FOUNDED 1900
THE ENGLISH SCHOOL
A SECOND CENTURY OF EXCELLENCE

YEAR 2 MID-PROGRAMME ENTRY EXAMINATIONS 2017

MATHEMATICS **SATURDAY 3rd JUNE 2017**

Time allowed: 2 hours

Instructions to candidates

Answer the questions in the spaces provided.
Without sufficient working, correct answers may be awarded no marks.

Information to candidates

This paper has 28 questions.
There are 18 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)**

Calculators are not allowed.

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

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

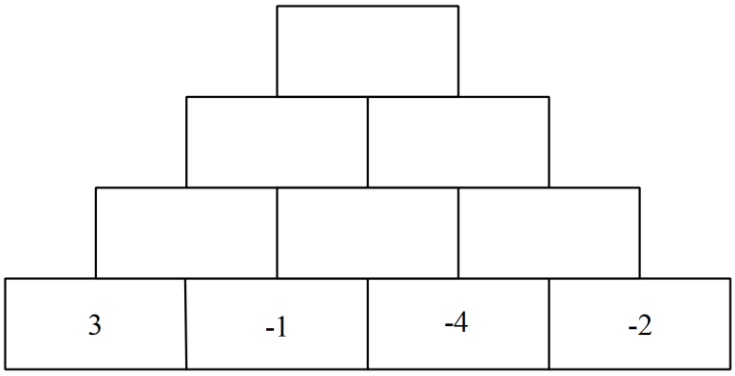
1. In a magic square, all the rows, columns and diagonals add up to the same total. Complete the following square.

0		-8
	-12	
		-24

(5)

(Total for Question is 5 marks)

2. In the following brick wall, work out the number to write in an empty brick by **multiplying** the numbers in the two bricks below it. Complete the brick wall below.



(3)

(Total for Question is 3 marks)

3. Calculate the following, showing clearly all your workings:

(a) $-2 + 14 \div (-2) \times 3 - 1$

(2)

(b) $(-2 - 3)^2 \times (2 - 8)^2$

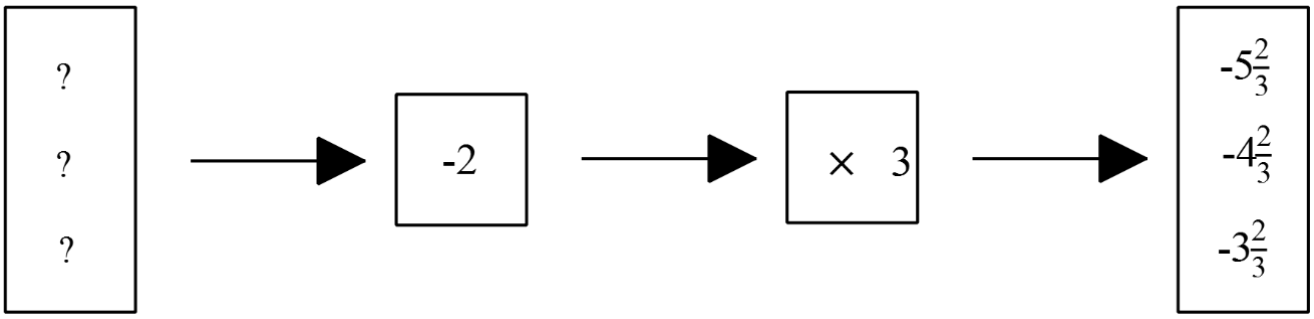
(2)

(c) $0.47 \div 10^4$

(1)

(Total for Question is 5 marks)

4. (a) Use the inverse operation to work out the inputs for each of these functıon machines.



(3)

(b) Write down the next term of the following sequence.

$4, 1, -3.5, -10.25, ...$

.....

(3)

(c) Work out the *n*-term of the following sequence.

