



THE ENGLISH SCHOOL
MID PROGRAM ENTRY INTO YEAR 4

MATHEMATICS

SATURDAY 1st June 2024

Time allowed: 2 hours

Instructions to candidates

Answer all the questions in the spaces provided.

Without sufficient working, correct answers may be awarded no marks.

Information to candidates

This paper has 27 questions.

There are 23 pages in this question paper.

Full marks may be obtained for answers to all questions.

The total marks for this paper is 120.

The marks for each question is shown in round brackets, e.g. (2)

Calculator may be used.

Advice for candidates

Write your answers neatly and in good English.

Work steadily through the paper.

Do not spend too long on one question.

Show all stages in any calculations.

Materials required for the paper

Calculator, ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks:

.....%

1. Rosie sells her laptop to John and makes a 15% profit.
John then sells the laptop to Michael for £391. John makes a 15% loss.
How much profit did Rosie make?

£
(3)

2. Mano has three shelves of books. There are x books on shelf **A**.
There are $(3x + 1)$ books on shelf **B**. There are $(2x - 5)$ books on shelf **C**.
There is a total of 44 books on the three shelves.
All the books have the same mass. The books on shelf **B** have a total mass of 7500 g.

Work out the total mass of the books on shelf **A**.

.....g
(5)

3. $-2 \leq n < 5$

n is an integer.

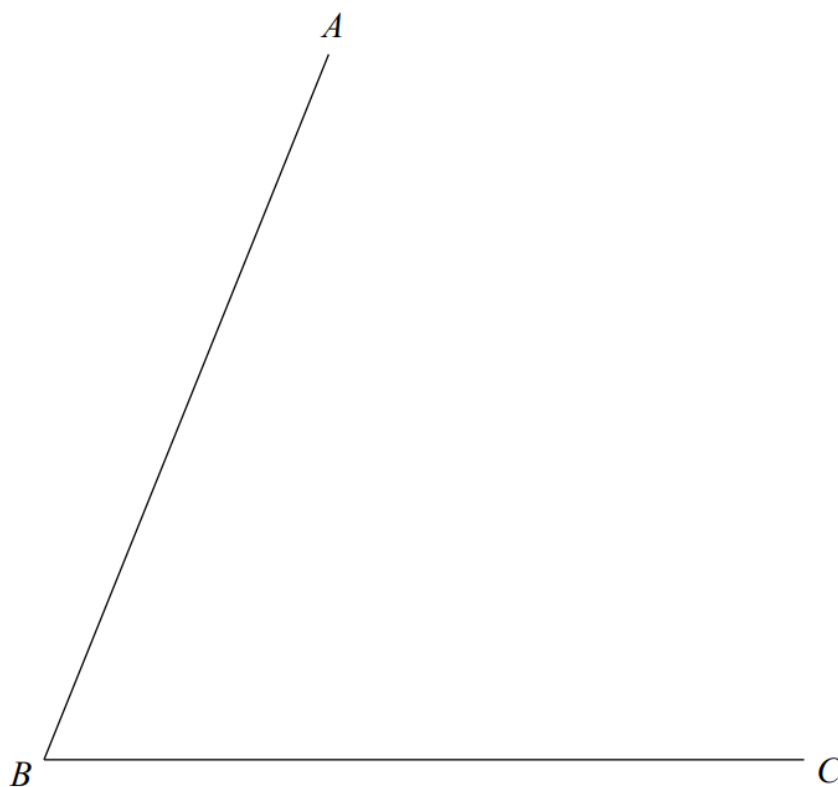
(a) Write down the greatest possible value of n .

.....
(1)

(b) Solve $\frac{2}{5}g - 4 < 6$

.....
(2)

4. Use a ruler and compasses to construct the line BP that bisects the angle ABC.
You must show all construction lines.



(2)

5. (a) Write $5^3 \div 5^{-4}$ as a single power of 5.

