FOUNDED 1900
THE ENGLISH SCHOOL
A SECOND CENTURY OF EXCELLENCE

YEAR 3 MID-PROGRAMME ENTRY EXAMINATIONS 2019

MATHEMATICS **SATURDAY 1ST OF JUNE 2019**

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 24 questions.

There are 16 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.

NAME: _____MARK:_____

1. The population of birds in the Boreal forest is 35000.
   12% of the birds are swans, 26% of the birds are parrots, 50% of the remaining birds are ducks, and the rest are pigeons.

   i) Calculate how many pigeons there are in the boreal forest.
   Show all your steps.

…….....(3)

   ii) Write down the percentage of the birds which are ducks.

…….....(1)

   iii) It is estimated that the number of birds in the boreal forest will increase to 36050 in the next year. Calculate the percentage increase of the birds.
   Show all your steps.

…….....(2)

TOTAL FOR Q1 = 6

2. A bag of fruit contains a total of 90 oranges and apples. Oranges and apples are in the ratio 2 : 13

i) Calculate how many oranges and how many apples there are in the bag.
Show all your steps.

…….....(3)

ii) One fruit is chosen at random from the bag.
What is the probability of choosing an orange?
Give your answer as a simplified fraction.

…….....(1)

TOTAL FOR Q2 = 4

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3. If I spin a fair, five-sided spinner 150 times, how many times should I expect the spinner to land on each side?
Show all your steps.

…….....(2)
TOTAL FOR Q3 = 2

4. This question is about straight lines.

i) Complete the following tables: (2)

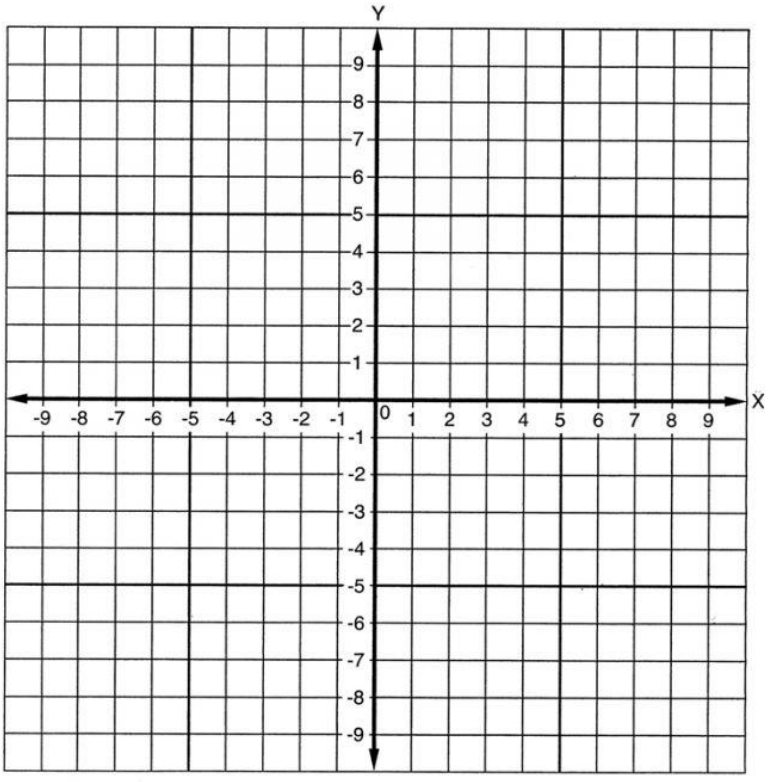
LINE 1: **y = - 2x + 5**

x	**- 2**	**0**	**3**	**6**
y = - 2x + 5				

LINE 2: **y = x – 1**

x	**-8**	**0**	**3**	**9**
y = x - 1				

ii) Plot Line 1 and Line 2 on the same graph paper below. (2)



iii) Write down the solution to the simultaneous equations: (1)

y = -2x + 5 and y = x – 1

x =…….....

y =…….....

