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

13+ Entrance Examination 2016

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 on to 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

(a) $4 + 6 \div 2$ _____ [1]

(b) $-3 - 7 - 12$ _____ [1]

(c) $120 + 60 \div (20 - 5)$ _____ [1]

(d) $-16 \div 4 \times -2$ _____ [1]

2. Simplify the following expressions fully

(a) $3x + 2y + 6y - 5x$ _____ [2]

(b) $(3a)^2 \times 2a$ _____ [2]

(c) $xy + 2y^2 + 3yx + 4y^2 + 5x^2$ _____ [2]

3. Solve the following equations showing your method clearly.

(a) $3(2x + 9) - 7x = 4(x + 3)$

$x =$ _____ [4]

(b) $\dfrac{x + 9}{3} = 15$

$x =$ _____ [2]

4. An Old Haberdasher Tamal is baking some cakes for a bake off. His recipe gives the following information about ingredients for a cake for 6 servings.

Ingredient	Amount required
Sugar	210g
Butter	180g
Eggs	8
Flour	300g

(a) The sugar needs to be split in the ratio 5:1 for the sponge and the icing respectively. Find how much sugar is needed for the sponge.

_____ [3]

(b) Find how much flour would be needed to make this cake for 11 servings.

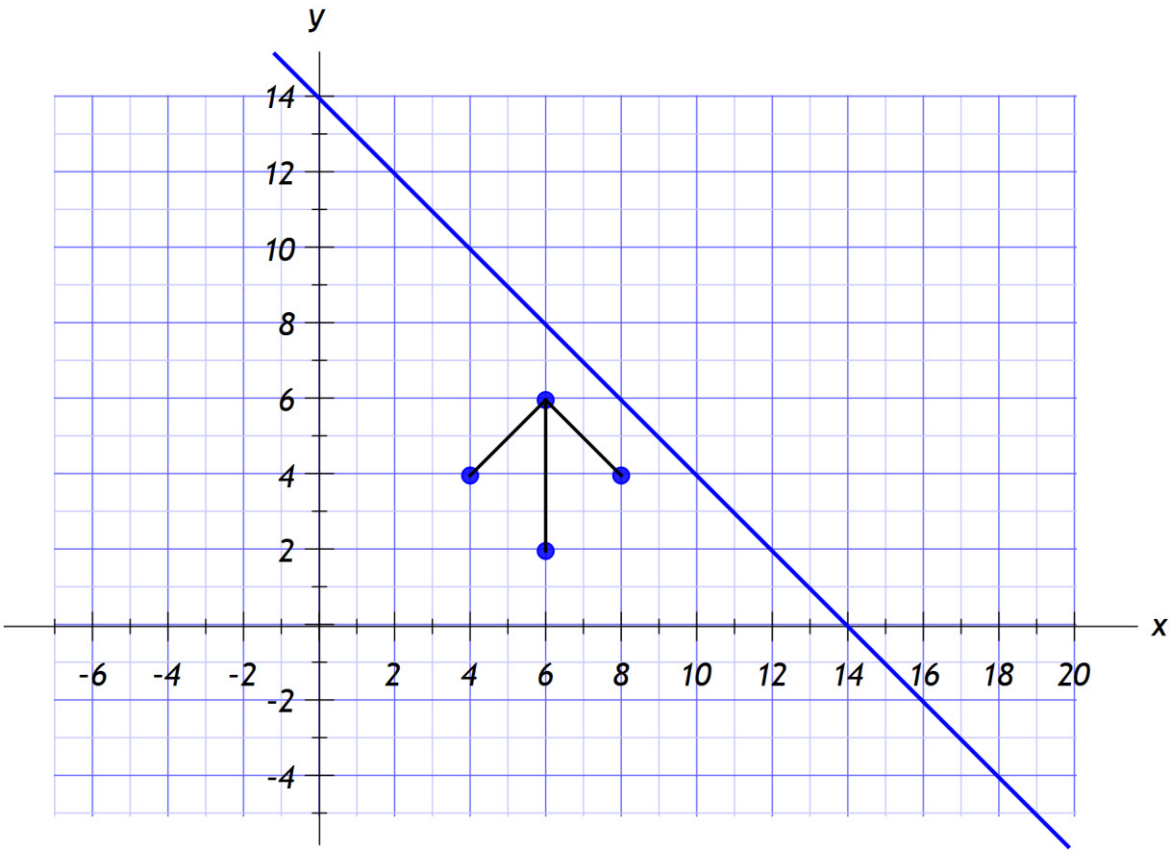
_____ [2]