.....
(1)

(b) Simplify:

(i) $\sqrt{49 \times 10^{2n}}$

.....
(1)

(ii) $\frac{(2fg)^3}{kx^2} \div \frac{4f^2g^3}{k^2x^2}$

.....
(3)

(c) Without using a calculator and showing all steps in your working, work out the value of

$$27^{\frac{2}{3}} + \left(\frac{1}{2}\right)^{-3}$$

.....
(3)

6. Solve the following equations. Leave answers as fractions where necessary.

(a) $2\sqrt{x} + 5 = 6$

.....
(3)

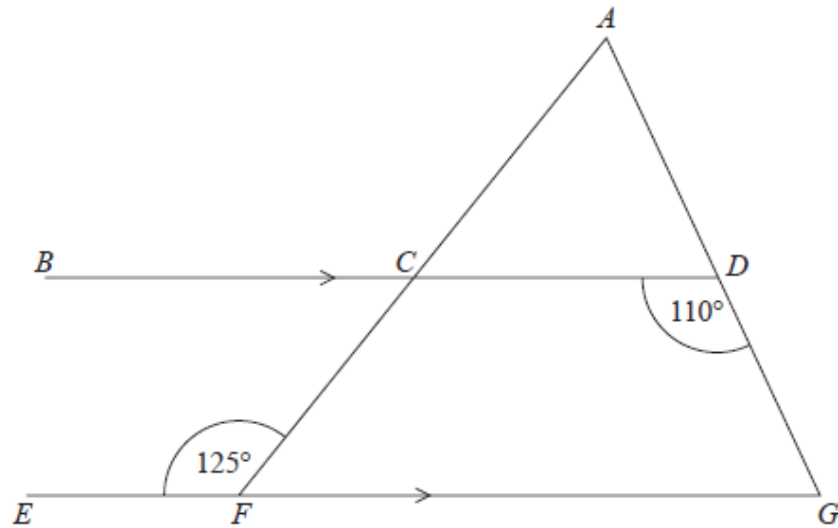
(b) $x^2 - 21x + 20 = 0$

.....
(2)

(c) $\frac{3x+4}{5} - \frac{2x}{3} = 2$

.....
(3)

7. ACF and ADG are straight lines.
 BCD and EFG are parallel lines.



Show that triangle ACD is isosceles.
 Give a reason for each stage of your working.

.....
 (5)

8. James thinks of two numbers.

He says “The Highest Common Factor of my two numbers is 3

The Lowest Common Factor of my two numbers is 45”

Write down two numbers, other than 3 and 45, that James could be thinking of.

.....
(3)

9. Rearrange this formula to make a the subject

$$\frac{a^3b}{7} + 5 = c$$

.....
(3)

10. (a) Write $\frac{1}{27}$ as a recurring decimal.

.....
(1)

