Entrance Examinations (14+)

2017

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 80.

Name: …………………………………………………………………………Age: ………………………

Present school:………

Q1.

Find the value of

$$(2.8 - 0.45)^2 + \sqrt[3]{5.832}$$

....

(Total for question = 2 marks)

Q2.

Here are four numbers.

$$0.43 \qquad \frac{3}{7} \qquad 43.8\% \qquad \frac{7}{16}$$

Write these numbers in order of size.
Start with the smallest number.

....

(Total for question = 2 marks)

Q3.

(a)   Write 0.000 423 in standard form.

....

(2)

(b)   Write 4.5×10^4 as an ordinary number.

....

(1)

(Total for question is 3 marks)

Q4.

Work out 234% of 150

....

(Total for question = 2 marks)

Q5.

Here are the equations of four straight lines.

Line A $y = 2x + 4$
Line B $2y = x + 4$
Line C $2x + 2y = 4$
Line D $2x - y = 4$

Two of these lines are parallel.

Which are they?

Line .... and line ....

(Total for question is 2 marks)

Q6.

[NON-CALCULATOR – show full working in this question]

Work out the value of $(9 \times 10^{-4}) \times (3 \times 10^{7})$

Give your answer in standard form.

....

(Total for question = 2 marks)

Q7.

$f = 5x + 2y$

$x = 3$ and $y = -2$

Find the value of f.

....

(Total for question = 2 marks)

Q8.

Solve $3x + 7 = 1$

$x = $ ....

(Total for question = 2 marks)

Q9.

Emily and Abi have saved a total of £458 for their holiday.
Abi saved £72 more than Emily.

How much did Abi save?

£ ....

(Total for question is 3 marks)

Q10.

Thomas has 20 sweets.
Jack also has 20 sweets.

Thomas gives Jack x sweets.

Thomas then eats 5 of his sweets.
Jack then eats half of his sweets.

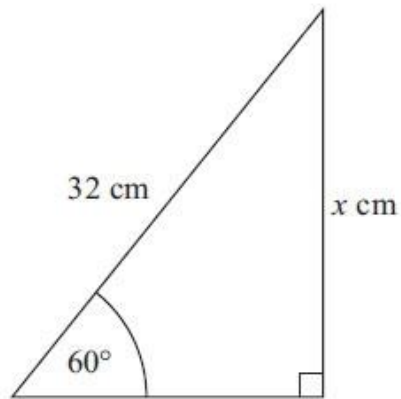Write expressions for the number of sweets Thomas and Jack now have.

Thomas..   Jack..

(Total for question = 3 marks)

Q11.

Find an equation for a straight line with gradient 7 passing through the point (9,13).

....

(Total for question = 3 marks)

Q12.

Diagram **NOT** accurately drawn

32 cm

x cm

60°

Calculate the value of x.
Give your answer correct to 3 significant figures.

....

(Total for Question is 3 marks)

Q13.

(a) Expand and simplify $3(y - 2) - 5(2y - 1)$

....

(2)

(b) Simplify $5u^2w^4 \times 7uw^3$

....

(2)

(Total for question = 4 marks)

Q14.

