YEAR 3 MID-PROGRAMME ENTRY EXAMINATIONS 2018

MATHEMATICS   **SATURDAY 2nd JUNE 2018**
Time allowed: 2 hours

Instructions to candidates

Answer the questions in the spaces provided – there may be more space than you need.
Without sufficient working, correct answers may be awarded no marks.

Information to candidates

This paper has 30 questions.
There are 22 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 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.

1. (a) (i) Write 40000000 in standard form.

....

(ii) Write 3×10^{-5} as an ordinary number.

…………….....................................

(2)

(b) Without using a calculator, work out the value of

$$3 \times 10^{-5} \div 40000000$$

Give your answer in standard form.

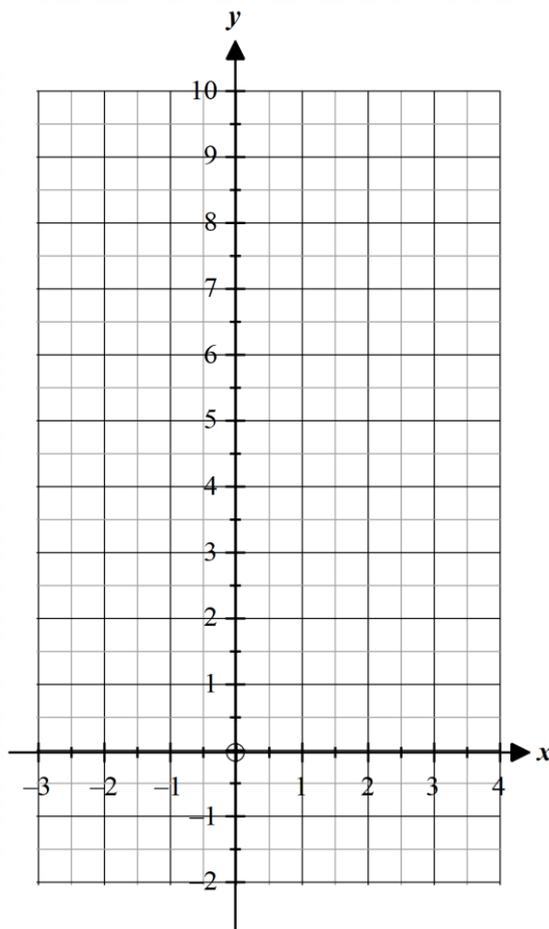You must show all the steps used to work out this value.

………….....................................

(2)
(Total 4 marks)

2. (a) Complete the table of values for $2x + y = 5$

x	-2	-1	0	1	2	3
y	9					

(2)

(b) On the grid, draw the graph of $2x + y = 5$

(2)
(Total 4 marks)

