The Haberdashers' Aske's Boys' School
Elstree, Herts

13+ Entrance Examination 2015

MATHEMATICS

Time : 1 hour

Full Name .....

Exam Number .....

Please follow these instructions

- You are **not** allowed to use a calculator in this examination
- Write **all** necessary working, and your answers, in the appropriate spaces on the examination paper. You may get credit for correct working if the answer is wrong.
- If there is a question you do not understand, move onto the next question.
- There are 100 marks for the paper. The marks for each question are shown in brackets. Do not spend too long on one question.

DO **NOT** OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

1. Work out the value of the following calculations

(a) $2+8\times3$ _____ [1]

(b) $23+(-7)-12$ _____ [1]

(c) $30\div(10-5)\times2$ _____ [1]

(d) 0.2×0.4 _____ [1]

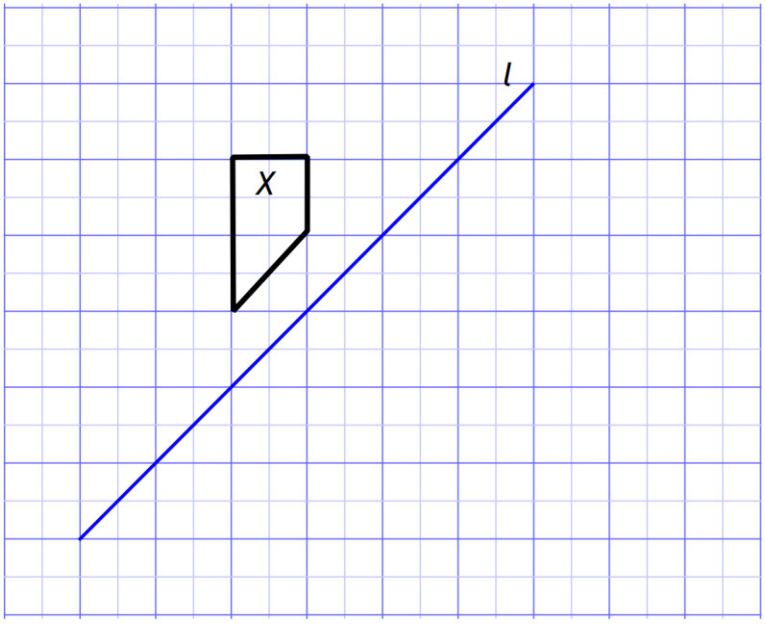
2. Simplify the following expressions fully

(a) $4x+5y+6x-7y$ _____ [2]

(b) $4-2x+x^2+2x+4$ _____ [2]

(c) $x+xy+y+yx+x$ _____ [2]

3. Draw the reflection of shape X in the line l. [2]



4. Solve the following equations showing your method clearly.

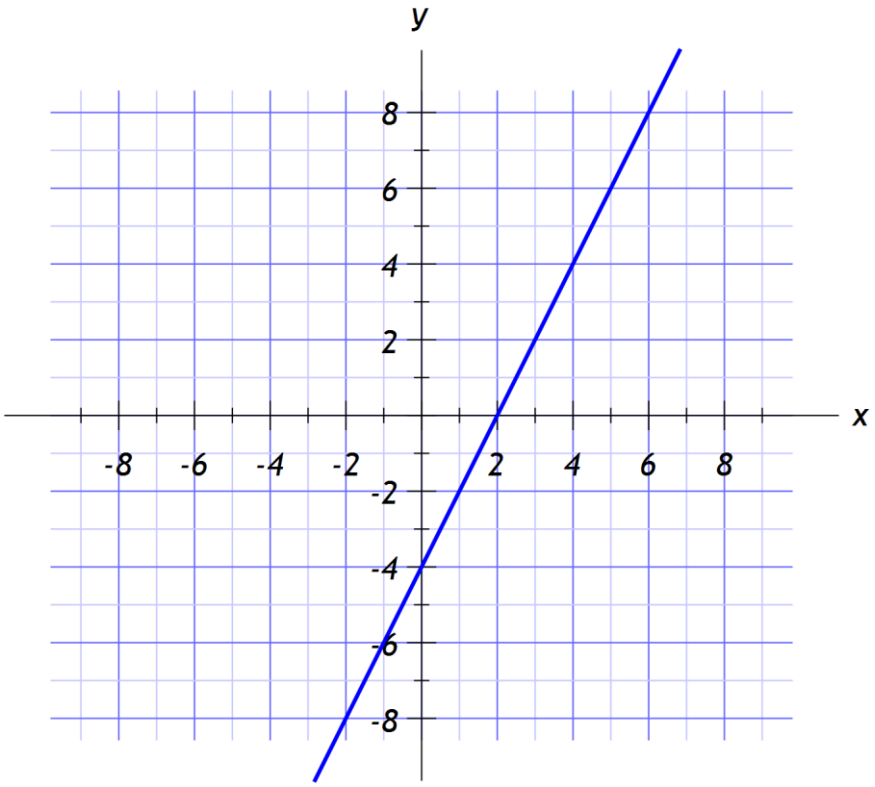
(a) $7x - 20 = 3x + 4$

$x =$ _____ [3]