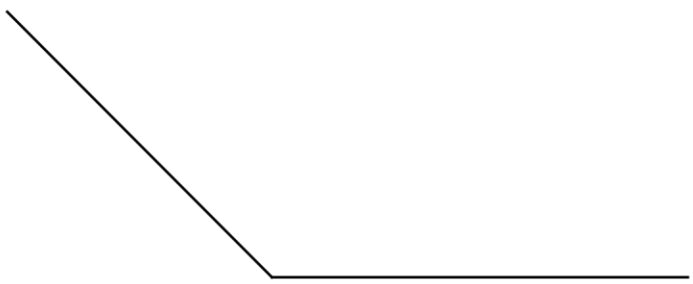
5, 11, 17, 23, …

.....

(2)

(Total for Question is 8 marks)

5. Use a ruler and a pair of compasses to construct the angle bisector of the following obtuse angle.
You must show all construction lines.



(2)

(Total for Question is 2 marks)

6. Expand the brackets and simplify each expression as much as possible.

(a) $4x - 3(x - 9)$

(2)

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

(2)

(c) $\frac{a^2}{2}(4a^2 - 3ab + 6b^2)$

(3)

(Total for Question is 7 marks)

7. Simplify these expressions as much as possible.

(a) $a \times b \times 2a \times 3a \times 3b \times 4a \times 3$

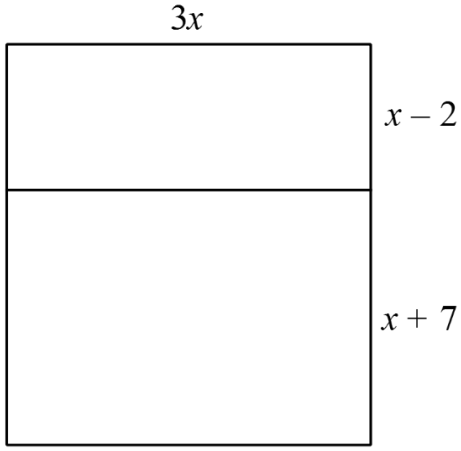
(2)

(b) $(5x)^3 - \frac{1}{6}x \times 3x \times 4x$

(2)

(Total for Question is 4 marks)

8. Here is a rectangle.



(a) Work out the perimeter of the shape in the form of $10(\ldots\ldots)$.

(2)

(b) Write down an expression for the area of the top rectangle.

(1)

(c) Write down an expression for the area of the bottom rectangle.

(1)

(d) Write down an expression for the area of the whole shape in the form of $3x(\ldots\ldots)$.

(2)

(Total for Question is 6 marks)

9. In the isosceles triangle ABC, which is shown below, you are given that:
AB = AC
angle B = *(3x + 32)°*
angle C = *(87 − 2x)°*
Work out the value of x. Show clear algebraic working.

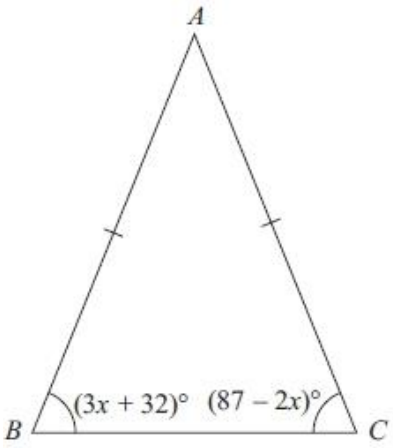


Diagram **NOT** accurately drawn

(2)

(Total for Question is 2 marks)

10. Solve the following equations

(a) $\frac{x}{2} - 3 = 2$

(2)

(b) $4x - 3(3x - 1) = 15$

(2)

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

(2)

(Total for Question is 6 marks)

11. Lisa sees a dress in a sale.
The normal price of the dress is $45
The price of the dress is reduced by 12% in the sale.

(a) Work out the price of the dress in the sale.

$.....

(2)

(Total for question = 2 marks)

12. Here is a number machine.

(a) Work out the output when the input is –3

.....

(1)

(b) Work out the input when the output is – 27

.....

(1)

(Total for question = 2 marks)

13. Here are the temperatures in Madrid at midnight for one week.

−7°C −6°C −1°C 4°C 0°C 0°C 3°C

(a) Work out the mean temperature.

.....°C

(1)

(b) Work out the range.

