular lawn measuring 15 metres by 12 metres, surrounded by a path of width x metres. There is a fence all around the outside of the path.

(a) Given that the length of the fence is 74 metres, write down an equation that x satisfies.

....

....

[2]

(b) Solve the equation to find the value of x.

....

....

....

....

[2]

Turn over.

17. An alloy is made by using copper and zinc in the ratio of 17:3.

(a) How much zinc is used to make 4 kg of the alloy?

....

....

....

....

....

....

[2]

(b) There is only 1·5 kg of zinc available, but plenty of copper. What is the greatest amount of the alloy that can be made?
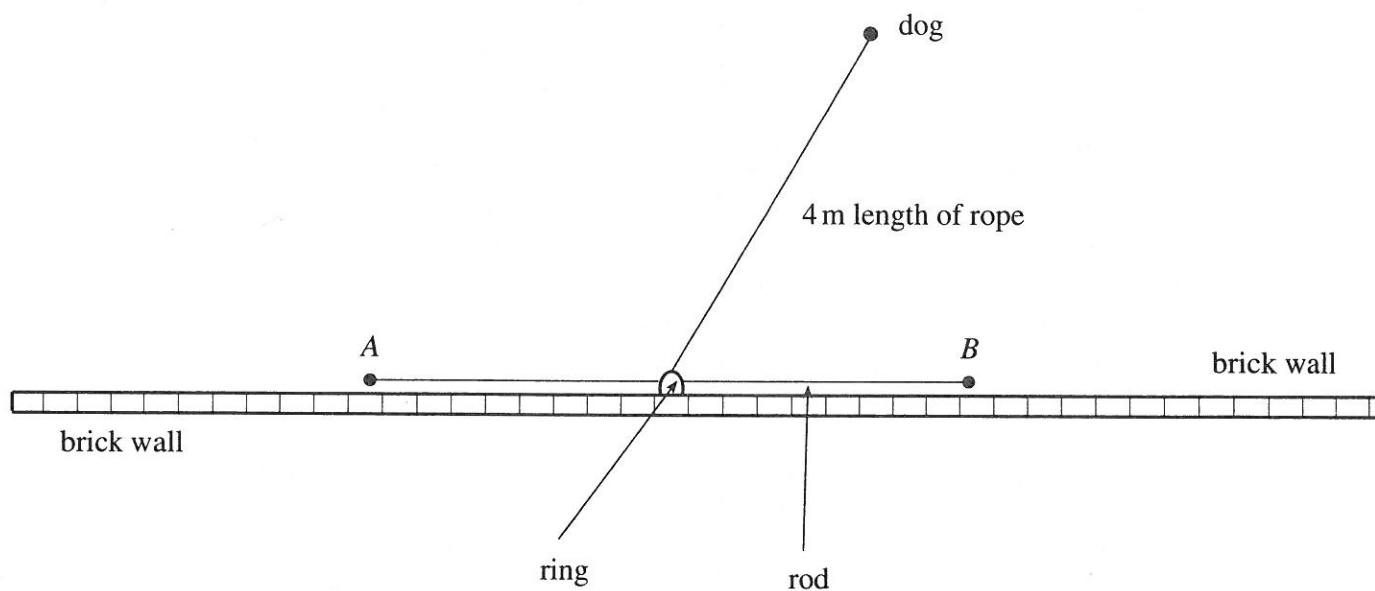
....

....

....

....

....

[2]

