

13+ Entrance 2016

MATHEMATICS

One hour

- Answer as many questions as possible, presenting your answers clearly and neatly and showing all relevant working in the spaces provided.
- Calculators may be used in any question unless stated otherwise. In a question where a calculator is prohibited, your working must display sufficient detail to show that it has not been used.
- If you cannot do a question, leave it and go on to the next. You might need to move fast to get to the end of the paper.

There are 19 questions; the total number of marks available is 75.

Name: *Age:*

Present school:

1 Work out 12% of 480m

..... [2 marks]

2 Write each of these correct to 2 decimal places.

a 2.654

b 5.107

.....

.....

..... [1 mark]

..... [1 mark]

3 Change the following amounts by the percentages shown.

a Increase £78 by 13%

b Decrease £426 by 18%

.....

.....

..... [2 marks]

..... [2 marks]

4 Simplify each of the following.

a $2(q + 3) + 3(q - 4)$

.....

..... [2 marks]

b $x^2 \times x^5$

.....

[1 mark]

c $\frac{y^6}{y^3}$

.....

..... [1 mark]

5 Write each of these correct to 3 significant figures

a 5634

b 80251

.....

.....

..... [1 mark]

..... [1 mark]

6 Evaluate each of these, showing ALL of your working.

Cancel the answer to its simplest form or write as a mixed number as appropriate.

a $\frac{2}{5} + \frac{1}{3}$

b $\frac{2}{3} - \frac{2}{5}$

.....
.....
.....

[2 marks]

.....
.....
.....

[2 marks]

c $\frac{3}{8} \times \frac{2}{9}$

d $\frac{9}{14} \div \frac{3}{7}$

.....
.....
.....

[2 marks]

.....
.....
.....

[2 marks]

7

Arrange in order of ascending size (smallest first)

5×10^{-3} , 1.3%, 0.015, $\frac{8}{1000}$

.....[3 marks]

8

(a) Showing your working (and without using a calculator), estimate the answer to

$$\frac{(13.2)^2 + 29.7}{6.9 \times 1.491}$$

..... [3 marks]

(b) Now work it out on your calculator instead. Give your answer correct to 3 significant figures.

..... [2 marks]

9 Solve these equations:

a $3(x - 4) = 15$

b $5x - 3 = 2x + 9$

.....
.....
.....
.....

[3 marks]

.....
.....
.....
.....

[3 marks]

10 Divide £230 in the ratio 2:3.

.....
.....
.....

[3 marks]

11 I buy a car at £1700 and sell it for £2040. Calculate

a my profit

.....

[1 mark]

b my percentage profit

.....

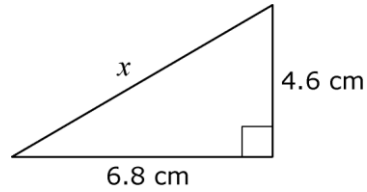
[2 marks]

12 Which is larger, $\frac{2}{3}$ of $2\frac{2}{5}$ or $\frac{2}{5}$ of $2\frac{2}{3}$? Show your working.

.....
.....
.....
.....

[3 marks]

13 Find the length x in this triangle.



.....

.....

.....

[3 marks]

14 Simplify the following expression:

$$\frac{2a^2bc^3 \times 6a^3b^2c}{4ab^3c^2}$$

.....

[4 marks]

15 **a** There are 240 pupils in Year 11. Forty-five of them are left-handed.

What is the ratio (in its lowest terms) of left-handed : right-handed pupils in Year 11?

.....

.....

[3 marks]

b When the 210 pupils in Year 10 are included, the ratio of left-handed : right-handed pupils changes to 2 : 7.

How many left-handed pupils are there in Year 10?

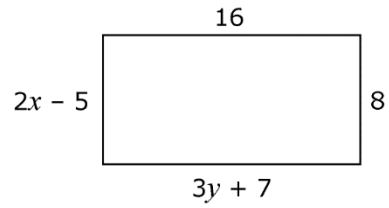
.....

.....