(b) $\frac{8}{x} = 3$

$x =$ _____ [2]

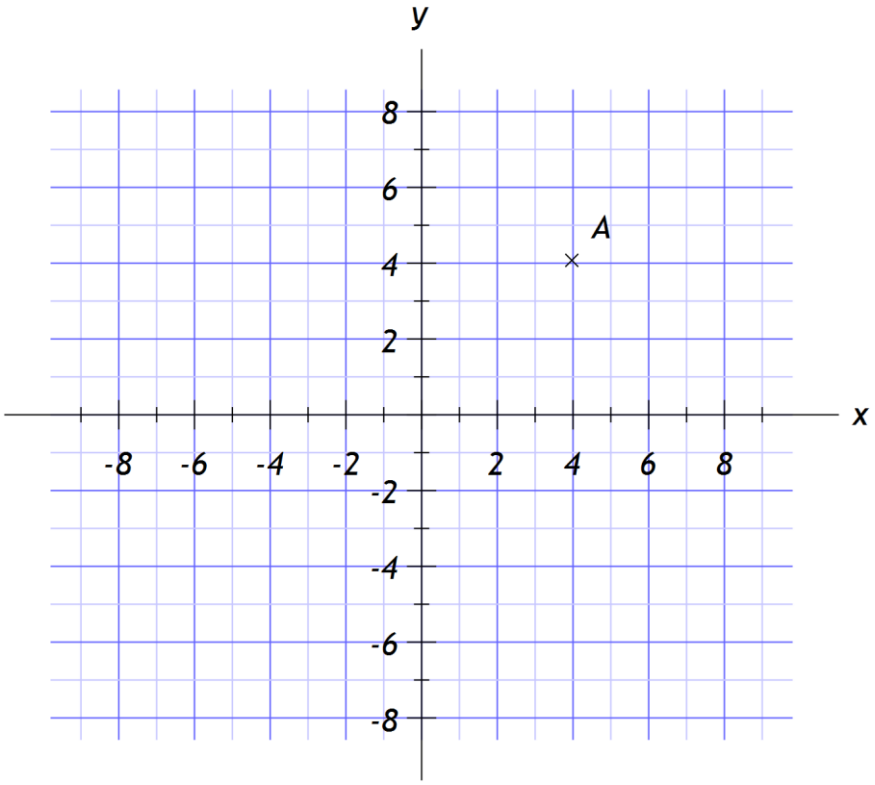
5. Find the gradient of the line drawn and hence find its equation.



Gradient _____

Equation _____ [4]

6. The point A has coordinates (4, 4).



(a) Draw the line $y = 6$ on the graph. Reflect the point A in the line $y = 6$ and label the image B. Write down the coordinates of B.

B = _____ [3]

(b) A and B form two corners of a square. The other corners could be at (8, 4) and (8, 8). There are two other possible squares with A and B at two corners. Write down the pairs of coordinates for both corners of both possible squares. You do not need to draw the squares.

_____ and _____

_____ and _____ [4]

7. Work out the value of the following formulae when x is 8 and y is -2.

(a) $3x + 1$ _____ [1]

(b) $2y^2 + 1$ _____ [1]

(c) $\frac{x + 4}{y + 4}$ _____ [1]

8. Bob has £500 and gives 70% to Edmund and 40% of what is left to George. Work out how much money each person has.



Bob _____

Edmund _____

George _____ [3]

9. Write down the missing two numbers in the common sequences below.

(a) 1, 3, 5, ____, 9, 11, ____ [2]

(b) 1, 3, ____, 10, 15, 21, ____ [2]

(c) ____, 3, 5, 8, 13, 21, ____ [2]

(d) ____, 7, 15, 31, 63, 127, ____ [2]

10. Raul is cycling a trail which is 33 kilometres long.

(a) Raul completes the trail in 3 hours. Find his average speed.

