Year 7

Addition and subtraction

<u>Addition:</u>

==e.g==   763 + 289 =

Method:

- The most common method for adding numbers is the following...
- Write your numbers on top of each other, keeping all your units, tenths, hundreds, thousands etc in line...

H	T	U

➕   7   6   3
    2   8   9

You need to add each column up separately, *==starting from the right!==*

1) Add your units column...

3 + 9 = **12**

The 2 goes under the units

The 1 gets added on to the column to the left

H	T	U

➕   7   6   3
    2   8   9
       1
           2

2) Add your tenths column...

6 + 8 + 1 = **15**

The 5 goes under the tenths

The 1 gets added to the next column to the left

H	T	U
7	6	3
2	8	9
1	**1**	
	5	**2**

3) Add your hundreds column

7 + 2 + 1 = **10**

Because this is the last column you just write this number down under the column

Answer = **1052**

H	T	U
7	6	3
2	8	9
1	**1**	
1	**0**	**5**	**2**

Questions...

Work out the following additions

a 367 + 128   **b** 249 + 178   **c** 255 + 24

Work out the following additions

a $2367 + 2444$ **b** $1286 + 4306$ **c** $3457 + 345$ **d** $2039 + 768$

Find the missing numbers.

a $234 + ? = 476$ **b** $312 + ? = 508$ **c** $278 + ? = 566$

The sum of two numbers is 564. One of the numbers is 128
Work out the other number.

Subtraction:

<mark style="background-color: cyan">e.g.</mark> $498 - 267 =$

Method:
 There are various different methods for subtraction. This method is the easiest to explain and doesn't involve any subtraction at all... It's working out what you need to add to your second number to make the first.

- Draw a number line, starting at your second number, and ending at the first.

267   3   **498**

- Keep adding numbers, making it as easy for yourself as possible, until you get to the number you want.

$$+3 \qquad +30 \qquad +100 \qquad +98$$

267   270   300   400   498
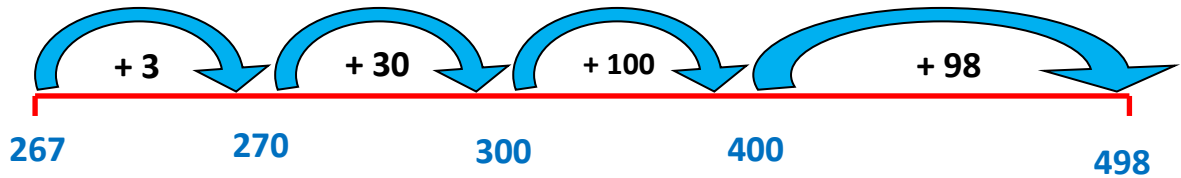
- Then add all the numbers used in your steps...

3
30
98
100
─────
=231

Or you can use the 'borrowing' method… e.g. 365 - 258

```
  H  T  U
  3  6  5
- 2  5  8
─────────
```

Put the numbers in columns.

```
  3  5  ¹5
- 2  5   8
─────────
         7
─────────
```

$5 - 8$ you cannot do so borrow one ten from the tens column to make 15 $15 - 8 = 7$. Put 7 in the answer space.

```
  3  5  ¹5
- 2  5   8
─────────
  1  0   7
─────────
```

Subtract the numbers in the tens and hundreds columns.

Questions...

Work out the following subtractions
a $648 - 123$ b $459 - 320$ c $877 - 434$

Work out the following subtractions
a $400 - 168$ b $305 - 213$ c $704 - 178$

Find the missing numbers.
a $213 - ? = 80$ b $235 - ? = 122$ c $428 - ? = 244$

Here is a menu.
Jo buys one tea, two coffees,
two sandwiches and three cakes.
Work out the total cost.

The Café in
the Park
Tea
Coffee   £1.05
Soft drink   £1.89
              £1.59
Sandwich £2.65
Cake
              £2.79

How much change would she get from a £20 note?

Year 7

Long Multiplication

73 x 56 =

Method:

- *Grid Method*

- Split each number up like so... **73 x 56 =**

  70   50

  3   6

- Place these numbers into a grid like this...

x	70	3
50	**3500**	**150**
6	**420**	**18**

You now need to work out the missing boxes by multiplying the two numbers in line with this box.

- **7 x 5 = 35 so... 70 x 50 = 3500**
- **5 x 3 = 15 so... 50 x 3 = 150**
- **6 x 7 = 42 so... 6 x 70 = 420**
- **6 x 3 = 18**

- The last step is to add all these numbers together.

```
  3500
  1150
   420
    18
_____
  4088
```

- **Your teacher will probably show you this lattice method too.**

Example Use the lattice method. Multiply 34×26.

Write 26 above the lattice.
Write 34 on the right side of the lattice.

Multiply 3×6. Then multiply 3×2.
Multiply 4×6. Then multiply 4×2.

Write the answers as shown in the lattice.

Add the numbers along each diagonal starting at the right.

For the sum 18, write 8. Then add 1 to the sum along the diagonal above.

Read the answer. $34 \times 26 = 884$

Questions. Use any method that will allow you to get the aswer correct and with confidence.

1) **78** x **62** =

x	70	8
60		
2		

2) **68 x 74 =**

3) 548 x 72 =

4) 652 x 379 =

5) 8742 x 518 =
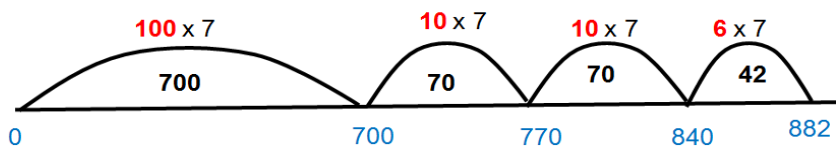

6) 1234 x 5678

Year 8

Long Division

e.g.   **882 ÷ 7**

Number line: This method may be familiar from primary school.

- Draw a number line starting at zero and ending in the number that is being divided (882)
- Go up in multiples of the number you are dividing by (7) until you reach the number you are dividing
- The answer is the total multiples you used

882 ÷ 7
"How many 7's do we need to make 882?"

So We used 100 + 10 + 10 + 6 = **126** sevens to make 882

Concise method "The bus stop"

7 goes into 8 once with a remainder of 1, we write a 1 on the answer space and the remainder is carried forward to the next digit making it 18.

```
     1   2   6
7 |  8  ¹8  ⁴2
```

7 goes into 18 twice (2 x 7 = 14, 3 x 7 = 21) with a remainder of 4 (18 – 14 = 4). Write the 2 above the 18 and carry the 4 to the next digit giving 42.

7 goes into 42 6 times exactly, write the 6 above the 42 giving a final answer of 126.

Questions...