TOTAL FOR Q4 = 5

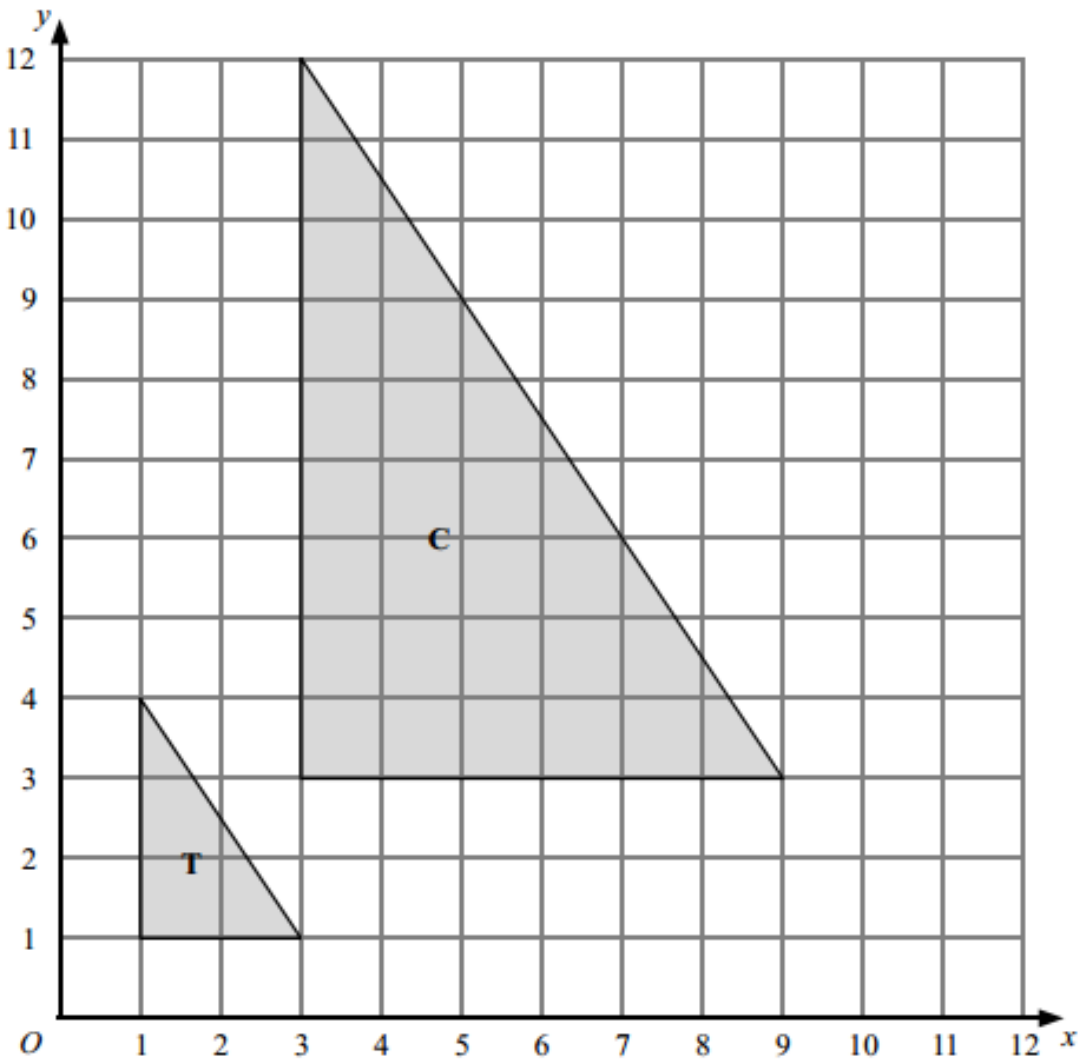
5. The diagram below shows the enlargement of triangle T from triangle C.

i) Write down the scale factor of enlargement.

…….....(1)

ii) Find the centre of enlargement.

…….....(1)



TOTAL FOR Q5 = 2

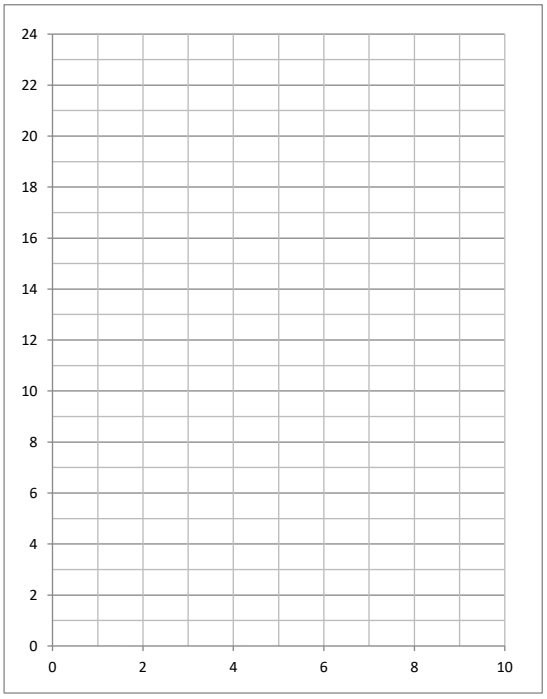
6. This question is about proportion.

i) The table below shows the variables x and y.

x	1	2	4	6	9
y	2	4	8	12	18

Is there a direct or an inverse proportion between x and y? Explain your answer. (2)

ii) Plot the following points on the graph paper below and connect them. (1)



iii) Work out a formula of y in terms of x. Show all your steps.