Line **L** is drawn on the grid below.
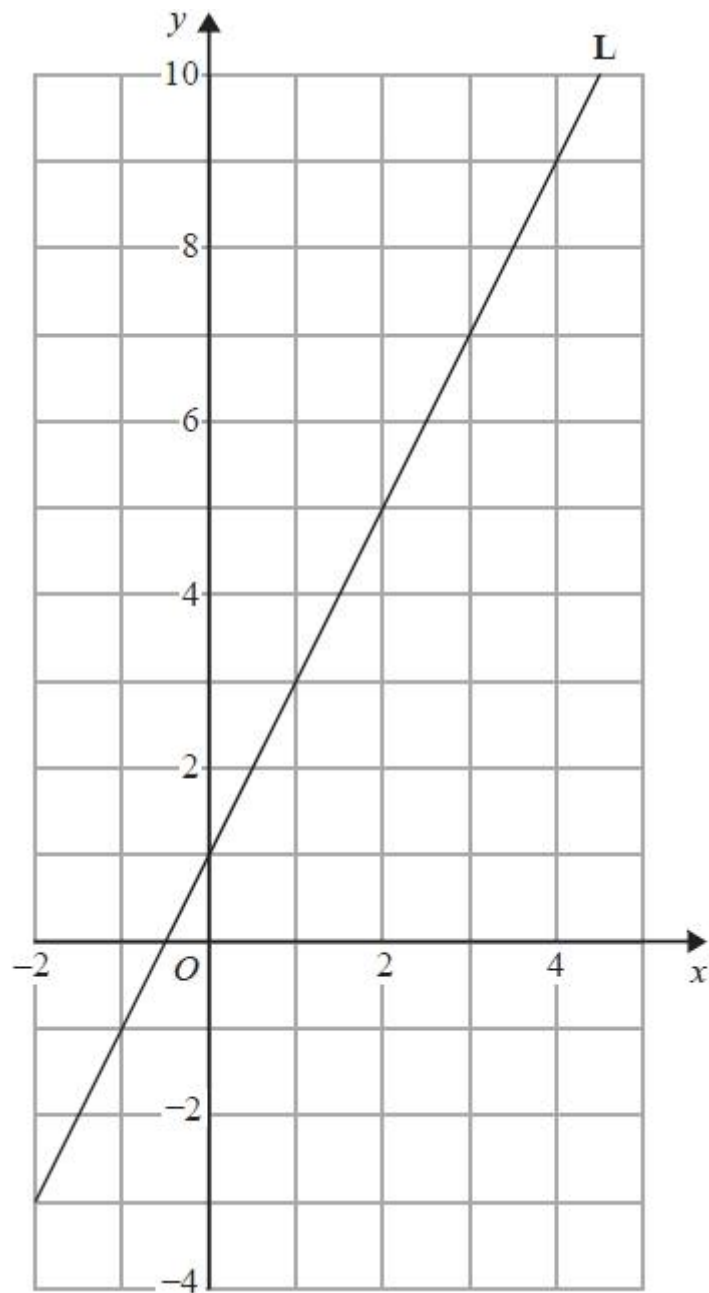
Find an equation for the straight line **L**.
Give your answer in the form $y = mx + c$

....

(Total for question is 3 marks)

Q15.

There are 500 passengers on a train.

$\dfrac{7}{20}$ of the passengers are men.

40% of the passengers are women.

The rest of the passengers are children.

Work out the number of children on the train.

....

(Total for question is 3 marks)

Q16.

On a farm, 4 ½ out of every 15 acres of the land are used to grow crops.

Wheat is grown on $\dfrac{5}{8}$ of the land used to grow crops.

What percentage of the total area of the land on the farm is used to grow wheat?

....
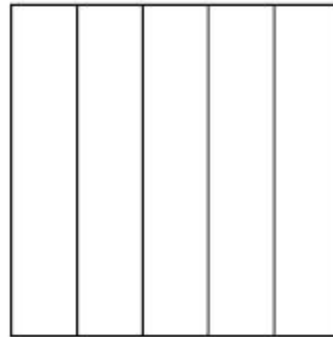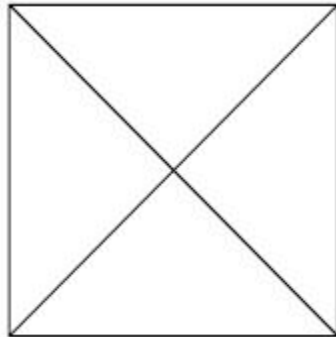
(Total for question = 3 marks)

Q17.

Here are two identical squares.

The first square is divided into four equal parts.
The second square is divided into five equal parts.