1) 648 ÷ 3 =

_____

2) 845 ÷ 5 =

_____

3) 768 ÷4 =

_____

4) 259 ÷7 =

_____

Year 8

Multiplying and dividing by powers of 10

A Few Rules:

Powers of ten are numbers such as 10, 100, 1000, 10000 etc

When you multiply a number by a power of 10, you move the decimal place so many times to the **_right_** depending on how many 0's in the power of ten.

When you divide a number by a power of 10, you move the decimal place so many times to **_left_** depending on how many 0's in the power of ten.

Power of 10	Decimal place moves...
x 10	One to the right
x 100	Two to the right
x 1000	Three to the right
÷10	One to the left
÷100	Two to the left
÷1000	Three to the left

e.g. What is... 0.5678 x 100

Method:

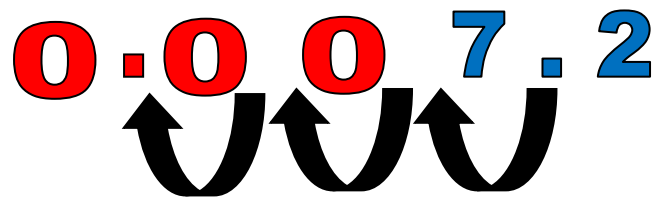- Because I am multiplying by 100, the decimal place is going to move two to the **_right_**.

- Write your answer with the new decimal place and remove any unnecessary zeros... **56.78**

One more example...

What is... 7.2 ÷ 1000

Method:

- Because I am dividing by 1000, the decimal place moves 3 places to the **_left_**.

- Fill in any necessary zeros and rewrite your number with its new decimal place... Answer = **0.0072**

Questions

1) 62 ÷ 10 =

2) 7.36 x 1000 =

3) 879 ÷ 100 =

4) 0.0037 x 100 =

5) (0.5 + 0.25) ÷ 1000 =

Multiplication and division with negatives

Few rules when multiplying two numbers...

- If the two numbers have the same sign the answer is a **positive (+)** **(Positive and a positive) OR (negative and a negative)**

- If the two numbers have a different sign the answer is a **negative (–)** **(Positive and a negative) OR (Negative and a positive)**

Examples...

-3 x 8 = -24   because a **negative** and a **positive** make a *negative*

-5 x -4 = 20   because a **negative** and a **negative** make a *positive*

16 ÷ -4 = -4   because a **positive** and **a negative** make a *negative*

-20 ÷ -5 = 4   because a **negative** and a **negative** make a *positive*

Obviously a **positive** and a **positive** make a *positive* so don't make silly mistakes!!

Questions...

-7 x 8 =____   Why?_____

-9 x -5 =____   Why?_____

18 ÷ -6 =____   Why?_____

-32 ÷ -8 =____   Why?_____

Multiplication and division with decimals

Multiplication: e.g.   **0.3 x 0.2 =**

Method:

- Using the numbers in the sum it gives you, make it into a sum that you can easily do. Then work out what you do to each number to make it back to the original sum, like so....

$$3 \times 2 = 6$$

$$\div 10 \qquad \div 10$$

$$0.3 \times 0.2 = ?$$

So to work out this number, you have to **÷10** then **÷10** again

- 6 **÷ 10** = 0.6 $\longrightarrow$ 0.6 **÷10** = **0.06**

You can also count the number of digits occurring after a decimal point, 1 in each part of the question (giving a total of 2) so 2 in the answer.

Questions...

1) 0.3 x 0.7 =

2) 0.05 x 0.5 =

3) 0.06 x 90

4) 4 x 0.003 =

For more complicated questions we can complete the multiplication with whole numbers and slot the decimal point in at the end

e.g. 43.2 x 2.6

First use your grid method to calculate 432 x 26 = 11232

Then adjust your answer to get   43.2 x 2.6 = 112.32

Work out

a   6.34 × 0.4   b   4.21 × 0.3

Petrol costs 89.3p per litre. Mr. Peters buys 32.7 litres of petrol. Work out the total cost of the petrol. Give your answer in pounds.

Division:

e.g.   **0.12 ÷ 0.06 =**

Method:
- The method for dividing **_is not_** the same as multiplication!
- What you have to do is make the number you are dividing by (in this case **0.06**) into a whole number.

To get 0.06 into a whole number I have to **x 100**

0.06 ➔ **6**

- Whatever you have to do to this number, you have to do to both numbers in the sum!!

0.12 ÷ 0.06 = ?

x 100

12 ÷ 6 = 2

Questions…

1) $40 \div 0.002 =$

2) $7 \div 0.35 =$

3) $0.008 \div 0.02 =$

4) $1.8 \div 0.006 =$

Where the first number is decimal but the second number is not you can use your 'bus stop' method, just line up the decimal place in the question with one in your answer

e.g for $35.4 \div 2$ or $84.2 \div 4$

$$\begin{array}{r} 1\ 7.\ 7 \\ 2\overline{)3\ ^15.\ ^14} \end{array}$$

$$\begin{array}{r} 2\ 1.0\ 5 \\ 4\overline{)8\ 4.2\ ^20} \end{array}$$

Sometimes you need to write an extra zero.

Place value when multiplying

e.g.   Use the information that   **97 x 123 = 11931**

Write down the value of   **9.7 x 12.3 =**

Method:

Whenever you see the words *write down,* it means the numbers you need are given to you all ready on the page.

- What you have to do is see what you had to do to the original numbers to get the numbers in the new sum. Like so....

97 x 123 = 11931

÷ 10   **÷ 10**

So to work out this number, you have to **÷10** and **÷10** again

9.7 x 12.3 = ?

- **11931 ÷ 10 = 1193.1**   **1193.1 ÷ 10 = 119.31**

Use the information that   **97 x 123 = 11931**

Write down the value of   **0.97x 12300 =**

- You need to see what you do to each number in the original sum, to make the numbers in the new some.

$$97 \times 123 = 11931$$

$$\div 100 \qquad x\ 100$$

$$0.97 \times 12300 = ?$$

So to work out this number, you have to **÷100** then **x100**

- **11931 ÷ 100 = 119.31** ⟶ **119.31 x 100 = 11931**
- *If you think about it this makes sense, because if you ÷100 then x100 you would end up with the number you started with as they cancel each other out.*

Questions...

1 Given that $6.4 \times 2.8 = 17.92$ work out

    a 64×28 **b** 640×2.8 **c** 0.64×28 **d** 0.64×0.028

Given that $18.3 \div 1.25 = 14.64$ work out

a $183 \div 1.25$ **b** $1.83 \div 1.25$ **c** $0.183 \div 1.25$ **d** $0.183 \div 12.5$

And for a challenge...