…….....(2)

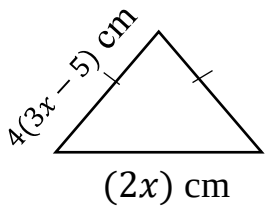
iv) Use the formula from iii) to find the value of y when $x = 12$.

.

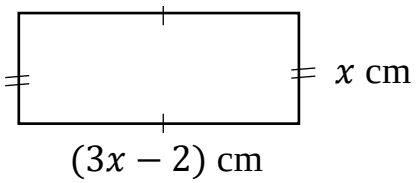
…….....(2)

TOTAL FOR Q6 = 7

7.



ISOSCELES TRIANGLE



RECTANGLE

i) Write down a simplified expression in terms of *x* for the perimeter of the isosceles triangle.

…….....(2)

ii) Write down a simplified expression in terms of *x* for the perimeter of the rectangle.

…….....(2)

iii) Given that the perimeter of the isosceles triangle is equal to the perimeter of the rectangle, form an equation and solve it to find the value of *x*.

Show all your steps.

…….....(3)

TOTAL FOR Q7 = 7

8. Solve the following algebraic equations for *x*.
Show all your steps. Give your answers as simplified fractions, where necessary.

i) $\frac{x-3}{4} = \frac{3x-2}{5}$

…….....(3)

ii) $12(2-4x) - 2 = 4(2x+9)$

…….....(3)

TOTAL FOR Q8 = 6

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9. Simplify the following algebraic expressions.
Show all your steps. Give your answer in factorised form, where necessary.

i) $3x^2 + 5x + 2x^2 - x - x^2 =$

…….....(2)

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

…….....(3)

iii) $\frac{6ac^2}{a} \div \frac{3a^2}{ac} =$

…….....(3)

TOTAL FOR Q9 = 8

10. Fully factorise the following algebraic expressions.
Show all your steps.

i) $x^2 + 5x - 24$

…….....(2)

ii) $x^2 + 12x + 11$

…….....(2)

iii) $15a^2b + 9ab^2$

…….....(2)

iv) $9x^2 - 25$

…….....(2)

TOTAL FOR Q10 = 8

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11. Make the letter in the bracket, the subject of the formula.
Show all your steps.

i) $2(x - 9) = 4y - 1 \qquad [y]$

…….....(3)

ii) $Q = \frac{p-1}{3} \qquad [p]$

…….....(2)

iii) $p = 2L^2 + 2W \quad [L]$

…….....(3)

TOTAL FOR Q11 = 8

12. When $u = 5$ and $v = -2$, find the value of T:

$$T = \frac{u + 3v}{uv}$$

…….....(3)

TOTAL FOR Q12 = 3

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13. Complete the tables below accordingly:

ORDINARY FORM	**STANDARD FORM**
1560	
	3.7×10^{-4}

NUMBER	**2 DECIMAL PLACES**
46.799	
0.0723	

TOTAL FOR Q13 = 4

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14. This question is about upper and lower bounds.

Given that: $a = 4,$ *to the nearest unit*
$b = 0.32,$ *to 2 decimal places*
$c = 7000,$ *to the nearest thousand*

Calculate the upper bound of *y*. Show all your steps. Give your answer correct to 2 decimal places.

$$y = \frac{2c}{a - b}$$

…….....(4)
TOTAL FOR Q14 = 4

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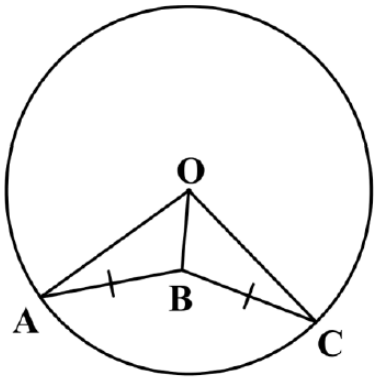
15. A car is originally worth EUR 15000. After one year, its value drops by 20%.
The following year, it drops by a further 12%.
Calculate the value of the car after these two years.

