

Working with Numbers

Types of number

Factors	Numbers that divide into a number exactly e.g. the factors of 12 are 1, 2, 3, 4, 6 and 12
Whole numbers	Counting numbers including 0 e.g. 0, 1, 2, 3, 4, 5...
Integers	Positive and negative numbers including 0 that are not fractions or decimals e.g. -5, -4, -3, -2, -1, 0, +1, +2, +3, +4, +5...
Multiples	In a "times table" e.g. multiples of 5 include 5, 10, 15, 20, 25...
Square	A square number is a number multiplied by itself e.g. 5^2 is the same as $5 \times 5 = 25$
Square root	e.g. $\sqrt{4} = 2$ because $2 \times 2 = 4$
Prime number	A number with only two factors, 1 and the number itself e.g. $3 = 1 \times 3$

Rounding

Rounding is where a number is made into an approximate amount. A number can be rounded off to the tenth, whole number, ten, hundred, thousand, etc.

e.g. 37 to the nearest ten = 40
832 to the nearest hundred = 800

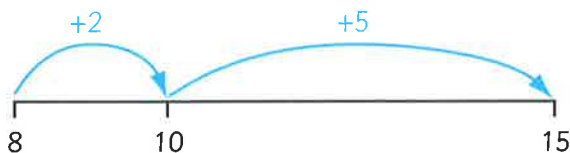
A number that lies half way between tens, hundreds, thousands, etc. is always rounded up, numbers below this are rounded down.

e.g. 6.5 rounded to the nearest whole number = 7
748 rounded to the nearest hundred = 700

Calculations: Addition

Step 1 Use a number line to add in steps

$$8 + 7 = 15$$



Step 2 Use partitioning into ones, tens, hundreds

$$34 + 22 = 56$$

$$\begin{array}{r} 4 + 2 = 6 \\ 30 + 20 = 50 \\ \hline 56 \quad (50 + 6) \end{array}$$

Step 3 Start to use the expanded column method

$$47 + 76 = 123$$

$$\begin{array}{r} 47 \\ + 76 \\ \hline 13 \quad (7 + 6) \\ 110 \quad (40 + 70) \\ \hline 123 \end{array}$$

Step 4 With practice, you will be able to use the column method

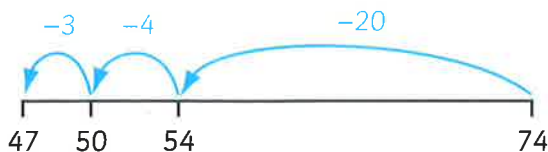
$$258 + 87 = 345$$

$$\begin{array}{r} 258 \\ + 87 \\ \hline 345 \\ \hline 11 \end{array}$$

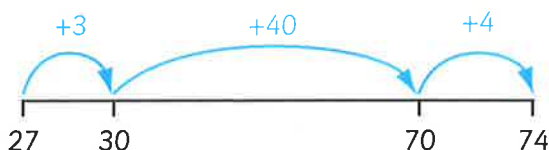
Calculations: Subtraction

Step 1 Use a number line to 'take away' in steps

$$74 - 27 = 47$$



You can also count up from the smaller number to find the difference



Step 2 Use partitioning

$$74 - 23 = 51$$

$$\begin{array}{r} (70 + 4) \\ - (20 + 3) \\ \hline 50 + 1 = 51 \end{array}$$

Step 3 Move on to three-digit numbers

$$563 - 241 = 322$$

$$\begin{array}{r} (500 + 60 + 3) \\ - (200 + 40 + 1) \\ \hline 300 + 20 + 2 = 322 \end{array}$$

Harder

$$563 - 278 = 285$$

$$\begin{array}{r} \begin{array}{ccc} 400 & 150 & 13 \\ (500 & + 60 & + 3) \end{array} \\ - (200 + 70 + 8) \\ \hline 200 + 80 + 5 = 285 \end{array}$$

Step 4 After time, you will be able to use the column method

$$\begin{array}{r} \overset{6}{\cancel{7}}\overset{1}{4} \\ - 27 \\ \hline 47 \end{array}$$

$$\begin{array}{r} 563 \\ - 241 \\ \hline 322 \end{array}$$

$$\begin{array}{r} \overset{4}{\cancel{5}}\overset{15}{6}\overset{1}{3} \\ - 278 \\ \hline 285 \end{array}$$

$$\begin{array}{r} \overset{4}{\cancel{5}}\overset{9}{6}\overset{1}{3} \\ - 278 \\ \hline 225 \end{array}$$

