

GCSE Mathematics

Calculator

Foundation Tier

Free Practice Set 3

1 hour 30 minutes



ANSWERS

Marks shown in brackets for each question (2)

Typical Grade Boundaries

C	D	E	F	G
76	60	47	33	20

Legend used in answers

Green Box - Working out

5b means five times b
 $b = -3$ so $5 \times -3 = -15$

Red Box and ✓ - Answer

48 % ✓

Authors Note

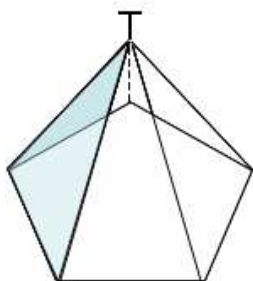
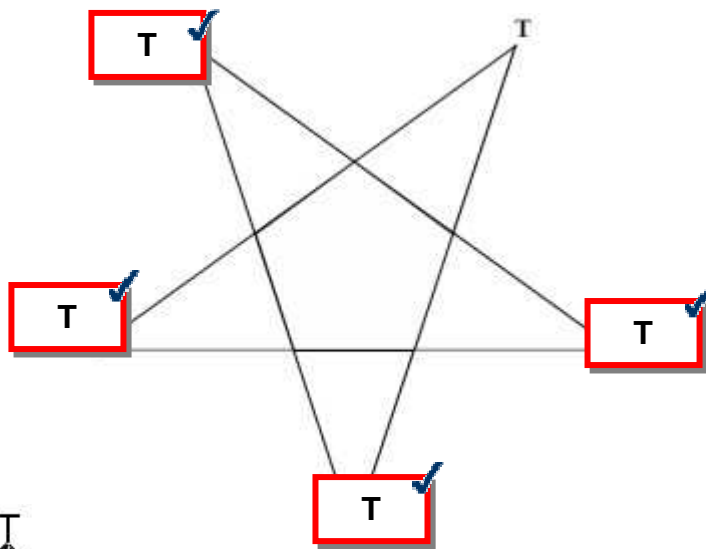
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1. A net of a 3-D shape is shown below. It folds together to make the 3-D shape. Four other vertices meet at T.

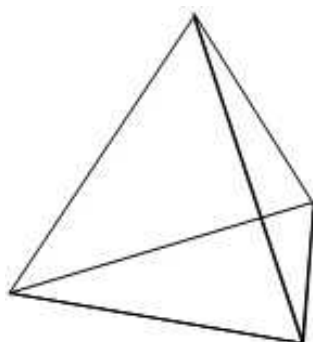
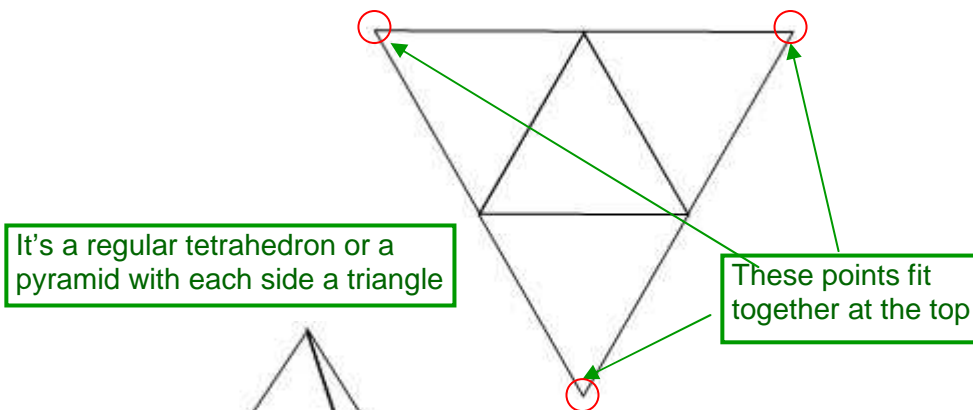
a) Mark these four vertices with a letter T



The triangular sides fold upwards to hit the top or vertices of the shape

(2)

b) The diagram shows a net of a 3-D shape. In the space below, draw a 3-D sketch of the shape.



(2)

2. a) Draw a prime factor tree for 168 and 40

A prime factor tree breaks a number down into its prime number factors.

2 is the first prime number

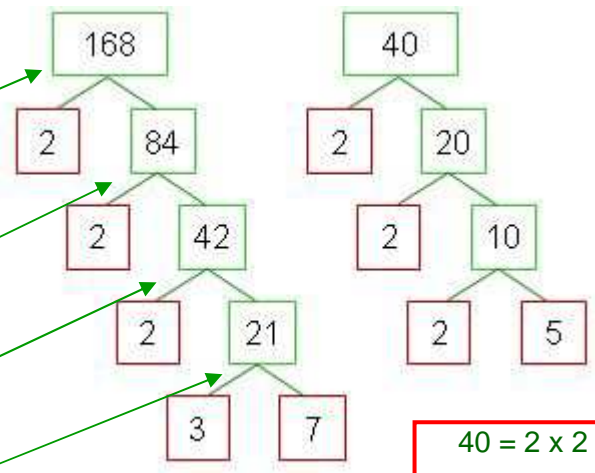
Start with your number at the top. See if it can be halved. This halves into 2 and 84