.....°C

(1)

(Total for question = 2 marks)

14. Put brackets in the following to make the calculation correct.

(i) $2 + 4 \times 6 - 3 = 33$

(ii) $2 + 4 \times 6 - 3 = 14$

(2)

(Total for question = 2 marks)

15. Some students take part in a quiz.

They all start with a score of zero.

When a student gives a correct answer, 2 points are added to the student's score.

When a student gives a wrong answer, 1 point is subtracted from the student's score.

(a) Write down an expression for the total number (T) of points if a student answer x correct answers and y wrong answers?

.....

(1)

Malik gives the correct answer to 14 questions and the wrong answer to 5 questions.

(b) How many points does Malik have?

.....

(2)

(Total for Question is 3 marks)

16.

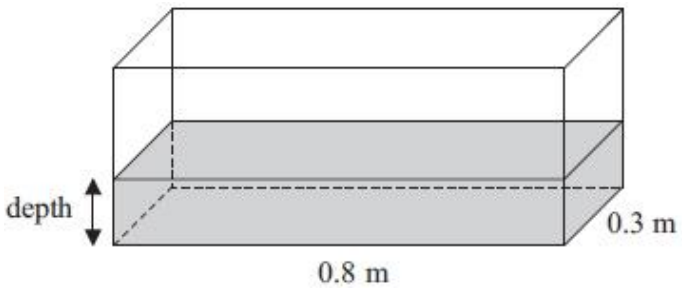


Diagram **NOT** accurately drawn

A fish tank is in the shape of a cuboid.
The length of the fish tank is 0.8 m and the width is 0.3 m.
The volume of water in the fish tank is 108 litres.
Work out the depth of the water in the fish tank.

.....m

(Total for question = 3 marks)

17. At a school fete, Colin is selling drinks.
He sells tea, coffee and juice.
Marion is selling food.
She sells burgers and pizzas.

Each coffee costs x p. A tea costs 10p less than a coffee. A juice costs 50p more than a tea.

(a) Write an expression for the price of a juice in terms of x.

(2)

(b) Caroline buys two coffees and two juices and pays £2.80. Form an equation in x and solve it to find the price of a coffee.

(3)

Each burger costs £1.65.
Each pizza costs £3.10.

Caroline buys 3 burgers and 4 pizzas.

She pays with a £20 note.

(c) Work out how much change she should get.

£ .....

(2)

(Total for question = 7 marks)

18.

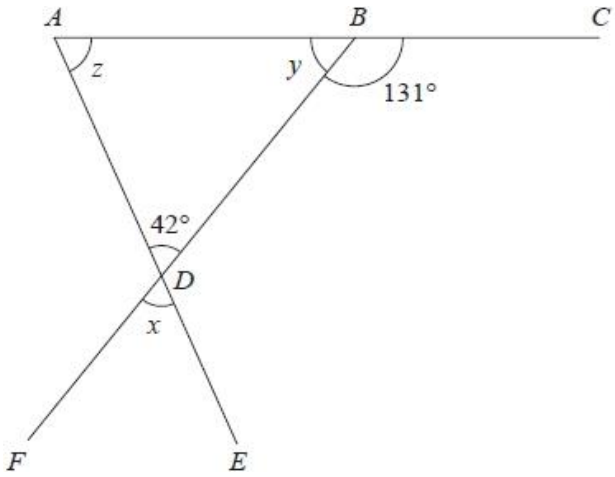


Diagram **NOT** accurately drawn

ABC, *BDF* and *ADE* are straight lines.

(a) Write down the size of angle *x*.

..... °

(1)

(b) Work out the size of angle *y*.

..... °

(1)

(c) Work out the size of angle *z*.

..... °

(1)

(Total for question = 3 marks)

19. Here are two road signs.

(A)

(B)

(a) How many lines of symmetry does sign (A) have?

.....

(1)

(b) Write down the order of rotational symmetry of sign (B).

.....

(1)

(c) Change 3.8 m^2 to cm^2.

.....cm

(1)

(d) Change 300 m to kilometres.

.....km

(1)

(e) Round off the number 2.477 to 1 decimal place

.....