[3 marks]

16 The diagram shows a rectangle.

a Find the value of x .

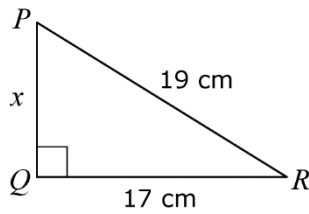


.....
 [2 marks]

b Find the value of y .

..... [2 marks]

17 Calculate length x in triangle PQR .



.....

 [3 marks]

18 Solve these equations:

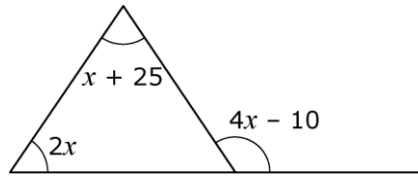
a $\frac{n}{3} + 8 = 10$

b $\frac{2x - 7}{2} = 6$

.....

 [3 marks] [3 marks]

19 The diagram shows a triangle, with an exterior angle shown.



Find the value of x .

.....

.....

..... [4 marks]

END OF EXAM – BE SURE TO CHECK YOUR WORK THOROUGHLY

Entrance Examinations (13+)

2015

MATHEMATICS

One hour

- Answer as many questions as possible, presenting your answers clearly and neatly and showing all relevant working in the spaces provided.
- Calculators may be used in any question unless stated otherwise. In a question where a calculator is prohibited, your working must display sufficient detail to show that it has not been used.
- If you cannot do a question, leave it and go on to the next. You might need to move fast to get to the end of the paper.

There are 18 questions; the total number of marks available is 100.

Name: Age:

Present school:

1. (a) Write these numbers to **two decimal places**:

(i) 1.73205 [1]

(ii) 2.23606797 [1]

(iii) 8.1953 [1]

(b) Write these numbers to **three significant figures**:

(i) 75132 [1]

(ii) 0.032566 [1]

(iii) 4997 [1]

[total 6 marks]

2. (a) Find 17% of £523.

£ [2]

(b) Increase 890 kg by 30%.

..... kg [2]

[total 4 marks]

3. Simplify each of the following as much as possible.

(a) $h + h + h + h$

..... [1]

(b) $p \times p \times p \times p \times p$

..... [1]

(c) $4 \times 8y$

..... [1]

(d) $7a \times 5a^3$

..... [2]

(e) $(6k)^2$

..... [2]

(f) $(20c^5) \div (5c^3)$

..... [2]

(g) $5x + 8x - 2x$

..... [1]

(h) $3xy - 7xy + 5yx$

..... [2]

(i) $9h^2 + h - 5h^2 + 6h$

..... [2]

[total 14 marks]

4. Solve the following equations.

(a) $5x = 32$

$x = \dots\dots\dots$ [1]

(b) $x + 17 = 38$

$x = \dots\dots\dots$ [1]

(c) $4x - 15 = 105$

$x = \dots\dots\dots$ [2]

(d) $35 - x = 41$

$x = \dots\dots\dots$ [2]

(e) $\frac{x}{7} = 2.3$

$x = \dots\dots\dots$ [1]

(f) $\frac{118}{x} = 20$

$x = \dots\dots\dots$ [2]

[total 9 marks]

5. Answer the following questions without a calculator and showing ALL working.



(a) Express 0.083 as a percentage.

..... % [1]

(b) Express $\frac{7}{20}$ as a percentage.

..... % [1]

(c) Write 64% as a fraction in its lowest form.

..... [1]

(d) Work out the following...

