SUPPORTING YOUR CHILD WITH

NUMERACY

Methods

1234567890

How to help your child with Numeracy for parents, carers and guardians

"Numeracy is a skill for life, learning and work."

Index

Numeracy: Estimating

It is useful to develop a sense of size about things in the world around us.

- estimating height and length in cm, m, km, mm
  e.g. length of pencil = 10 cm
  width of desk = m

- small weights, small areas, small volumes
  e.g. bag of sugar = 1 kg

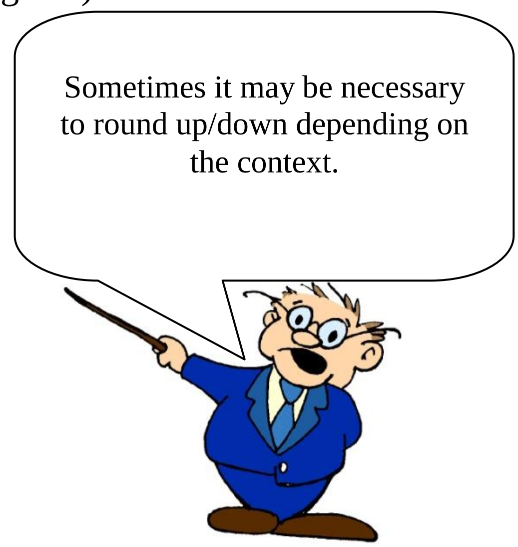
- areas in square metres, lengths in mm and m
  e.g. area of a blackboard = 4 m^2
  diameter of 1p = 15 mm

Using knowledge of rounding can be used to estimate the answer to a problem.

Examples:

If the digit following the degree of accuracy is 5 or more then we round up.

Round	74	→	70 (to the nearest 10)
	386	→	400 (to the nearest 100)
	347.5	→	348 (to nearest whole number)
	7.51	→	7.5 (to 1 decimal places)
	8.96	→	9.0 (to 1 d.p.)
	3.14159	→	3.142 (to 3 d.p)
	3.14159	→	3.14 (to 3 significant figures)



Numeracy: Addition

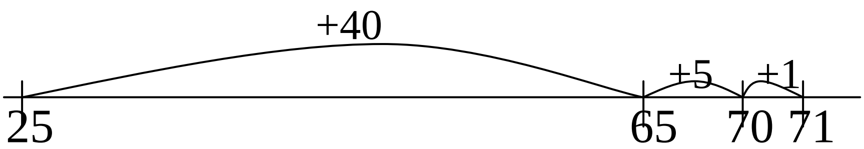
Mental Methods

Example: Work out 25 + 46

Method 1: Split the number.
Add the tens, then add the units, then add them together

20 + 40 = 60, 5 + 6 = 11, 60 + 11 = 71

Method 2: Jump on from one number (showing working on the empty number line).

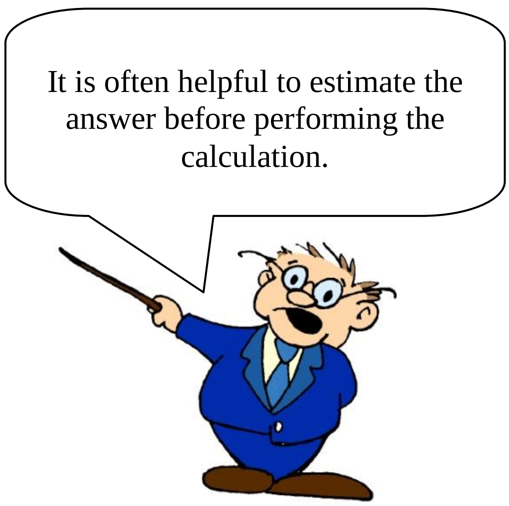


Written Method

To complete a written addition make sure the numbers are lined up in the appropriate columns.