The two squares are joined together as shown to make a rectangle.
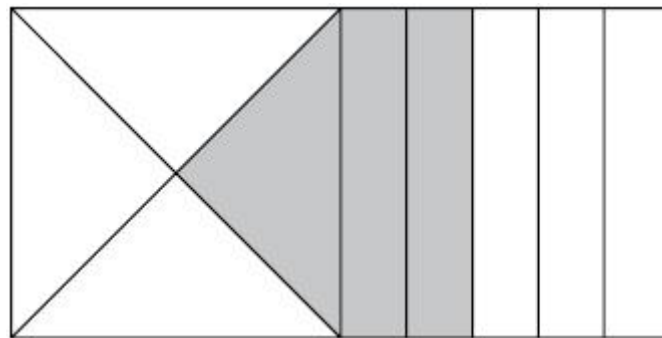
What fraction of the rectangle is shaded?

....

(Total for question = 3 marks)

Q18. [NON-CALCULATOR – show full working in this question]

(a) Work out $\dfrac{2}{7} + \dfrac{1}{5}$

....

(2)

(b) Work out $1\dfrac{2}{3} \div \dfrac{3}{4}$

....

(2)

(Total for question = 4 marks)

Q19.
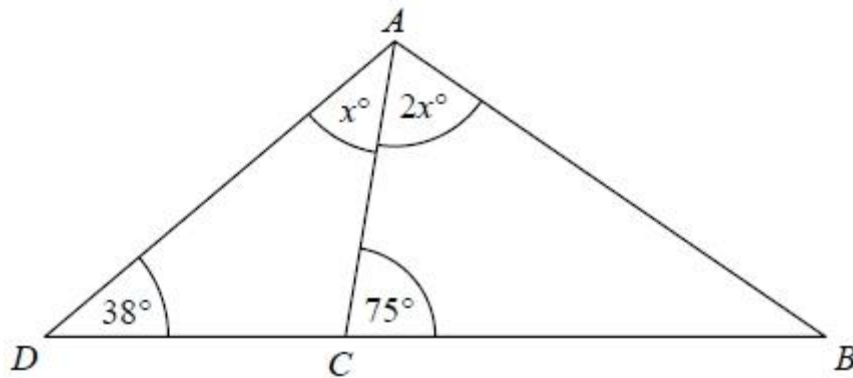
ABD is a triangle.
C is a point on *BD*.

Find angle *ABD*, giving reasons/working.

....

(Total for question = 4 marks)

Q20.

(a) Solve
$$4x + 5 = x + 26$$

x = ...

(2)

(b) Simplify

$$\frac{2x^2}{5y^4} \div \frac{8x}{35y^3}$$

....

(2)

(Total for question = 4 marks)

Q21.
Hamish the pig lives in a triangular field *ABC* of perimeter 20 m.

AB = 7 m.
BC = 4 m.

By calculation, deduce whether triangle *ABC* is a right–angled triangle.

(Total for question = 4 marks)

Q22.

A and B are two companies.

The table shows some information about the sales of each company and the number of workers for each company in 2004 and in 2014

	Company A		Company B	
	Sales (£ millions)	Number of workers	Sales (£ millions)	Number of workers
2004	320	2960	48	605
2014	388	3200	57	640

(a) Work out the percentage increase in sales from 2004 to 2014 for Company A.

.... %

(2)

(b) Which company had the most sales per worker in 2014, Company A or Company B?
You must show how you get your answer.

....

(3)

(Total for question = 5 marks)

Q23. Triangles *ABD* and *BCD* are right-angled triangles.