Given that $23 \times 56 = 1288$ work out

a 0.23×560 **b** $1288 \div 5.6$ **c** $12.88 \div 0.23$ **d** $1288 \div (23 \times 28)$

Year 7

Place Value

Write Down the value of the **6** in the number **3546281**

Method:
- Set all the other numbers except the one you want to zeros...0006000
- Cross out any irrelevant zeros...~~000~~6000
- Your answer is the number remaining... 6000

One more example...
Write down the value of the number **9** in the number **6.379654**

- Set all the numbers to zero except the 9... 0.009000
- Cross out any irrelevant zeros... 0.009~~000~~
- Write down your answer... 0.009

Questions

1) Write down the value of the 5 in the number 58967

2) Write down the value of the number 7 in the number 6.9784

3) Write down the value of the 3 in the number 1 in the number 765.9165

Year 8

Significant figures and decimal places

How to round to one significant figure...

e.g.   Round **9641** to one significant figure

- If you round a number to one significant figure, you end up with a number that has only one number that isn't a zero...e.g. 60, 1000, 0.2, 5
- The way you do this is the following...

Start from the left and pick out the first number that isn't a zero. In this case it is **9**

9 6 4 1

Look at the number after this one. In this case it is **6.** If this number is smaller than 5 the **9** stays as it is. If it is bigger than 5, the **9** rounds up

9 6 4 1

Because **6** is bigger than 5 the **9** rounds up to **10.**

 Then replace the other numbers after the original **9** with zeroes.

1 0 0 0 0

Answer = 10,000

Round 0.3498 to one significant figure

Start from the left and pick out the first number that isn't a zero. In this case it is **3**

0.3498

Look at the number after this one. In this case it is **4.** If this number is smaller than 5 the **3** stays as it is. If it is bigger than 5, the **3** rounds up

0.3498

Because **4** is smaller than 5 the **3** stays the same

0.3

When it is a decimal you can just get rid of any number *after* the **3** instead of having to replace them with zeros

Answer = 0.3

If it asks for two significant figures, you do exactly the same except instead of picking the first number that isn't a zero-you pick the second!

If it asks for three significant figures pick the third number from the left that isn't a zero, but from them on it is exactly the same!

How to round to one decimal place...

If you round a number to one decimal place, you will simply end up with a number that has one decimal place such as... 0.3, 2.1, 3.4, 7.0

e.g.   Round **5.678** to one decimal place

Pick out the first number after the decimal point. In this case it is **6.**

5.**6**78

Look at the number after this one. In this case it is **7.** If this number is smaller than 5 the **6** stays as it is. If it is bigger than 5, the **6** rounds up

5.**6****7**8

Because **7** is bigger than 5 the **6** rounds up to 7

You then simply get rid of all the other numbers so you only have one decimal place.

5.**7**

Answer = 5.7

If it asks for two decimal places, you do exactly the same except instead of picking the first number after the decimal -you pick the second!

If it asks for three decimal places pick the third number after the decimal place , but from them on it is exactly the same!

Questions...

1) Round 167,899 to one significant figure

2) Round 0.03467 to one significant figure

3) Round 5678 to two significant figures

4) Round 15.9436 to one decimal place

5) Round 0.0986 to one decimal place

6) Round 9.9873 to two decimal places

7) Round 1.9889 to one decimal place

Round these to the number of decimal places given in the brackets

a 45.56 (1)   **b** 3.2517 (3)   **c** 23.724 (2)   **d** 4.569 (2)

Round these to the number of significant figures given in the brackets

a 6712 (1)   **b** 8614 (3)   **c** 6926 (2)   **d** 82.14 (2)

Rounding whole numbers

e.g. Round **1563** to the nearest **10**

Method:

- Pick out the column of the unit you want... **1563**
- Look at the number after and see if it is bigger or smaller than 5 (if the number is smaller than 5 the number before stays the same, if it is 5 or bigger the number before rounds up one)... **1563**, 3 is smaller than 5, so the 6 stays as a 6.
- Replace any numbers after the 6 with a zero... 1560

One more example...

Round **167903** to the nearest **1000**

- Pick out the column of the unit I need... **167903**
- Look at the number after 7 and see if it's bigger or smaller than 5, **167903**...9 is bigger than 5 so the **7** rounds up to an 8
- Replace any numbers after the 8 with zeroes... 168000

Questions...

1) Round 1678 to the nearest 10

2) Round 234987 to the nearest 1000

3) Round 467890 to the nearest 10,000
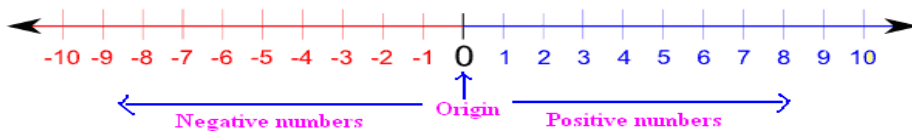
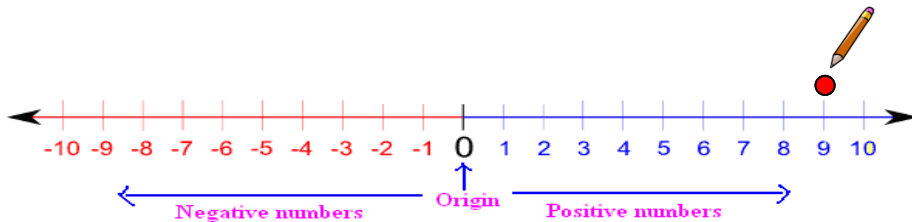4) Round 1589745 to the nearest million

Year 7

Negatives in real life

e.g. In the London the temperature was 9°, in Moscow it was 12 colder°. What is the difference in temperature between the two capitals?
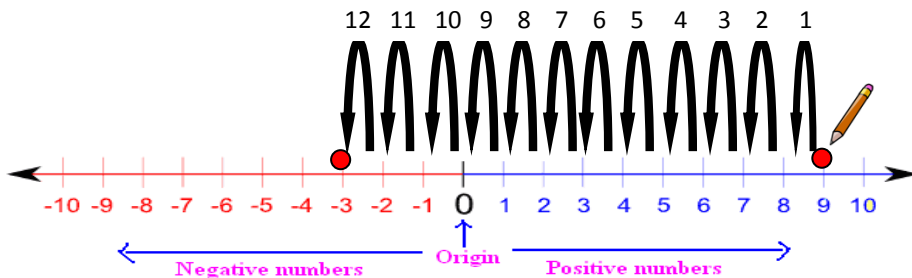
Method:

- A lot of people struggle with negative numbers, so if it helps draw out a number line!!

- Start at the temperature you know, in this case London: 9°.

- If it is getting **_colder_**, you move so many spaces to the **_left._**
  If it is getting **_hotter_**, you move so many places to the right.
  In this example it is 12°**_colder_** in Moscow so we need to move 12 spaces to the **_left_**.