…….....(3)

TOTAL FOR Q15 = 3

16. Given that *O* is the centre of the circle and *AB* = *BC*, prove that angle *OBA* is equal to angle *OBC*.
Give reasons for each step of your proof.



TOTAL FOR Q16 = 5

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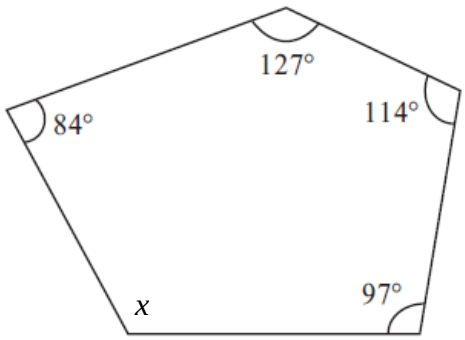
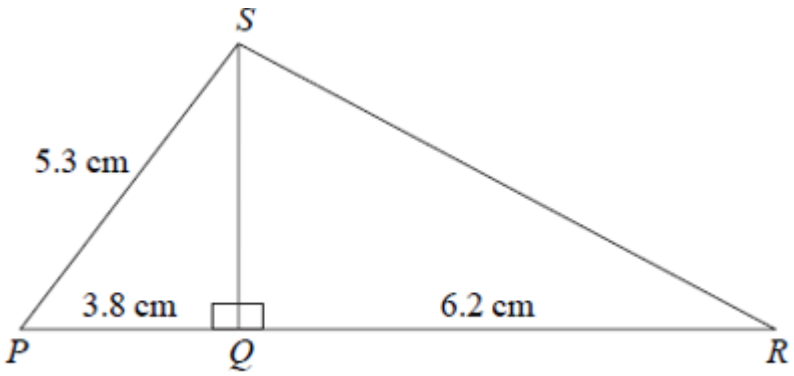
17. The following shape is an irregular pentagon.
Calculate the value of angle *x*.
Show all your steps. (Diagram not drawn to scale)



…….....(3)

TOTAL FOR Q17 = 3

18. Calculate the value of side RS, giving your answer correct to 3 significant figures.
Show all your steps.



…….....(4)

TOTAL FOR Q18 = 4

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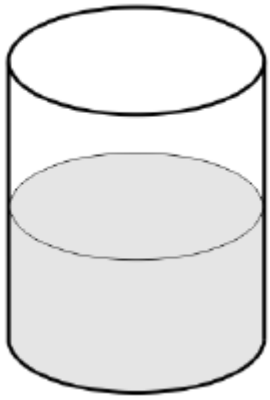
19. This question is about the following cylinder, with base diameter 100 cm and height 250 cm.
The cylindrical tank is half-full of oil.
How many Litres of oil are there in the tank? Give your answer to the nearest Litre.
Show all your steps.
(Diagram not drawn to scale)



…….....L (5)

TOTAL FOR Q19 = 5

20. A solid cube has a mass of 9.8 g.
It has a density of 0.92 g/cm^3.
Find the total surface area of the cube.
Give your answer correct to 1 decimal place.

…….....(5)