A

5 cm   10 cm

B   D

x cm   4 cm

C
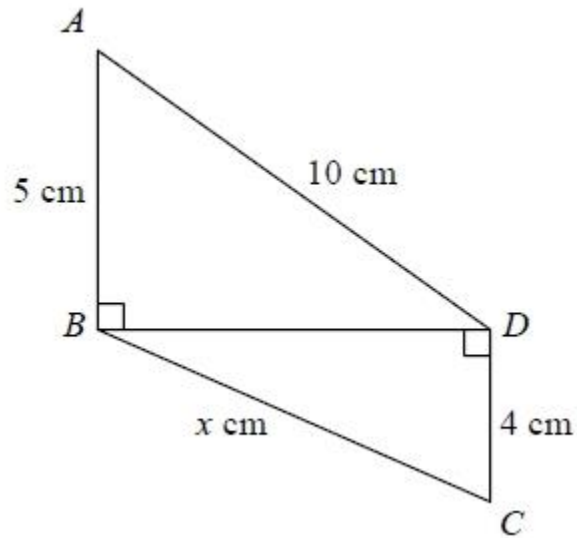
Work out the value of *x*.   Give your answer correct to 2 decimal places.

....

(Total for question = 4 marks)

Q24.

(a) Solve the equation $7x^2 - 23 \ = \ 985$

x = ...

(3)

(b) Solve the equation

$$\frac{y-1}{2} + \frac{y+1}{3} = 15$$

y = ...

(3)

(Total for question = 6 marks)

Q25.
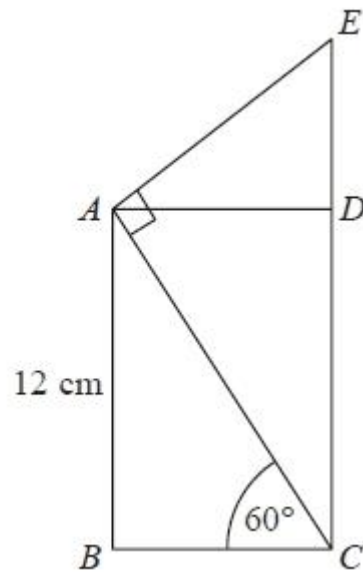
Diagram **NOT** accurately drawn

ABCD is a rectangle.
CDE is a straight line.

AB = 12 cm
Angle *ACB* = 60°
Angle *EAC* = 90°

Calculate the length of *CE*.
You must show all your working.

.... cm

(Total for question = 4 marks)

END OF EXAMINATION - MAKE SURE YOU CHECK ALL YOUR WORK.

14+ 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.

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- 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 23 questions; the total number of marks available is 90.

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 $\dfrac{y^6}{y^3}$

....

.... [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 $\dfrac{2}{5} + \dfrac{1}{3}$ **b** $\dfrac{2}{3} - \dfrac{2}{5}$

……………………………………………   ……………………………………………………………

……………………………………………   ……………………………………………………………

…………………………………… [2 marks]   ………………………………………………… [2 marks]

c $\dfrac{3}{8} \times \dfrac{2}{9}$ **d** $\dfrac{9}{14} \div \dfrac{3}{7}$

………………………………………   ……………………………………………………

………………………………………   ……………………………………………………

…………………………………… [2 marks]   ………………………………………………… [2 marks]

7

Arrange in order of ascending size (smallest first) 5×10^{-3} , 1.3%, 0.015, $\dfrac{8}{1000}$

……………………………..[3 marks]

8

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

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

………………………. [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, $\dfrac{2}{3}$ of $2\dfrac{2}{5}$ or $\dfrac{2}{5}$ of $2\dfrac{2}{3}$? Show your working.
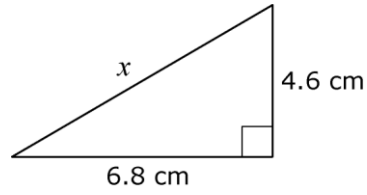
....

....

....

....   [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.

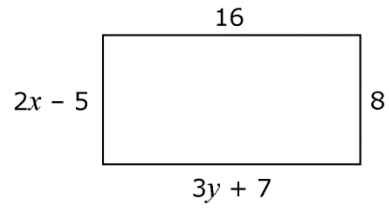How many left-handed pupils are there in Year 10?

....
.... [3 marks]

16 The diagram shows a rectangle.

a Find the value of x.

