Numeracy Across The Curriculum

A Guide for Parents/Carers and Staff explaining how topics involving numbers are taught within Girvan Academy

In Girvan Academy we encourage and support learning that takes place outside of school. Our pupils learn Numeracy across the curriculum, but parental involvement can have a positive effect in helping to improve your child's numeracy.

This information booklet is a resource that has been produced to give parents and carers a clear guide and feel confident in the ways that topics are taught across the school and in Mathematics.

Introduction

Curriculum for Excellence has given the opportunity for all educators to work together. All teachers now have a responsibility for promoting the development of Numeracy. With an increased emphasis upon Numeracy for all young people, teachers will need to revisit and consolidate Numeracy skills throughout schooling. To this end, I feel that it is important that "we" (all staff at Girvan Academy) deliver a consistent approach to "our" pupils. Pupils often have difficulties with transferable skills and if we can deliver consistent approaches to Numeracy across the school, we will be helping our pupils become successful learners.

This information booklet has been produced to inform parents/carers and teachers how the Numeracy Outcomes from Curriculum for Excellence are taught within the Maths Department and to demonstrate examples where Numeracy is used across many other curricular areas at Girvan Academy.

"Parents are a child's first and most enduring educators and their influence cannot be overestimated." Learning in numeracy takes place all around us, not just in the classroom. Here are some ideas how parents and families can help support and develop numeracy skills.

- Cooking or baking: How will we measure how much? Can you read the numbers? Can you help me count the spoons? How many cupcake cases will we need? How long will it take to cook? What time will it be ready? What it we double or halve the recipe? How many will we make? How many cakes will we get each in our family? How many chocolate buttons will we need if we put three on each cake?
- Shopping: How many will we need? How much? Will we have enough from this amount? What shape is this? Which is more or less? Which is bigger? How do we work out 20% off? What will it cost if we buy ten? Which is better value?
- Watching or playing sports – what's the score now? What if they get two more goals? How much is the black worth? What is treble twenty? How much better have they done than last week? What do these statistics mean? How long is the game? What time will it be at half-time?
- Recycling – how will we sort these? How many? What shape is this? Which is the longest? Can you find me a cylinder?
- Walking or driving to school – How long does it take? How many steps? How many number fours can you spot on the way? What number patterns can we spot? Are these numbers odd or even? What shapes can you spot? What directions are we taking? What would be the time difference if we walked or cycled?

It is hoped that use of the information in the booklet will help our parents/carers. You will hopefully be given an insight into the way number topics are being taught to your children in the school, making it easier for you to help them with their homework, and as a result improve their progress.

Angela Potter
Principal Teacher of Mathematics
Girvan Academy

Note: Each topic starts by displaying the outcomes for both the third and fourth level. Remember that the fourth level is for the majority of pupils to reach by the end of S3.

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Number and Number Processes

Third Level	Fourth Level
I can use a variety of methods to solve number problems in familiar contexts, clearly communicating my processes and solutions. *MNU 3-03a* ***I can continue to recall number facts quickly and use them accurately when making calculations.*** *MNU 3-03b* ***I can use my understanding of numbers less than zero to solve simple problems in context.*** *MNU 3-04a* **Benchmarks** • ***Recalls quickly multiplication and division facts to the 10th multiplication table.*** • ***Uses multiplication and division facts to the 12th multiplication table.*** • ***Solves addition and subtraction problems working with whole numbers and decimal fractions to three decimal places.*** • ***Solves addition and subtraction problems working with integers.*** • ***Solves multiplication and division problems working with whole numbers and decimal fractions to three decimal places.*** • ***Solves multiplication and division problems working with integers.***	***Having recognised similarities between new problems and problems I have solved before, I can carry out the necessary calculations to solve problems set in unfamiliar contexts.*** *MNU 4-03a* **Benchmarks** • ***Interprets and solves multi-step problems using the four operations.***

When pupils come to secondary school they have to cope with many different subjects and have a lot of new interests but it is still important that they practise their basic number work which may be reinforced as it was in primary school.

Every pupil should know their times tables particularly as they move up the school. Their six, seven, eight and nine times tables are very important and can be practised at home. The eleven and twelve times tables should also be reinforced.