- Wherever you land is your answer... So it is -3° in Moscow.

Questions...

1. **Wind chill**

When the wind blows it feels colder.
The stronger the wind, the colder it feels.

Fill in the gaps in the table.
The first row is done for you.

Wind strength	Temperature out of the wind (°C)	How much **colder** it feels in the wind (°C)	Temperature it feels in wind (°C)
Moderate breeze	5	7 degrees colder	−2
Fresh breeze	−8	11 degrees colder	......
Strong breeze	−4	...... degrees colder	−20
Gale	......	23 degrees colder	−45

3 marks

2) The temperature on 16th December was 1 °C

> **On the 15th December it was** 5 °C colder
> **than on 16th December.**

What was the temperature on 15th December?

✎ .... °C

1 mark

3) The thermometers show the temperature at different times on one day.

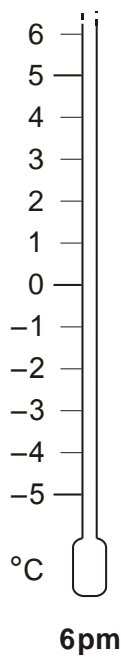| 6am	1pm
6	6
5	5
4	4
3	3
2	2
1	1
0	0
−1	−1
−2	−2
−3	−3
−4	−4
−5	−5
°C	°C

6am   **1pm**
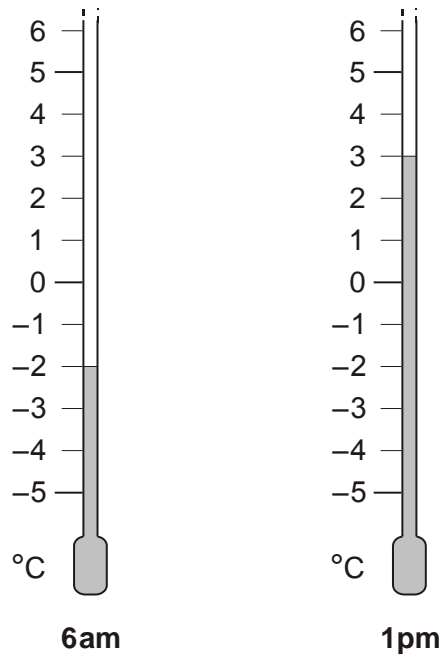
(a)   Write the missing number below.

✎ From **6am** to **1pm** the temperature went up by .... °C

1 mark

From **1pm** to **6pm** the temperature **went down by 7°C**

Shade the thermometer to show the temperature at 6pm.

6
5
4
3
2
1
0
−1
−2
−3
−4
−5
°C

6pm

Estimations

e.g.   _Estimate_   **91 x 78**
                          ‾‾‾‾‾‾‾‾
                           3.8

Method:

Whenever you see the word _estimate_, it means you don't have to find out an exact answer so don't panic!!

- It's all about making the question easy for yourself!
  You do this by rounding each number to one significant figure

  - **91** rounded to one significant figure is **90**
  - **78** rounded to one significant figure is **80**
  - **3.8** rounded to one significant figure is **4**
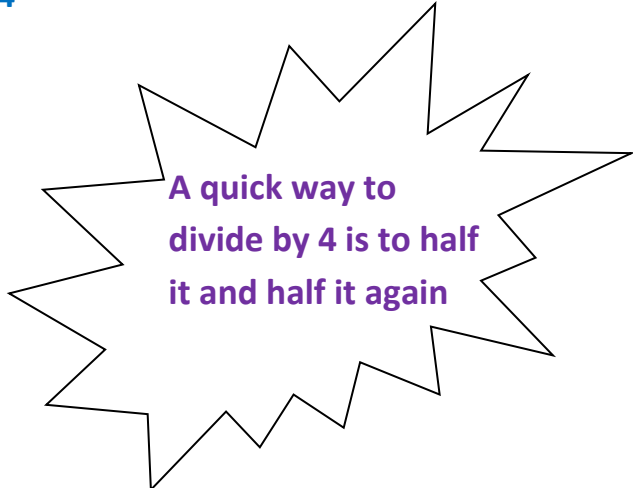
So now you have the sum   **90 x 80**   which is easier to work out
                             ‾‾‾‾‾‾‾‾
                               4

9 x 8 = 72 ...so... **90 x 80 = 7200**

So that leaves me with   **7200**
                            ‾‾‾‾
                             4

7200 ÷ 2 = 3600

3600 ÷ 2 = 1800

A quick way to divide by 4 is to half it and half it again

30

Questions...

1. **Rounding**

(a) Circle the **best** estimate of the answer to

$$72.34 \div 8.91$$

6   7   8   9   10   11

(b) Circle the **best** estimate of the answer to

$$32.7 \times 0.48$$

1.2   1.6   12   16   120   160

(c) Estimate the answer to $\dfrac{8.62 + 22.1}{5.23}$

Give your answer to **1 significant figure**.

....

(d) **Estimate** the answer to $\dfrac{28.6 \times 24.4}{5.67 \times 4.02}$

....

29) **(c)** Use your calculator to work out $$\frac{\sqrt{9392}}{0.42 \times 23.2}$$ a) Write down all the figures on your calculator display. You must give your answer as a decimal. **(2 marks)** b) Write your answer to part (a) correct to 1 significant figure. **(1 mark)**	30) **(c)** Use your calculator to work out $$\frac{\sqrt{372} \times 12.7}{13.43 - 0.32}$$ a) Write down all the figures on your calculator display. You must give your answer as a decimal. **(2 marks)** b) Write your answer to part (a) correct to 1 significant figure. **(1 mark)**

1 mark

Work out an estimate for the value of each of these expressions by first rounding the numbers to 1 significant figure.

a 3.4×4.9 **b** 5.4×3.8 **c** 9.4×9.9 **d** 13.4×3.9 **e** 24.4×4.7

Work out an estimate for the value of each of these expressions by first writing the numbers correct to 1 significant figure.

a $211 \div 12$ **b** $346 \div 3.2$ **c** $985 \div 478$ **d** $377 \div 48$ **e** $2334 \div 12.9$

Work out an estimate for the value of each of these expressions by first rounding the numbers to 1 significant figure.

a $\dfrac{5.4 \times 9.9}{10.1}$ **b** $\dfrac{9.8 \times 4.9}{5.1}$ **c** $\dfrac{16.4 \times 9.9}{16.8}$ **d** $\dfrac{6.8 \times 19.9}{12.1}$ **e** $\dfrac{17.4 \times 20.3}{38.7}$

Fractions of numbers

e.g.   **¾** of 24

Method:

- ***Divide by bottom, times by top!!!***

  So for this example you would do...