Example: Work out 345 + 279

Step 1	Step 2	Step 3
$\begin{array}{r} 3\,4\,5 \\ +\,2\,7\,9 \\ \hline 4 \\ \hline {\scriptstyle 1} \end{array}$	$\begin{array}{r} 3\,4\,5 \\ +\,2\,7\,9 \\ \hline 2\,4 \\ \hline {\scriptstyle 1\;1} \end{array}$	$\begin{array}{r} 3\,4\,5 \\ +\,2\,7\,9 \\ \hline 6\,2\,4 \\ \hline {\scriptstyle 1\;1} \end{array}$

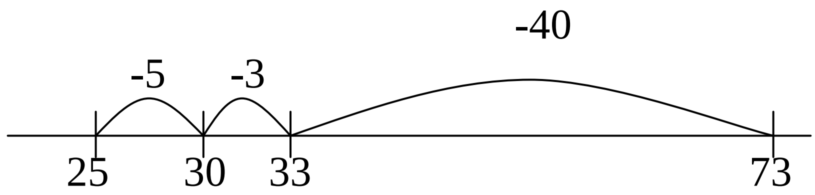


Numeracy: Subtraction

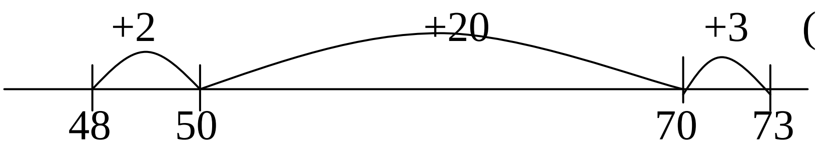
Subtraction can be completed mentally.

Example: Work out 73 – 48

Method 1: Jump back 48 from 73 (showing working on the empty number line).



Method 2: Count on from 48 to 73 to find the difference.



(2 + 20 + 3 = 25)

Written Method

To complete a written subtraction make sure the numbers are lined up in the appropriate columns.

Example: Work out 873 – 295

Step 1

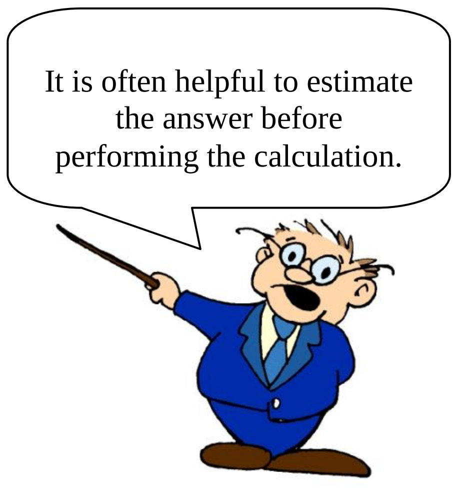
$$\begin{array}{rrr} & {}^{6} & {}^{1} \\ 8 & \cancel{7} & 3 \\ -\,2 & 9 & 5 \\ \hline & & 8 \\ \hline \end{array}$$

Step 2

$$\begin{array}{rrr} {}^{7} & {}^{16} & {}^{1} \\ \cancel{8} & \cancel{7} & 3 \\ -\,2 & 9 & 5 \\ \hline & 7 & 8 \\ \hline \end{array}$$

Step 3

$$\begin{array}{rrr} {}^{7} & {}^{16} & {}^{1} \\ \cancel{8} & \cancel{7} & 3 \\ -\,2 & 9 & 5 \\ \hline 5 & 7 & 8 \\ \hline \end{array}$$



Numeracy: Multiplication

It is essential for many topics to have a good understanding of multiplication table (times tables) facts.

Mental Methods

Example: Work out 39 x 6

Method 1: Split the number being multiplied, then add together
30 x 6 = 180,   9 x 6 = 54,   180 + 54 = 234

Method 2: Round the number being multiplied and subtract the extra amount.
40 x 6 = 240,   40 is 1 too many so subtract 1 x 6   240 – 6 = 234

Multiples of 10 and 100

To multiply by 10 move every digit one place to the left.
To multiply by 100 move every digit two places to the left.