(1)

(f) Round off the number 189.951 to 1 decimal place

.....

(1)

(g) Write 16% as a decimal.

.....

(1)

(h) Write 16% as a fraction.
Give your fraction in its simplest form.

.....

(2)

(i) Three consecutive numbers have a sum of 216. Using algebra find the largest number.

.....

(2)

(Total for question = 11 marks)

20.

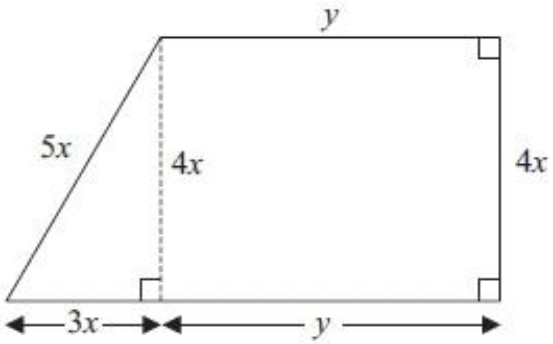


Diagram **NOT** accurately drawn

The shape in the diagram is made from a rectangle and a right-angled triangle.
The diagram shows, in terms of x and y, the lengths, in centimetres, of the sides of the rectangle and of the triangle.

(a) Find an expression for the perimeter, P cm, of the shape

P = ...

(2)

(b) Work out the value of P when $x = 3$ and $y = 7$

P = ...

(1)

(Total for question = 4 marks)

21. A school has 1200 pupils and 60 teachers.

(a) Find the ratio of the number of pupils to the number of teachers.
Give your ratio in the form n : 1

..... : 1

(1)

In Year 7 at the school, the ratio of the number of pupils who play Guitar to the number of pupils who play Piano is 3 : 2

(b) Work out the number of pupils in Year 7 who play guitar if 106 pupils in Year 7 play Piano.

.....

(2)

(Total for Question is 3 marks)

22. The diagram shows a prism.
The cross-section of the prism is an isosceles triangle.
The lengths of the sides of the triangle are 13 cm, 13 cm and 10 cm.
The perpendicular height of the triangle is 12 cm.
The length of the prism is 8 cm.

Work out the total surface area of the prism.

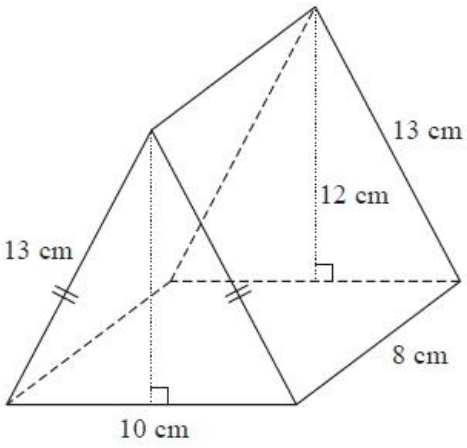
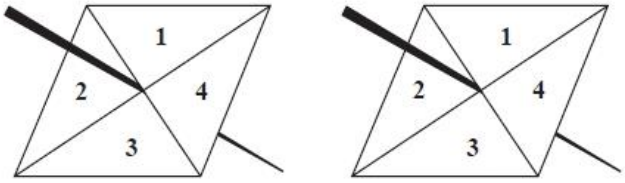


Diagram **NOT** accurately drawn

..... cm^2

(Total for Question is 3 marks)

23. Here are two fair spinners.



Spinner **A** Spinner **B**

Shola spins each spinner once.

The score is the **sum** of the number spinner **A** lands on and the number spinner **B** lands on.

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

Spinner B / Spinner A	**1**	**2**	**3**	**4**
1				
2				6
3		5		
4			7	

(2)

(b) Find the probability that the score will be 3.

.....

(1)

(c) Find the probability that the score will be a prime number.

.....