  24 ÷ 4 = 6 ... Then times this number by the top number... 6 x 3 = 18

One more example...

What is... 3/8 of 32

- ***Divide by bottom, times by top!!!***

  So for this example you would do...
  32 ÷ 8 = 4 (This is 1/8 of 32). Then times this number by the top number... 4 x 3 = 12

Questions...

a i $\frac{1}{5}$ of £20   ii $\frac{2}{5}$ of £20   b i $\frac{1}{5}$ of £15   ii $\frac{3}{5}$ of £15

c i $\frac{1}{6}$ of £12   ii $\frac{5}{6}$ of £12   d i $\frac{1}{3}$ of 18 kg   ii $\frac{2}{3}$ of 18 kg

e i $\frac{1}{4}$ of 20 cm   ii $\frac{3}{4}$ of 20 cm

Year 8

Ordering decimals

e.g. Put these numbers in order from smallest to largest

0.016   0.2   0.11   0.009   0.17   0.1

Method:

- See which number has the most decimal places and put all the other numbers to the same number of decimal places... 0.016 and 0.009 are to 3 decimal places, so I make all the others to 3 decimal places by adding zeros...

0.016   0.200   0.110   0.009   0.170   0.100

- You can now just see them as normal numbers and ignore the decimal...

16   200   110   9   170   100

- Put these numbers in order, then for your answer write the number in the form it first gave you...

9   16   100   110   170   200

0.009   0.016   0.1   0.11   0.17   0.2

Questions

1) Put these numbers in order from smallest to largest...
   0.14   0.016   1.17   1.5   0.2

2) Put these numbers in order from largest to smallest...

1.34   1.041   1.0057   2.09   1.296

Year 8

Fractions, decimals and percentages

There are a few fractions that are best learnt rather than having a technique. These are the ones that involve 'recurring decimals'. *A recurring decimal has a number that goes on for ever*

For example **0.666...** is recurring as you would end up writing **6's** forever.

So you don't have to do this you put a dot above the first 6... **0.6̇**

These are the ones you need to know...

1/3 = 33.3% = 0.3̇

2/3 = 66.6% = 0.6̇

1/9 = 11.1% = 0.1̇

2/9 = 22.2% = 0.2̇

3/9 = 33.3% = 0.3̇

etc...

You need to know how to write fractions as decimals and percentages, or sometimes the other way around! Some you may find easy to work out in your head, but for others you will need the following method.

e.g.   Write $\dfrac{1}{10}$ as a percentage and a decimal...

Method:

It is best to covert the fraction into a percentage first, because if you do this the decimal is easy to work out. To convert it into a percentage you need to know that *a percentage is out of 100!!*

- So you need to convert $\dfrac{1}{10}$ into a fraction out of 100

$$\frac{1}{10} \longrightarrow \frac{?}{100}$$

- To do this, you need to look at what you times your bottom number by to make 100...In this case to get from 10 ⟶ 100 you need to multiply by 10 *Whatever you do to the bottom you do to the top!*

- So I also need to multiply the 1 by 10

$$\frac{1}{10} \xrightarrow{\text{X 10}} \frac{?}{100}$$

- **1 x 10 =10**... Therefore the top number is **10... =** $\frac{10}{100}$

- *When you have the fraction out of 100, the percentage is just the top number* ..= **10%**
- To write this as a decimal, *just think of money*, with the top number being pence. How would you write 10 pence as a decimal?... **0.10**

One more example...

1) Write $\frac{2}{5}$ as a percentage and a decimal

- First you need to work it out as a percentage...
  Remember... *a percentage is out of 100!!*

$$\frac{2}{5} \longrightarrow \frac{?}{100}$$

- To get from 5 ⟶ 100 you need to multiply by 20
  Remember... *Whatever you do to the bottom you do to the top!*
  So you need to multiply the 2 by 20

$$\frac{2}{5} \xrightarrow{\text{X 20}} \frac{?}{100}$$

36

$$\frac{40}{100}$$

- 2 multiplied by 20 equals 40... So the top number is 40...
- ***When you have the fraction out of 100, the percentage is just the top number***...= **40%**
- To write it as a decimal, you just need to think how would you write 40p as decimal... **0.40**

The other way around:

Sometimes it may give you percentage and ask you to write it as a fraction or a decimal. So we almost have to work backwards from the previous method...

e.g. Write **0.2** as a *fraction* and a *percentage*...

Method:

- ***When you are given a decimal always put it to two decimal places*** if it isn't already and this stops you making any silly mistakes!!

- So to put **0.2** to two decimal places you just simply add a zero on the end... **0.20**

- The percentage is then simply whatever comes after the decimal place... **20%**

- The fraction is this number out of 100... $$\frac{20}{100}$$

Simplifying fractions

- If you are asked for the fraction in its simplest form you need to cancel the fraction down until it simplifies no further!

- To simplify fractions you look for a number that goes into both the top and bottom number and divide them both by this number...
  (The bigger the number you pick, the less steps of simplifying you have to do)

$$\frac{20}{100} \xrightarrow[\div 2]{\div 2} \frac{10}{50} \xrightarrow[\div 2]{\div 2} \frac{5}{25} \xrightarrow[\div 5]{\div 5} \boxed{\frac{1}{5}}$$

37

OR

$$\frac{20}{100} \xrightarrow[\div 20]{\div 20} \boxed{\frac{1}{5}}$$

Questions...

1) Write $\dfrac{3}{5}$ as a percentage and a decimal

2) Write $\dfrac{5}{10}$ as a percentage and a decimal

3) Write **0.75** as a *fraction* and a *percentage...*

4) Write **0.7** as a *fraction* and a *percentage...*

5) Write 40% as a fraction and a decimal

6) Write 4% as a fraction and a decimal

a Write 32% as a decimal.　　　**b** Write $\frac{3}{10}$ as a decimal.

c Which is bigger 32% or $\frac{3}{10}$?

a Write $\frac{3}{4}$ as a decimal.　　　**b** Write 72% as a decimal.

c Which is bigger $\frac{3}{4}$ or 72%?

Year 9

Ordering Fractions, Percentages and decimals

e.g.   Put these in order from smallest to largest...

$\dfrac{2}{5}$ 0.22   19% $\dfrac{1}{4}$

Method:

- The reason this question is difficult is because they are all in different forms... some are fractions, some are decimals, some are percentages.

- In order to be able to compare them easily you need them all in the same form... the easiest one to convert them all into is **_percentages._**

$\dfrac{2}{5} \xrightarrow[\text{X 20}]{\text{X 20}} \dfrac{40}{100}$ **= 40%**

0.22   **=22%**

19%   **= 19%**

$\dfrac{1}{4} \xrightarrow[\text{X 25}]{\text{X 25}} \dfrac{25}{100}$ **= 25%**

- We can now put these percentages in order...
  19%   22%   25%   40%

- Your answer is them in the form it first gave you...