Th	H	T	U			Th	H	T	U	
		2	3	x 10				2	3	x 100
	2	3	0			2	3	0	0	

Th	H	T	U•	t	h		Th	H	T	U•	t	h	
		2	3 •	4	6	x 10			2	3 •	4	6	x 100
	2	3	4 •	6			2	3	4	6 •	0		

Examples:

	24 x 30		5• 6 x 400
Multiply by 3	24 x 3 = 72	Multiply by 4	5• 6 x 4 = 22• 4
Multiply by 10	72 x 10 = 720	Multiply by 100	22• 4 x 100 = 2240

Numeracy: Multiplication

Multiplication by 2 digits

Example: Work out 34 x 26

Step 1

Do 34 x 6 first

3 4	
x 2 6	
2 0 4	34 x 6
____	
____	

Step 2

Do 34 x 20
Insert a zero

3 4	
x 2 6	
2 0 4	34 x 6
6 8 0	34 x 20
____	

Step 3

Now add together the two parts

3 4	
x 2 6	
2 0 4	34 x 6
6 8 0	34 x 20
8 8 4	

Multiplication of 2 decimals

To multiply two decimals change both the decimals to whole numbers by multiply by 10 or 100. Carry out the multiplication as above. Change the answer back by dividing by 10 or 100 as necessary.

Example: Work out 3•4 x 0•26

Change to 34 x 26	3•4 x 10 = 34, 0•26 x100 = 26
Work out 34 x 26 as above	34 x 26 = 884
Change back to 3•4 x 0•26	944 ÷10 ÷ 100 = 0•884

Numeracy: Division

By recalling times tables facts division can be carried out accurately.

Method 1: No remainders

Example: Work out 174 ÷ 3

$$\begin{array}{r|l} \multicolumn{1}{r}{} & \;\;\;5\;\;\;\;8 \\ \cline{2-2} 3 & 1\;{}^{1}7\;\;{}^{2}4 \end{array}$$

Method 2: Remainder
Carry on the calculation by inserting zeros until there is no remainder.

Example: Work out 27•5 ÷ 4

$$\begin{array}{r|l} \multicolumn{1}{r}{} & \;\;\;6\;\bullet\;8\;\;\;7\;\;\;5 \\ \cline{2-2} 4 & 2\;{}^{2}7\;\bullet\;{}^{3}5\;\;{}^{3}0\;\;{}^{2}0 \end{array}$$

Numeracy: Negative Numbers

Negative numbers or *integers* are used in many real life situations.

The temperature is -4 ^{o}C (negative 4 degrees Celsius)

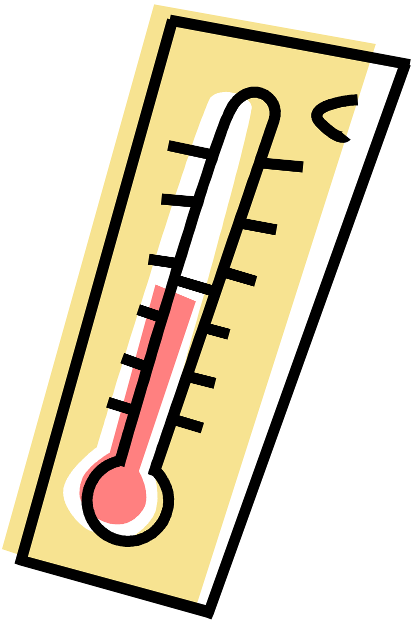
Addition/Subtraction	**Examples**
When adding on a positive number go upwards	3 + 5 = 8
When adding on a negative number go downwards	3 + (-5) = -2
When subtracting a positive number do downwards	4 – 7 = -3
When subtracting a negative number do upwards	4 – (-7) = 11

Multiplication/Division

(+ve positive number, -ve negative number)

Multiplying a +ve by a +ve the answer will be +ve	3 x 5 = 15
Multiplying a –ve by a +ve the answer will be –ve	(-3) x 5 = -15
Multiplying a +ve by a –ve the answer will be –ve	3 x (-5) = -15
Multiplying a –ve by a –ve the answer will be +ve	(-3) x (-5) = 15

Dividing a +ve by a +ve the answer will be +ve	24 ÷ 6 = 4
Dividing a –ve by a +ve the answer will be –ve	(-24) ÷ 6 = -4
Dividing a +ve by a –ve the answer will be –ve	24 ÷ (-6) = -4
Dividing a –ve by a –ve the answer will be +ve	(-24) ÷ (-6) = 4



Numeracy: BODMAS

The order in which calculations are carried out is important. If we have more than one operation we should use the following order.