(c) Tamal has a box of 20 eggs and plenty of sugar, butter and flour to make as much cake as possible. Find the maximum number of servings he can make.



_____ [3]

5. The graph below shows a line and an arrow shape.



(a) Find the gradient of the line.

_____ [2]

(b) Reflect the arrow in the line. [2]

(c) Draw the line with gradient 2 and y-intercept 8 on the graph. [2]

6. Work out the value of the formulae below when x is -4 and y is 0.2.

(a) $25 - 3x$ _____ [1]

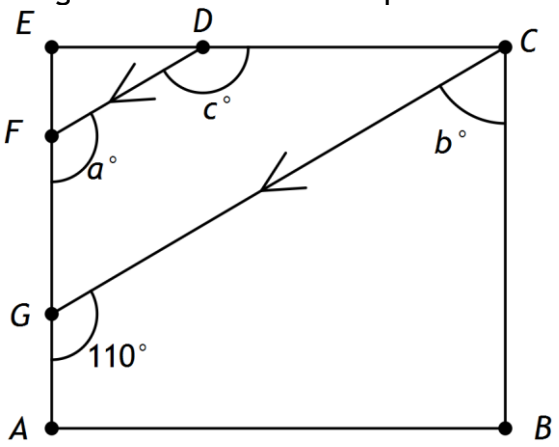
(b) y^2 _____ [1]

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

(d) $2x^2$ _____ [1]

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

(a) *ABCE* is a rectangle and *CG* and *DF* are parallel lines.

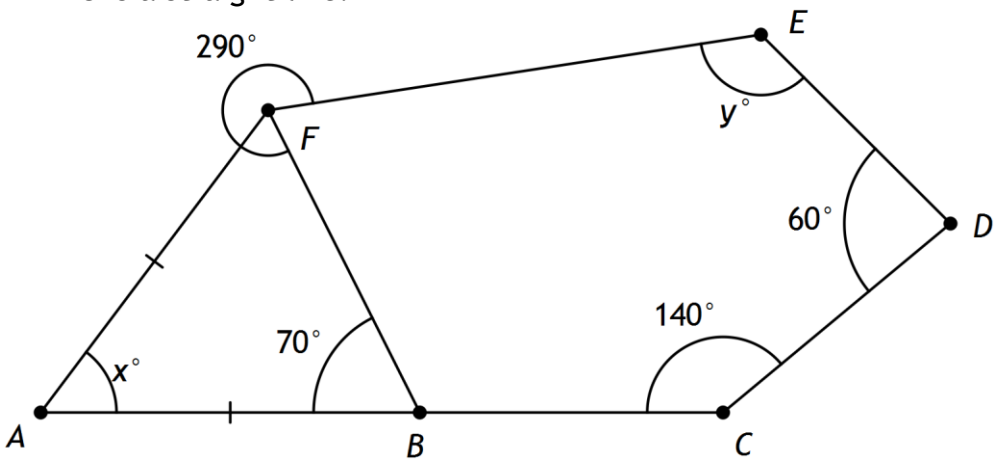


a = _____

b = _____

c = _____ [3]

(b) *BCDEF* is an irregular pentagon and *AF* and *AB* are the same length. ABC is a straight line.



x = _____

y = _____ [3]

8. All the items in an antique shop have been reduced by 40% in a sale.

(a) David buys an antique for £120. Find the price of the antique before the sale.

_____ [2]

(b) David then sells the antique for £150. Find what percentage of the £150 which is profit.

