



Entrance Examinations (14+)

2019 (November 2018 version)

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 25 questions; the total number of marks available is 170.

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]

(c) Joshua buys a rare stamp for \$2000 and sells it for \$2700.

(i) How much profit did Joshua make?

\$ [1]

(ii) What was Joshua's percentage profit?

..... % [2]

[total 7 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 $\frac{18}{48}$ as a fraction in its lowest form.

..... [1]

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

..... [1]

(e) 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 9 marks]

6. If $a = 5$, $b = -2$ and $c = -3$, find the value of ...



(a) ab

..... [1]

(b) $b - c$

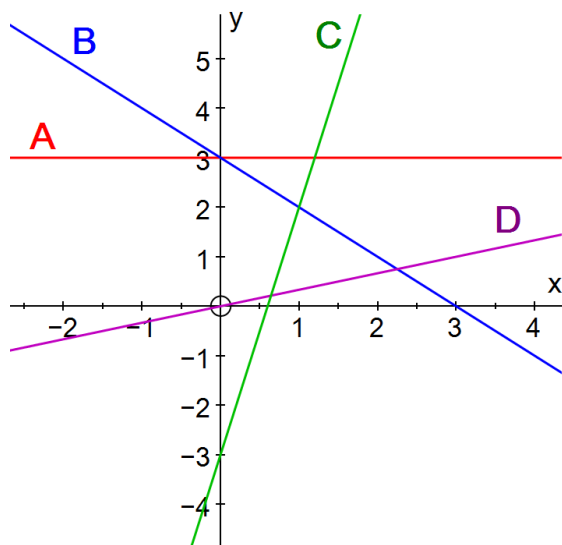
..... [1]

(c) $(a + c)^2$

..... [2]

[total 4 marks]

7. Match the lines A, B, C and D to their equations in the table.



Equation of line	Letter of this line in diagram
$y = 5x - 3$	
$y = \frac{1}{3}x$	
$y = 3$	
$x + y = 3$	

[total 4 marks]

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



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

[1]

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



[1]

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

[2]

$$(d) \quad 3\frac{1}{3} - 1\frac{2}{7} = 2\frac{1}{21}$$

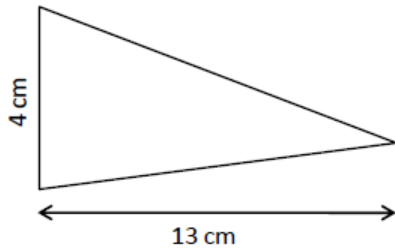
[3]

$$(e) \quad 2\frac{4}{9} \times 1\frac{10}{11} = 4\frac{2}{3}$$

[3]

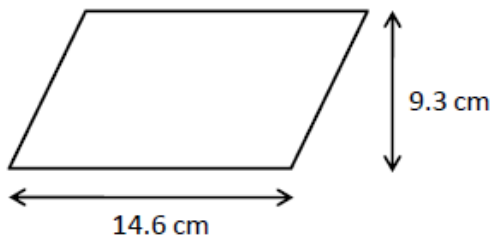
[total 10 marks]

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



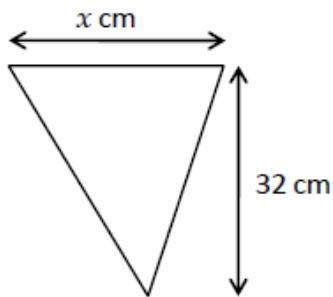
..... cm² [2]

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



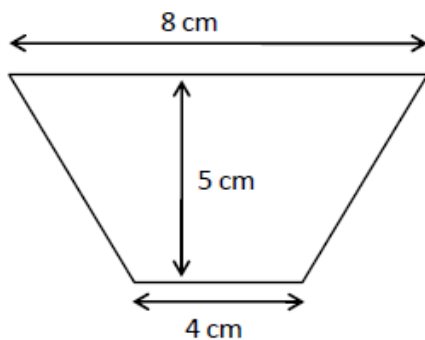
..... cm² [2]

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



$x =$ [3]

- (d) Find the area of the shape below.



..... cm² [2]

[total 9 marks]

10. Write these numbers in standard form:

(a) 60000000

..... [1]

(b) 7341

..... [1]

[total 2 marks]

11. The average distance of Mercury from the Sun is 56.9 million km.

(a) Write the distance 56.9 million km in standard form.

..... km [1]

The average distance between the Earth and its moon is 3.844×10^5 km.

(b) Write the distance 3.844×10^5 km as an ordinary number.

..... km [1]

The diameter of the moon is 3476 km.

(c) (i) Calculate the circumference of the moon.

Write down the full number on your calculator display.

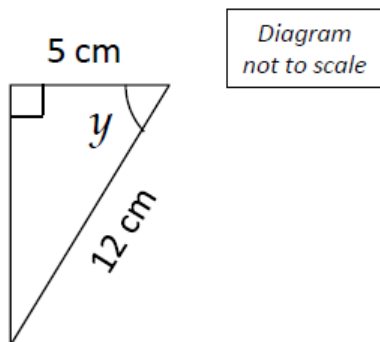
..... km [2]

(ii) Give the circumference of the moon (ie your answer to (ci)) to 3 significant figures.