B racket
O peration (ie squaring, taking square root of)
D ivision
M ultiplication
A ddition
S ubtraction

Examples:

30 – 4 x 2		(9 + 3) ÷ 6	
= 30 - 8	**M**ultiply	= 12 ÷ 6	**B**racket
= 22	**S**ubtract	= 2	**D**ivision
3 x 4^2		$(3 \times 4)^2$	
= 3 x 16	**O**peration	= 12^2	**B**racket
= 48	**M**ultiply	= 144	**O**peration

(7 x 6) – $\sqrt{25}$
= 42 – $\sqrt{25}$ **B**racket
= 42 –5 **O**peration
= 37 **S**ubtraction

Most Scientific calculators use BODMAS.

Numeracy: Fractions

Simple Fractions

To work out simple fractions of 1 or 2 digit numbers divide by the denominator (the number on the bottom)

Examples:

$\frac{1}{3}$ of 12 = 12 ÷ 3 = 4 ; $\frac{1}{5}$ of 70 = 70 ÷ 5 = 14

To work out more challenging fractions divide by the denominator (the number on the bottom) and multiply by the numerator (the number on the top)

Examples:

$\frac{3}{4}$ of 24 = 24 ÷ 4 x 3 = 18

Equivalent Fractions

To work out equivalent fractions multiply the top and the bottom by the same number. Equivalent fractions can also be **simplified** by dividing both the top and bottom of the fraction by the same number.

$$\frac{3}{4} \overset{\times 6}{\underset{\times 6}{=}} \frac{18}{24} \qquad \frac{35}{40} \overset{\div 5}{\underset{\div 5}{=}} \frac{7}{8}$$

Improper Fractions and Mixed Numbers

An improper fraction is one where the number on the top is larger than the number on the bottom. We can express improper fractions as a mixed number (a whole number and a fraction) by simplifying.

$$\frac{23}{4} = 5\frac{3}{4}$$

23 ÷ 4 = 5 remainder 3

Numeracy: Fractions

Addition and Subtraction

Fractions can only be added or subtracted if they have the same denominator.

Examples:

$$\frac{1}{2} + \frac{1}{3}$$
$$= \frac{3}{6} + \frac{2}{6}$$
$$= \frac{5}{6}$$

$$\frac{5}{4} - \frac{1}{3}$$
$$= \frac{15}{12} - \frac{4}{12}$$
$$= \frac{11}{12}$$

Multiplication

To multiply fractions multiply the numerators, then multiply the denominators.

Examples:

$$\frac{4}{7} \times \frac{2}{3}$$
$$= \frac{4 \times 2}{7 \times 3}$$
$$= \frac{8}{21}$$

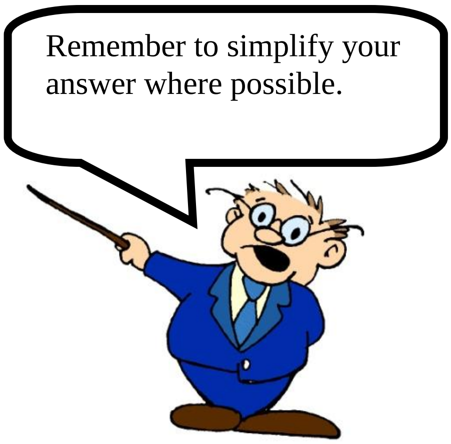
$$\frac{3}{7} \times \frac{2}{3}$$
$$= \frac{6}{21}$$
$$= \frac{2}{7}$$

Division

To divide fractions flip the second fraction and change the sum to multiply. Please note a/b means $\frac{a}{b}$.

Example:

$$\frac{5}{7} \div \frac{2}{3}$$
$$= \frac{5}{7} \times \frac{3}{2}$$
$$= \frac{15}{14} = 1\frac{1}{14}$$



Numeracy: Percentages

Percentage means *parts of one hundred*.