84 can be halved again = 2 x 42

42 can be halved again = 2 x 21

21 = 3 x 7 both prime numbers

168 = 2 x 2 x 2 x 3 x 7
These are all prime numbers



40 = 2 x 2 x 2 x 5

(2)

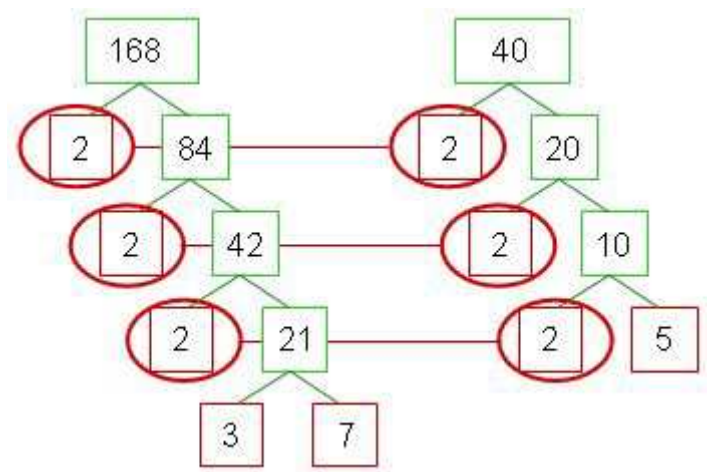
b) Using your prime factor tree or otherwise work out the Highest Common Factor for 168 and 40

The highest common factor is the biggest number that will go into both 168 and 40. Look at the prime numbers that we got for 168 and 40 and mark the common ones.

$$168 = 2 \times 2 \times 2 \times 3 \times 7$$

$$40 = 2 \times 2 \times 2 \times 5$$

The common factors in both are 2 x 2 x 2 = 8



The common factors in both trees are shown above. For one tree just multiply them together them So 2 x 2 x 2 = 8

8

(2)

3. a) A rectangle is shown. Work out the area.

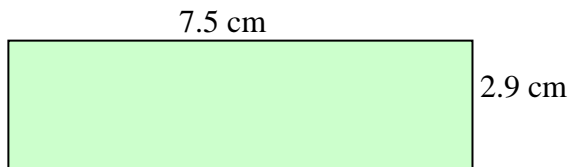


Diagram NOT drawn accurately

Area of a rectangle is
Length x width

Length = 7.5 cm
Width = 2.9 cm

Area = 7.5 cm x 2.9 cm

21.75 ✓
cm²
(2)

7 . 5 x 2 . 9 =

A square is shown below with an area of 441 cm²

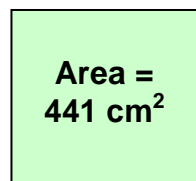


Diagram NOT drawn accurately

Area = length x width
For a square, length and width
are the same

- b) What is the length of one side of this square?

To find anything which has been squared ²
use √ on your calculator
e.g. the number squared to get 49 is √49 = 7

If the length and height = L
Then area = L x L = L²
To get L, take **Square Root** √ of the area

21 ✓
cm
(2)

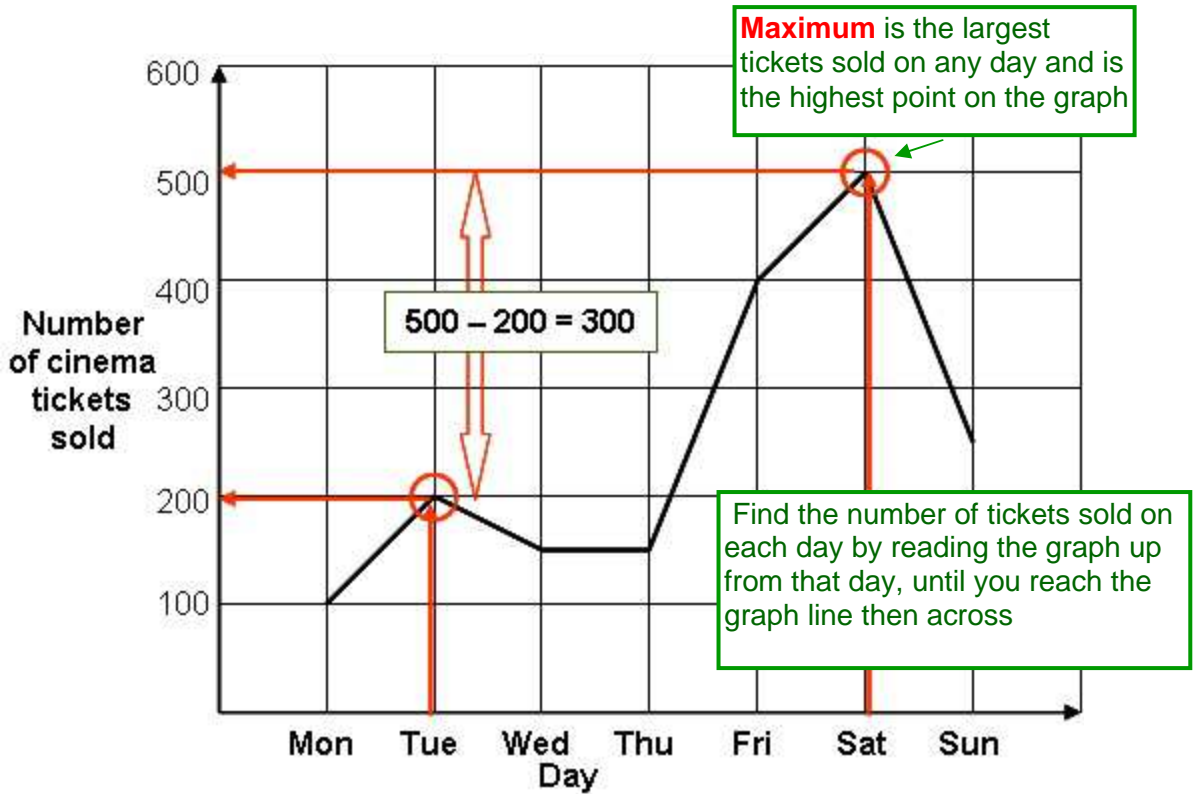
Length = $\sqrt{\text{area}}$ = $\sqrt{441}$ = 21