_____

3. A straight line has equation $y = 5 - 3x$
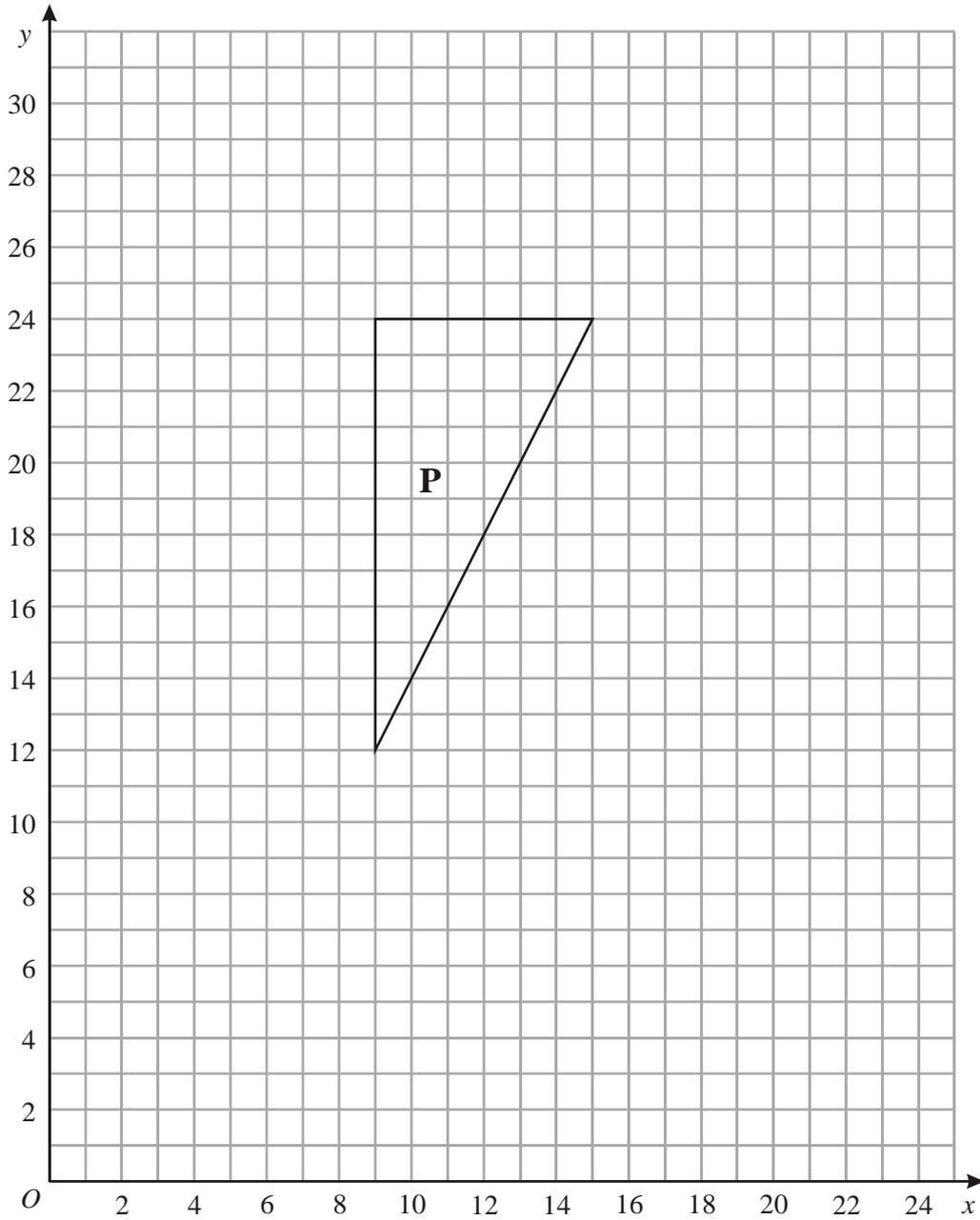
(a) Write down the gradient of the line.

………………………………….

(1)

(b) Write down the coordinates of the point where the line crosses the y axis.

(…… , ……)
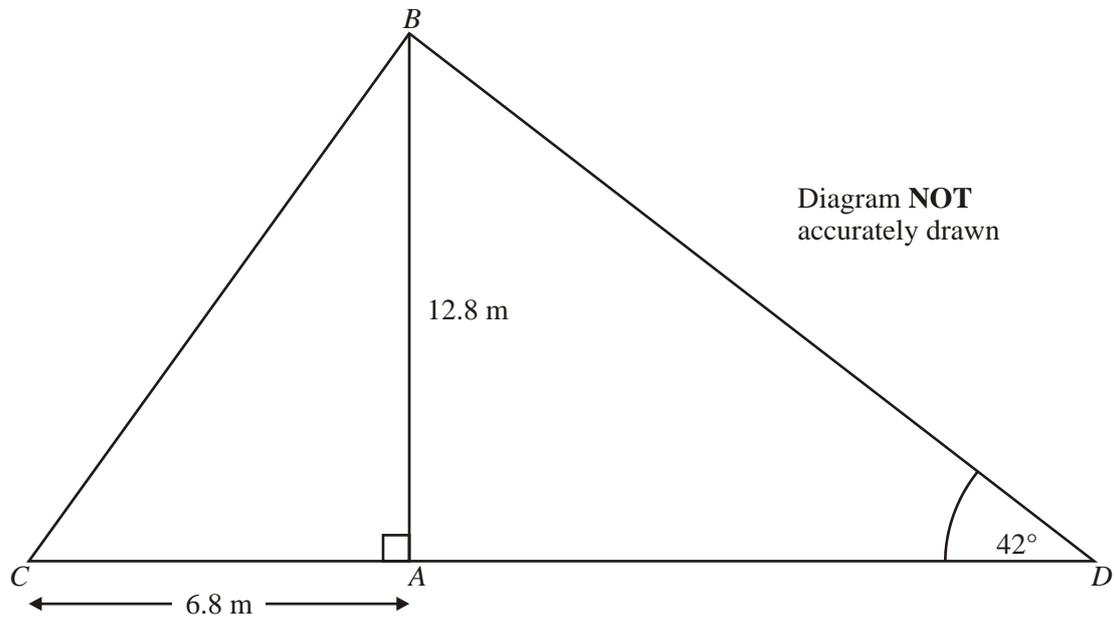
(1)
(Total 2 marks)