Percentages can be expressed as a decimal or a fraction. Here are some common simple percentages.

Percentage	Decimal	Fraction
100%	1	$\frac{1}{1}$
50%	0.5	$\frac{1}{2}$
10%	0.1	$\frac{1}{10}$
5%	0.05	$\frac{1}{20}$
20%	0.2	$\frac{1}{5}$
25%	0.25	$\frac{1}{4}$
75%	0.75	$\frac{3}{4}$
$33\frac{1}{3}$ %	0.333...	$\frac{1}{3}$
$66\frac{2}{3}$ %	0.666...	$\frac{2}{3}$

Example: Work out 25% of 84

Method 1: Express as a fraction

25% of 84 = $\frac{1}{4}$ of 84 = 21

Method 2: Express as a decimal

25% of 84 = 0.25 x 84 = 21

Method 3: Using a calculator

25% of 84 = 84 ÷100 × 25 = 21

Numeracy: Percentages

We can use knowledge of more common percentages to help calculate others.

Examples:

Calculate 70% of £90

Work out 10%	10% of £90 = £9
Multiply by 7	70% of £90 = £9 x 7 = £63

Calculate 15% of £67

Work out 10%	10% of £67 = 67 ÷ 10 =6.70
Work out 5%	5% of £67 = 6.70 ÷ 2 = 3.35
So	15% of £67 = £10.05

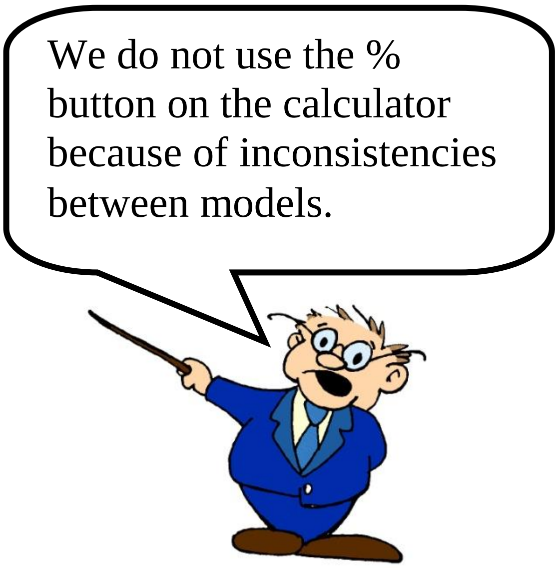
Calculate 8% of £34

Work out 1%	1% of £34 = 34 ÷ 100 = 0.34
Multiply by 8	8% of £34 = 0.34 x 8 = £2.72

Fractions → Percentages

Example: John scored 18 marks out of 40 in a test. Write this as a percentage.

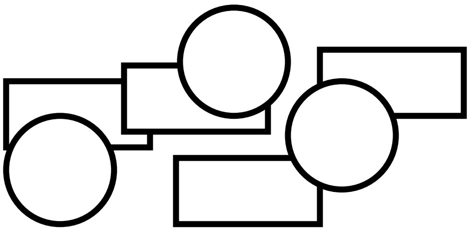
$$\frac{18}{40} = 18 \div 40 = 0.45 = 45\%$$



Numeracy: Ratio

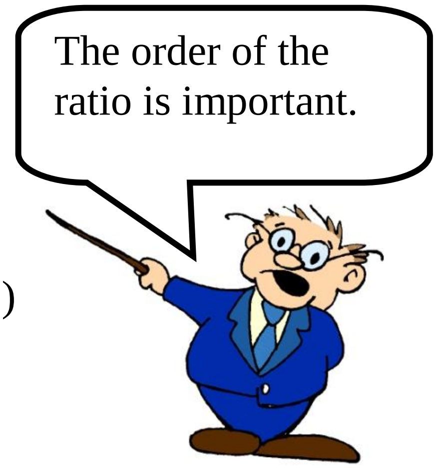
When two quantities are compared it is useful to write as a ratio.