16

$2x - 5$ 8

$3y + 7$

....

.... [2 marks]

b Find the value of y.

.... [2 marks]

17 Calculate length x in triangle *PQR*.

P

19 cm

x

Q

17 cm

R

....

....
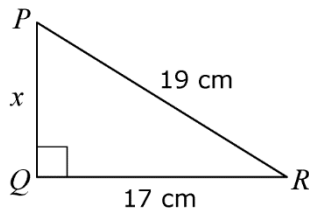
.... [3 marks]

18 Solve these equations:

a $\dfrac{n}{3} + 8 = 10$ **b** $\dfrac{2x - 7}{2} = 6$

....

....

.... [3 marks]   .... [3 marks]

19 The diagram shows a triangle, with an exterior angle shown.
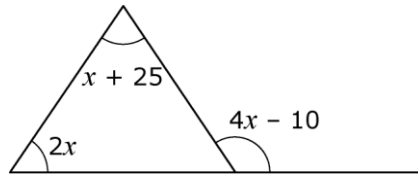
Find the value of x.

....

....

.... [4 marks]

20 Find the equation of the line *AB*.

....
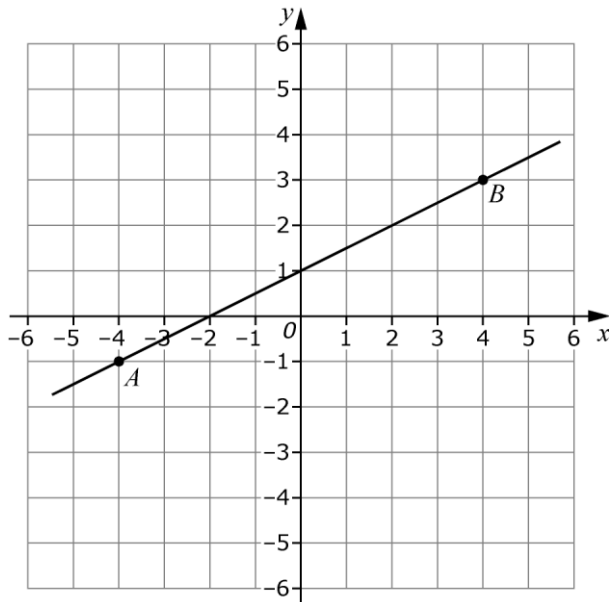
.... [3 marks]

21 Show that $1\dfrac{7}{9} \div 2\dfrac{2}{3} = \dfrac{2}{3}$ without using a calculator. Show <u>all</u> your working.

....

....

....

.... [4 marks]

22 **a** Work out $2.6 \times 10^6 \times 5 \times 10^8$
Give your answer in standard form.

………

……………………………………………………………………………………………… [2 marks]

b Work out $(4.2 \times 10^5) \div (7 \times 10^{-4})$

Give your answer in standard form.

………

……………………………………………………………………………………………… [2 marks]

23 Find the side marked x.

………

………
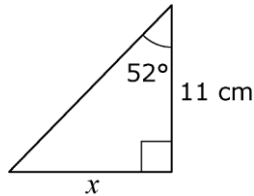
……………………………………………………………………………………………… [4 marks]

END OF EXAM – BE SURE TO CHECK YOUR WORK THOROUGHLY

The King's School
Canterbury

Entrance Examinations (14+)

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.
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- 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) $5x = 32$

$x =$ .... **[1]**

(b) $x + 17 = 38$

$x =$ .... **[1]**

(c) $4x - 15 = 105$

$x =$ .... **[2]**

(d) $35 - x = 41$

$x =$ .... **[2]**

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

$x =$ .... **[1]**

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

$x =$ .... **[2]**

[total 9 marks]

5. Answer the following questions without a calculator and <u>showing ALL working</u>.

(a) Express 0.083 as a percentage.