_____

4.

On the grid, enlarge triangle **P** by a scale factor of $\frac{1}{3}$, centre (15, 6).

Label the new triangle **R**.

(Total 2 marks)

5. The diagram represents a vertical flagpole, *AB*.
The flagpole is supported by two ropes, *BC* and *BD*, fixed to the horizontal ground at *C* and at *D*.

Diagram **NOT** accurately drawn

AB = 12.8 m.
AC = 6.8 m.
Angle *BDA* = 42°.

(a) Calculate the size of angle *BCA*.
Give your answer correct to 1 decimal place.

.............................°

(3)

(b) Calculate the length of the rope *BD*.
Give your answer correct to 3 significant figures.

.... m

(3)
(Total 6 marks)

6. Joe rolls a 6-sided dice and spins a 4-sided spinner.

The dice is labelled 1, 2, 3, 4, 5, 6

The spinner is labelled 1, 2, 3, 4

Joe adds the score on the dice and the score on the spinner to get the total score.

He records the possible total scores in a table.

		dice					
+		**1**	**2**	**3**	**4**	**5**	**6**
spinner	**1**	2	3	4	5	6	7
	2						
	3						
	4						

(a) Complete the table of possible total scores.

(2)

(b) Write down all the ways in which Joe can get a total score of 5
One of them has been done for you.

(1, 4),………………………………

(2)

(c) Write down all the ways Joe can get a total score of 8 or more.

…………………...

(2)

(Total 6 marks)

7.

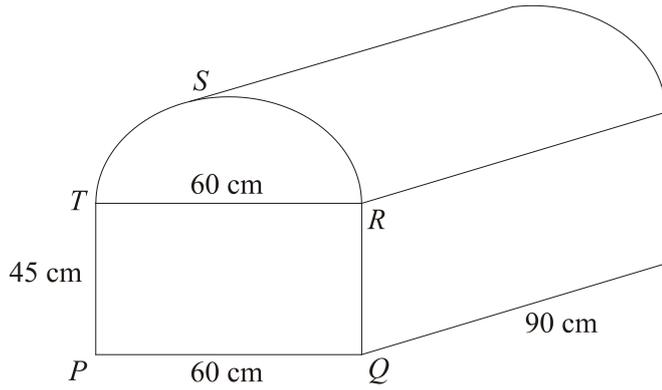Diagram **NOT** accurately drawn

The diagram shows a prism of length 90 cm.
The cross section, *PQRST*, of the prism is a semi-circle above a rectangle.
PQRT is a rectangle.
RST is a semi-circle with diameter *RT*.
PQ = *RT* = 60 cm.
PT = *QR* = 45 cm.

Calculate the volume of the prism.
Give your answer correct to 3 significant figures.

.... cm³

(Total 5 marks)

8. (a) Solve $20y - 16 = 18y - 9$

$y =$ ....

(3)

(b) Solve $\dfrac{40 - x}{3} = 4 + x$

$x =$ ....
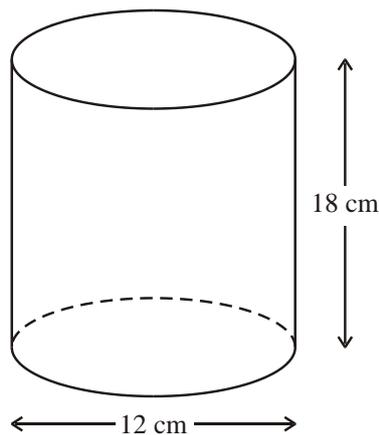
(3)
(Total 6 marks)

_____

9.