(b) By writing $1.2\dot{4}\dot{3}$ as a fraction, calculate

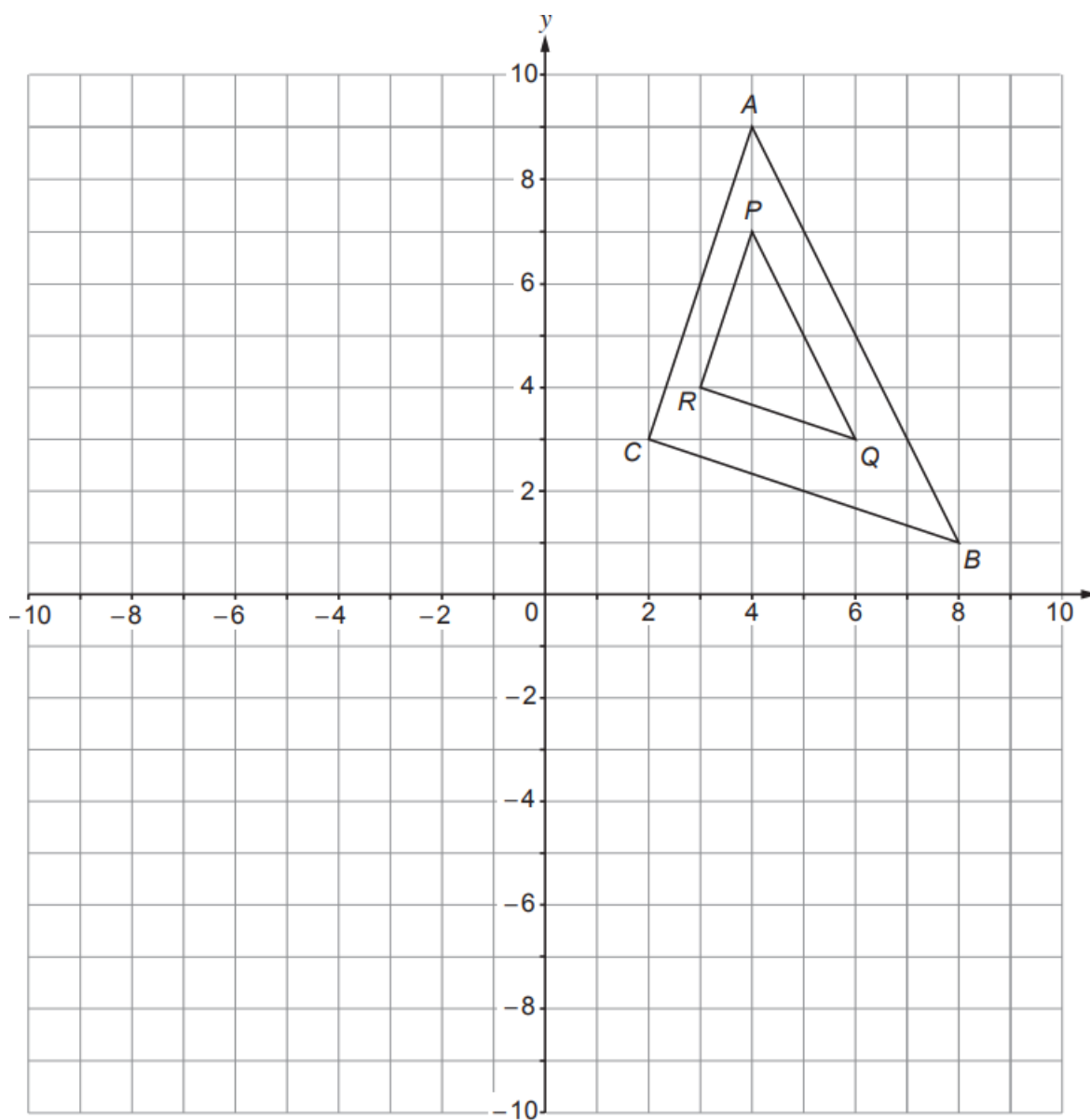
$$1.2\dot{4}\dot{3} - \frac{8}{9}$$

giving your answer as a fraction.

.....
(4)

11.

Leave
blank



(a) Describe the single transformation that maps triangle ABC to triangle PQR

.....

.....

(3)