.... % **[1]**

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

.... % **[1]**

(c) Write $\dfrac{18}{48}$ 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.
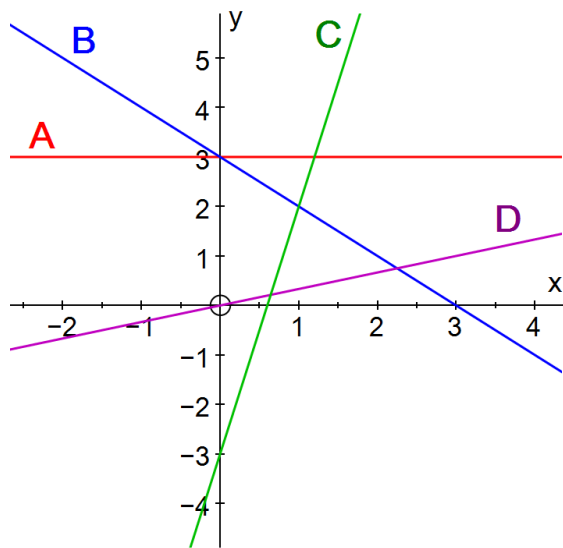
Equation of line	Letter of this line in diagram
$y = 5x - 3$	
$y = \frac{1}{3}x$	
$y = 3$	
$x + y = 3$	

[total 4 marks]

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

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

[1]

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

[1]

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

[2]

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

[3]

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

[3]

[total 10 marks]

9. (a) Calculate the area of the triangle shown below.
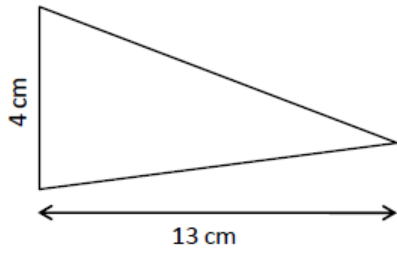
.... cm² **[2]**

(b) Calculate the area of the parallelogram shown below.
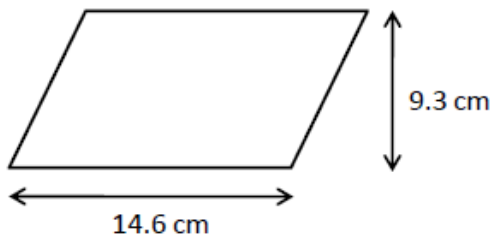
.... cm² **[2]**

(c) The triangle below has an area of 384 cm². Find the value of the length marked x.
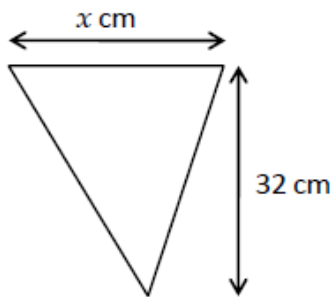
$x =$ .... **[3]**

(d) Find the area of the shape below.
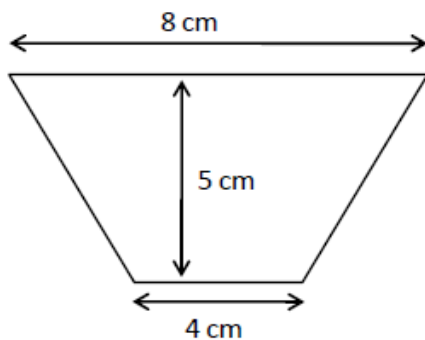
.... cm² **[2]**

[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.

5 cm

Diagram
not to scale

y

12 cm

....° **[3]**
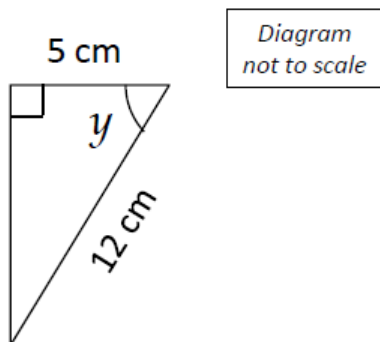
(b) Find the value of the length d, giving your answer to 2 decimal places.