Diagram **NOT** accurately drawn

The diagram shows a solid cylinder.
The cylinder has a diameter of 12 cm and a height of 18 cm.

Calculate the **total** surface area of the cylinder.
Give your answer in terms of π.

………………………… cm^2

(Total 4 marks)

_____

8

10. Factorise

$$x^2 + 7x + 6$$

…………........................
(Total 2 marks)

_____

11. Brass is made up of copper and zinc.
Every 100 grams of brass contains 20 grams of zinc.

(a) Work out the weight of zinc in 60 grams of brass.

……………………… g

(2)

Brass contains 4 parts by weight of copper to 1 part by weight of zinc.

(b) Work out the weight of copper in 350 grams of brass.
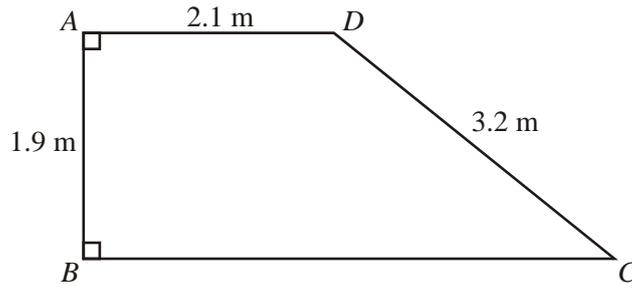
…

…………………… g

(2)
(Total 4 marks)

_____

12.

Diagram **NOT** accurately drawn

ABCD is a trapezium.
AD is parallel to *BC*.
Angle *A* = angle *B* = 90°.
AD = 2.1 m,   *AB* = 1.9 m,   *CD* = 3.2 m.

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

………………………… m

(Total 4 marks)

13.   *A* is the point with coordinates (2, 5)
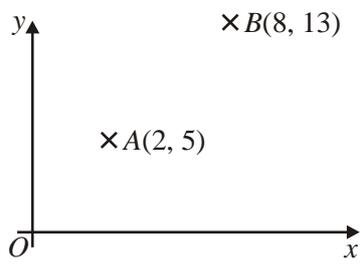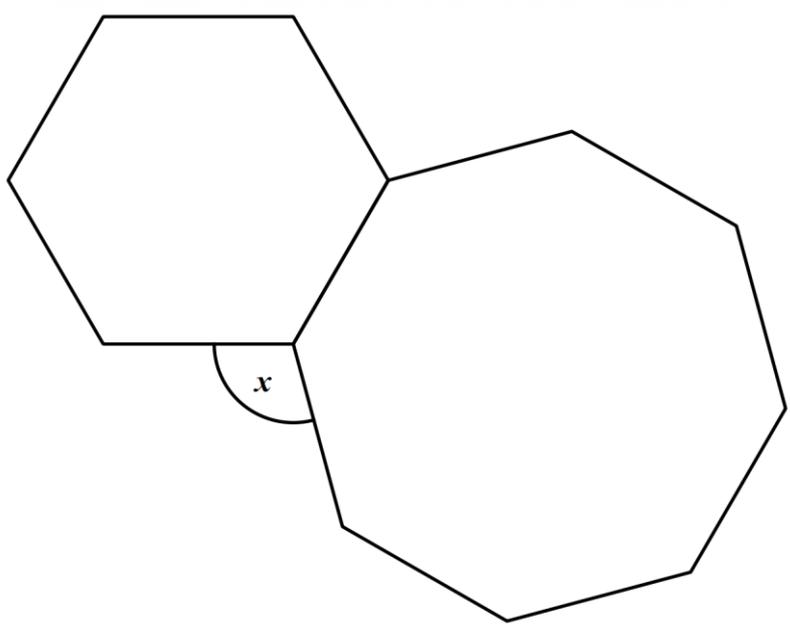   *B* is the point with coordinates (8, 13)

   Calculate the length *AB*.

   y ▲   ×*B*(8, 13)

            ×*A*(2, 5)

   O   x

   Diagram **NOT** accurately drawn

   ………..
                                    (Total 3 marks)

_____

14.   The diagram shows a regular octagon and a regular hexagon.

   Work out the size of the angle marked *x*.

   x = ... °
                                    (Total 4 marks)

_____

15. The size of each exterior angle of a regular polygon is 40°.

Work out the number of sides of the regular polygon.