18. A dog is tied to a 4 m length of rope, at the other end of which is a ring. This can slide over a rod *AB*, attached to a brick wall. The ring cannot slide off the rod due to stoppers at *A* and *B*.
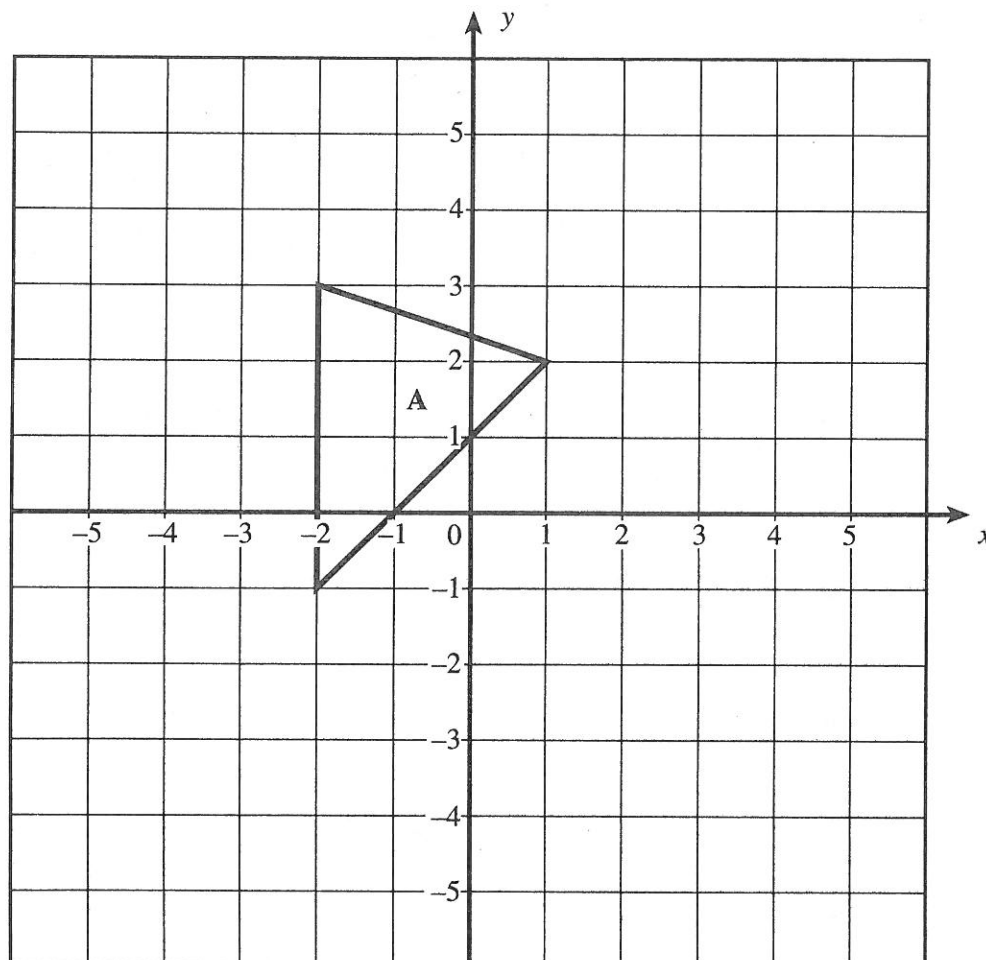

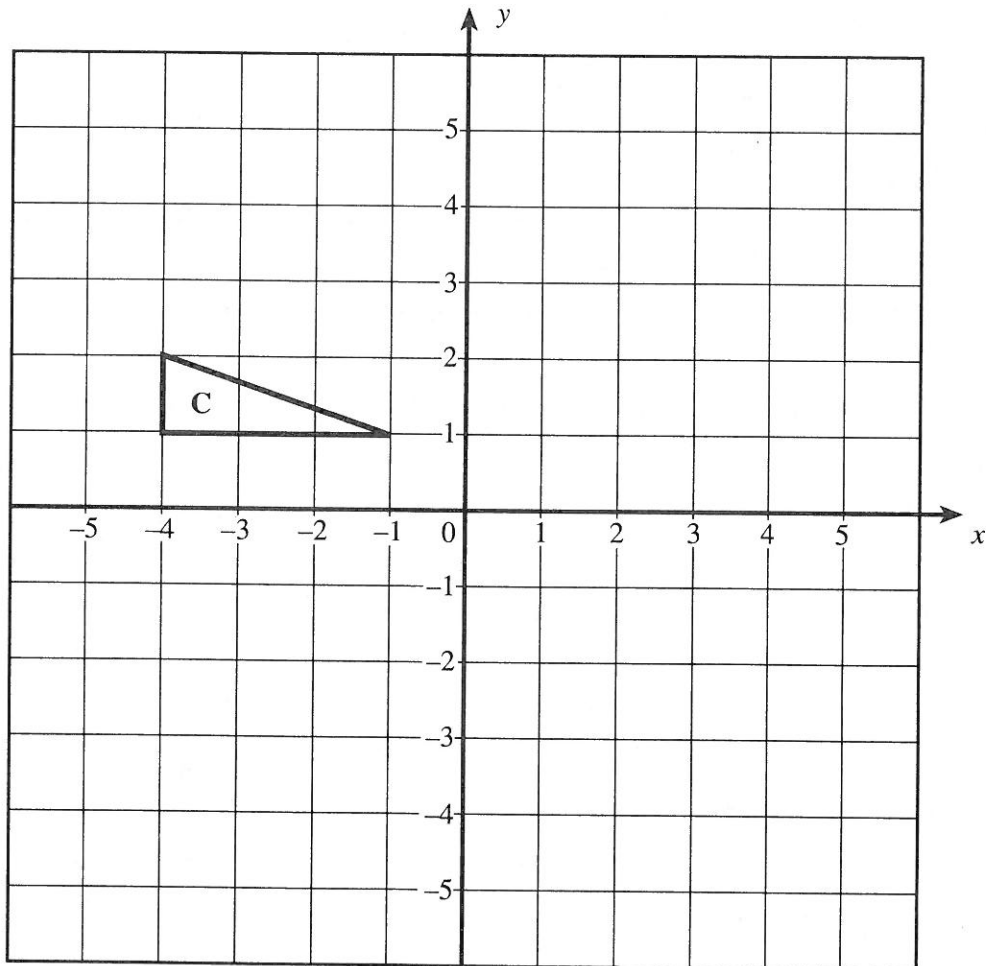Using a scale of 1 cm to represent 1 m, draw on the diagram below the region in which the dog can move. [3]

