AQA Higher Practice paper (calculator 2)

Higher Tier

Time: 1 hour 30 minutes

The maximum mark for this paper is 80.
The marks for **each** question are shown in brackets.

1 One billion in the UK is one thousand million.
Circle one billion written in standard form.

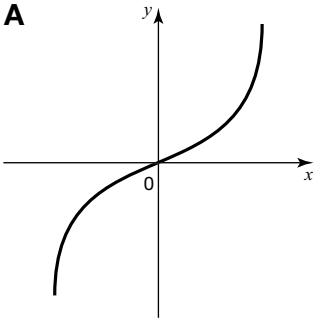
100×10^6 1×10^6 1×10^9 1×10^8

[1 mark]

2 Here are 4 graphs.

Circle the letter of the graph of $y = x^3$.

A



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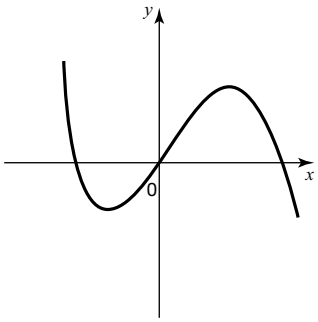

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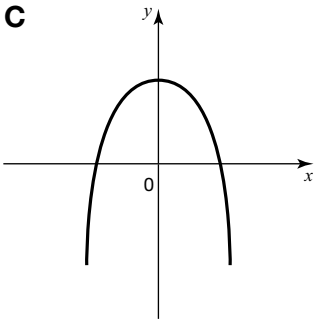

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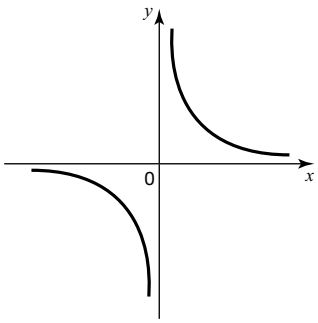
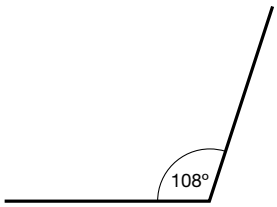


[1 mark]

3 The diagram shows part of a regular polygon.

Circle the number of sides of the regular polygon.

6 8 7 5



[1 mark]

4 Circle the volume that is the same as 7.6 m^3.

760 cm^3 76 cm^3 76 000 cm^3 7 600 000 cm^3

[1 mark]

5 Solve $6x - 5 > 1 - 2x$

.....

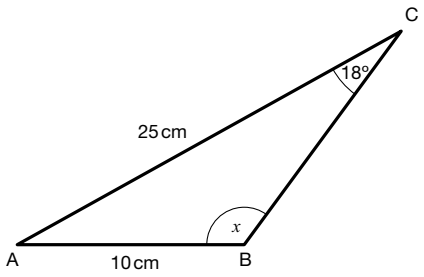
[2 marks]

6 Factorise $4x^2 + 15x - 4$

.....

[2 marks]

7 The diagram shows a triangle *ABC* with an obtuse angle x.



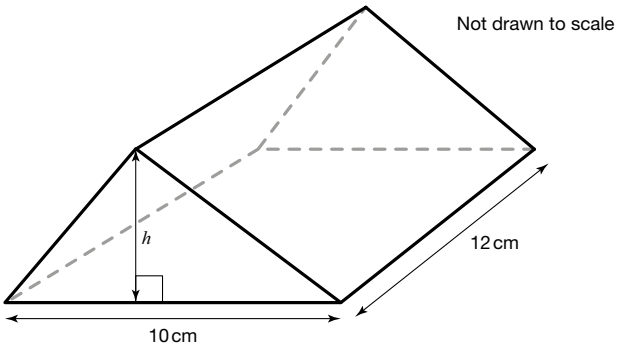
Work out the size of angle x.

Give your answer correct to 1 decimal place.

.....

[3 marks]

8



The diagram shows a triangular prism with a volume of 960 cm^3.

Find the height of the triangle.

.....

[3 marks]

9 Two spheres are mathematically similar.

The ratio of their volumes is $\frac{27}{8}$

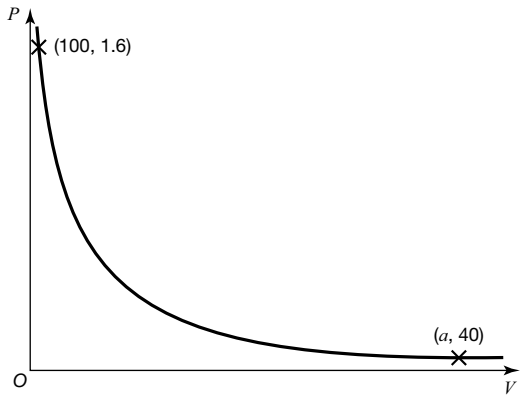
Circle the ratio of their surface areas.