(1)

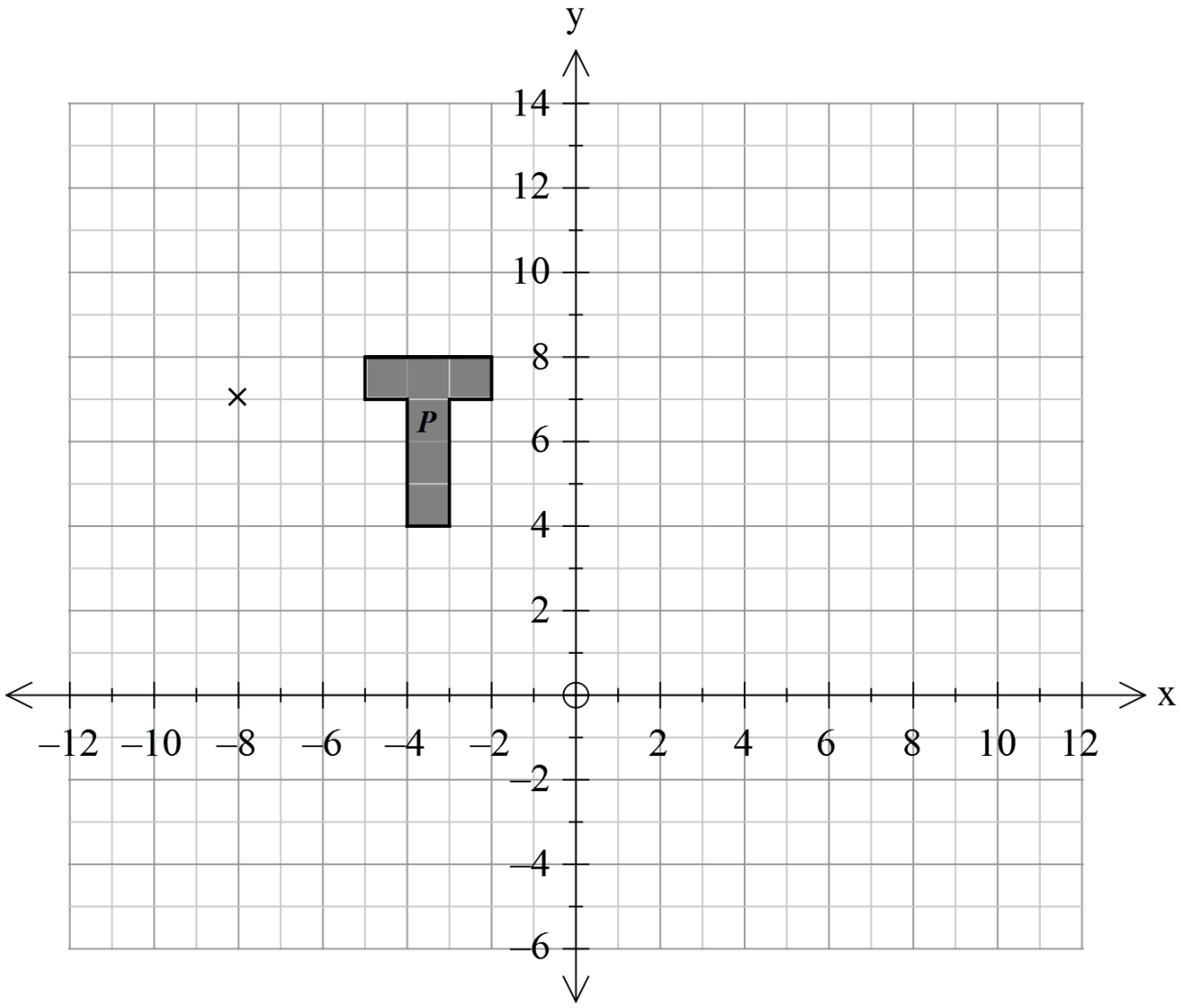
(d) Find the probability that the score will **not** be 3.

.....

(1)

(Total for question = 5 marks)

24.



(a) On the grid, enlarge shape **P** with scale factor 2 and centre (−8, 7).
Label the new shape **Q**.