…………......................................

(Total 2 marks)

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16. (a) Expand and simplify $(x + 7)(x - 4)$

………………………………..

(2)

(b) Expand $y(y^3 + 2y)$

………………………………..

(2)

(c) Factorise $p^2 + 6p$

………………………………..

(2)

(d) Factorise completely $6x^2 - 9xy$

…………..………………….

(2)

(e) Factorise completely $4x^2 - 9$

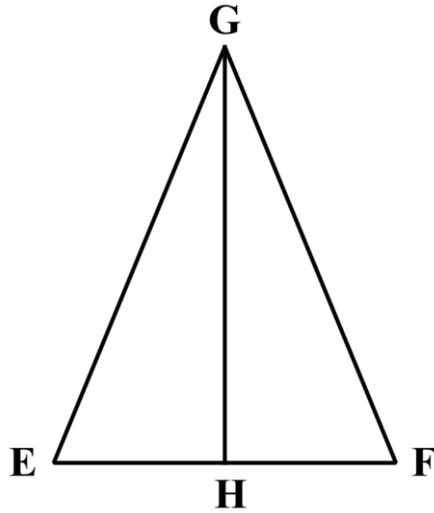………………………………..

(2)

(Total 10 marks)

17.

Diagram **NOT** accurately drawn

Given that GH bisects angle EGF and

EG = FG

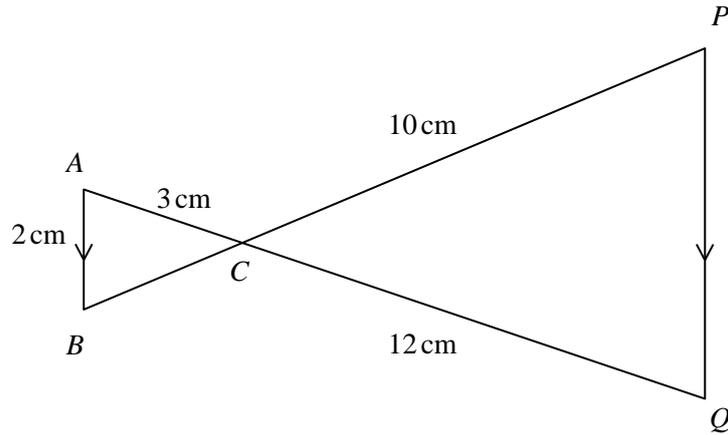Prove that triangle GEH is congruent to triangle GFH.

(Total 4 marks)

18.

Diagram **NOT**
accurately drawn

ACQ and *BCP* are straight lines.
AB is parallel to *PQ*.
AB = 2 cm.
AC = 3 cm.
CQ = 12 cm.
CP = 10 cm.

(a)   Given that the triangles *ACB* and *QCP* are similar, work out the length of *BP*.

.... cm

(4)

(b)   Express the ratio of the area of triangle *ABC* to the area of triangle *QPC* in the
form **1 : n**

....

(1)

(Total 5 marks)

_____

14

19. The fraction, p, of an adult's dose of medicine which should be given to a child who weighs w kg is given by the formula

$$p = \frac{3w + 20}{200}$$

Make w the subject of the formula

$w = $ …..……………………

(3)
(Total 3 marks)

_____

20. Bytes is a shop that sells computers and digital cameras.

In 2003, Bytes sold 620 computers.
In 2004, Bytes sold 708 computers.

(a) Work out the percentage increase in the number of computers sold.
Give your answer to an appropriate degree of accuracy.

………….................................... %

(4)

In a sale, prices are reduced by 14%.

The sale price of a digital camera is £129.86

(b) Work out the price of the digital camera before the discount.