√ 4 4 1 =

So each side is 21 cm which
gives an area of 21x21=441 cm²

**Note: get used to your calculator: Older calculators may
need to enter the value first then the square root button**

4. The graph below shows the number of cinema tickets sold each day during a week



a) What was the maximum number of tickets sold.

500 tickets
(1)

b) What was the mean number of tickets sold per day, during the week

Find the mean = $\frac{\text{Total tickets sold in the week}}{\text{Days in a week}}$
 $= \frac{100+200+150+150+400+500+250}{7} = \frac{1750}{7} = 250$
250 tickets
(2)

c) What was the range of the number of tickets sold during the week

Range = highest – lowest
 $= 500 - 100$
 $= 400$
400 tickets
(1)

d) How many more tickets were sold on Saturday than Tuesday ?

500 sold Saturday
 200 sold Tuesday
 Difference = $500 - 200$
300 tickets
(1)

5. a) What is 0.757

i) correct to 2 decimal places

The 2nd decimal place could be 0.75 or 0.76.
Look at the numbers after the 2nd decimal point to see if it is closer to 750 or 760
757 is closer to 760 so to 2 decimal place it is 0.76

0.76

(1)

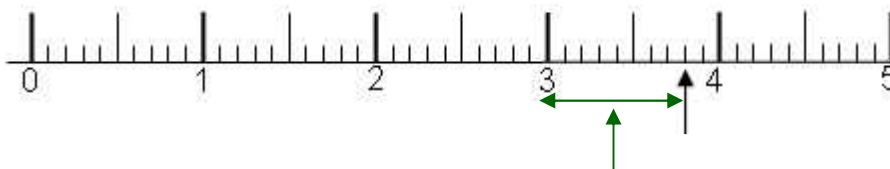
ii) correct to 1 significant figure

1 significant figures – is it 0.700 or 0.800
757 is closer to 800
so to 1 significant figures it is 0.800 but we ignore the last zeros = 0.8

0.8

(1)

b) What is the number marked below

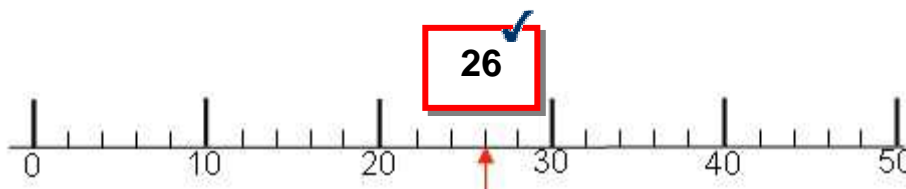


There are 10 small divisions between 3 and 4 so each one is 0.1.
We have 8 small divisions which is 0.8.

3.8

(1)

c) Mark the number 26 with an arrow on the line above



There are 5 small divisions between 20 and 30 so each one is 2.
We need another 6 after the 20 which is 3 more small divisions

(1)

6. Mrs Smith went to a museum with five teenagers and an adult friend. It was £6.50 for an adult and £3.50 for each teenager. How much did it cost altogether to get in?

Total cost	= cost of 5 teenagers + cost of 2 adults
	= £3.50 x 5 + 2 x £6.50
	= £17.50 + £13.00
	= £30.50

3 . 5 x 5 + 6 . 5 x 2 =

Check that your calculator works things out in the correct order. It should do the multiplication before the addition

£ **30.50** ✓
.....
(2)

7. The table below shows how far it is in miles between four towns.

Toddington			
41	London		
156	195	Grimsby	
163	202	68	Bradford

The shows how far it is between Toddington and London

The shows how far it is between London and Grimsby

The shows how far it is between Grimsby and Bradford

Biggest mileage so farthest apart are London and Bradford

- a) Work out the distance between Toddington and London

..... **41** ✓ miles
(1)

- b) Which two towns are the farthest distance apart?