(i) $7 + 2 \times 4$

..... [1]

(ii) $(-3) \times (-6)$

..... [1]

(iii) $(-27) \div 9$

..... [1]

(iv) $16 - 8 \div 4 + 3^2$

..... [2]

[total 8 marks]

6. Without using a calculator, show that...

(a) $\frac{3}{8} + \frac{1}{6} = \frac{13}{24}$



[1]

(b) $\frac{4}{5} \times \frac{15}{28} = \frac{3}{7}$

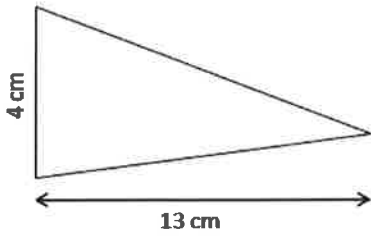
[1]

(c) $\frac{5}{18} \div \frac{25}{12} = \frac{2}{15}$

[2]

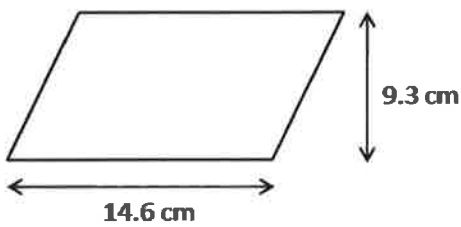
[total 4 marks]

7. (a) Calculate the area of the triangle shown below.



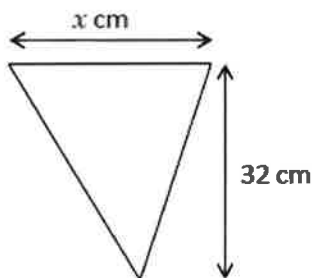
..... cm² [2]

(b) Calculate the area of the parallelogram shown below.



..... cm² [2]

(c) The triangle below has an area of 384 cm². Find the value of the length marked x .



$x =$ [3]

[total 7 marks]

8. (a) Find the value of the length p , giving your answer to 2 decimal places.

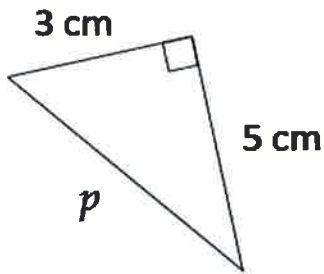


Diagram
not to scale

..... cm [3]

- (b) Find the value of the length x , giving your answer to 2 decimal places.

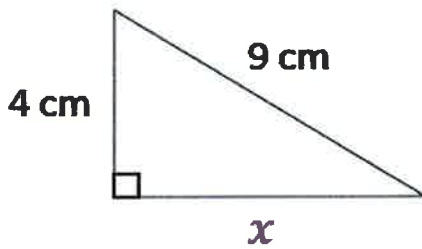


Diagram
not to scale

..... cm [3]

[total 6 marks]

9. In the Carlsbad Caverns (New Mexico, USA), there can be as many as 1500 bats crammed tightly into five square feet.

(a) How many bats could fit in a space of 20 square feet?

.....
[2]

(b) How many bats could fit in a space of 3 square feet?

.....
[2]

[total 4 marks]

10. An earthquake struck Iran in May 1997.
500 out of 1600 inhabitants of the village of Ardakul were killed during the earthquake and aftershocks.

What percentage of the inhabitants of Ardakul were killed?

..... %

[total 2 marks]

11. When Mont Pelée volcano in Martinique erupted in 1902, a cloud of hot gas of temperature 1075°C was created. When this cloud reached the town of St Pierre, it had cooled to a temperature of 700°C .
What was the percentage decrease in temperature of the hot gas cloud from creation to reaching St Pierre? Give your answer to 2 decimal places.

..... %

[total 3 marks]

12. At a station, there are two platforms. Trains leave platform 1 and 2 simultaneously at 09:00. Thereafter, there is a train from platform 1 every 25 minutes, and a train from platform 2 every hour. When is the next time that two trains depart from the station together?

.....