..... km [1]

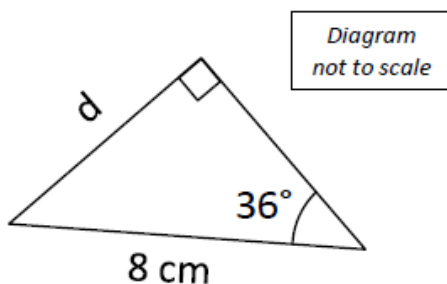
[total 5 marks]

12. (a) Find the value of the angle y , giving your answer to 2 decimal places.



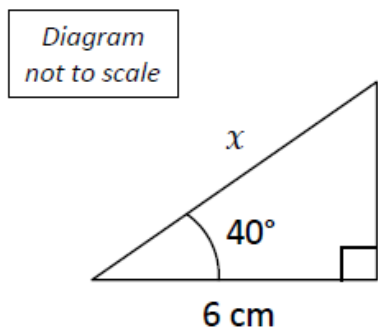
..... ° [3]

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



..... cm [3]

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



..... cm [3]

[total 9 marks]

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

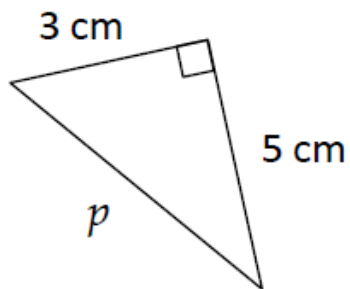


Diagram
not to scale

..... cm [3]

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

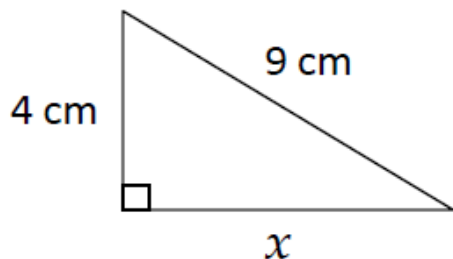


Diagram
not to scale

..... cm [3]

[total 6 marks]

14. Complete the table by stating the gradients of the straight lines given in the table.

Equation of line	Gradient
$y = 4x + 9$	
$y = 5 - 2x$	
$2y + 3x = 8$	

[total 4 marks]

15. (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 $11(6 + 2x) = 99$

$x =$ [3]

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

$x =$ [3]

[total 14 marks]

16. 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]

17. 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.

..... %

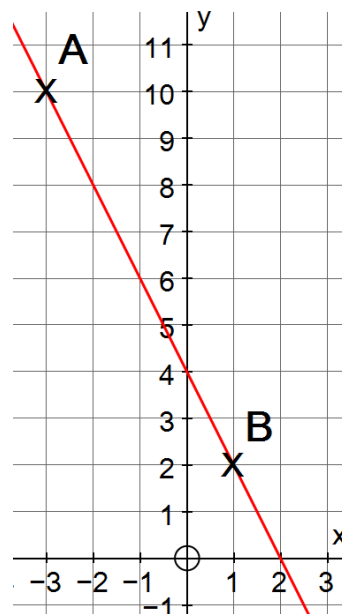
[total 3 marks]

18. Jasmine says that the point $(9,32)$ lies on the line with equation $y = 4x - 3$.
Is she correct? Show working to help fully explain your answer.

.....

[total 3 marks]

19. The straight line shown on the graph passes through the points A(-3,10) and B(1,2).



(a) Give the coordinates of the midpoint of the line AB.
Show your working.

..... [2]

(b) Find the equation of the straight line that passes through A and B.

..... [2]

(c) Give an equation of a line that is parallel to the line that passes through A and B.

..... [2]

[total 6 marks]

20. Simplify each of the following fractions:

(a) $\frac{26x^2y}{2xy}$

..... [2]

(b) $\frac{12a}{5k} \times \frac{10}{3ak}$

..... [3]

(c) $\frac{9x}{y^3} \div \frac{15x}{y^2}$

..... [3]

(d) $\frac{3x}{5} - \frac{2x}{9}$

..... [3]

[total 11 marks]

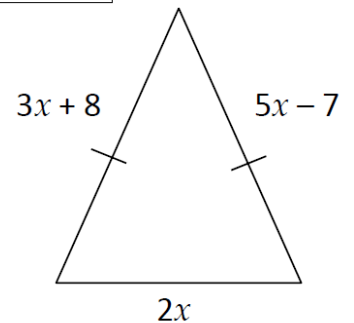
21. The triangle shown is isosceles.

(a) Use the information that the 'triangle is isosceles' to form an equation in x .

..... [1]

(b) Solve your equation to find the value of x .

Diagram
not to scale



$x =$ [3]

(c) Find the value of the perimeter of this triangle.

..... [2]

[total 6 marks]

22. The lengths of some of the rivers in South America (in metres) are given in the table.

River	Length (metres)
Amazon	6.798×10^6
Magdalena	1.497×10^6
Marona	4.200×10^5
Orinoco	2.410×10^6
Río de la Plata	2.900×10^5
Río Negro	2.990×10^6

(a) Which is the shortest river in the table?

