

FIRST NAME..... SURNAME.....  
CURRENT SCHOOL.....

Mark

## MAGDALEN COLLEGE SCHOOL OXFORD



### 13+ ENTRANCE EXAMINATION

### SPECIMEN

### MATHEMATICS

**Please read this information before the examination starts.**

- This examination is 1 hour long.
- Please try **all** the questions.
- Write your answers in the spaces provided.
- All working should be written on the paper.
- Calculators are allowed.

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1. Simplify

a)  $3x + 2y + 5x - 3y$

Answer:..... [1]

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b)  $2x^2 + 2x^2$

Answer:..... [1]

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c)  $\frac{a+a+a}{a}$

Answer:..... [1]

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d)  $\frac{x}{3} + \frac{x}{4}$

Answer:..... [2]

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e)  $2n^2k + k^2n + 3kn^2$

Answer:..... [2]

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f)  $2 + 5a - 5$

Answer:..... [2]

2. Sound travels at 330 metres per second. If thunder is heard 24 seconds after the lighting is seen, how far away is the storm?

Give your answer in km.

*Answer:*..... [2]

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3. How many paving stones, each measuring 75cm by 60cm, are needed to cover a rectangular courtyard 9m by 6m?

*Answer* .....[3]

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4. The distance from Oxford to London is 90km. I travel from Oxford to London at 45km/h as there is a lot of traffic. The road is less congested on the return journey. I calculate that my average speed for the TOTAL journey is 60km/h. What was my average speed for the journey from London to Oxford?

*Answer:*..... [4]

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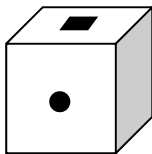
5. A set of five positive whole numbers has a mean of 6, a median of 5 and a mode of 4.

List a set of possible numbers

*Answer:....., ....., ....., ....., .....[3]*

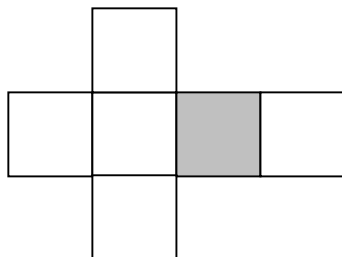
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6. Consider the cube shown below



One face is painted grey, one face has a circular hole cut out of it and one face has a square hole cut out of it. All the other faces of the cube are white and have no holes in them.

Here is a net of the cube.



Draw the circular hole and the square hole on the correct places on the net

[2]

7. In each question, find the number that is the odd one out.

a)

$$2 \times 2 \times 2, 3 \times 2, 2^3$$

Answer:..... [1]

b)

$$40\%, \frac{2}{5}, \frac{40}{10}$$

Answer:..... [1]

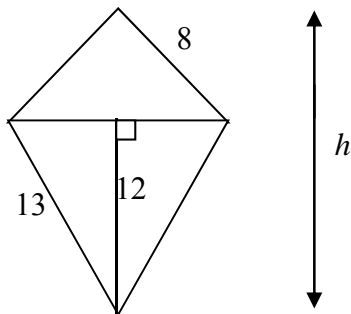
c)  $\frac{2}{3}, 60\%, \frac{6}{10}$

Answer:..... [1]

d)  $\frac{1+1}{1 \times 1}, \frac{2+2}{2 \times 2}, \frac{1+1}{-1 \times -1}$

Answer:..... [1]

8. Here is a diagram of a kite; all **measurements are in cm.**



Work out the length  $h$ , giving your answer in millimetres correct to the **nearest millimetre.**

Answer: ..... [5]

9. Solve the following equations

a)  $\frac{x}{5} = 35$

*Answer:*..... [1]

b)  $\frac{63}{x} = 7$

*Answer:*..... [1]

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c)  $\frac{3}{4}x - 5 = 7$

*Answer:*..... [3]

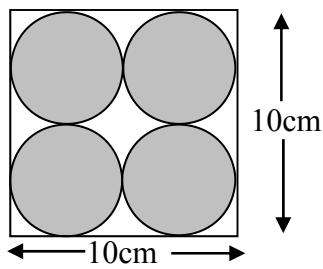
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d)  $\frac{7}{x+1} = 3$

*Answer:*..... [3]

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10. Consider this diagram which shows four identical circles inside a square of side length 10cm.



Find the unshaded area.

*Answer:*..... [4]

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11. The year 2011 is one where the digits add up to a total of 4. List the years where this occurred between 1000 and 2000 AD

*Answer:*..... [3]

*Answer:*..... [4]

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12.

If:

$$A + C = A$$

$$F \times D = F$$

$$B - G = G$$

$$A + H = E$$

$$B \div H = G$$

$$E - G = F$$

and  $A$  to  $H$  represent the numbers from 0 to 7 (not necessarily in that order)

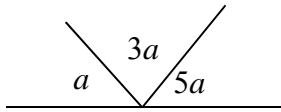
Find the values of  $A, B, C, D, E, F, G$  and  $H$ .

Answer:  $A = \dots B = \dots C = \dots D = \dots E = \dots F = \dots G = \dots H = \dots [8]$

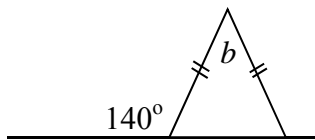
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13. i) Find the values of the angles  $a$  and  $b$  if :



Answer:  $a = \dots\dots\dots$  [2]



Answer:  $b = \dots\dots\dots$  [3]

14. These are approximate equivalents of some metric and imperial units:

$$1 \text{ metre} \approx 1.1 \text{ yards}, \quad 2.5 \text{ cm} \approx 1 \text{ inch}, \quad 1 \text{ pint} \approx \frac{3}{5} \text{ litre}$$

Answer the following questions using these approximations.