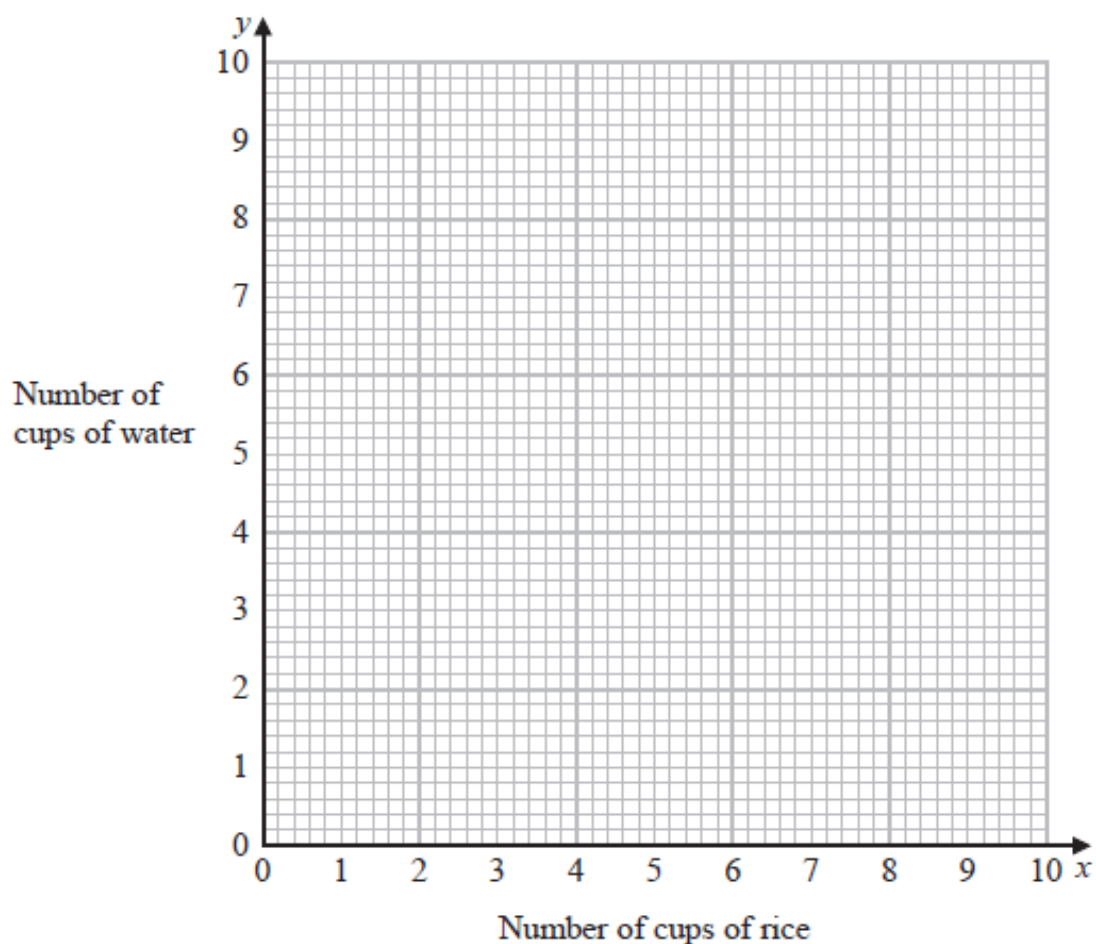
(b) On the grid above, draw the reflection of triangle ABC in the line $y = -x$

(2)

12. To cook rice

the number of cups of rice (x) : the number of cups of water (y) = 4 : 5

(a) Use this information to draw a graph to show the relationship between the number of cups of rice and the number of cups of water needed to cook rice.



(2)

(b) (i) Find the gradient of the line drawn in part (a).

.....
(1)

(ii) Explain what this gradient represents.

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

13. Solve the following simultaneous equations.

$$4x - 3y = 10$$

$$2x + y = 0$$

.....
(3)

14.

$$a = \frac{v^2}{r}$$

$v = 3.5$ correct to 1 decimal place.

$R = 0.08$ correct to 1 significant figure.

Work out the upper bound for the value of a .

Give your answers to 6 significant figures. You must show all your working.

.....
(4)

15. The mean length of 5 sticks is 4.2 cm.
Nawal measured the length of one of the sticks as 7 cm.

(a) Work out the mean length of the other 4 sticks.

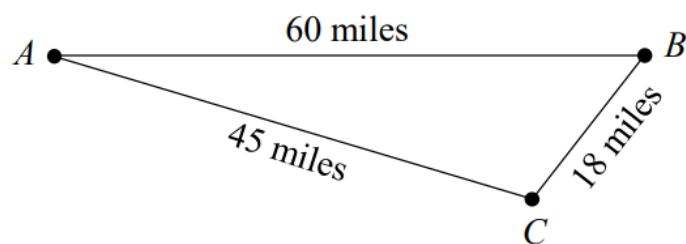
..... cm
(3)

Nawal made a mistake. The stick was not 7 cm long.
It was 17 cm long.