[total 3 marks]

13. (a) Expand $9(2 + 7x)$

..... [2]

(b) Expand $-5(y - 3a)$

..... [2]

(c) Expand and simplify $6(a + 2c) + 2(4a - c)$

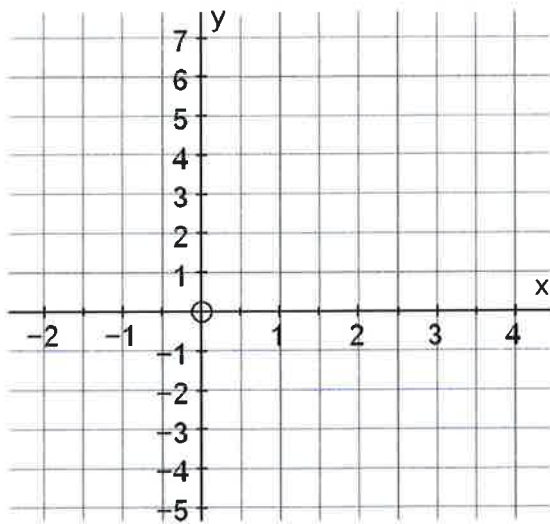
..... [4]

(d) Solve $8x - 7 = 5x + 35$

$x =$ [3]

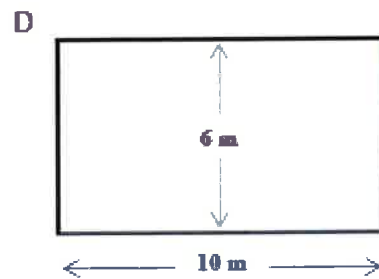
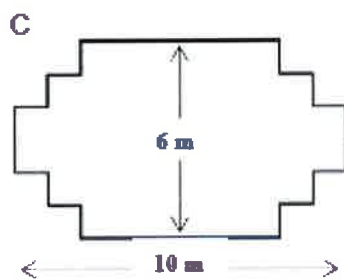
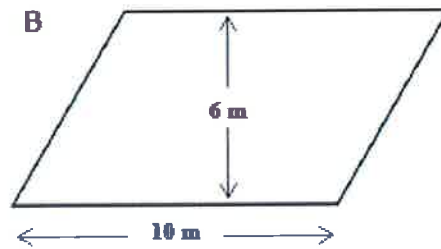
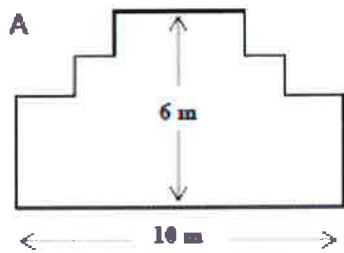
[total 11 marks]

14. Draw the line $y = 2x - 1$ on the graph provided below.



[total 2 marks]

15. A carpenter has 32 metres of timber and wants to make a border around a garden bed. He is considering the following designs for the garden bed.

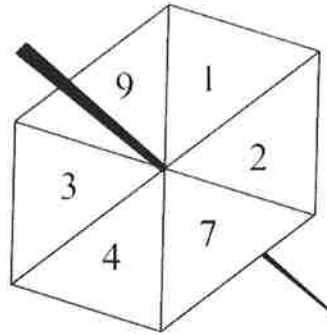


Which of the above designs are possible if only 32 metres of timber are available?

[total 2 marks]

16. Here is a fair 6-sided spinner

Jake is going to spin the spinner once.



(a) What is the probability that the spinner will land on 4?

..... [1]

(b) Write down the probability that the spinner will land on a number greater than 10?

..... [1]

Liz is going to spin the spinner 120 times.