$\frac{27}{4}$ $\frac{9}{2}$ $\frac{27}{8}$ $\frac{9}{4}$

[1 mark]

10 P is inversely proportional to V.

The graph below shows the coordinates of two points that lie on the curve.



Find the value of a.

[3 marks]

11 Sketch the graph of $y = 2x^2 - 5x + 4$

Mark the coordinates where the graph cuts the y-axis and the coordinates of the turning point.

[4 marks]

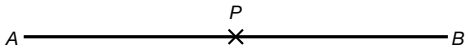
12 *AB* is part of a sewer pipe.

Part of a house is shown shaded.

A pipe is to be fitted from *P* to the edge of the house. The length of the pipe from *B* to the house needs to be as short as possible.

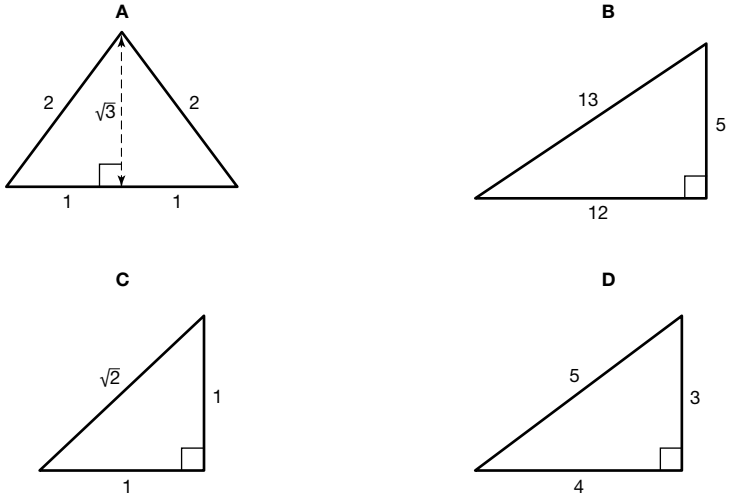
Using only ruler and compasses, show where the pipe will join the edge of the house.

Show its position with *X* on the diagram.



[2 marks]

13 Here are sketches of four triangles.



Circle the letter of the triangle that you would use to work out the exact value of Sin 60°.

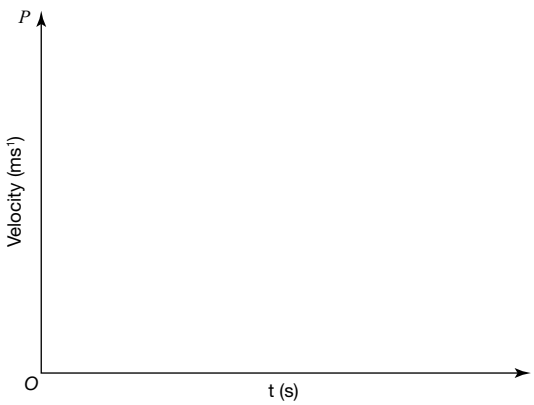
[1 mark]

14 Cars A and B are travelling along a straight road.

Car A travels with a constant velocity of 20 m/s. At time $t = 0$, it overtakes car B.

At time $t = 0$, car B is travelling with a velocity of 15 m/s. It immediately accelerates uniformly and both cars travel a distance of 600 m, where car B overtakes car A.

a Draw a velocity–time graph showing the motion of the cars from $t = 0$ until car B overtakes car A.



[2 marks]

b Show that car B overtakes car A at $t = 30$ s.

[2 marks]

c Find the acceleration of car B.

.....

[2 marks]

15 The line $y = 3x + 6$ intersects the curve $y = x^2 - 2x + 1$ at two points.

Find the x-coordinates for each of these two points.

Give your answers correct to 2 decimal places.

.....

[4 marks]

16 The first three terms of a term-to-term sequence are a b c

The term-to-term rule is multiply by 3 and subtract 2.

Show that $c = 9a - 8$

[3 marks]

17 Georgina works in a high street fashion shop.

On the first day of a sale all the prices are reduced by 20%.

On the final day of the sale, the sale prices are all reduced by a further 25%.

Georgina says the shop should on the last day of the sale reduce all the original prices by $20\% + 25\% = 45\%$.

a Explain why she is wrong.

.....

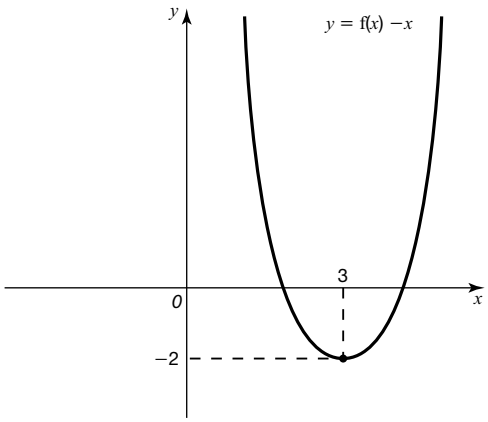
[1 mark]

b What is the correct overall percentage reduction?

.....