£ ....
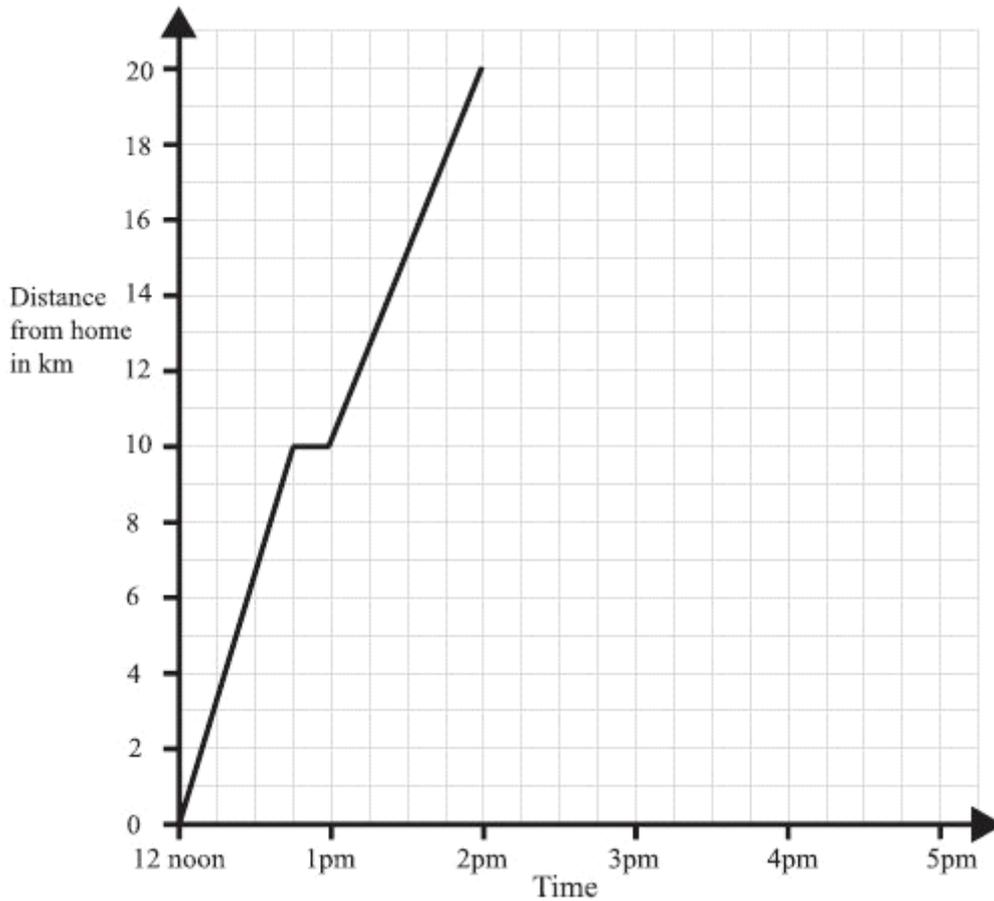
(3)
(Total 7 marks)

_____

21.
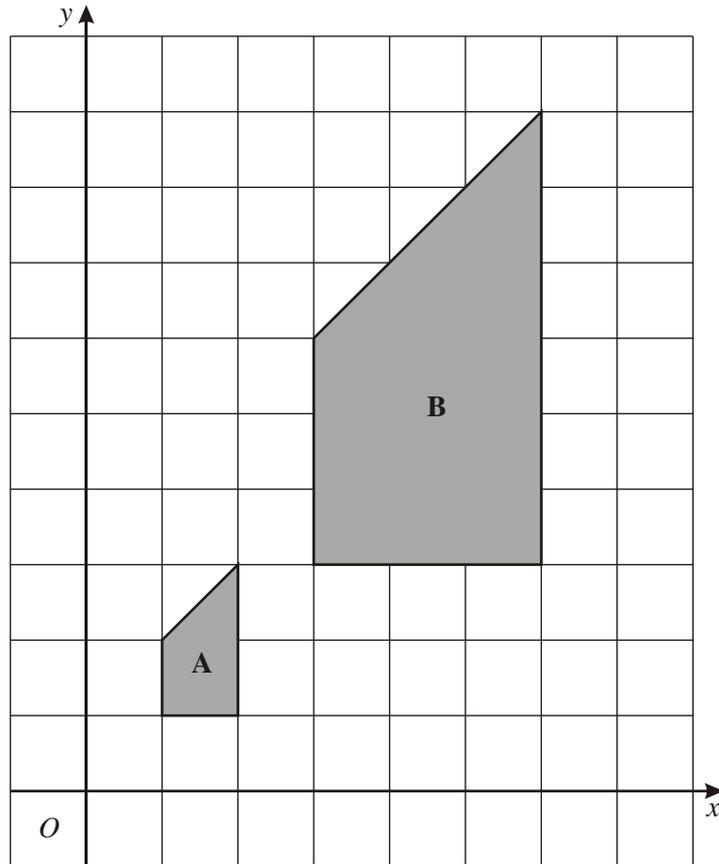
Describe fully the single transformation which maps shape **A** onto shape **B**.