London ✓ and **Bradford** ✓
(1)

Martin starts in Toddington
He goes to Grimsby.
Then he goes to Bradford.
Then he returns back to Toddington.

- c) What is the total distance that Martin has driven?

Add up all the distances:	
Toddington – Grimsby	= 156 miles
Grimsby – Bradford	= 68 miles
Bradford – Toddington	= 163 miles
Total	387 miles

..... **387** ✓ miles
(3)

8. David went to Greece.

He changed £300 into Euros (€)
The exchange rate was £1 = €1.15

a) How many Euros will he get?

We have to decide whether to
Multiply 300 by 1.15 or divide 300 by 1.15

We know that we get more Euros (€1.15) for each pound.
So you multiply by 1.15 to convert pounds into euros:

$$£300 \times 1.15 = €345$$

3 0 0 x 1 . 1 5 =

€... **345**
(2)

When he came home he changed €19.25 back to pounds
The exchange rate was now £1 = €1.10

b) How many pounds did he get?

When we convert Euros back into pounds we get fewer pounds
So you divide by 1.10 to convert Euros into pounds:

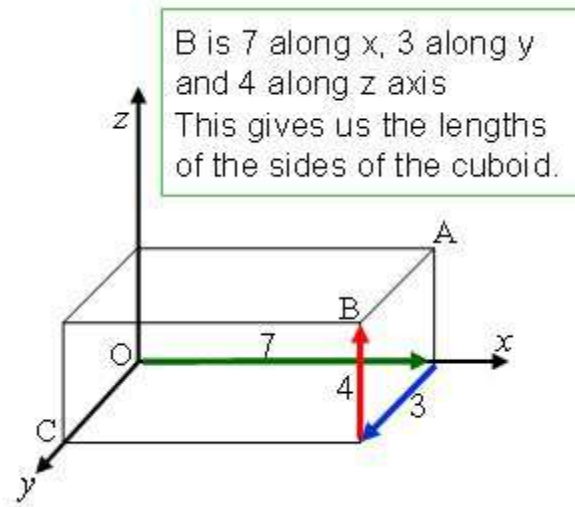
$$€19.25 \div 1.10 = £17.50$$

1 9 . 2 5 ÷ 1 . 1 =

£..... **17.50**
(2)

9. A cuboid lies on the co-ordinate axes.

When you have co-ordinates of (x, y) they are on a graph.
If you add a z co-ordinate it makes it into a 3-D space.
Each corner of the cuboid is given by the co-ordinate (x, y, z)



Distances in cm
Not drawn accurately

The point B has co-ordinates $(7, 3, 4)$

- a) What are the co-ordinates of the point A

A is the same distance as B along the x -axis
It has no distance along the y -axis
A is the same distance as B along the z -axis

..... **7, 0, 4** ✓
(1)

- b) What are the co-ordinates of the point C

C only has a distance along the y -axis of 3
It has zero distance along the x -axis and the z -axis

..... **0, 3, 0** ✓
(1)

- c) What is the distance between A and B

A to B has a distance along the y -axis of 3

..... **3 cm** ✓
(1)

10. Simplify

a) $11p - 7p$

Simplify means adding or subtracting anything that is the same type of thing
Here we have just p's
11 lots of p's minus 7 lots of p's gives 4 lots of p's.
We write this as $4p$

$4p$ ✓

(1)

b) $a \times a \times b \times 8$

When we have the same thing, times itself, we use a small number at the top right to show how many times we do this.
We write $a \times a$ as a^2
When we multiply one letter times another we write them next to each other without the x sign. So $a^2 \times b = a^2b$.
When we multiply a^2b by 8 we write this as $8a^2b$.

$8a^2b$ ✓

(1)