TOTAL FOR Q20 = 5

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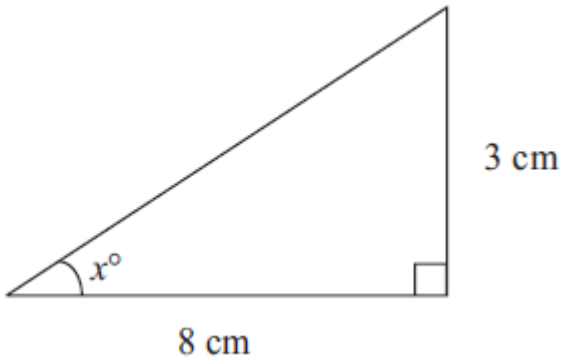
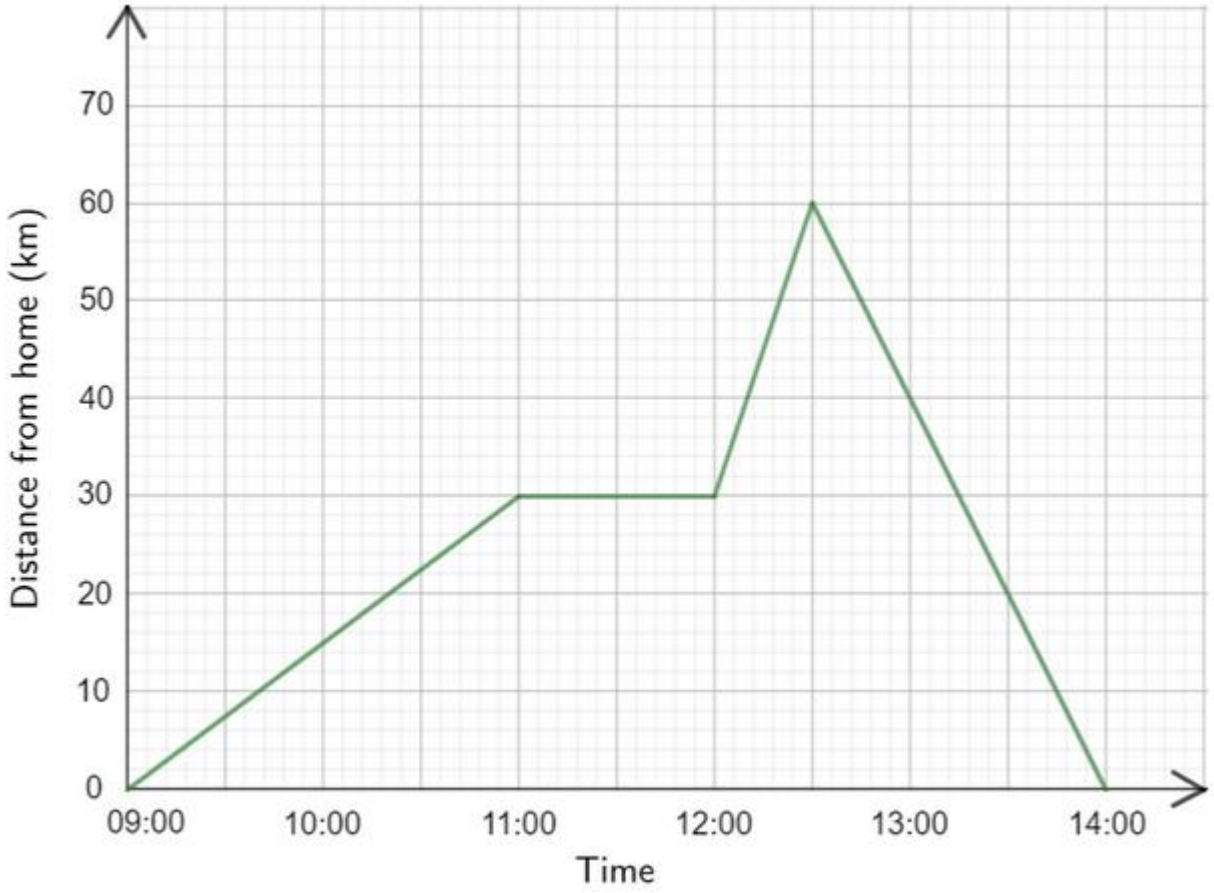
21. Calculate the value of the angle marked *x*, correct to 3 significant figures. Show all your steps.



…….....(3)

TOTAL FOR Q21 = 3

22. The distance-time graph below shows Sally's journey on a particular day.
Sally left home at 09:00 for a road trip. She stopped at the coffee shop for an iced coffee.
Then she continued her journey until she reached her destination at 12:30.
She briefly took some photos of the scenery and drove back home at a steady speed.



i) For how many minutes did Sally stop at the coffee shop? ……minutes (1)

ii) Find her distance from home at 13:30. ...……km (1)

iii) Between which two times of Sally's journey was she travelling the fastest?
Justify your answer with calculations.