(b) How does this affect your answer to part (a) ?

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

16. A lorry and a car both travel from A to B .



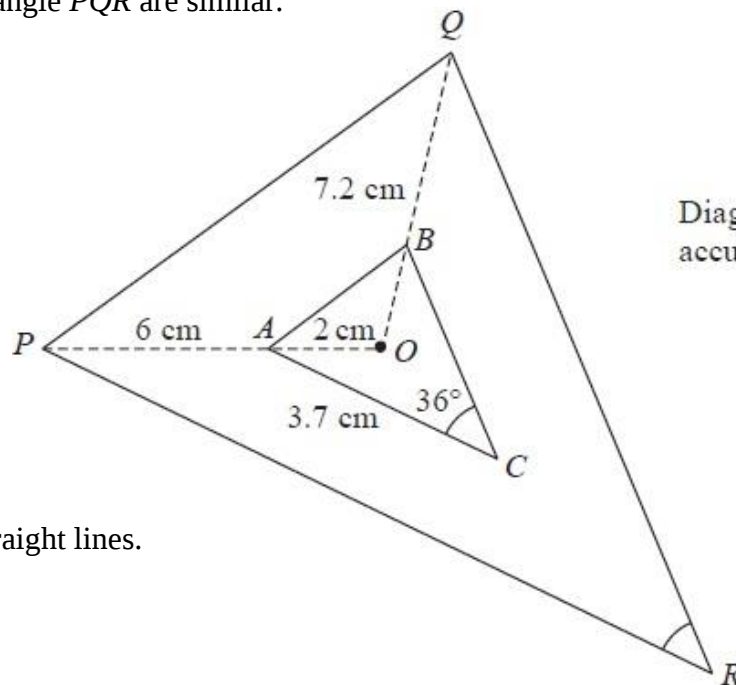
The lorry takes the direct 60-mile route from A to B travelling at an average speed of 50 mph. The car goes from A to B but passes through point C along the route.

Between A and C , the car travels at an average speed of 60 mph. Both vehicles depart A at the same time and arrive at B at the same time.

Work out the average speed of the car between C and B .

..... mph
(4)

17. Triangle ABC and triangle PQR are similar.



OAP and OBQ are straight lines.

$OA = 2$ cm.

$AP = 6$ cm.

$BQ = 7.2$ cm.

$AC = 3.7$ cm.

Angle $C = 36^\circ$

- (a) Find the size of angle R .

.....^o
(1)

- (b) Work out the length of OB .

..... cm
(2)

- (c) Work out the length of PR .

..... cm
(2)

18.

Leave
blank

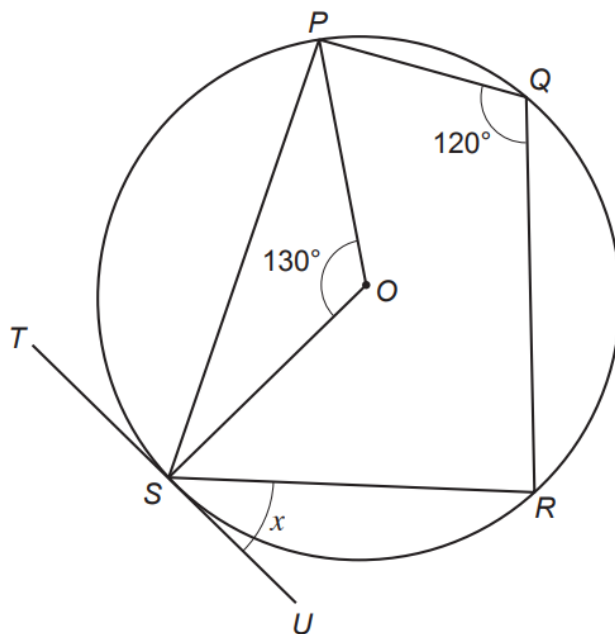


Diagram not drawn to scale

P, Q, R and S are points on a circle with centre O.
The line TU is a tangent to the circle at the point S.
 $\text{POS} = 130^\circ$ and $\text{PQR} = 120^\circ$.