Place Value

Millions M	100s Thousands	10s Thousands	Thousands TH	Hundreds H	Tens T	Units U	Decimal Point	Tenths t	Hundredths h
				4	9	2	•	6	8

From the table above the:
4 stands for 4 Hundreds or 400
9 stands for 9 Tens or 90
2 stands for 2 Units or 2
6 stands for 6 tenths or 0·6 or $\frac{6}{10}$.
8 stands for 8 hundredths or 0·08 or $\frac{8}{100}$.
Reading and writing large numbers is a common difficulty that you can help with.
3,678,023 reads
"Three million, six hundred and seventy eight thousand, and twenty three."

Addition

Pupils are encouraged to set out their working neatly using a ruler. It is important that pupils learn to **line up their decimal points** as a large number of pupils have difficulties with this and end up with the wrong answer.

Example 1 Calculate $14.6 + 5.23$

$$\begin{array}{r} 1\,4\,.\,6 \\ +\,5.\,2\;\;3 \\ \hline 6\;6\,.\,9 \\ \hline \end{array}\ \times \qquad\qquad \begin{array}{r} 1\;4\,.\,6\;0 \\ +\quad 5\,.\,2\;3 \\ \hline 1\;9\,.\,8\;3 \\ \hline \end{array}\ \checkmark$$

Note: When adding or subtracting decimals, figures with the same place value must be in line with each other. Zeros can be added in to help pupils line up and consequently answer the question correctly.

Example 2

How much does it cost altogether for a book costing £6.68 and a maths set at £12.43?

$$\begin{array}{rccccc} & & 6 & \cdot & 6 & 8 \\ + & 1 & 2 & \cdot & 4 & 3 \\ \hline & 1 & 9 & \cdot & 1 & 1 \\ \hline & & {\scriptstyle 1} & & {\scriptstyle 1} & \end{array}$$

It would cost £19·11 altogether.

Note: Communicate your answer using words.

We can put the carry on figure underneath the line although some people prefer to put it above the line – either is perfectly acceptable.

Subtraction

The method for subtraction is called decomposition. We DO NOT borrow 1 and pay back. If the number on top is too small to subtract from, we move one place to the left and exchange (see example below).

Example 1 What is the difference between £16.79 and £13.85?

$$\begin{array}{cccccc} & 1 & \overset{5}{\cancel{6}} & \cdot & {}^{1}7 & 9 \\ - & 1 & 3 & \cdot & 8 & 5 \\ \hline & 0 & 2 & \cdot & 9 & 4 \\ \hline \end{array}$$

The difference in price is £2·94.
Note: Communicate your final answer using appropriate units.

We also expect pupils to carry out subtraction mentally.

- Counting on:

e.g. to solve 41 – 27, count on from 27 until you reach 41

- Breaking up the number being subtracted:

e.g. to solve 41 – 27, subtract 20 then subtract 7

Your child will have learned these strategies in primary school through Number Talks.

Multiplication

We must all encourage our pupils to learn their times tables so that they are able to recite them confidently.

Example 1 A packet of crisps weighs 26·7 grams. What is the weight of 8 packets?

$$
\begin{array}{rrrrr}
 & 2 & 6 & \cdot & 7 \\
 & & & \times & 8 \\
\hline
2 & 1 & 3 & \cdot & 6 \\
\hline
 & {\scriptstyle 5} & {\scriptstyle 5} & &
\end{array}
$$

8 packets of crisps weigh 213·6 grams.

Note: Communicate your final answer using appropriate units.

Example 2 Scott changed £600 to Canadian dollars before going on holiday to Canada. If the exchange rate was £1 = 1·53 Dollars, how many Dollars would David receive?

$$
\begin{aligned}
&1.53 \times 600 \\
=\ &1.53 \times 100 \times 6 \\
=\ &153 \times 6 \\
=\ &918
\end{aligned}
$$

Note: The multiplication could be completed in a different order.
Communicate your final answer using appropriate units.

Scott would receive 918 Canadian dollars.