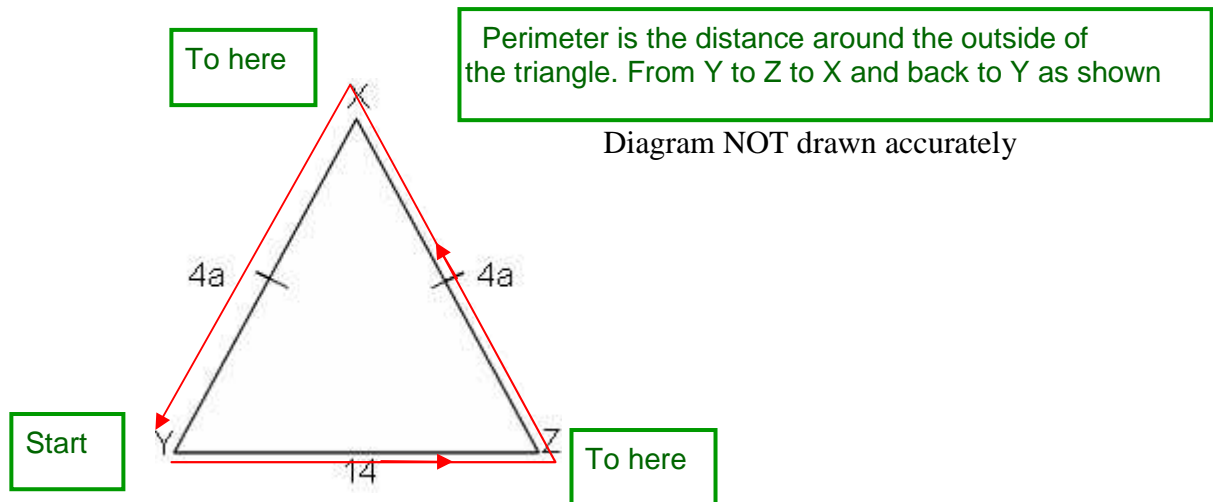
c) $(q + q + q) \times 2$

First simplify what's inside the brackets
 $(q + q + q) = 3q$
Now multiply this by $2 \times 3q = 6q$

$6q$ ✓

(1)

11.



In the diagram, above shows an isosceles triangle XYZ with measurements in centimetres.

$$XY = 4a$$

$$XZ = 4a$$

$$YZ = 14$$

a) Find an expression in terms of a , for the *Perimeter* of the triangle in its simplest form

$$\text{Perimeter} = YZ + ZX + XY$$

$$YZ + ZX + XY = 4a + 4a + 14 = 8a + 14$$

$$8a + 14$$

$$\text{Simplify } 4a + 4a + 14 = 8a + 14$$

(2)

The perimeter of the triangle is 54 cm

Make an equation with 54 and your previous answer

b) Find the value of a

$$\text{Perimeter} = 8a + 14 = 54$$

Get rid of 14 on left by **subtracting 14** from both sides

$$a = 5$$

(2)

$$8a + 14 - 14 = 54 - 14. \text{ So } 8a = 40$$

Divide sides by 8

$$\text{So } \frac{8a}{8} = \frac{40}{8} \quad \text{so } a = 5$$

12. Dileep went to the shops. His receipt is shown below. Complete the receipt

To get this column multiply the two columns together.
 Number of items x price each = total for item
 e.g. 4 x £1.20 = £4.80

Item	Number of items	Price each	Total for item
Bottles of orange juice	4	£1.20	£4.80
Packets of crisps	3	£0.27	£. 0.81 ✓
Pair of Jeans	3	£. 7 ✓	£ 21.00
Pair of socks	3	£2.54	£. 7.62 ✓
Total cost			£. 34.23 ✓

0 **.** **2** **7** **x** **3** **=**

$3 \times 0.27 = 0.81$

(4)

2 **1** **÷** **3** **=**

To get the cost of each item divide the total cost by the number of items

$21 \div 3 = 7$

3 **x** **2** **.** **5** **4** **=**

$3 \times 2.54 = 7.62$

Add up all the amounts in the right hand column = £34.23

4 **.** **8** **0** **+** **0** **.** **8** **1** **+** **2** **1** **+** **7** **.** **6** **2** **=**

13. a) David drove at 58 miles per hour for 7 hours.

How far did he go?

In 1 hour David drove 58 miles
In 2 hours David drove 116 miles (58 x 2)
In 7 hours David drove 58 x 7 miles = 406

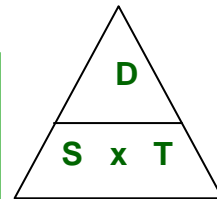
5 8 x 7 = 4 0 6

406 miles
(2)

- b) Connor ran 400 metres in 74 seconds.
Work out his average speed.
Write down all the figures on your calculator display.

Using the formula triangle, S is speed, D is distance and T is time.

$$S = \frac{\text{distance}}{\text{time}} = \frac{400 \text{ m}}{74 \text{ s}} = 5.405405$$