19. *(a)* Draw the image of the triangle **A** after a translation of 4 units in the *x* direction and –2 units in the *y* direction. Label the image **B**. [2]

(b) Rotate the triangle **C** through 90° clockwise about the point (−1, −1).
Label the image **D**. [2]

20. A random sample of people at work revealed the following information regarding their type of job and their gender.

	Management	Clerical	Other
Female	16	63	82
Male	14	70	105

(a) Use this information to estimate the probability that a randomly chosen person at work is in management.

....

....

....

[1]

(b) Estimate the number of people in management jobs in a workforce of 700 000.

....

....

....

....

[2]

21. Solve the following simultaneous equations by an algebraic (not graphical) method. Show all your working.

$$4x + 2y = 17$$
$$5x + 3y = 23$$

[4]

22. Factorise

(a) $4x^2y - 6xy^2$,

[2]

(b) $x^2 - 4x - 12$.

[2]

Turn over.

23. A group of 120 volunteers were invited to complete an experiment. The time taken, measured to the nearest minute, by each volunteer was noted and the results were as shown in the following table.

Time taken (to the nearest minute)	11-15	16-20	21-25	26-30	31-35	36-40	41-45
Number of volunteers	2	12	26	48	20	9	3

(a) Complete the following cumulative frequency table.

Time taken (less than)	10·5	15·5	20·5	25·5	30·5	35·5	40·5	45·5
Cumulative frequency	0							

[1]

(b) On the graph paper opposite, draw a cumulative frequency diagram to show this information. [3]

(c) Use your cumulative frequency diagram to find the interquartile range.

....

....

....