In Girvan Academy when pupils are multiplying or dividing by 10, 100 or 1000 we instruct them to move the digits. When multiplying by 10, 100 or 1000, the digits move to the left and when dividing by 10, 100 or 1000, the digits move to the right, using zeros where necessary as place holders.

Division
Pupils will not be able to divide if they are not confident with their times tables.
Again we must positively encourage pupils to learn their times tables.

Example 1 Robert is paid £44·94 for working 7 hours. How much does he earn each hour?

$$\begin{array}{r|l} & 0\ 6\cdot 4\ 2 \\ \hline 7 & 4\ {}^{4}4\cdot{}^{2}9\ {}^{1}4 \end{array}$$

Note: Communicate your final answer using appropriate units.

Tony earns £6·42 each hour.

Example 2 40 squirrels equally shared 2520 nuts which had fallen from trees in an orchard. How many nuts did each squirrel get?

$$\begin{aligned} & 2520 \div 40 \\ = \;& 2520 \div 10 \div 4 \\ = \;& 252 \div 4 \\ = \;& 63 \end{aligned}$$

Note: Communicate your final answer using appropriate units.
Each squirrel got 63 nuts.

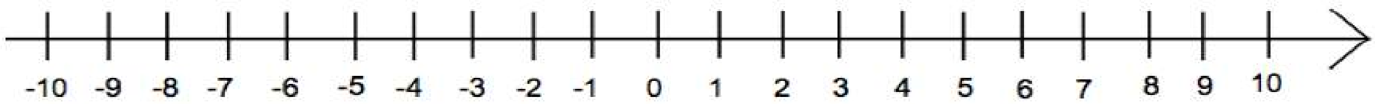
Negative Numbers

Pupils Should:

- Be able to recognise negative numbers in real life:

  - Temperature
    - Bank balances
  - Floors in a building
    - Stock market losses
  - Golf scores
    - Sea level

- Know the position of negative numbers on a number line and be able to put negative and positive numbers in order.



- Be able to read temperatures from a thermometer.
- Be able to add and subtract negative and positive numbers, for example:

  -2 + 5 = 3
  7 – 10 = -3
  (-4) – 6 = -10
  5 + (-9) = -4   *Remember adding a negative is the same as subtracting*

- Be able to solve problems involving negative numbers, for example:

Example 1 One morning in Girvan the temperature was -1°C.
In Newton Stewart it was 5°C colder. What was the temperature in Newton Stewart?

Since it was colder, the temperature in Newton Stewart was 5°C less than -1°C so the calculation is: (-1) - 5 = - 6°C

The temperature in Newton Stewart was - 6°C.

Example 2 My bank balance at the end of last month was (-£400).
The next day my salary of £1100 was paid into my account. What was my new balance?

The starting balance was (-£400) and £1100 was added so the calculation is:
(-400) + 1100 = £700

The new balance was £700.

Estimating and Rounding

Third Level	Fourth Level
I can round a number using an appropriate degree of accuracy, having taken into account the context of the problem. *MNU 3-01a* **Benchmarks** • ***Rounds decimal fractions to three decimal places.*** • ***Uses rounding to routinely estimate the answers to calculations.***	***Having investigated the practical impact of inaccuracy and error, I can use my knowledge of tolerance when choosing the required degree of accuracy to make real-life calculations.*** *MNU 4-01a* **Benchmarks** • ***Rounds answers to a specified significant figure.*** • ***Demonstrates that the context of the question needs to be considered when rounding.*** • ***Demonstrates the impact of inaccuracy and error, for example, the impact of rounding an answer before the final step in a multi-step calculation.*** • ***Uses a given tolerance to decide if there is an allowable amount of variation of a specified quantity, for example, dimensions of a machine part, 235 mm ± 1 mm.***

Estimating

For every calculation we perform, we should really carry out a rough check in order to satisfy ourselves that the result is reasonably accurate.

Example 1 How much money would I need to be able to buy 18 fudges at 19p each?

As an approximation we could easily find the cost of 20 fudges costing 20p each
i.e. $18 \times 19 \approx 20 \times 20 = 400$p = £4.00

This answer is obviously too high (the actual answer is £3·42), but it does give us a rough idea of how much we should expect to pay.

Example 2
What would be the approximate weight of 48 packets of crisps each weighing 32·5 g?