………………………………………………………………………………………..

………………………………………………………………………………………..

(Total 3 marks)

_____

22. A man left home at 12 noon to go for a cycle ride.
The travel graph represents part of the man's journey.

At 12.45pm the man stopped for a rest.

(a) For how many minutes did he rest?

……………minutes

(1)

(b) Find his distance from home at 1.30pm.

…………………….km

(1)

The man stopped for another rest at 2pm.

He rested for one hour.

Then he cycled home at a steady speed. It took him 2 hours.

(c) Complete the travel graph.

(2)
(Total 4 marks)

23. A straight line passes through the points (0, 5) and (3, 17).

Find the equation of the straight line.

....
(Total 3 marks)

_____

24. p is inversely proportional to m.
$p = 48$ when $m = 9$

Calculate the value of p when $m = 12$

....
(Total 2 marks)

_____

25. Emily rolls a fair six-sided dice once.

Which of these outcomes are mutually exclusive?

Tick any answers that are correct.

a   Rolling a 5 **and** rolling a square number   ____

b   Rolling a number greater than 4 **and** rolling a square number   ____

c   Rolling a triangular number **and** rolling a number greater than 3   ____

d   Rolling a prime number and rolling a 2   ____

(Total 1 mark)

_____

26. (a) Complete the table of values for $y = x^2 - 3x - 1$.