Find the value of x . Give a reason for each step of your answer.

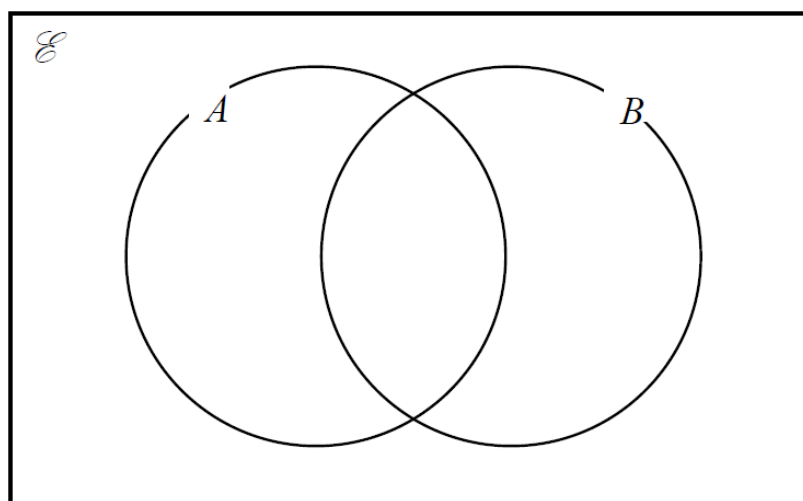
.....
(4)

19. $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$A = \{\text{multiples of } 3\}$

$B = \{\text{factors of } 12\}$

(a) Complete the Venn diagram for this information.



(3)

(b) $C = \{2, 4, 10\}$

Tick ($\checkmark$) the appropriate box

(i) $A \cap C = \emptyset$

True

☐

False

☐

(ii) $C \subset B$

True

☐

False

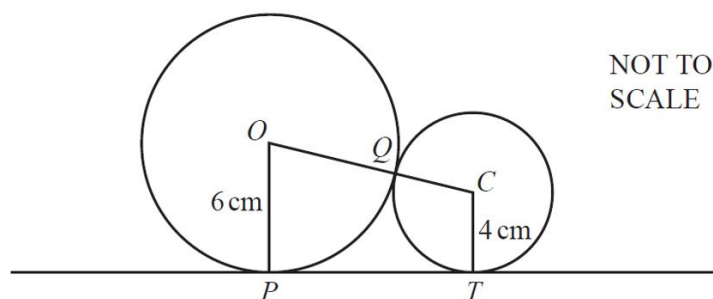
☐

(2)

20. By rationalising the denominator, show that $\frac{6-\sqrt{500}}{\sqrt{5}+1}$ can be written in the form $a\sqrt{5}-b$, where a and b are integers.

.....
(4)

21. Two circles, centres O and C , of radius 6 cm and 4 cm respectively, touch at Q . PT is a tangent to both circles.



- (a) Write down the distance OC .

..... cm
(1)

- (b) Calculate the distance PT , giving your answer to one decimal place.

..... cm
(3)