Example:



There are 4 circles and 3 rectangles.
The ratio of circles:rectangles is

4:3 (we say as 4 to 3)



Ratios can be simplified like fractions.
Example: Simplify 12:20

Method: Divide each side by 4
12:20
3:5

Ratio can be used to solve problems.
Example: To make purple paint the ratio of blue paint to red paint is 2:3. If you have 8 litres of blue paint how much red paint do you need?

	blue : red	
Multiply by 4	2 : 3	Multiply by 4
	8 : 12	

Example: Andrew and Beth share £35 in the ratio 3:4. How much do they each get?

Number of parts	=	3 + 4	= 7	
1 part	=	£35 ÷ 7	= £5	
3 parts	=	£5 x 3	= £15	Andrew gets £15
4 parts	=	£5 x 4	= £20	Beth gets £20

Numeracy: Proportion

Two quantities are said to be in direct proportion if they both go up at the same rate.

Example:
If 5 bananas cost 80 pence, then what do 3 bananas cost ?

Method:

5 bananas cost 80 p
1 banana costs $80 \div 5 = 16$p
3 bananas costs $16 \times 3 = 48$ pence

Two quantities are said to be in inverse proportion if one quantity goes up as the other goes down.

Example:
Five men take 6 days to build a wall. How long would 3 men take?

Method:

5 men take 6 days
1 man takes $6 \times 5 = 30$ days
3 men take $30 \div 3 = 10$ days

Numeracy: Time

It is helpful to recall time facts.

1 minute	=	60 seconds
1 hour	=	60 minutes
1 day	=	24 hours
1 year	=	52 weeks
	=	365 days (or 366 in a leap year)

Time can be written in 12 hour and 24 hour clock

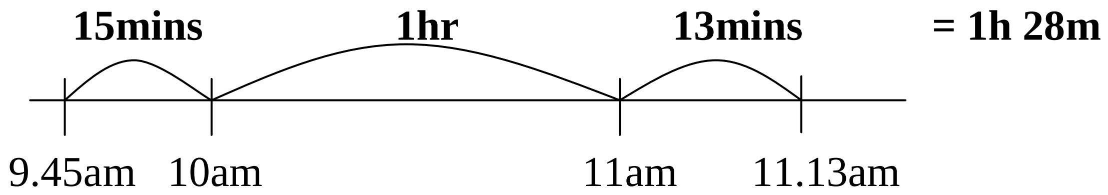
Examples:

12 hour clock		24 hour clock
11:27 pm	=	2327
9:35 am	=	0935
12:56 am	=	0056
12:56 pm	=	1256

We can calculate time differences.

Example: How long it is between 9:45am and 11:13am.

Method: Count on from 9.45am until 11.13am (shown on empty number line).



Minutes can be changed in hours to aid solving problems.

Example: Change 27 minutes in hours.

Method: 27 min = 27 ÷ 60 = 0.45 hour

Numeracy: Measurement

Pupils should be able to solve practical problems using knowledge of measurements.

It is helpful to know some conversions between common units.

Length

10 mm	=	1 cm
100 cm	=	1 m
1000 m	=	1 km

Weight

1 kg	=	1000 g
1 tonne	=	1000 kg

Volume

1000 ml	=	1 litre
1 cm^3	=	1 ml

When answering questions in context remember pupils should always include appropriate units.

Numeracy: Data Analysis

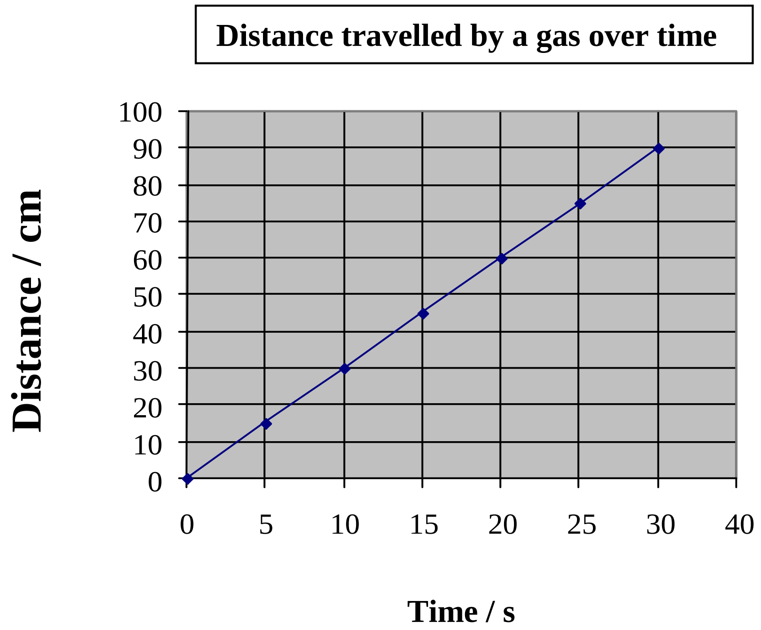
Information can be collated, organised and communicated in appropriate ways.