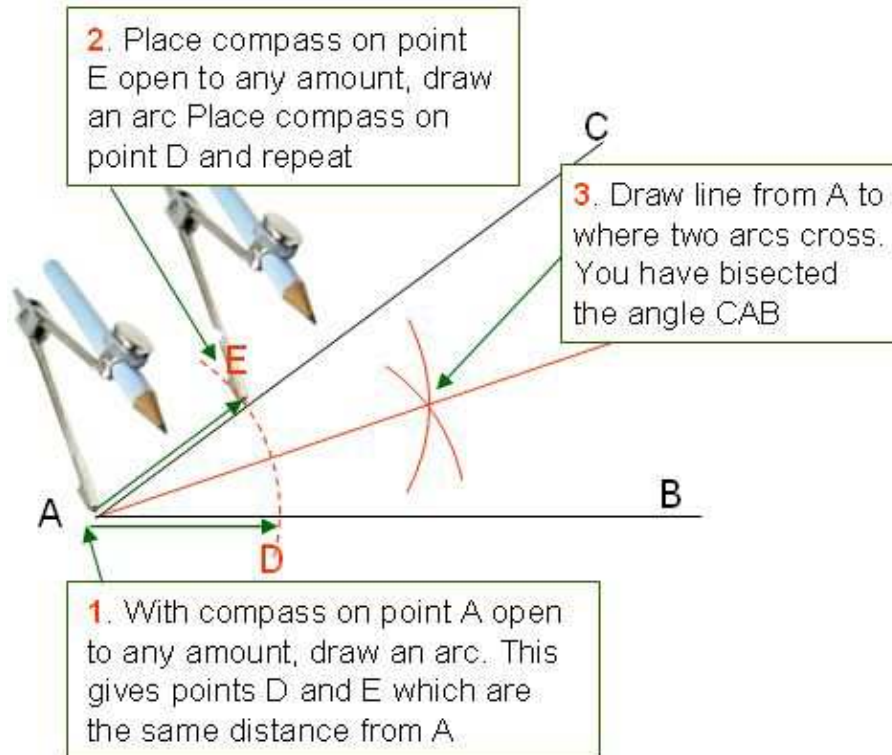


4 0 0 ÷ 7 4 = 5 . 4 0 5 4 0

HINT: the units metres per second tell you that to find the speed take metres and 'Per' or divide by seconds

5.4054054 metres per second
(2)

14. An angle BAC is shown below.



a) Using a compass and pencil construct a bisector of this angle.

(2)

b)

Diagram NOT accurately drawn

So this angle is $180 - 121 = 59^\circ$

This line = 180°

Work out the value of a .

Now we can work out the top angle in the Δ

Angles in a Δ add up to 180°

So top angle in $\Delta = 180 - 56 - 59 = 65^\circ$

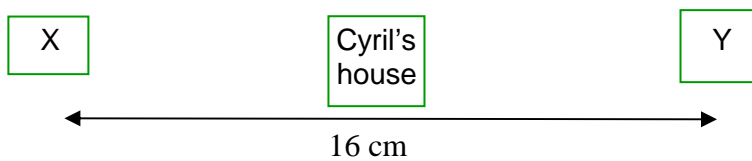
1 8 0 - 5 6 - 5 9 =

A full circle at the top = 360 degrees

So $a = 360 - 65 = 295^\circ$

$a = \dots \boxed{295^\circ} \dots$ (2)

15. A map is drawn to a scale of 1cm: 8km
 Two schools X and Y are 16 centimetres apart on the map.
 Cyril's house is exactly mid way between the schools.
 Work out the actual distance Cyril's house to X
 Give your answer in kilometres.



1 cm on the map	= 8 km.
16 cm	= 8 x 16 km
So distance between X and Y	= 8 x 16 km
Cyril's house is halfway	
Distance from his house to X	= $\frac{8}{2} \times 16 = 64$ km

8
×
16
÷
2
=

64 ✓
 km
 (2)

16. What is $\frac{6}{20}$

i) as a fraction in its simplest form

We simplify fractions by finding a number that divides into the top and bottom. This is called cancelling.

We can cancel down 6 and 20 with 2. $\frac{\cancel{6}^3}{\cancel{20}^{10}}$

We write a small 3 after the 6 because 2 goes into 6 three times

We write a small 10 after the 20 because 2 goes into 20 ten times.

Nothing else goes into 3 and 10 so we have simplified as much as possible

$\frac{3}{10}$

(1)

ii) as a decimal

$\frac{1}{10}$ is 0.1 as a decimal so $\frac{3}{10}$ is 0.3

0.3

(1)

iii) as a percentage

To convert a decimal to a percentage move the decimal point two places to the right. This is the same as multiplying by 100.

30%

(1)

iv) Work out $\frac{6}{20}$ of £300

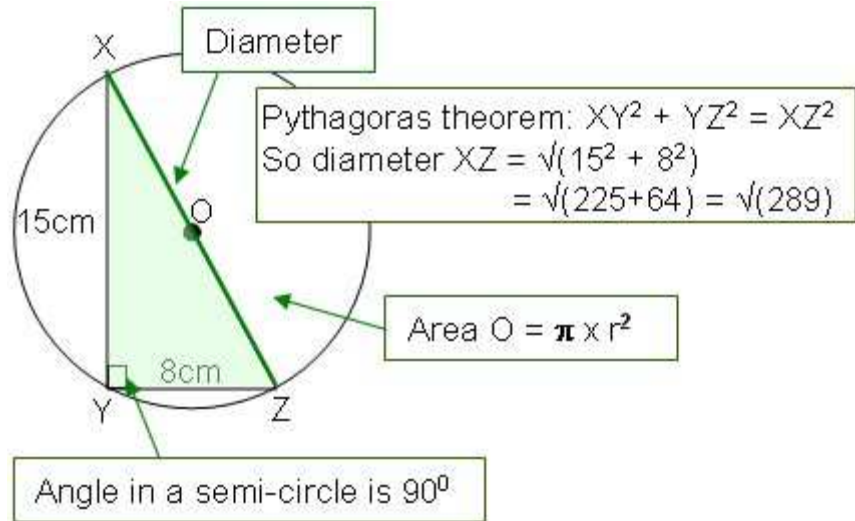
To convert a decimal to a percentage move the decimal point two places to the right. This is the same as multiplying by 100.