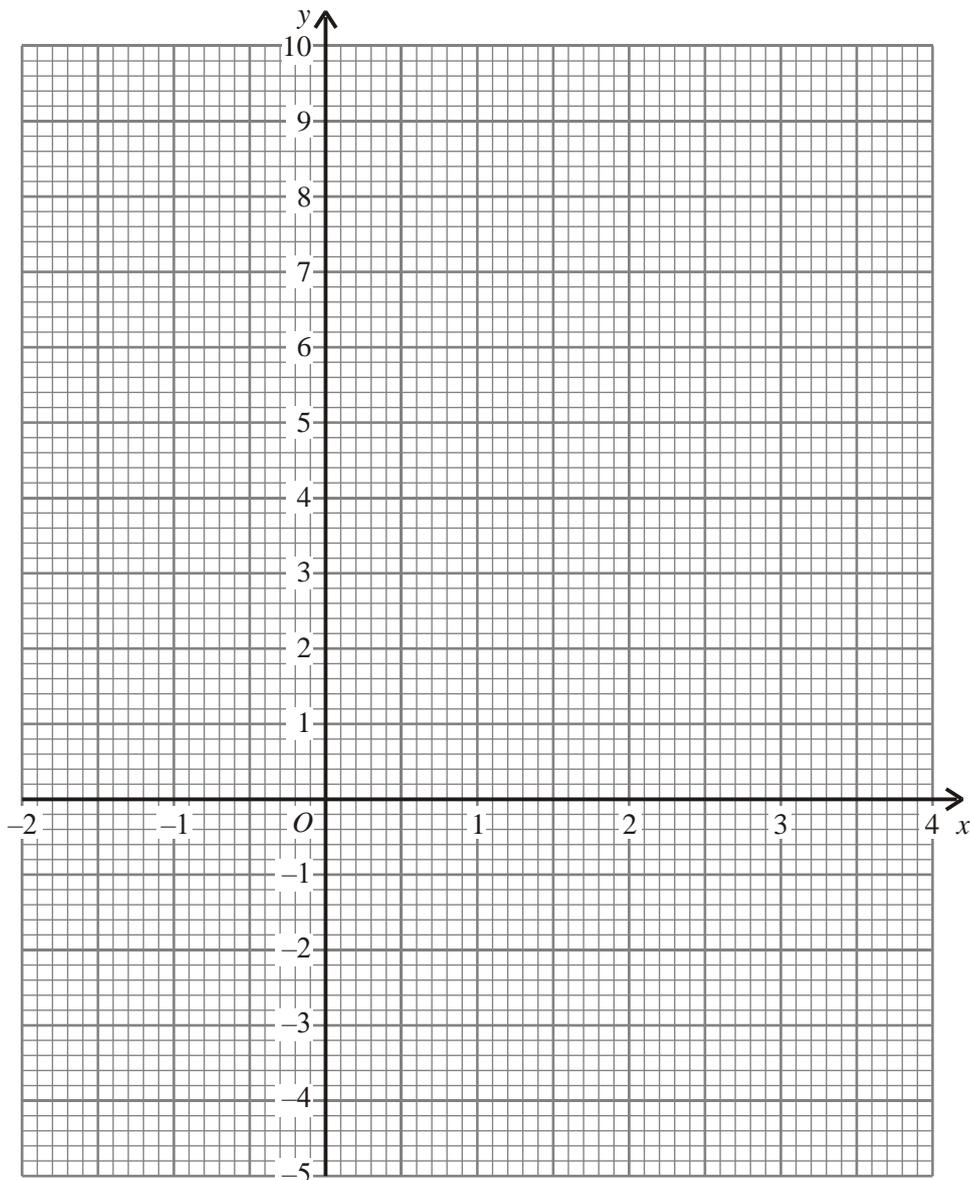| x	-2	-1	0	1	2	3	4
y		3	-1	-3			3

(2)

(b) On the grid below, draw the graph of $y = x^2 - 3x - 1$.

(2)

(c) Use your graph to solve the equation $x^2 - 3x - 1 = 6$.

....

(2)

(Total 6 marks)

27. Colin takes a loan of £560.

He pays £2.24 in simple interest each week.

(a) Calculate the weekly rate of interest.

………………………
(2)

(b) Calculate the yearly rate of interest.

………………………
(1)

(Total 3 marks)

_____

28. A rectangle has area 80 cm^2 (to the nearest cm^2).

It has length 10 cm (to one significant figure).

(a) Write down the upper bound for its area.

……………………… cm^2

(1)

(b) Write down the upper bound for its length.

……………………… cm
(1)

(c) By showing your working, find the upper bound for its width.

………………………..cm

(2)

(Total 4 marks)

_____

29. Simplify fully :

(a) $\dfrac{5x+20}{15}$

…………………………….

(2)

(b) $\dfrac{x+1}{4}+\dfrac{3x}{4}$

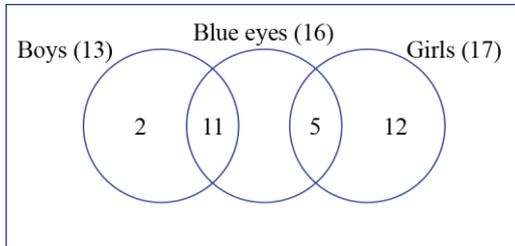……………………………

(1)

(c) $\dfrac{5x}{9}+\dfrac{2x}{3}$

……………………………

(2)

(Total 5 marks)

30. In a class of 30 pupils there are 13 boys.

Out of the 16 blue-eyed pupils, 5 are girls.

This information is shown in the Venn diagram.

Boys (13)   Blue eyes (16)   Girls (17)

2   11   5   12

(a) What is the probability that a teacher chooses a blue-eyed boy from the class at random?

Answer: ………………………….

(1)

A teacher chooses a girl at random.

(b) What is the probability that the girl does not have blue eyes?

Answer:………………………….

(1)

(Total 2 marks)

_____

TOTAL 120 MARKS

GOOD LUCK