  19%   0.22 $\dfrac{1}{4}$ $\dfrac{2}{5}$

Questions...

1)

(b) Write these numbers in order of size, starting with the smallest.

$$\frac{1}{4} \qquad 30\% \qquad 0.2$$

....

....

(b) _____ _____ _____ **[1]**
        smallest

2)

Write these numbers in order from *largest to smallest.*

$$\frac{4}{5} \qquad 81\% \qquad \frac{3}{4} \qquad 1.79 \qquad 0.805$$

In each part, write the numbers in order of size. Start with the **smallest** number.

a $\frac{1}{2}$ 53% 0.48

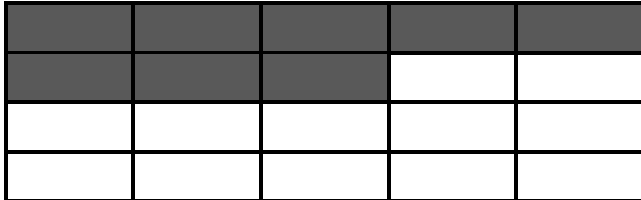**b** 0.73 $\frac{3}{4}$ $\frac{7}{10}$ 72%

c $\frac{1}{4}$ 0.2 23%

d 0.44 $\frac{4}{10}$ 48% $\frac{9}{20}$

Year 8

Shading fractions of rectangles

e.g.   What fraction of the shape is shaded?

Method:

- The first thing you need to do is *count the total amount of boxes***... = 20**
- Then you need to *count the amount of boxes shaded*... = 8
- (Be careful, it may ask for the fraction of un-shaded boxes to try and catch you out)
- So your answer is **8 out of 20**, which as a fraction is $\dfrac{8}{20}$

*An extension to this question is usually to ask for this fraction in either its simplest form or as a percentage...

To simplify the fraction...

$$\frac{8}{20} \xrightarrow[\div 4]{\div 4} \frac{2}{5}$$

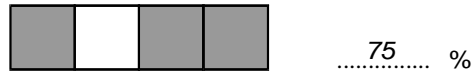*To write this fraction as a percentage...*

$$\frac{8}{20} \xrightarrow[\times 5]{\times 5} \frac{40}{100} \longrightarrow \ =40\%$$

Questions...

1. Grid percentages

Each diagram below was drawn on a square grid.

(a) Write what **percentage** of each diagram is shaded.
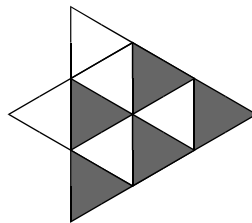   The first one is done for you.

.....*75*..... %

.... %

1 mark

.... %

1 mark

2. Shading

$\frac{1}{2}$ of the diagram below is shaded.

Look at this diagram:
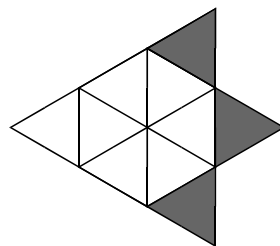
What **fraction** is shaded?

1 mark

What **percentage** is shaded?

(b)   Shade $\frac{2}{5}$ of the diagram below:
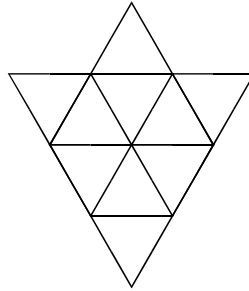
1 mark

What **percentage** of the diagram have you shaded?

.... %

1 mark

3.   Equivalence

Some of the statements below are correct.

Tick (✔) the correct ones.

	Tick (✔) if correct
$\frac{1}{2}$ = 0.5	
$\frac{9}{30}$ = $\frac{3}{10}$	
0.75 = $\frac{3}{4}$	
$\frac{1}{2}$ is equivalent to 10%	
$\frac{1}{5}$ is equivalent to 5%	

Calculating simple percentages can be done from knowing just a few key facts

- Finding 50% of something is the same as halving it
- Finding 25% is equivalent to dividing by 4
- Finding 10% is the same as dividing by 10
- Finding 1% is equivalent to dividing by 100

This works because 50 & 2, 25 & 4, 10 & 10, 1 & 100 are all factor pairs of 100

We can use these facts to calculate percentages

e.g.   20% of £45… £45 ÷ 10 = £4.50 (this is 10%)… £4.50 x 2 = £9

15% 0f 600m…600 ÷ 10 = 60m (this is 10%)… half of 60m = 30m (this is 5%)… 60m + 30m = 90m

Find the new price of a TV which originally cost £600 after a sale reduced its price by 15%...

15% of 600 = 90…600 – 90 = 510… new price £510

Work out

a   20% of £300   b   25% of 60 g   c   20% of 80 cm   d   75% of 400 m

e   80% of £30   f   4% of 700 g   g   12% of 300 kg   h   65% of 300 km

7) Dennis has 120 sweets and he gives 35% of them to his friend Max. How many sweets does Dennis have left? **(2 marks)**	8) Frankie buys a new coat in a 15% off sale. The original cost of the coat was £65. Work out how much the coat will cost in the sale. **(2 marks)**

22) There are 500 students in Lowdon secondary school. Each student has to pick whether they join the football, rounders or swimming team.

35% of the students choose to be on the football team.
$\frac{2}{5}$ of students choose to be on the rounders team.

Work out how many students choose to be on the swimming team.

In a sale all prices are reduced by 15%.
Work out the sale price of each of the following:

15% OFF

Computer normally £1200

Television normally £300

CD Player normally £40
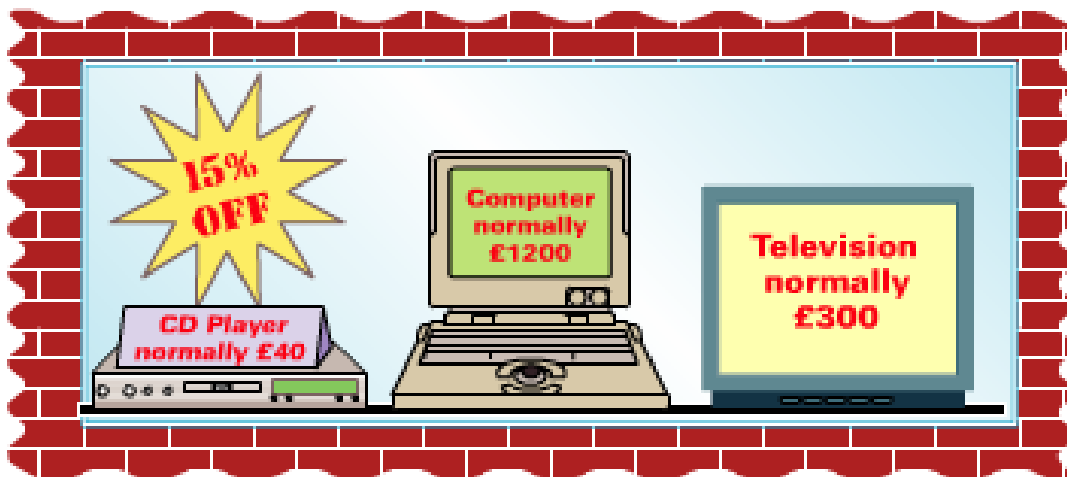
The table shows the salaries of three workers.
Each of these workers receives a 5% salary increase.
Work out the new salary of each worker.