Diagram
not to scale

d

36°

8 cm

.... cm **[3]**

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

Diagram
not to scale

x

40°

6 cm
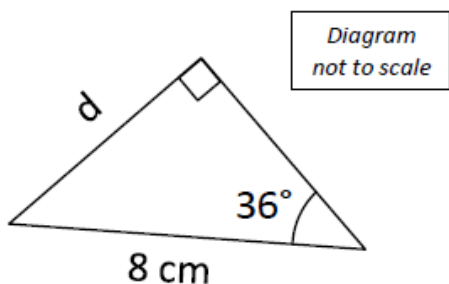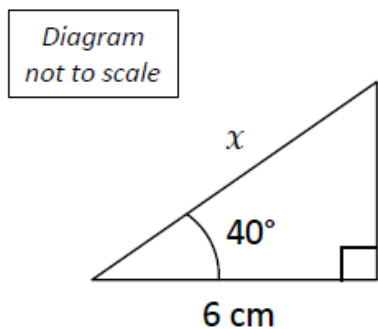
.... cm **[3]**

[total 9 marks]

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

3 cm

5 cm

p
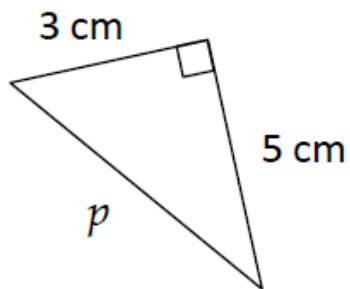
Diagram not to scale

.... cm **[3]**

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

9 cm

4 cm

x
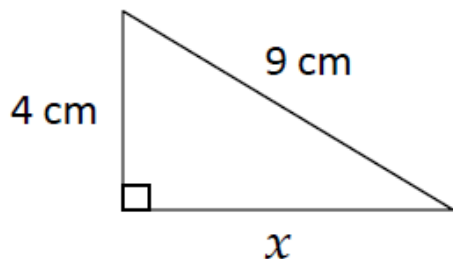
Diagram not to scale

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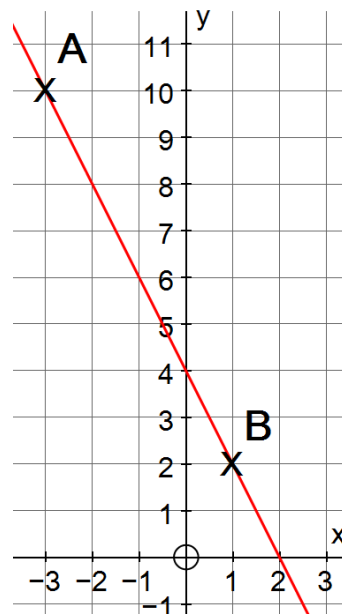
(a) Give the coordinates of the midpoint of the line AB.
   Show your working.

   .... **[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) $\dfrac{26x^2 y}{2xy}$

   .... **[2]**

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

   .... **[3]**

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

.... **[3]**

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

.... **[3]**

[total 11 marks]

21. The triangle shown is isosceles.

Diagram not to scale

$3x + 8$ $5x - 7$

$2x$

(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.
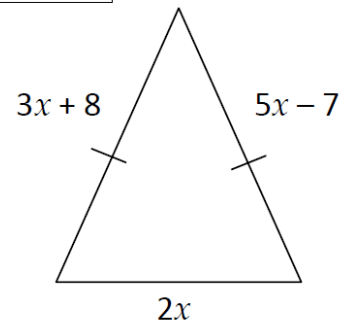
$x =$ .... **[3]**

(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".