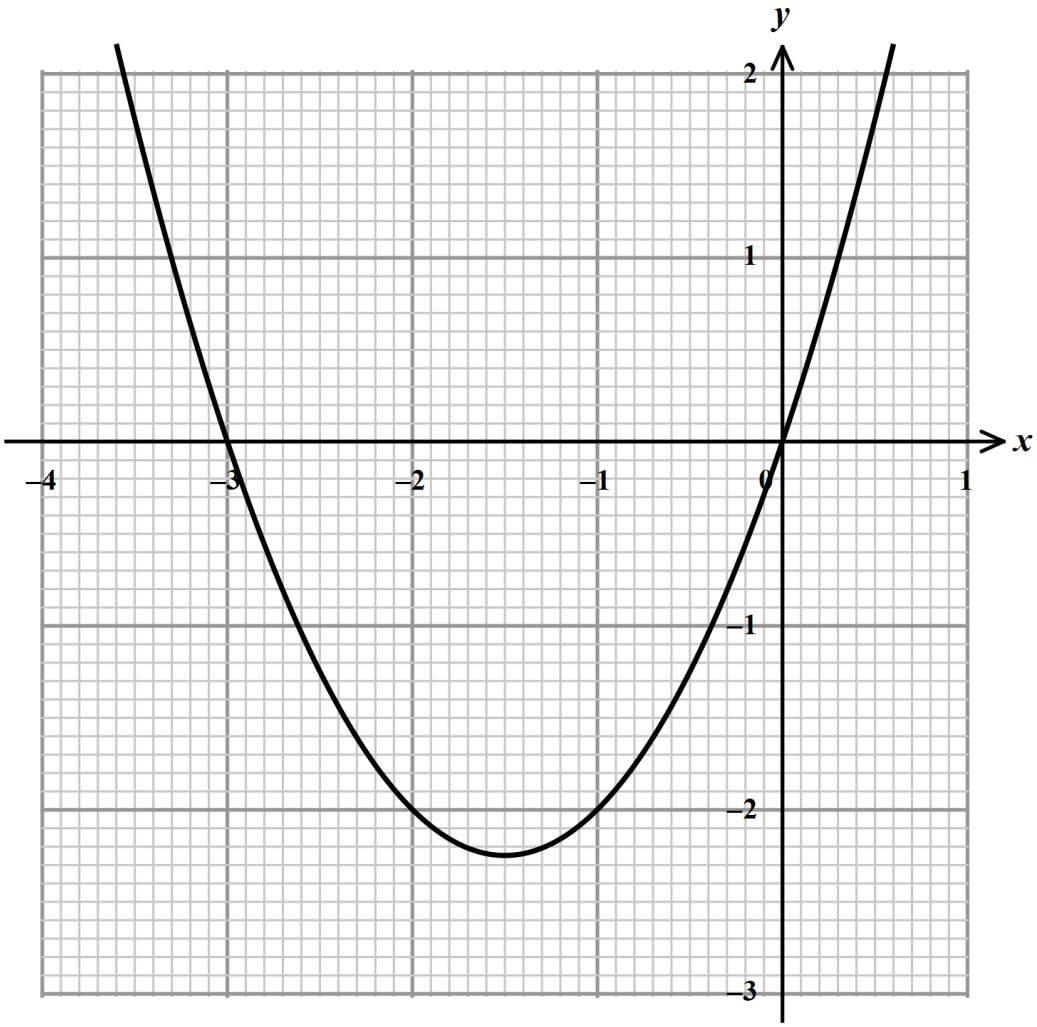
…….....(3)

iv) Calculate Sally's average speed (excluding stops).

…….....(2)

TOTAL FOR Q22 = 7

23. The graph shows the curve with equation $y = x^2 + 3x$



Use the graph to solve:

i) $x^2 + 3x = 0$

…… (2)

ii) $x^2 + 3x = -2$

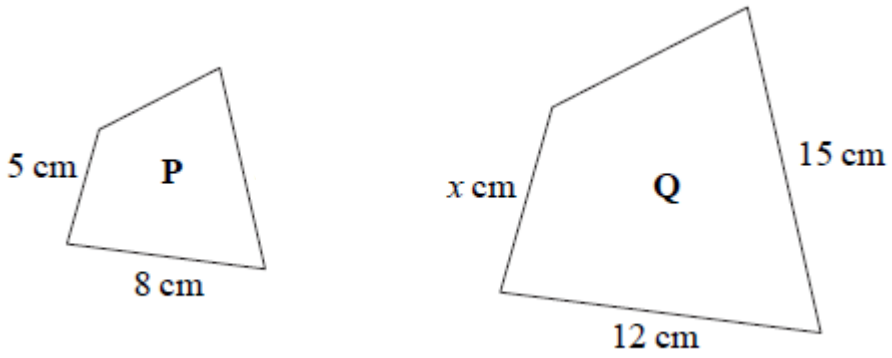
…… (2)

iii) $x^2 + 3x = 1$

…… (2)

TOTAL FOR Q23 = 6

24. The shapes P and Q are mathematically similar. (Diagrams not drawn to scale)



i) Calculate the value of side *x*. Show all your steps.

…….....(2)

ii) The area of shape *P* is 60 cm^2. Calculate the area of shape Q.

…….....(3)

TOTAL FOR Q24 = 5

TOTAL MARKS = 120
END OF PAPER