Line Graphs

Method: Choose an appropriate scale for the axes to fit the paper
If necessary, make use of a jagged line to show that the lower part of a graph has been missed out.
Label the axes .
Give the graph a title.
Number the lines **not** the spaces.
Plot the points neatly.
Join up the points with a straight line or a smooth curve as appropriate.

Example: The distance a gas travels over time has been recorded in the table below.

Time (s)	0	5	10	15	20	25	30
Distance (cm)	0	15	30	45	60	75	90

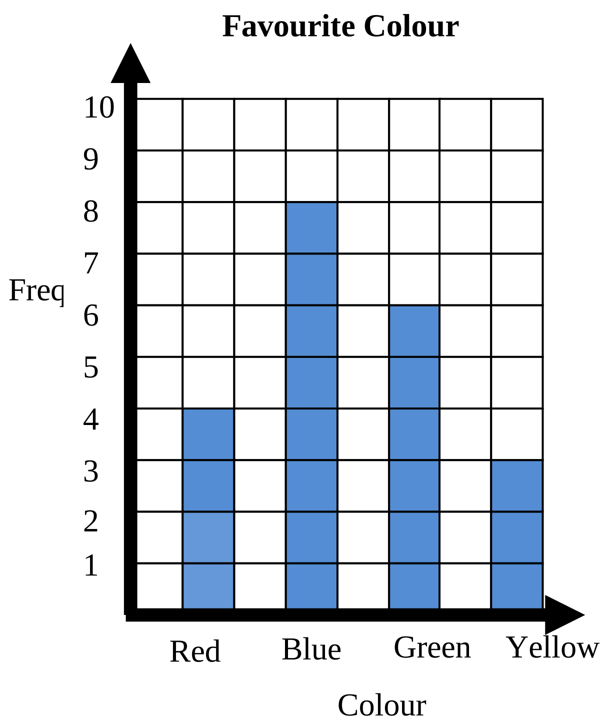


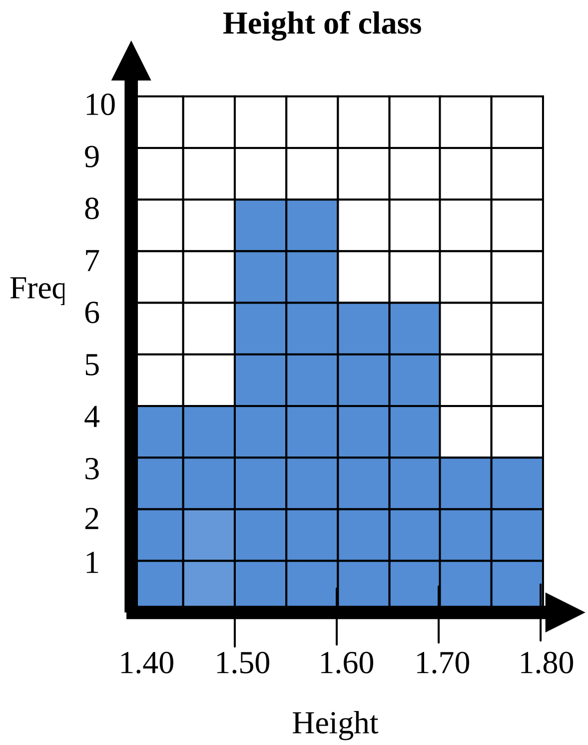
Numeracy: Data Analysis

Bar Charts

Method: Give the graph a title.
Label the axes.
Label the bars in the centre of the bar (each bar has an equal width).
Label the frequency (up the side) on the lines not on the spaces.
Bars are only joined together when grouped numbers.