[2 marks]

18 The graph shows the curve $y = f(x)$



The turning point of the curve is at (3, −2)

Write down the coordinates of the turning points for the curves with equations

a $y = f(x + 2)$

.....

[1 mark]

b $y = f(x) + 2$

.....

[1 mark]

c $y = -f(x)$

.....

[1 mark]

19 Disprove the following statement by giving a counter-example.

For all real numbers a and b, if $b^2 > a^2$, then $b > a$

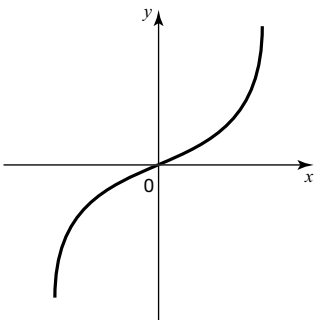
.....

[3 marks]

20 One of these graphs is a sketch of the curve with equation $y = 2^x$.

Which one? Circle the correct letter.

A



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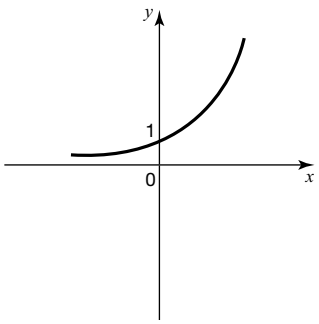

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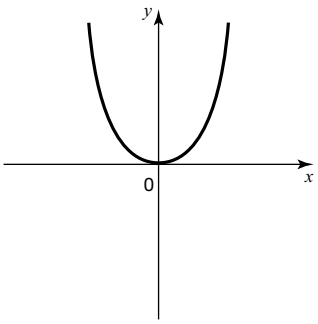

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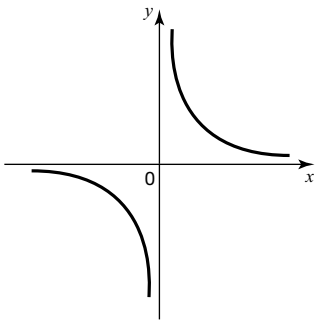


[1 mark]

21 **a** Make v the subject of the following formula.

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

.....

[2 marks]

b Solve the equation $2x^2 - 7x + 4 = 0$ giving your answer to 2 decimal places.

.....

[2 marks]

22 Giovanni deposited £20 000 in a savings account on 1 January 2017.

The account pays 5% interest per year.

At the end of each year, Giovanni withdraws £2000.

How much will he have in the account in January 2021?

[4 marks]

23 **a** Prove that the cubic equation $x^3 - 4x + 2 = 0$ has a root between 0 and 1.

[2 marks]

b Show that the equation $x^3 - 4x + 2 = 0$ can be rearranged to give $x = \frac{x^3}{4} + \frac{1}{2}$

[2 marks]

c Starting with $x_0 = 0.5$, use the iterative formula $x_{n+1} = \frac{(x_n)^3}{4} + \frac{1}{2}$ to find an estimate for one of the roots of the equation by working out x_4

Give your answer correct to 3 decimal places.

$x_4 =$ .....

[3 marks]

24 A bag contains only red and blue counters. The ratio of red to blue counters is 4 : 5

a The total number of counters in the bag is 36.

Circle the number of red counters in the bag.

20 16 4 36

.....

[1 mark]

b Two counters are removed from the bag at random.

Find the probability that

i both counters are red

.....

[1 mark]

ii the counters are different colours.

.....

[2 marks]

25 The functions f and g are such that

$f(x) = 5x^2 + 4$ and $g(x) = x + 1$

a Find $f(-2)$

$f(-2) =$ .....

[1 mark]

b Find $f^{-1}(x)$

$f^{-1}(x) =$ .....

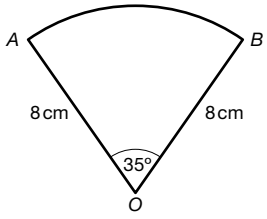
[2 marks]

c Find $fg(x)$

$fg(x) =$ .....

[2 marks]

26 *OAB* is a sector of a circle with radius 8 cm.



a Work out the length of arc *AB*.

Give your answer correct to 2 decimal places.

..... cm

[2 marks]

b Work out the area of sector *OAB*.

Give your answer correct to 2 decimal places.

..... cm

[2 marks]

27 Three grandchildren visit their grandparents every 12 days, 16 days and 18 days respectively.

On one day, they all visit their grandparents.

a What is the minimum amount of time after which two grandchildren will call on the same day?

..... days

[2 marks]

b What is the minimum amount of time after which all three will again call on the same day?

..... days

[2 marks]

28 Show that $\frac{1}{3x^2 + 5x - 2} \div \frac{1}{9x^2 - 1}$ simplifies to $\frac{ax + b}{cx + d}$, where a, b, c and d are integers.

Give the values of a, b, c and d.

$a =$ .....

$b =$ .....

$c =$ .....

$d =$ .....

[4 marks]