Calculations: Multiplication

Step 1

Know that $3 \times 4 = 4 \times 3$

and $2 \times 45 = 45 \times 2$

Step 2

Know that 2×37 (or 37×2)

is the same as $(2 \times 7) + (2 \times 30)$

Step 3

Use the grid method
show your working on a grid

\times	2	
30	60	(2×30)
7	14	(2×7)
	<u>74</u>	

Step 4

Use expanded short multiplication

$$7 \times 38 = 266$$

$30 + 8$	
$\times 7$	
<hr style="width: 50%; margin-left: 0;"/>	
56	(7×8)
210	(7×30)
<hr style="width: 50%; margin-left: 0;"/>	
266	

Step 5

Reduce the amount of writing
by using short multiplication

38
$\times 7$
<hr style="width: 50%; margin-left: 0;"/>
266
<hr style="width: 50%; margin-left: 0;"/>
5

Calculations: Multiplication

Step 6

Know that

$$45 \times 23 = (3 \times 5) + (3 \times 40) + (20 \times 5) + (20 \times 40)$$

Step 7

Show your working on a grid

\times	20	3
40	800	120
5	100	15

$$\begin{aligned} 45 \times 23 &= (3 \times 5) + (3 \times 40) + (20 \times 5) + (20 \times 40) \\ &= 15 + 120 + 100 + 800 \\ &= \mathbf{1035} \end{aligned}$$

Step 8

Expanded long multiplication
for 2-digit numbers

$$\begin{array}{r} 45 \\ \times 23 \\ \hline 15 \quad (3 \times 5) \\ 120 \quad (3 \times 40) \\ 100 \quad (20 \times 5) \\ 800 \quad (20 \times 40) \\ \hline 1035 \end{array}$$

Step 9

Long multiplication

$$\begin{array}{r} 45 \\ \times 23 \\ \hline 135 \quad (3 \times 45) \\ 900 \quad (20 \times 45) \\ \hline 1035 \end{array}$$

Calculations: Division

Step 1

Know how division is related to multiplication

$$5 \times 8 = 40$$

$$40 \div 8 = 5$$

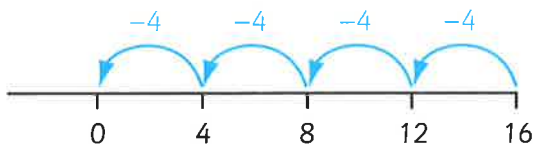
$$40 \div 5 = 8$$

Step 2

Use repeated subtraction

e.g. find out how many 4s there are in 16

$$16 \div 4 = 4$$



Step 3

The expanded method e.g.

$$81 \div 3$$

The answer is between 20 and 30, because

$$20 \times 3 = 60$$

$$30 \times 3 = 90 \text{ (too many)}$$

Finally we divide 21 by three to give 7 with no remainder

Tens Units

$$\begin{array}{r} 27 \\ 3 \overline{)81} \\ \underline{-60} \\ 21 \\ \underline{-21} \\ 0 \end{array}$$

$$(20 \times 3)$$

$$(7 \times 3)$$

We take 20×3 away from 81 to leave 21

Calculations: Division

Step 4 - Short division

$$\begin{array}{r} 27 \\ 3 \overline{) 81} \end{array}$$

This is the same as step 3 but we don't show the working out

Step 5 - Short division with remainders

$$\begin{array}{r} 64 \text{ r} 2 \\ 3 \overline{) 194} \end{array}$$

Answer: $64 \text{ r} 2$ or $64\frac{2}{3}$

Step 6 - Long division with remainders

$$\begin{array}{r} 25 \text{ r} 11 \quad \text{or } 25\frac{11}{22} \quad \text{or } 25\frac{1}{2} \\ 22 \overline{) 561} \\ \underline{- 440} \quad (20 \times 22) \\ 121 \\ \underline{- 110} \quad (5 \times 22) \\ 11 \end{array}$$

Step 7 - Long division where the answer has up to 2 decimal places

$$\begin{array}{r} 21.75 \\ 16 \overline{) 348} \\ \underline{- 320} \quad (20 \times 16) \\ 28 \\ \underline{- 16} \quad (1 \times 16) \\ 12.0 \\ \underline{- 11.2} \quad (0.7 \times 16) \\ 0.80 \\ \underline{- 0.80} \quad (0.05 \times 16) \\ 0 \end{array}$$