Examples:





Numeracy: Data Analysis

PIE CHARTS

Method: Label all the slices
Give the pie chart a title
Encourage slices to be drawn in a clockwise direction

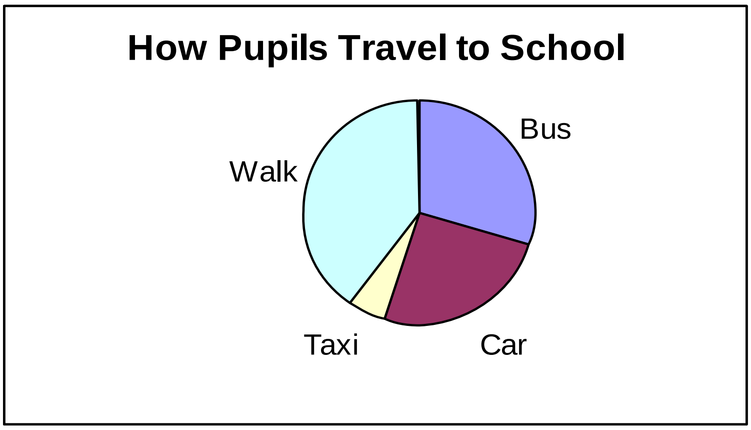
Examples: A class were asked how they got to school.

Pie chart worked out using percentage

Transport	Percentage	Angle
Bus	30%	30% of 360 = 108°
Car	25%	25% of 360 = 90°
Taxi	5%	5% of 360 = 18°
Walk	40%	40% of 360 = 144°

Pie chart worked out using frequencies.

Transport	Frequency	Angle
Bus	6	$\frac{6}{20}$ of 360 = 108°
Car	5	$\frac{5}{20}$ of 360 = 90°
Taxi	1	$\frac{1}{20}$ of 360 = 18°
Walk	8	$\frac{8}{20}$ of 360 = 144°
Total	20	360°



Numeracy: Data Analysis

To analyse data it is often useful to work out the average.

There are three different types of average,

Mean - this is found by adding up all the values and dividing by the number of values.

Median - this is the middle value of an ordered set of data. If there are two numbers in the middle it is between these two numbers.

Mode - this is the most common value in a data set.

The range is the highest value – lowest value of the data set.

Example: Work out the mean, median, mode and range for this set of data.

3 5 6 7 4 11 7 8 4 7

Mean $= \dfrac{3+5+6+7+4+11+7+8+4+7}{10} = \dfrac{62}{10} = 6 \cdot 2$

Ordered data 3 4 4 5 6 ↑ 7 7 7 8 11

Median = 6•5

Mode = 7 (most common number in the data set)

Range = highest value – lowest value
= 11 - 3
= 8

Numeracy: Probability

By understanding probability pupils can determine how many times they expect an event to occur and use this information to make predictions.

Probability is written as a fraction.

$$\text{Probability of an event} = \frac{\text{number of favourable events}}{\text{Number of possible events}}$$

Example: A bag contains 3 red balls and 4 blue balls. What is the probability that a ball chosen at random is 3?

Method: How many red balls?
How many balls altogether?
$P(\text{red}) = \frac{3}{7}$

Example: A team has won 5 games, drawn 3 games and lost 4 games. If they played 48 games in a season how many games would they expect to win?

$P(\text{win}) = \frac{5}{12}$

$\text{Expect} = \frac{5}{12} \times 48 = 20 \text{ games}$

Numeracy: Vocabulary

Often words mean the same.

Addition
add
sum of`
total
plus
more than
altogether

Subtraction
subtract
minus
take away
find the difference
less than
remove

Multiplication
multiply
times
product
lots of
sets of

Division
divide
share
quotient
split between
groups of

Equals
will be
total
same as
makes

We hope that you find this booklet useful supporting your child with numeracy.