Helen	£12 000
Tom	£24 000
Sandeep	£32 000

Year 9

Square/Cube and prime numbers

<u>How to square numbers:</u>

If you square a number it means to times it by itself. For example...

5 squared means... 5 x 5 = 25

8 squared means... 8 x 8 = 64

But the question will not ask you, what is "5 squared"? It will ask you to work out '5^2'. It's exactly the same, as anything to the power of two means to square it.

<u>How to square root a number:</u>

When you square root a number, you are finding out what number multiplied by itself makes the number you are given. For example...

5^2 = 25... Therefore the square root of 25 is 5

8^2 = 64... Therefore the square root of 64 is 8

But the question will not say what is the "square root of 25" is? The maths sign for square root is the one that looks like a bus shelter... square root of 25 = $\sqrt{25}$

<u>How to cube a number:</u>

If you cube a number it means to multiply by itself three times. For example...

2 cubed means... 2 x 2 x 2 = 8

3 cubed means... 3 x 3 x 3 = 27

The maths sign for cubing a number is to the power of 3. For example...

2 cubed is written as 2^3

3 cubed is written as 3^3

How to cube root a number

When you cube root a number, you are finding out what number is multiplied by itself three times to make the number you are given. For example...

$2^3 = 8$... Therefore the cube root of 8 is 2

$3^3 = 27$... Therefore the cube root of 27 is 3

The maths sign for the cube root of a number is the same as the square root sign but with a little three at the side of the bus shelter. For example...

Cube root of 27 is wrote as $\sqrt[3]{27}$

Cube root of 8 is wrote as $\sqrt[3]{8}$

Prime numbers

A prime number is a number that has only two factors, *__1 and itself!__*
Remember- A factor is a number that ***goes into*** another number

For example **13 *is*** a prime number as the only two factors it has are 1 and 13

6 *is not* a prime number as it has four factors being **1,2,3,6**

All these sets of numbered should be should be learned to the stage where you can just remember them, instead of having to spend time in your exam working them out!

These are all the numbers you need to know!!

Square Numbers		Cube Numbers	First 15 Prime numbers
$1^2 = 1$	$11^2 = 121$	$1^3 = 1$	2,3,5,7,11,
$2^2 = 4$	$12^2 = 144$	$2^3 = 8$	
$3^2 = 9$	$13^2 = 169$	$3^3 = 27$	
$4^2 = 16$	$14^2 = 196$	$4^3 = 64$	13,17,19,23,
$5^2 = 25$	$15^2 = 225$	$5^3 = 125$	
$6^2 = 36$		$6^3 = 216$	
$7^2 = 49$			29,31,37,41
$8^2 = 64$			
$9^2 = 81$			
$10^2 = 100$			

Questions...

1) $6^3 =$ _____

2) $\sqrt{49} =$ _____

3) $4^2 =$ _____

4) $\sqrt[3]{125} =$ _____

5) $1^3 =$ _____

6) $\sqrt{81} =$ _____

7) $\sqrt[3]{64} =$ _____

Work out

a 2 times the fourth square number

b 3 times the seventh square number

c the sum of the third square number and the fifth square number

d the difference between the fifth cube number and the fifth square number

e the eighth square number multiplied by the third square number

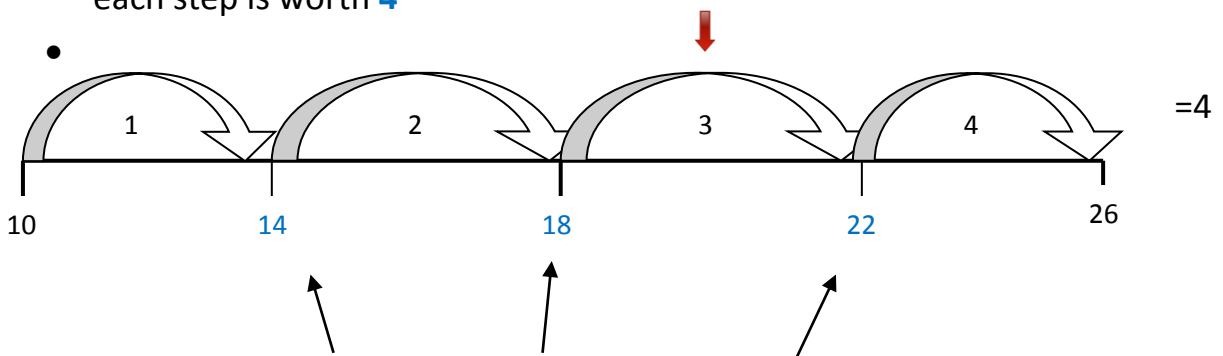**f** the fourth cube number multiplied by the fourth square number.

Year 7

Reading Scales

e.g. What number is the arrow pointing to?

10   26
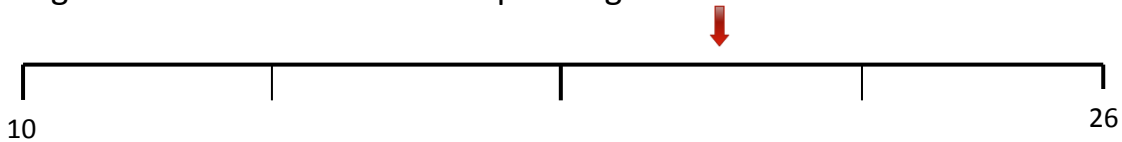
Method:

- Work out the difference on your scale... **26-10= 16**
  Divide this number by the number of steps on the scale... **16/4 = 4** ... So each step is worth **4**

-

10   14   18   22   26

- **You can now label the other points on the scale**
- **Your number lies half way between 18 and 22 so equals 20**
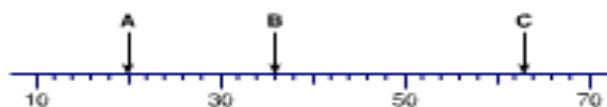
Question

Write down the number marked by
i arrow A, ii arrow B, iii arrow C.
Be as accurate as possible.