(a) The male shot putt world record stands at 23 metres. What is this record in yards?

Answer .....[2]

(b) The world's tallest ever woman was recorded at a height of 250 cm. Given that there are 12 inches in one foot, how tall is this in feet and inches?

Answer.....[3]

(c) The average female human's body contains 5.6 litres of blood. When pregnant, the amount of blood in a female's body doubles.  
How much blood would the average pregnant human female have in her body in pints?

Answer.....[3]

15. Solve these equations.

(a)  $3x - 7 = 8$

*Answer* .....[2]

(b)  $2(x - 1) = 10$

*Answer* .....[2]

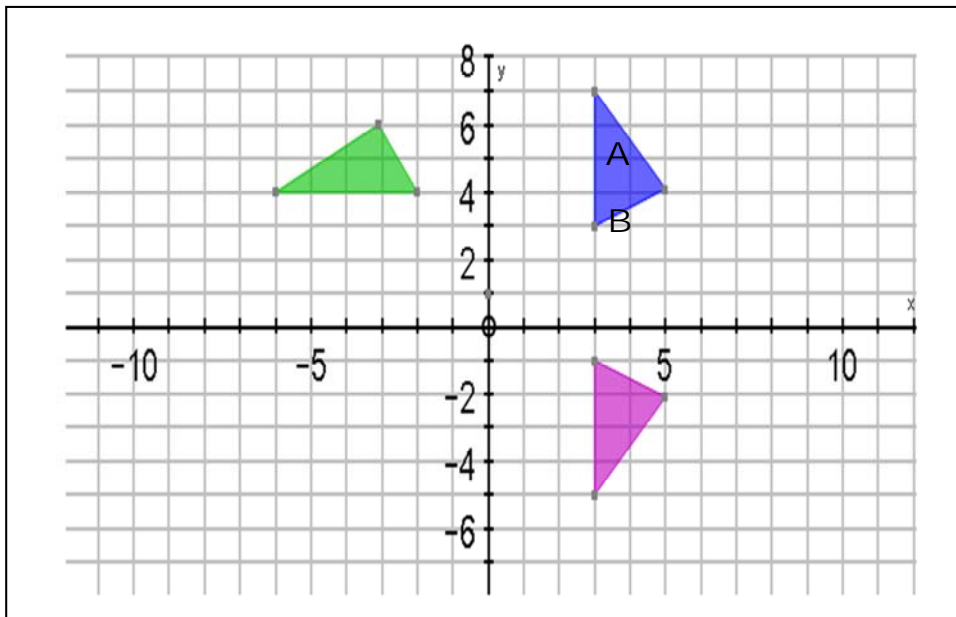
(c)  $3(2x - 4) = x - 7$

*Answer* .....[2]

d)  $2(x - 3) - (4x - 2) = 5$

*Answer* .....[3]

16.



(a) Describe the single transformation which will take shape A onto shape B.

**Answer**..... [2]

(b) Describe the single transformation which will take shape A onto shape C.

Answer ..... [2]

(c) If each of the squares on the grid is a square of side length 1, what is the area of shape A?

Answer ..... [2]

(d) A new transformation maps shape A onto shape D, and causes all of the lengths of shape A to double.

Write down the area of shape D.

Answer .....[3]

17. Leaving your answers as top heavy fractions work out:

$$(a) \frac{1}{1 + \frac{1}{2}} =$$

$$(b) \frac{1}{1 + \frac{1}{1 + \frac{1}{2}}} =$$

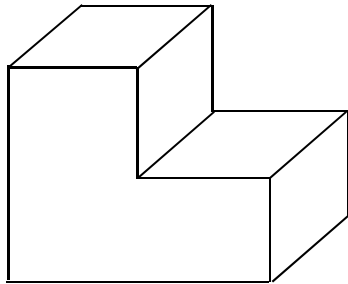
$$(c) \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{2}}}} =$$

[5]

Predict the next two answers if the pattern in the question continues in the same way.

Answer ....., .....[4]

18. A polystyrene moulding has a cross section in the shape of a letter L with its longer edges 10cm and all other measurements 5cm, including its depth. What is its total surface area?



*Answer* .....[5]

19. Suppose  $x = 2$ ,  $y = 0.5$  and  $z = -3$ .

i) Find the value of

a)  $2x + y$

*Answer*:..... [1]

b)  $x + (y - z)$

*Answer*:..... [2]

Suppose  $x = 2$ ,  $y = 0.5$  and  $z = -3$ .

c)  $x - 2(z - y)$

*Answer:..... [2]*

d)  $\frac{x^2}{y^2}$

*Answer:..... [2]*

20. James and Michael are arguing. James says that

$n^2 + n + 41$  is a prime number for any positive integer  $n$ . He uses the example

When  $n=1$ ,  $n^2 + n + 41 = 1+1+41=43$  which is a prime number

Michael is not sure, wants to try out a few more values of  $n$  and then wants to think about the problem.

(a) Try  $n=2$ . Is  $n^2 + n + 41$  a prime number?

*Answer:*..... [2]

(b) Try  $n=3$ . Is  $n^2 + n + 41$  a prime number?

*Answer:*..... [2]

(c) Do you think that  $n^2 + n + 41$  is a prime number for any value of  $n$ ?

Explain your reasoning fully.

*Answer:*..... [4]

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**END OF TEST – GO BACK AND CHECK YOUR WORKING**