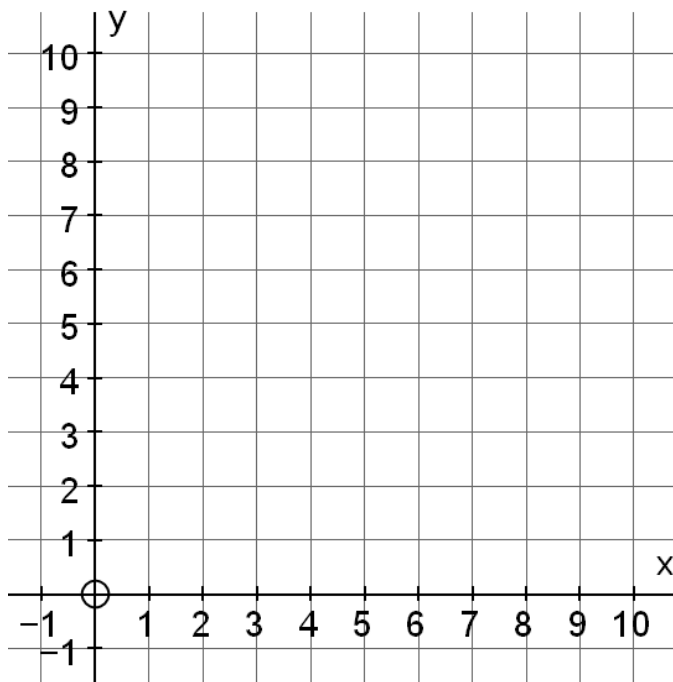.. **[2]**

[total 5 marks]

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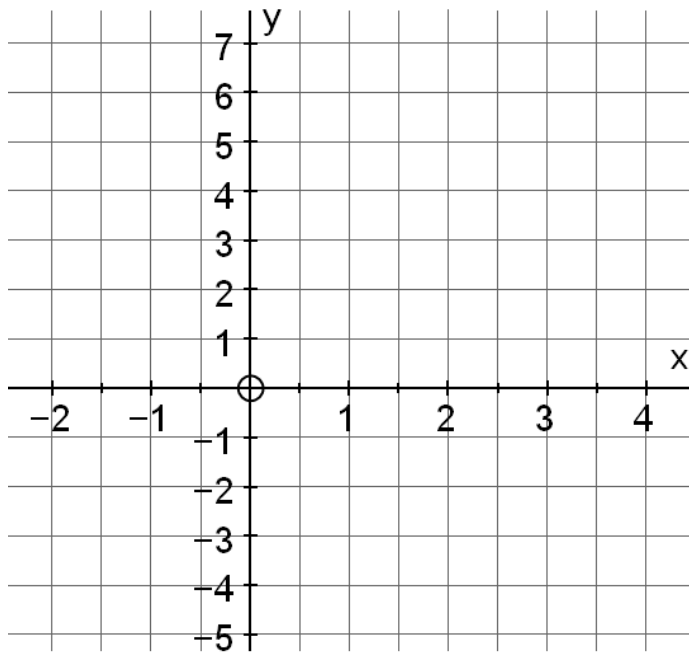
[2]

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

[3]

[total 5 marks]

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

$x =$ .... **[3]**

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

$x =$ .... **[1]**

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

$x =$ .... **[2]**

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

$x =$ .... **[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.
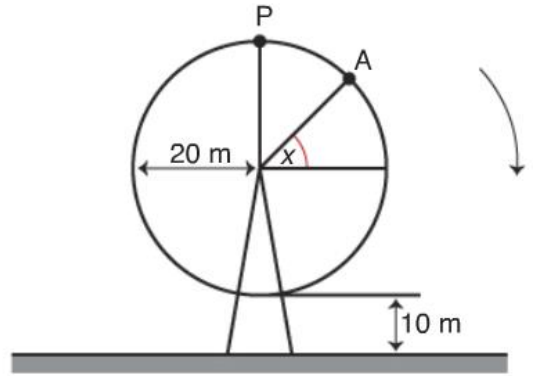
The wheel rotates at 2° per second.

(a) Calculate the height of a chair at point A above the ground if $x = 30°$.

.... m **[4]**

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

.... m **[5]**

[total 9 marks]