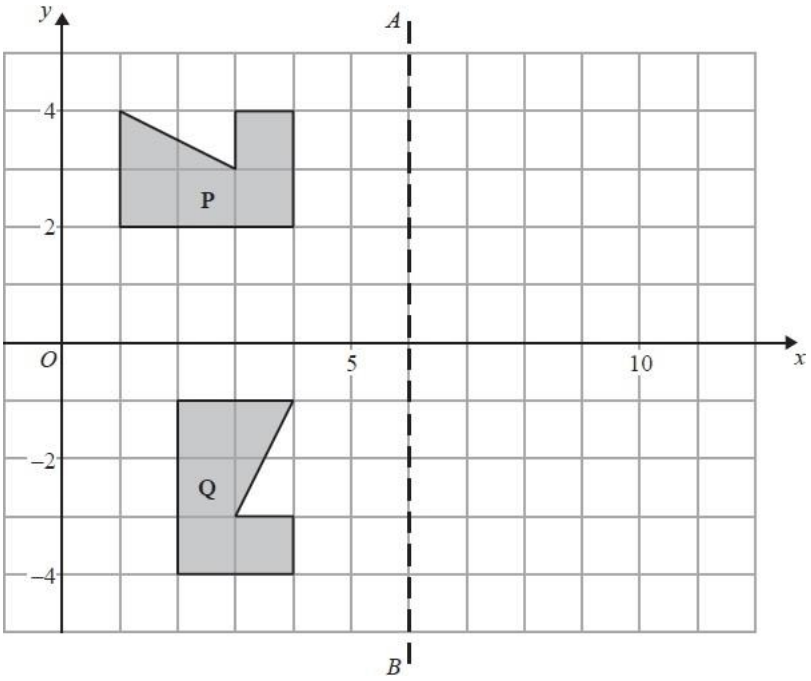
(2)

(b) On the grid, rotate shape P through 90° anti-clockwise about the point (−8, 7).
Label the new shape **R**.

(2)

(Total for question = 4 marks)

25. The diagram shows a shape **P**, a shape **Q** and a line *AB*.



(a) Write down an equation of the line *AB*.

.....

(1)

(b) Draw the image of shape **P** after a reflection in the line *AB* and label the new shape **T**.

(2)

(c) Translate **Q** 5 units right and 1 unit down and label the new shape **R**.

(3)

(Total for Question is 6 marks)

26. Here is a prism.

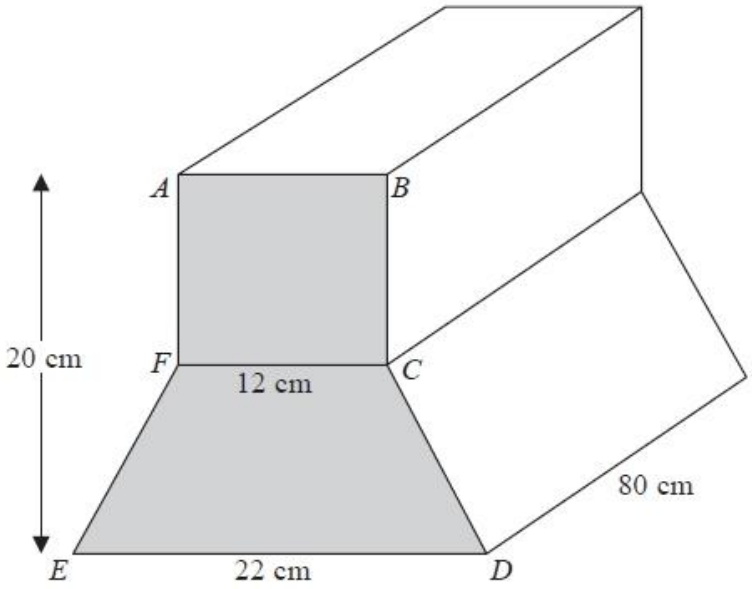


Diagram **NOT** accurately drawn

ABCDEF is the cross section of the prism.

ABCF is a square of side 12 cm.

FCDE is a trapezium.

ED = 22 cm.

The height of the prism is 20 cm.