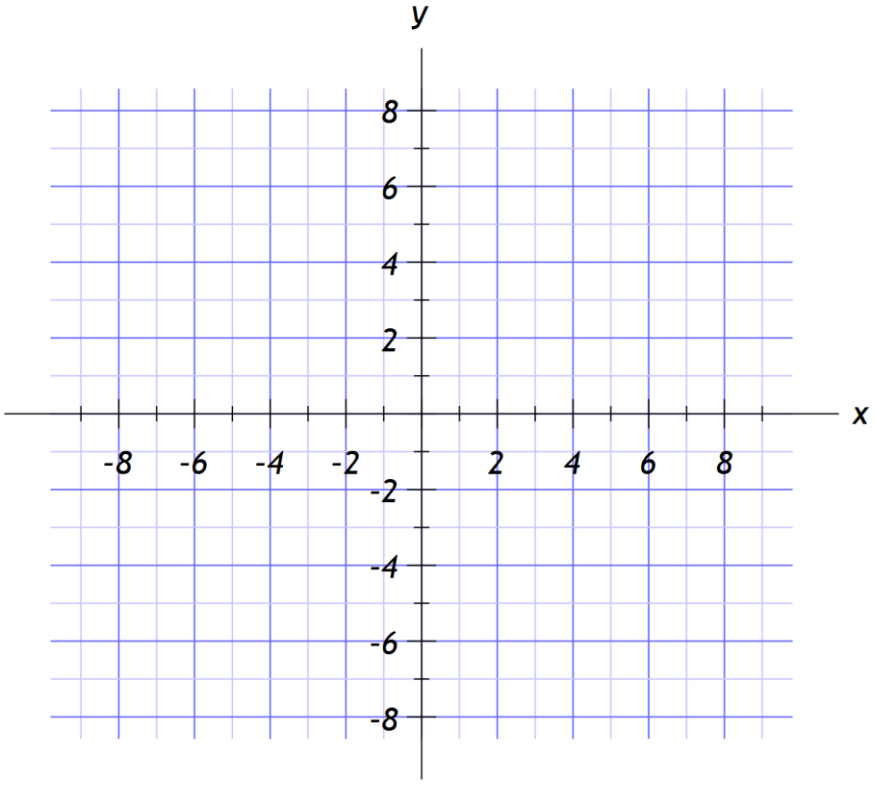
_____ [2]

9. The graph $3x - 2y = 6$ is to be drawn.

(a) Complete the table of values for the graph. [4]

x	y
0	
	0
4	
	2

(b) Draw the graph on the set of axes below. [2]



10. In a test there are 5 marks for correct answers and 2 marks are lost for incorrect answers. Bob got n correct answers.

(a) In terms of n find the number of marks he gained for his correct answers.

_____ [1]

(b) He answered 20 questions in total. Find a formula for the number of questions he got wrong.

_____ [1]

(c) Find a formula for the number of marks he lost for the wrong answers.

_____ [1]

(d) In total he got 65 marks. Using your previous answers write down an equation in n for the number of marks he got.

_____ [1]

(e) By solving the equation find how many questions he got right.

$n =$ _____ [3]

11. Fill in the missing numbers from these sequences. The rules for each sequence are given.

(a) In this sequence the same number is added to get from one term to the next.

3, _____, _____, 15, [2]

(b) In this sequence each term is multiplied by the same number to get the next term.

2, _____, _____, 54, [2]

(c) In this sequence the next term is found by adding the two terms before it.

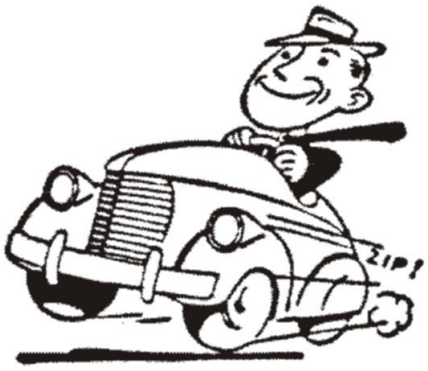
7, _____, _____, 15, [2]

12. Lewis is driving to meet a friend.

(a) He travels at 40km/hr for the first 3 hours. Find the distance travelled for the first part of the journey.