..... [1]

(b) What is the difference in length between the Orinoco and Marona rivers?

..... metres [2]

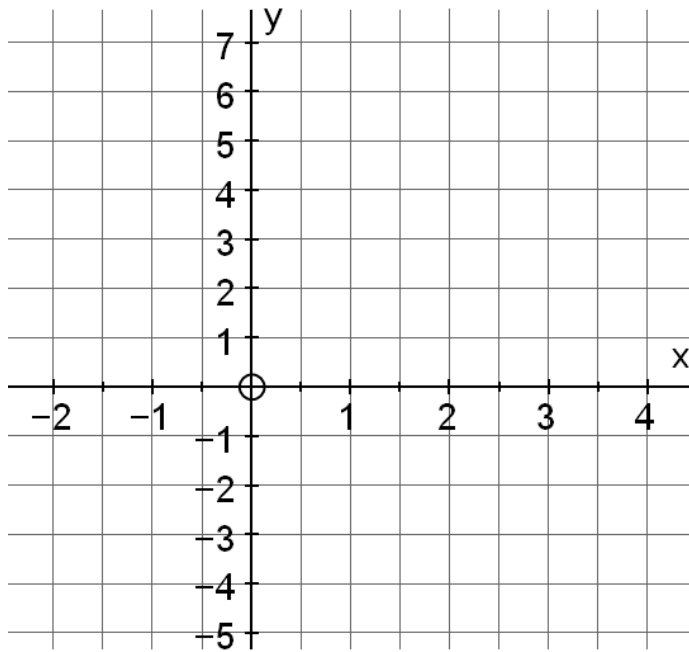
(c) Find the number (to the nearest integer) that completes this sentence:

“The Amazon River is _____ times as long as the Río de la Plata River”.

..... [2]

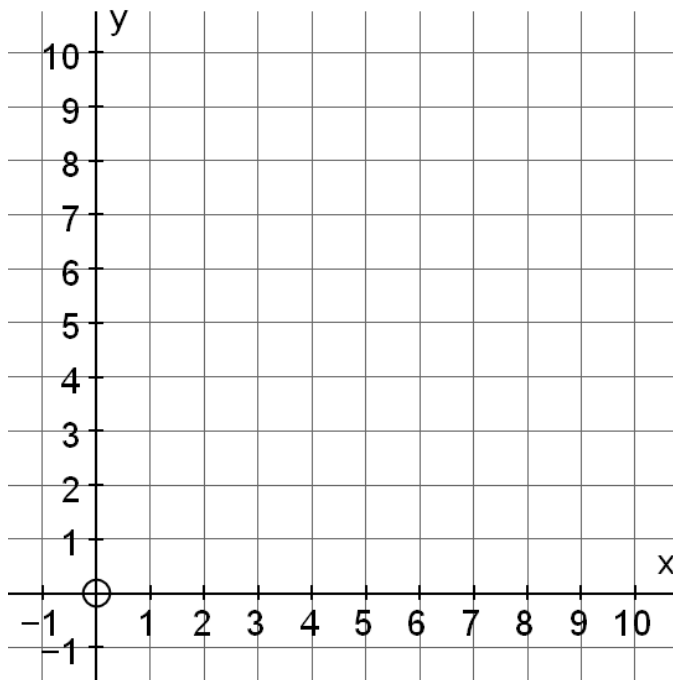
[total 5 marks]

23. (a) Draw the line $y = 2x - 1$ on the graph provided below.



[2]

- (b) Draw the line $2y + x = 8$ on the graph provided below.



[3]

[total 5 marks]

24. (a) Solve $x^2 - 8 = 41$

$x = \dots\dots\dots$ [3]

(b) Solve $\sqrt{x} = 12$

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

(c) Solve $\frac{x}{6} + 11 = 20$

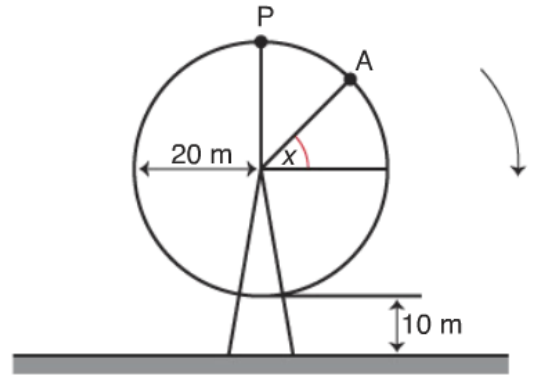
$x = \dots\dots\dots$ [2]

(d) Solve $\sqrt{x + 51} = 8$

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

[total 8 marks]

25. A circular Big Wheel funfair ride of radius 20m rotates in a *clockwise* direction. The lowest point is 10m above the ground and the highest point on the wheel is P.



The wheel rotates at 2° per second.

- (a) Calculate the height of a chair at point A above the ground if $x = 30^\circ$.

..... m [4]

- (b) Find the height of the chair above the ground 20 seconds after reaching point A.

..... m [5]

[total 9 marks]