....
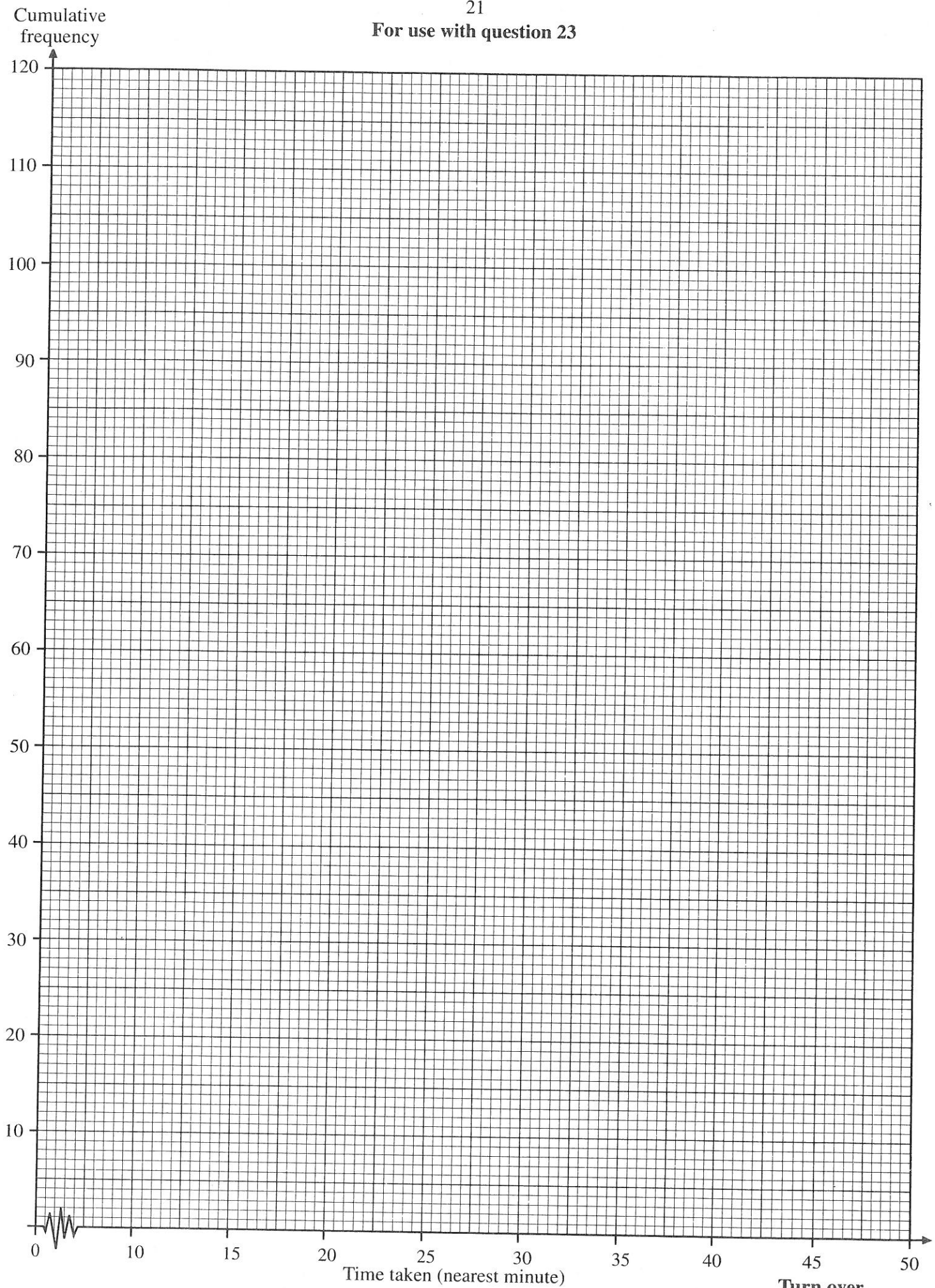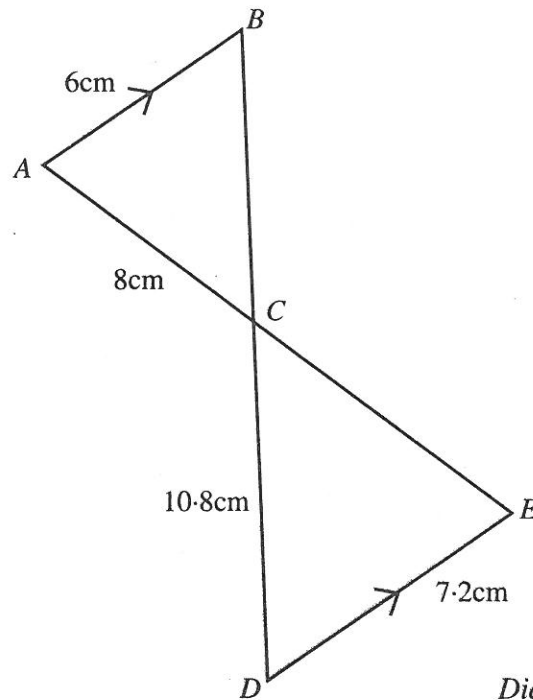
[2]

(d) Use your cumulative frequency diagram to complete the following statement.

80% of the volunteers took less than .... minutes to complete the experiment.

[1]

For use with question 23

Cumulative frequency

Time taken (nearest minute)

Turn over.

24.

6cm

A

8cm

B

C

10·8cm

E

7·2cm

D

Diagram not drawn to scale.

In the diagram, *AB* is parallel to *DE*, and the triangles *ABC* and *EDC* are similar.
AB = 6 cm, *AC* = 8 cm, *DE* = 7·2 cm and *CD* = 10·8 cm.

Showing all your working, find the length of

(a) *CE*,

....

....

....

....

[2]

(b) *BC*.

....

....

....

....

[2]

25. In each of the following formulae, every letter stands for the measurement of a length. By considering the dimensions implied by the formulae, write down, for each case, whether the formulae could be for a length, an area, a volume or none of these.

The first one has been done for you.

<u>Formula could be for:</u>

$6r^2h + 4r^3$ volume

$6r^2 + 4dh$ ....

$6(r + 4d)h$ ....

$6r^2 + 4dh + 3h$ ....

$6r + 4d + 3h$ ....

[2]

Turn over.

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

$$x < 4$$
$$y > -3$$
$$2y - x < -2$$

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

....

....

....

....

....

....

....

....

....

[3]

For use with question 26