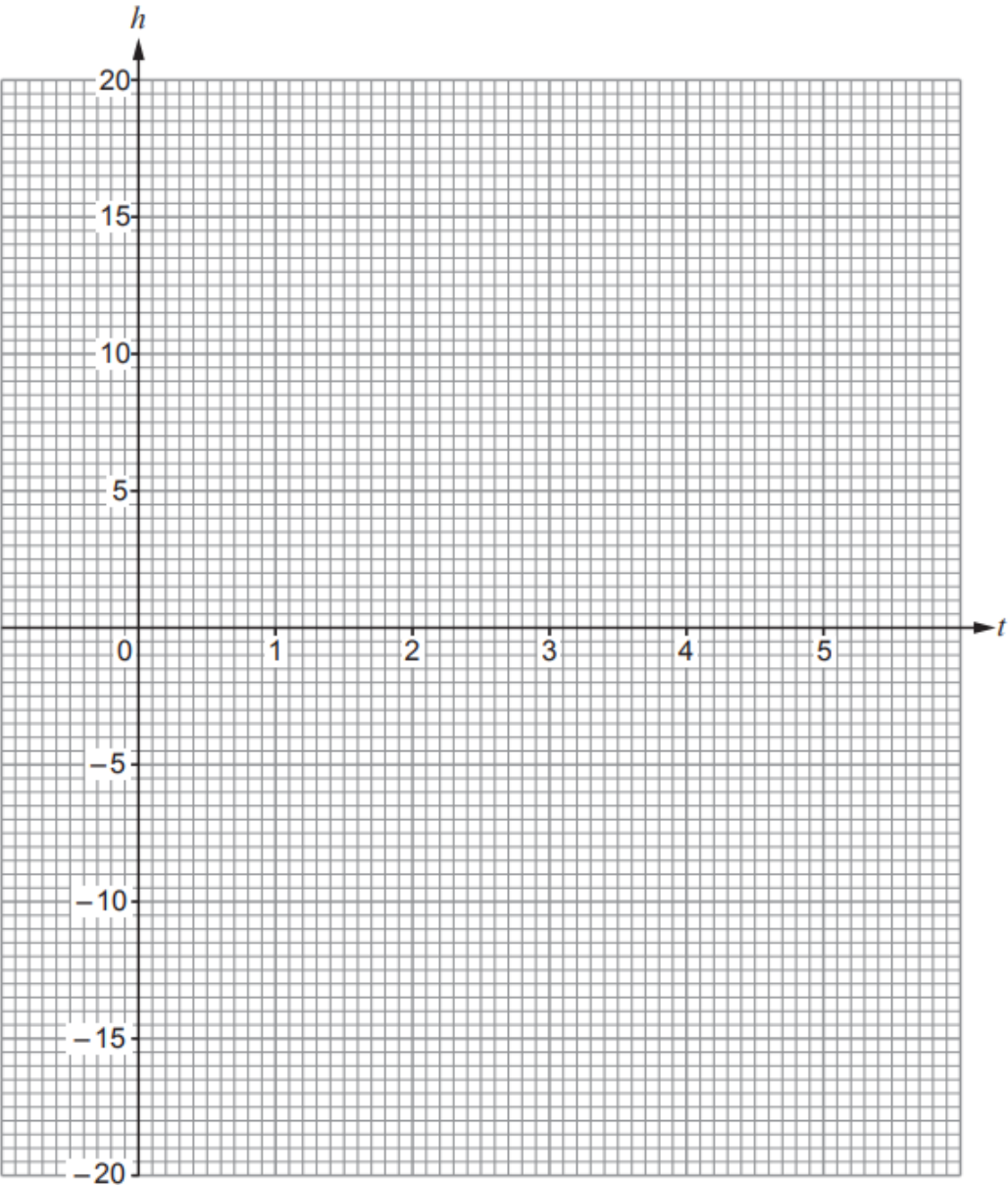
22. The table shows some of the values of $h = -3(t+1)(t-4)$ for $0 \leq t \leq 5$.

t	0	1	2	3	4	5
$h = -3(t+1)(t-4)$		18	18		0	

(a) Complete the table above.