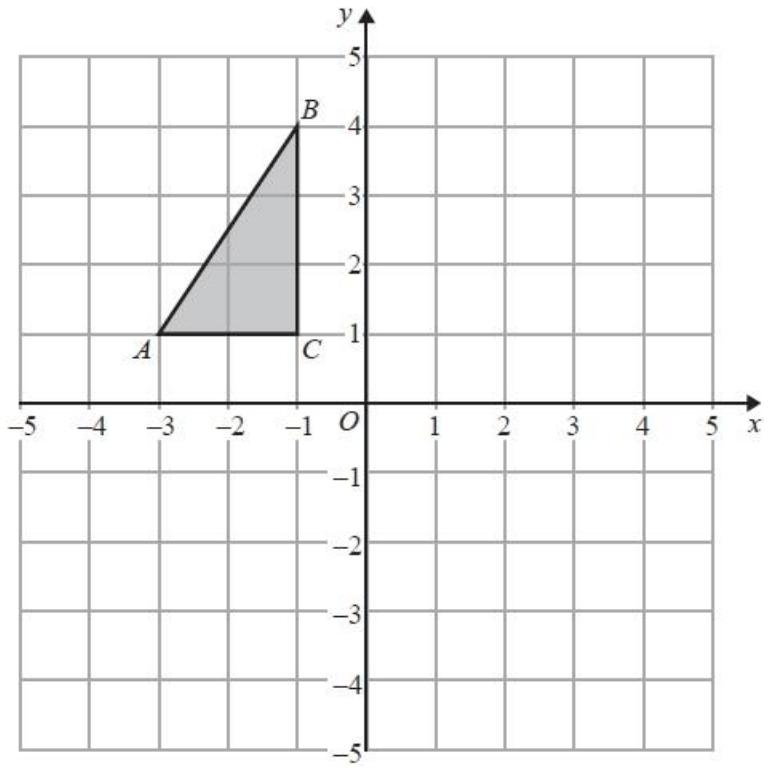
The length of the prism is 80 cm.

Work out the total volume of the prism.

..... cm^3

(Total for question = 4 marks)

27. The diagram shows triangle *ABC*.



(a) Write down the coordinates of point *A*.

(..... , ...)

(1)

(b) On the same grid, draw the graph of $y = 2x - 1$ by completing the following table.

x	-2	-1	0	1	2
y					

(2)

(c) Does the point (2,5) lie on the line $y = 2x - 3$? Explain your answer?

(1)

(Total for question = 4 marks)

28.

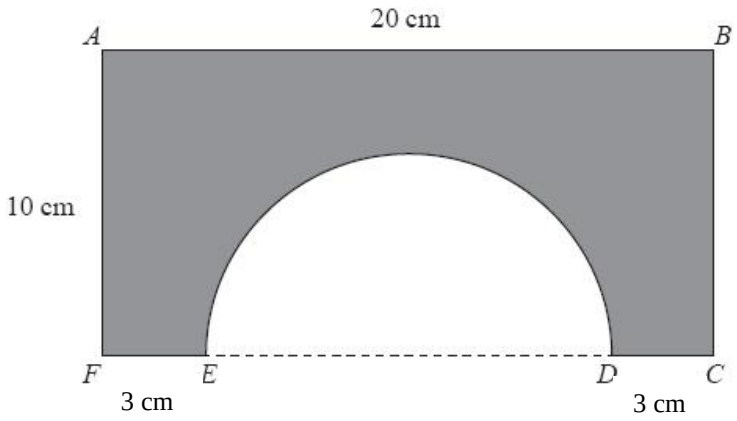


Diagram **NOT** accurately drawn

The shaded shape is made by cutting a semicircle from a rectangular piece of card, *ABCF*, as shown in the diagram.

FEDC is a straight line.
The centre of the semicircle lies on *ED*.
AF = *BC* = 10 cm, *AB* = 20 cm, *FE* = *DC* = 3 cm.

(a) Work out the perimeter of the shaded shape by using $\pi = \frac{22}{7}$.

..... cm

(2)

(b) Work out the area of the shaded shape by using $\pi = \frac{22}{7}$.

..... cm^2

(3)

(Total for question = 5 marks)

[TOTAL MARKS FOR PAPER = 120]

THE END