_____ [2]

(b) Raul returns back along the same trail in $2\frac{1}{2}$ hours. Show that his average speed for the return journey is $13\frac{1}{5}$ km/hr.

[3]

(c) Find his average speed for the total cycle.



_____ [3]

11. When written in prime factorised form 420 is written as $2^2 \times 3 \times 5 \times 7$.

(a) Write 72 in prime factorised form.

_____ [3]

(b) Using your answer or otherwise find the highest common factor of 72 and 420 giving your answer as a number, not prime factorised form.

_____ [2]

12. Three decorators are making shades of pink paint. Each one pours some red paint and some white paint into his bucket to create his shade. The higher the proportion of red paint, the darker the shade is.

Decorator	Litres of White	Litres of Red
Handy Andy	3	5
Ben the Builder	6	15
Charlie	5	13

(a) Handy Andy needs 240 litres of his shade. Find how much red paint would be in the mixture.

_____ [2]

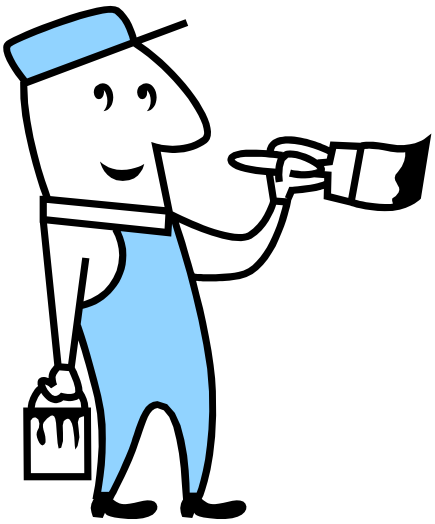
(b) Write the ratio of white paint to red paint in Ben the Builder's mixture in simplest whole number form.

_____ [2]

(c) Charlie increases the amount of white in his mixture by 30%. Find the ratio of white to red in the new shade of pink, giving your answer in simplest whole number form.

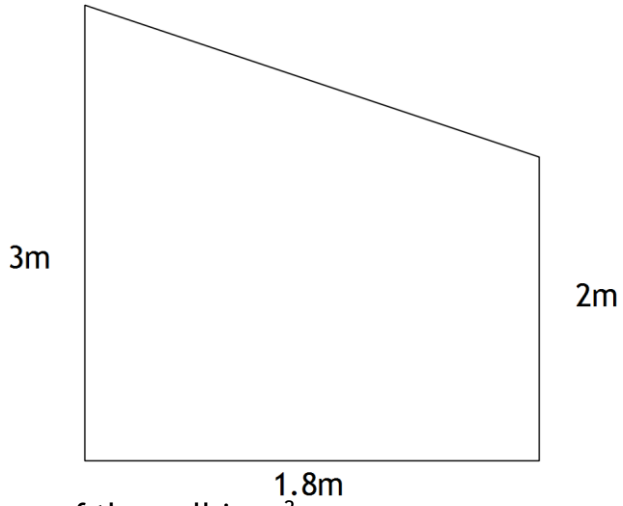
_____ [2]

(d) Find which decorator made the darkest shade originally, showing your working or giving reasoning clearly.



_____ [3]

13. A wall is built in the shape below.



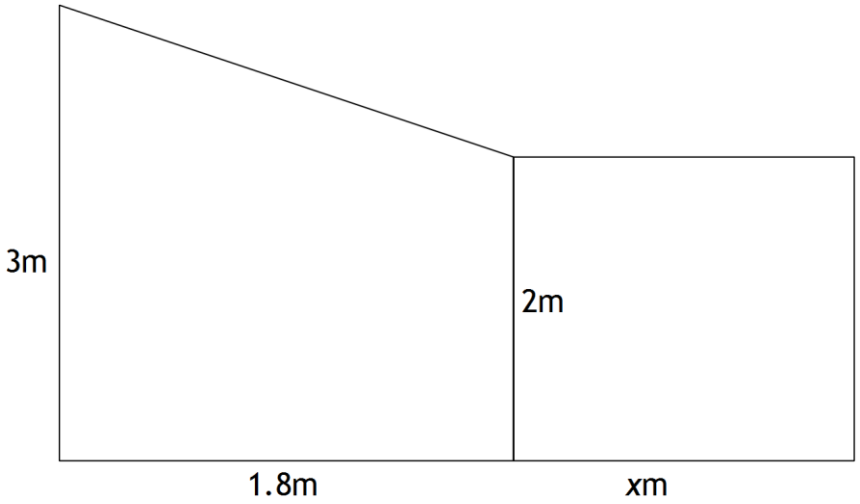
(a) Find the area of the wall in m^2.