6 x 300 ÷ 20 =

90

(2)

17. The diagram below shows triangle XYZ with circle centre at O



X, Y and Z are points on the circumference. XZ is the diameter of the circle

XY = 15 cm and YZ = 8cm

a) Work out the diameter XZ of the circle

Use Pythagoras Theorem to work out the hypotenuse of the triangle.
 $XZ^2 = 15^2 + 8^2 = 225 + 64 = 289$ so $XZ = \sqrt{289}$

Calculator input: $\sqrt{15^2 + 8^2} =$

Use x^2 button

17.cm
(3)

c) Work out the area of the circle correct to 3 significant figures

Area $O = \pi r^2$ Radius = diameter $\div 2 = 17 \div 2 = 8.5$

Calculator input: $\pi \times 8.5^2 =$ 226.98

227 cm²
(3)

226.98 → nearest to 227

sf 1st 2nd 3rd

Is 226.98 closer to 226 or 227
 226.98 is closer to 227

18. a) Shade one square to give this pattern a rotational symmetry of order 2.

(1)

Overall we have order two rotational symmetry.

Rotate by another $\frac{1}{2}$ turn and another order of rotational symmetry.

Rotate by $\frac{1}{2}$ turn we have the same pattern so one order of rotational symmetry.

- b) Translate triangle A by $\begin{pmatrix} -6 \\ -5 \end{pmatrix}$. Label it B.

(2)

$\begin{pmatrix} -6 \\ -5 \end{pmatrix}$ means move 6 in the minus y-direction and 5 in the minus x-direction

Minus 6 on y-axis

Reflect B to C. The distance from the y-axis from A or B is the same.

- c) Reflect your translated triangle B in the y-axis. Label it C.

(2)

19. a) Factorise $2y^2 + 4y$

Find a factor that goes into $2y^2$ and $4y$
 y is in both y^2 and y so it is a factor
 2 goes into 2 and 4 so it is a factor

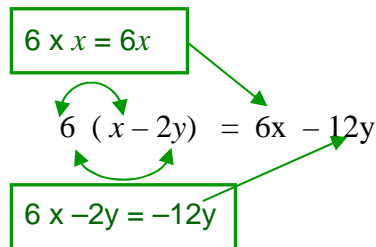
Rewrite $2y^2 + 4y$ as $2 \times y \times y + 2 \times 2 \times y$
 Put factor $2y$ outside bracket: $2 \times y (y + 2)$
 or $2y(y + 2)$

$2y(y + 2)$ ✓

(2)

b) Expand $6(x - 2y)$

Expand means multiplying everything inside the brackets by what's outside.
 So the bracket replaces a multiplication sign.



$6x - 12y$ ✓

(1)

c) Simplify $y^5 \times y^7$

When you multiply powers they ADD

$y^5 \times y^7 = (y \times y \times y \times y \times y) \times (y \times y \times y \times y \times y \times y \times y) = y^{12}$

y^{12} ✓

(1)

d) $p = 0.7ab^2$

Find the value of p when $a = 3$ and $b = 4$

$p = 0.7 \times a \times b \times b$
 using $a=3$ and $b=4$ $p = 0.7 \times 3 \times 4 \times 4$

0 . 7 x 3 x 4 x 4 =

33.6 ✓

$p = \dots\dots\dots$
 (2)

20. Use your calculator to work out

Make sure you add 5.9 and 6.7 before doing the square root
Using brackets tells your calculator to do this

a) $\sqrt{(5.9 + 6.7)}$ to 2 decimal place

(1)

$\sqrt{12.6} = 3.549$ To 2 decimal places this is 3.55

or

b) πr^2 when $r = 4.25$ to 1 decimal place

$\pi r^2 = \pi \times 4.25^2$

get π with shift π or whatever it is on your calculator

The x^2 button squares 4.25

or

To 1 decimal place 56.745 is 56.7

..... **56.7** (1)

c) $\frac{1}{0.35^2}$ to 1 decimal place

Work out 0.35^2 first = $0.35 \times 0.35 = 0.1225$
Then use the $1/x$ button

or

..... **8.2** (3)

d)
$$\frac{16.5 \times 8.3}{2.9 \times 7.2}$$

write down all the figures on your calculator display

Be careful with this! If you enter $16.5 \times 8.3 \div 2.9 \times 7.2$ you will get the wrong answer because you really want to divide the top by 2.9 then 7.2

1 6 . 5 x 8 . 3 ÷ 2 . 9 ÷ 7 . 2

or

(1 6 . 5 x 8 . 3) ÷ (2 . 9 x 7 . 2)