Write down the number marked by
i arrow A, ii arrow B, iii arrow C.
Be as accurate as possible.
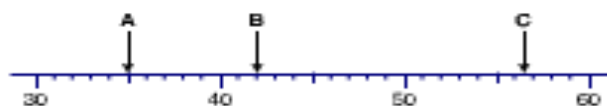
Write down the number marked by
i arrow A, ii arrow B, iii arrow C.
Be as accurate as possible.

Year 8

Proportion

If 5 apples cost £1.25, how much do 3 cost?

Method:

- ***It's all about working out how many 1 would be worth!***
- To work out how much one apple is worth you would do...

1.25 ÷ 5 = 0.25 ... So one apple costs 25p

- If one apple costs 25p, then 3 apples costs **3 x 25p = 75p** OR **£ 0.75**

Another example...

If 7 apples cost £2.10, how many would 9 cost?

- Remember- ***It's all about working out how many 1 would be worth!***
- To work out how much one apple is worth you would do...

2.10 ÷ 7 = 0.30 ... So one apple costs 30p

- If one apple costs 30p, then 9 apples costs **9 x 30p = 270p** OR **£ 2.70**

Questions....

1) If 4 pencils cost £1.20, how many would 10 cost?

2) A man bought 5 tickets for a concert. It cost him £125. He wants to buy another 3. How much would this cost him in total?

3) A woman bought 4 oranges and 5 apples from a shop. The 4 oranges cost her £1.60. In total she spent £4.10.
How much would 12 apples cost?

1) This is a list of ingredients for making vegetable soup.

Ingredients for vegetable soup for 8 people.

Potato – 200g
Onion – 80g
Carrot– 150g
Tomato – 120g

Liam needs to make vegetable soup for 12 people.

Work out the amount of each ingredient he needs.

…………………g Potato

…………………g Onion

…………………g Carrot

…………………g Tomato

(3 marks)

2) This is a list of ingredients for making 12 fairy cakes.

Ingredients for 12 fairy cakes

Flour – 250g
Butter – 120g
Sugar – 200g
Eggs - 3

Ellie needs to make 18 cakes for her sister birthday party.

Work out the amount of each ingredient she needs.

…………………g Flour

…………………g Butter

…………………g Sugar

………………… Eggs

(3 marks)

Reciprocals

A reciprocal of a number is what you multiply it by to make 1

Two rules:

- If you need to find the reciprocal of a whole number, you put 1 over the number..

Reciprocal of 6 = … **1 over 6** … $\frac{1}{6}$

Reciprocal of 4 = … **1 over 4** … $\frac{1}{4}$

- If you need to find the reciprocal of a fraction, you flip the fraction over..

Reciprocal of $\frac{1}{4}$ = $\frac{4}{1}$ = $\underline{4}$

Reciprocal of $\frac{2}{5}$ = $\frac{5}{2}$

Questions...

Find the reciprocal of...

1) 3   2) 7   3) ⅛   4) ⅔

Distance Tables

e.g.   What is the distance from London to Edinburgh

London			
155	Cardiff		
212	245	York	
413	400	193	Edinburgh

- You need to look for the number that is in the London column and in the Edinburgh row.

London			
155	Cardiff		
212	245	York	
413	400	193	Edinburgh

- This number is **413**

To make it slightly harder...

Daniel drives to London from York by the shortest route. He stops after 180 miles. How many more miles must he drive?

- So first you need to see the total distance from London to York by looking for the number that is in the London column and the York row

= 212

London			
155	Cardiff		
212	245	York	
413	400	193	Edinburgh

The last step is to subtract the distance he has already travelled from the total time.   **221 – 180 = 32**

54

Questions...

London			
196	Nottingham		
300	101	Manchester	
325	158	56	Liverpool

The chart shows the distances, in kilometres, between pairs of cities by the shortest route.

a)   Write down the distance between Nottingham and Manchester by the shortest route.

b)   Write down the names of the two cities which are the furthest apart.

c)   Diana drives to London from Liverpool by the shortest route. Peter drives to London from Manchester by the shortest route. Work out how many more kilometres Diana travelled.

Bristol

330	Hull					
187	143	Leicester				
269	71	82	Lincoln			
183	275	156	214	London		
261	154	142	135	296	Manchester	
349	65	169	119	312	105	York

One morning James drives from his home in Hull to Lincoln and then from Lincoln to York.

a   **i** Find the total distance he drives.

       ii How much further is this than the direct route from Hull to York?

Year 7

Multiples

Multiples of a number are all

of the numbers that appear

in its times table.

The multiples of 4 are 4, 8, 12, 16…

The 5th multiple of 6 is 30

Factors

A factor is a number that

divides exactly into another

number.

The factors of 12 are:

1, 2, 3 ,4, 6, 12

The factors of 13 are 1 and 13

The Highest Common Factor is the highest factor that two numbers have in common.

e.g. factors of 12 are 1, 2, 3, 4, 6, 12 and factors of 20 are 1, 2, 4, 5, 10, 20

      1, 2, 4 are common factors. **4 is the highest common factor**

The Lowest Common Multiple is the lowest number common to the times tables.

e.g. multiples of 6 are 6, 12, 18, 24, 30, 36, 42, 48, 54….

    Multiples of 8 are 8, 16, 24, 32, 40, 48, 56, 64…

      24 and 48 are common multiples. **24 is the lowest common multiple**

Questions...

1) Find all the factors of the following numbers:
    1) 20
    2) 24
    3) 27
    4) 32
    5) 40
    6) 50
    7) 56
    8) 120
    9) 200
2) 2 only has 2 factors (1 and 2), how many numbers can you find between 1 and 30 which have exactly 2 factors? (these are called prime numbers)
3) Find the highest common factors of the following pairs of numbers:
    1) 18 and 54
    2) 25 and 45
    3) 12 and 18
    4) 27 and 108
    5) 30 and 75
4) Find the HCF of these pairs of numbers:
    1) 90 and 450
    2) 96 and 480
    3) 39 and 195

A. List the first 5 multiples of:
1. 5
2. 7
3. 12
4. 14
5. 19

B. What is the:
1. 9th multiple of 8
2. 7th multiple of 6
3. 12th multiple of 12
4. 11th multiple of 10
5. 13th multiple of 5
6. 5th multiple of 13

C. List 3 numbers which are in:
1. 3 and 4 times tables
2. 3 and 5 times tables
3. 10 and 4 times tables
4. 9 and 2 times tables
5. 12 and 10 times tables

D. What is the lowest common multiple of:
1. 5 and 6
2. 7 and 8
3. 4 and 8
4. 9 and 6
5. 10 and 6

E. What is the lowest common multiple of:
1. 13 and 5
2. 15 and 12
3. 16 and 10