_____ m^2 [3]

(b) Find the area of the wall in cm^2.

_____ cm^2 [1]

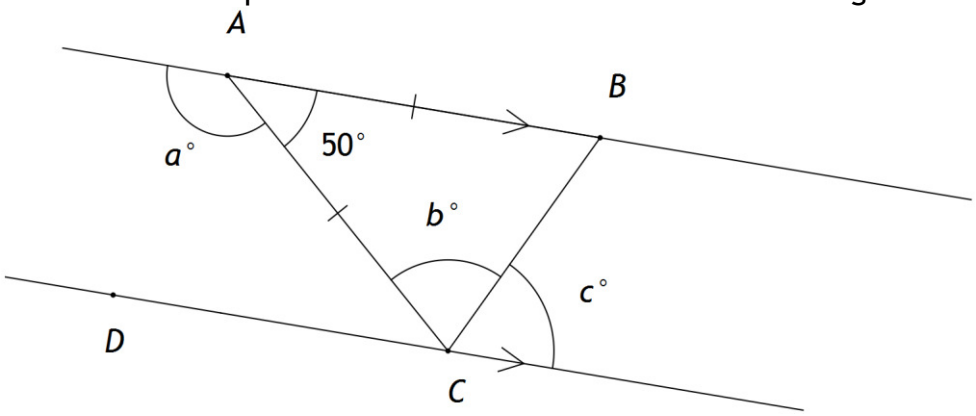
(c) The wall is extended by a length x metres to give the shape below. The total area is now $7.45m^2$. By setting up an equation or otherwise, find the value of x.



x = _____ [3]

14. Find the labelled missing angles in the following diagrams. The diagrams are not to scale.

(a) *AB* and *CD* are parallel lines. *AB* and *AC* are the same length.

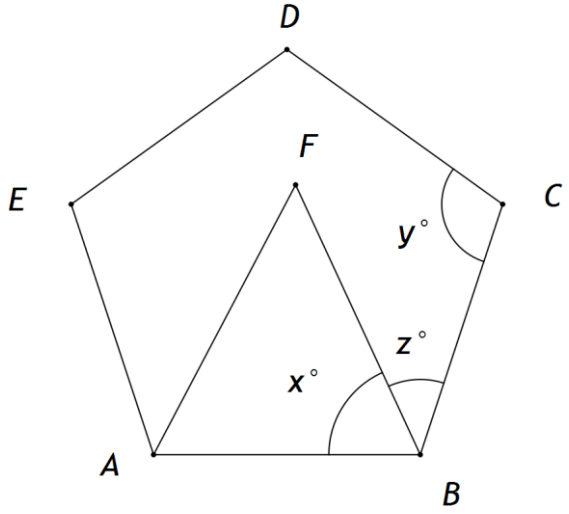


a = _____

b = _____

c = _____ [3]

(b) *ABCDE* is a regular pentagon and *ABF* is an equilateral triangle.



x = _____

y = _____

z = _____ [3]

15. For this question the symbol $\otimes$ means that $a \otimes b = 4a - 2b$. For example, $7 \otimes 3 = 4 \times 7 - 2 \times 3 = 22$

(a) Find the value of $5 \otimes 6$.

_____ [1]

(b) Find the value of $(5 \otimes 6) \otimes -2$.

_____ [1]

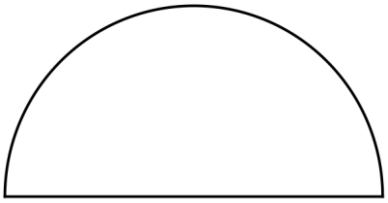
(c) Solve $x \otimes 3 = 98$.

$x =$ _____ [3]

(d) Solve $x \otimes (x + 1) = 98$.

$x =$ _____ [4]

16. The semicircle shown has diameter 8cm. Find the area and perimeter of the semicircle, leaving your answer in terms of π.



Area _____ [3]

Perimeter _____ [3]

17. Find the following statistics for the five numbers below.

4, 7, 9, 10, 10

(a) mean _____ [1]

(b) median _____ [1]

(c) mode _____ [1]

(d) range _____ [1]

(e) The four numbers 1, 2, 3 and 10 have a mean of 4 but no single value for the mode. Find all possible groups of four positive whole numbers which have a mean of 4 but do not have a single value for the mode.

[4]

END OF PAPER

Go back and check your answers