_____ [2]

(b) He knows he needs to average 50km/hr for the whole 400km journey to arrive on time. Find the speed he needs to average for the rest of the journey to arrive on time.



_____ [4]

13. Eleven pet owners were asked how many pets they had in total. The results are given below.

1, 1, 2, 3, 4, 5, 5, 6, 6, 6, 7

(a) Find the median number of pets owned.

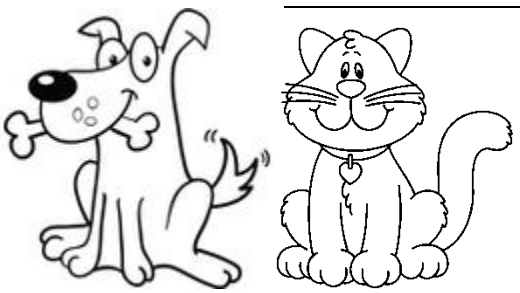
_____ [1]

(b) Find the range of the number of pets owned.

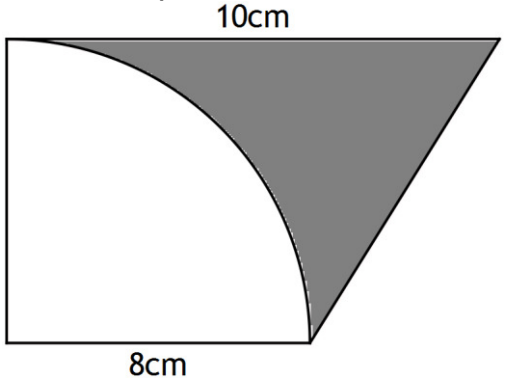
_____ [1]

(c) Two more owners are asked how many pets they have. Including their results the mean goes down to 4 but the mode is unchanged from the mode of the first eleven. Find the number of pets these two pet owners had.

_____ _____ [4]



14. In the diagram below, a quarter of a circle is cut out of a trapezium.



(a) Find the area of the quarter circle, leaving your answer in terms of π.

_____ [2]

(b) Find the shaded area, leaving your answer in terms of π.

_____ [4]

15. A shop offers three deals on golf balls. Andy wants to buy a large quantity of balls because he keeps losing his. Find which deal is best giving clear reasoning.

Deal A: Buy 10 get one free
Deal B: 10% off
Deal C: Buy 5 get a sixth half price

_____ [3]

16. The nutritional information for some cereal bars is shown in the table below. It shows the fraction of the recommended daily amount (RDA) of two minerals each contains.

Cereal bar	Fraction of RDA of Iron	Fraction of RDA of Vitamin D
Oatally Brilliant	$\frac{1}{3}$	$\frac{2}{5}$
Cornbix	$\frac{2}{5}$	$\frac{5}{6}$
Cheeribyes	$\frac{4}{7}$	$\frac{1}{4}$

(a) James mixes cereal bars. He has half a bar of Oatally Brilliant and two-thirds of a bar of Cornbix. Find the fraction of his RDA of iron he gets from these bars.

_____ [4]

(b) A pregnant woman is told she needs $1\frac{3}{5}$ times as much iron as the RDA. Her only source of iron is her Cheeribyes breakfast bars. Find how many she should eat to make sure she gets enough iron. Leave your answer as a mixed number.

_____ [3]

(c) A special 100g bar of Oatally Brilliant contains $\frac{4}{9}$ of the RDA of Vitamin D. Find the mass of the standard bar of Oatally Brilliant.

_____ [3]

17. Victor is trying to remember a question he answered. He remembers that he was asked to find the prime factorisation of a number between 40 and 100. He also remembers that the answer was the product of one prime and the square of another prime.

(a) The number might have been 50 because $50 = 2 \times 5^2$. Find all the other possible numbers he could have been asked to factorise.

[4]

(b) He also remembers that he was given that $1000 = 2^3 \times 5^3$ and the lowest common multiple of 1000 and the number in the question was 3000. Find the number in the question showing clear reasoning to get to your answer.

[2]

END OF PAPER

Go back and check your answers