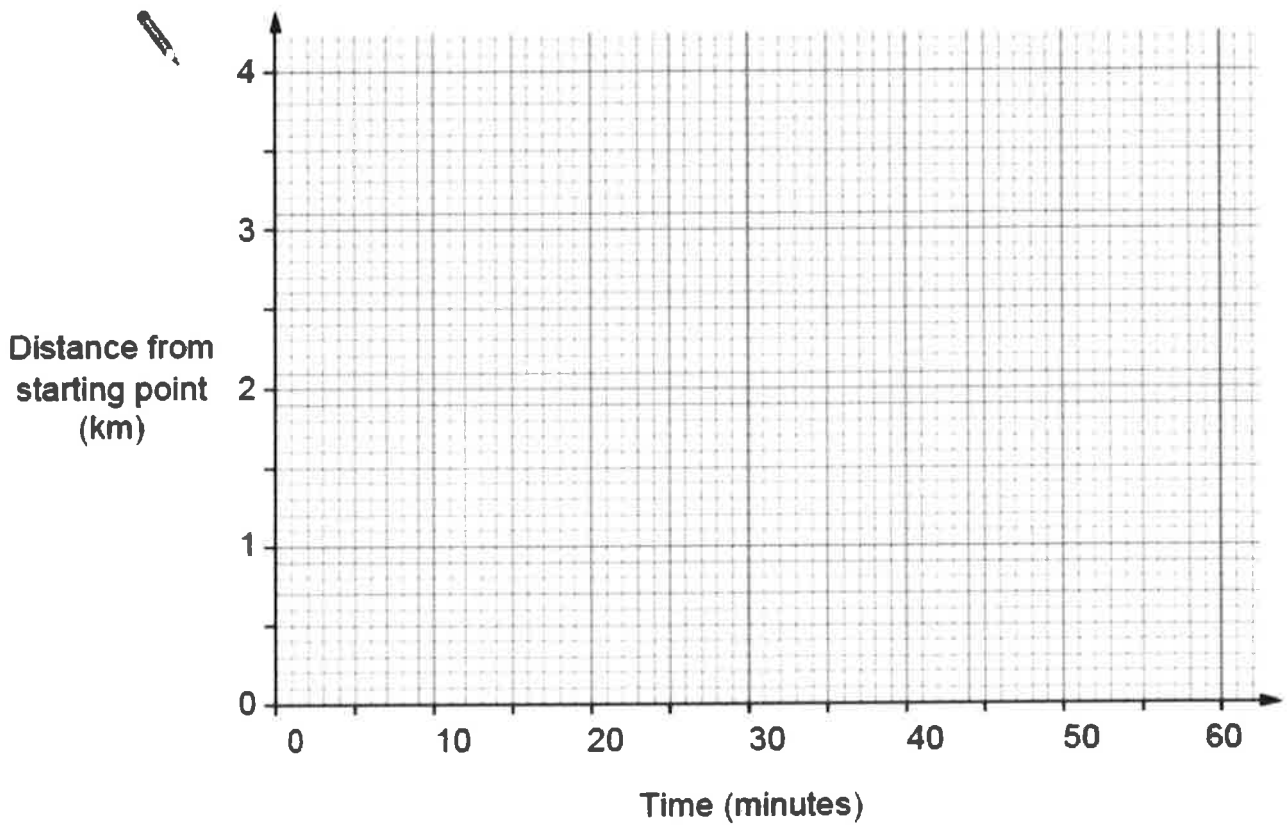
(c) Work out an estimate for the number of times the spinner will land on 7.

..... [2]

[total 4 marks]

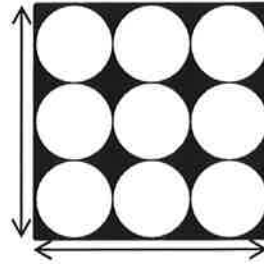
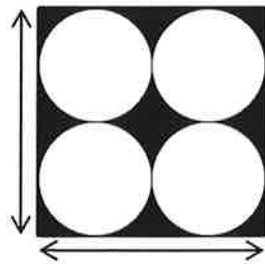
17. Ella made a journey where she walked to a place that was 4km away from her starting point.
- For the first 15 minutes she walked at 4km per hour
 - For the next 15 minutes she walked at 2km per hour
 - For the last 30 minutes she walked at a constant speed

Show Ella's journey accurately on the graph below.



[total 3 marks]

18. Jacob takes a square of dimensions $12\text{cm} \times 12\text{cm}$. He puts a square number of identical circles in it, with radii such that they just fit inside the square. The diagrams below show what he has done for four and nine circles.



*Diagrams
not to
scale*

- (a) Find the area of the shaded region (i.e. black region) for the diagram containing 4 circles.

.....
[4]

- (b) Find the area of the shaded region of a similar figure with 100 identical circles inside the square.

.....
[4]

[total 8 marks]