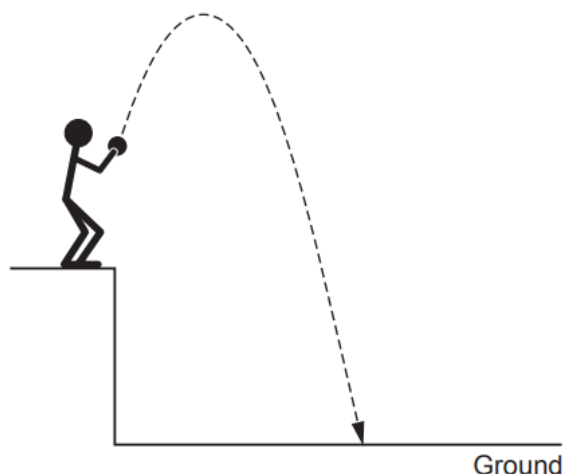
(1)

(b) On the graph paper below, draw the graph of $h = -3(t+1)(t-4)$ for $0 \leq t \leq 5$.



(2)

(c)



Derek throws a ball upwards from a point above horizontal ground.
The height, h metres, of the ball above the ground t seconds after Derek throws it is

$$h = -3(t+1)(t-4)$$

Using your graph in part (b) answer the following questions:

(i) What is the height of the ball above the ground at the start of Derek's throw?

.....
(1)

(ii) How many seconds after Derek throws the ball does it first hit the ground?

.....
(1)

(iii) How many seconds after Derek throws the ball is it at its maximum height?

.....
(1)

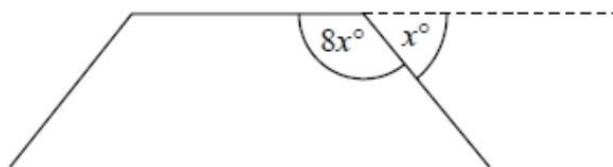
(iv) What is the maximum height of the ball above the ground?

.....
(1)

23. A marine runs 500 metres east and then 600 metres north. If he had run directly from his starting point to his final position, what bearing should he have run on?

.....^o
(3)

24. The diagram shows three sides of a regular polygon.



The size of each exterior angle of the regular polygon is x°
 The size of each interior angle of the regular polygon is $8x^\circ$
 Work out the number of sides the regular polygon has.

.....
(3)

25. This frequency table shows how many books students in Ms. Thornton’s class read last term.

Number of books	Frequency
0	6
1	8
2	11
3	5
4	2
5	1

Find:

(a) the median number of books read,

.....
(2)

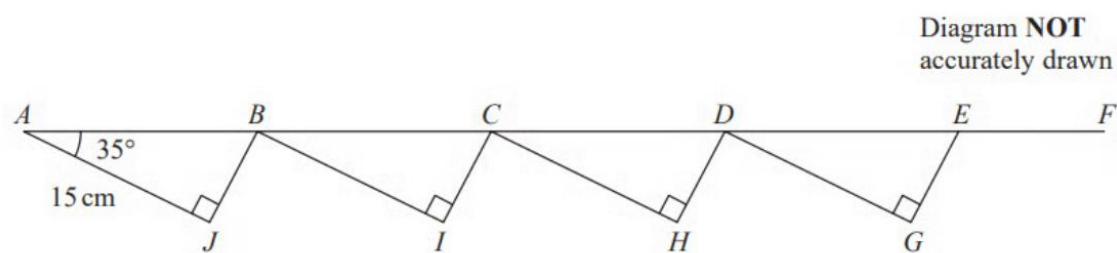
(b) the interquartile range,

.....
(3)

(c) the range

.....
(1)

26. The diagram shows four congruent right-angled triangles ABJ , BCI , CDH and DEG . The diagram also shows the straight line $ABCDEF$.



$AJ = 15\text{cm}$
 $\text{Angle } BAJ = 35^\circ$
 $AF = 80\text{cm}$

Work out the length of EF .
 Give your answer correct to 3 significant figures.

.....
 (4)

27. The straight line L_1 has the equation $6y = 25 - 9x$
The line L_1 passes through the point A with coordinates (k, k) .

(a) Work out the value of k .

$k = \dots\dots\dots$
(2)

The point B has coordinates $(7.5, 8)$
The straight line L_2 is perpendicular to line L_1 and passes through point B .

(b) Work out the equation of the line L_2

$\dots\dots\dots$
(4)

TOTAL FOR PAPER IS 120 MARKS

END OF PAPER