6.558908

(2)

e) the cubed root of 343

The cube root of a number is a value that when multiplied by itself 3 times equals that number. Try a few numbers first to see if the answer can be guessed: $5^3 = 5 \times 5 \times 5 = 225$
 $6^3 = 6 \times 6 \times 6 = 216$; $7 \times 7 \times 7 = 343$. We have guessed correctly that the cubed root is 7

3 shift \sqrt{x} 3 4 3 =

Look for the root button

7

(1)

f) 6.4 cubed to 1 decimal place

Cubed means that number times itself three times
Use the x^y button

262.1

(1)

or

6 . 4 x 6 . 4 x 6 . 4 =

6 . 4 x^y 3 =

The x^y button multiplies the number any number of times.
Enter the number, press this button then enter the number of times you want to multiply it by itself

21. Eva has a bag of 20 coloured buttons

6 buttons are blue
10 buttons are green
4 buttons are red.

$$\text{Total number buttons is } 6 + 10 + 4 = 20$$

Eva takes a button at random from the bag

What is the probability that Eva

a) takes a red button

$$\frac{4 \text{ or } 1}{20 \quad 5}$$

(1)

$$\begin{aligned} \text{Probability (red)} &= \text{number of red buttons} \div \text{total number buttons} \\ &= 4 / 20 \end{aligned}$$

b) does not take a blue button

$$\frac{14 \text{ or } 7}{20 \quad 10}$$

(1)

$$\begin{aligned} \text{Probability (blue)} &= \text{number of blue buttons} \div \text{total} = 6/20 \\ \text{So probability (NOT blue)} &= 1 - 6/20 = 14/20 \end{aligned}$$

c) takes a yellow button

$$0$$

(1)

There are no yellow buttons so the probability is zero

22. Jane paid £10.56 for 5 mp3 downloads and 2 CDs

If 6 mp3 downloads cost £7.68 how much is it for 1 CD.

You can work out the cost of 1 mp3 download

If 6 mp3 downloads cost £7.68 then 1 mp3 download costs $£7.68 \div 6 = £1.28$

$$7 \ . \ 6 \ 8 \ \div \ 6 \ =$$

So the cost of 5 mp3 downloads is cost of 1 mp3 download $\times 5 = £6.40$

$$1 \ . \ 2 \ 8 \ \times \ 5 \ =$$

5 mp3 downloads and 2 CDs cost £10.56.

To work out the cost of 2 CDs take the cost of the 5mp3 downloads away from this
 $£10.56 - £6.40 = £4.16$

$$1 \ 0 \ . \ 5 \ 6 \ - \ 6 \ . \ 4 \ =$$

Finally to work out the cost of 1 CDs divide by 2

$£4.16 \div 2 = £2.08$

$$4 \ . \ 1 \ 6 \ \div \ 2 \ =$$

2.08

(3)

23. Sylvia gets 3.6% **simple** interest per year on her £4000.
How much will she have after 2 years.

Simple interest means that the interest is the same every year.

Interest for one year = $4000 \times 3.6 \div 100 = \text{£}144$

4 0 0 0 x 3 . 6 ÷ 1 0 0 =

4 0 0 0 x 3 . 6 shift % =

Interest for two years = $\text{£}144 \times 2 = \text{£}288$

Find the % button on your calculator to make it simpler

Add the interest to the £4000: $\text{£}4000 + \text{£}288 = \text{£}4288$

£ **4288** ✓
.....
(3)

24. The equation

$$x^3 - 7x = 4$$

Trial and improvement means trying out different values for the letters in an equation to see how close you get to the given answer

Has a solution between 2 and 3.

Using trial and improvement find the solution to 1 decimal place.

Show all your working.

For this equation make a table with columns for the x , x^3 , $-7x$ and answer

Use the power button to get x^3

4×3^3 gives $4^3 = 64$

 x^y

x	x^3	$-7x$	$=$	
2	8	-14	-6	Too low

 $2 \times x^y \times 3$
 $- 7 \times 2$
 $=$

3	27	-21	6	Too high
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 $3 \times x^y \times 3$
 $- 7 \times 3$
 $=$

6 is closer to 4 than -6 so x is nearer 3 than 2. Try $x = 2.7$ next

2.7	19.68	-18.9	0.78	Too low
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 $2 \cdot 7 \times x^y \times 3$
 $- 7 \times 2 \cdot 7$
 $=$

This is too low so try a higher value for x . Go up by one decimal point $x = 2.8$

2.8	21.95	19.6	2.35	Too low
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 $2 \cdot 8 \times x^y \times 3$
 $- 7 \times 2 \cdot 8$
 $=$

This is too low so try $x = 2.9$

2.9	24.39	20.3	4.09	OK
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 $2 \cdot 9 \times x^y \times 3 - 7 \times 2 \cdot 9 =$

$x =$

2.9

(4)

TOTAL FOR PAPER: 100 MARKS

END