We can roughly interpret this problem as being 50 packets each weighing 30 g
i.e. $48 \times 32{\cdot}5 \approx 50 \times 30 = 1500$ g = 1·5 kg

Pupils can practise estimating sensibly and getting the feel of large and small weights, heights and distances and using money in a practical way.

Rounding

Examples - When using large or small numbers it is useful to round numbers to give an approximation.

a) Round 4·8 cm to the nearest cm.

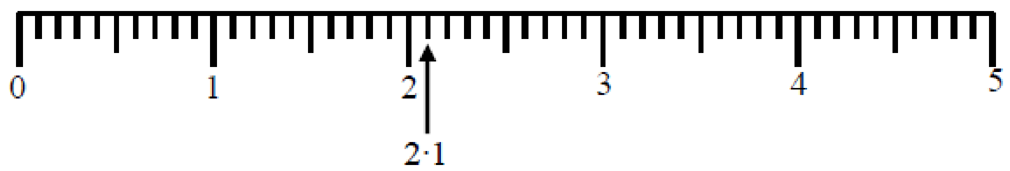
4·8 cm is between 4 cm and 5 cm

It is nearer 5cm.

So, we say that 4·8 cm ≈ 5 cm (to the nearest cm).

b) Round 2·1 cm to the nearest cm

2·1 cm is between 2 cm and 3 cm



It is nearer to 2cm.

So, we say that 2·1 cm ≈ 2 cm (to the nearest cm).

c) Round 8·5 cm to the nearest cm

8·5 cm is between 8 cm and 9 cm

When the number is half-way between, round up to the higher number.

You would say that 8·5 cm is rounded up to 9 cm (to the nearest cm).

Reminders

The rules you have learned apply to all units of measurement.

a) Round 3·2 kg to the nearest kilogram (kg)

3·2 kg is between 3 kg and 4 kg

It is nearer to 3 kg.

So, 3·2 kg ≈ 3 kg (to the nearest kg).

b) Round 4·9 m to the nearest metre (m)

4·9 m is between 4 m and 5 m

It is nearer to 5 m.

So, 4·9 m ≈ 5 m (to the nearest m)

c) Round 6·3 to the nearest whole number

6·3 is between 6 and 7

It is nearer to 6

So, 6·3 ≈ 6 (to the nearest whole number)

The rules for rounding are:

If the digit after the one you are rounding to is a 0, 1, 2, 3 or 4, the last digit stays the same. Otherwise if the digit is a 5, 6, 7, 8 or 9, you have to add on 1 (e.g. round up) to the last digit.

The above rule for rounding works in all cases.

Examples

1) 27 (rounded to the nearest ten) → 30
2) 5364 (rounded to the nearest hundred) → 5400
3) 843 (rounded to the nearest ten) → 840
4) 1953 (rounded to the nearest thousand) → 2000
5) 23·35 (rounded to 1 decimal place) → 23·4
6) 214·65 (rounded to the nearest whole number) → 215

Decimals

3·74 has 2 decimal places because it has 2 digits to the right of the decimal point.

Reminders

When you write an amount of money in pounds, you use 2 digits after the point to show the pence. e.g. £3·65 means £3 and 65 pence.

Example 1 Round £3·968 to the nearest penny.

When you round an amount like £3·968 you look at the pence, nearest penny means 2 decimal places since there are 100 pennies in a pound.

In the next decimal place is an 8 and since it is bigger than 5 we round up to 97 pence.

£3·968 ≈ £3·97 (to the nearest penny).

Example 2 Round £2·593164 to the nearest penny.

£2.59̳3164 Any numbers after the pence means "a bit more"

This is the pence

Since the 3 is less than 5 we leave it as 59 pence

£2·593164 ≈ £2·59 (to the nearest penny).

Example 3 Round £7·402 to the nearest penny.

£7·402

This is the pence

Since the 2 is less than 5 we leave it as 40 pence

£7.402 ≈ £7.40 (to the nearest penny).

Significant Figures

Sometimes a number has far too many figures in it for practical use. This can be overcome by reducing the number to a certain number of significant figures, e.g.
Jonathan won £3,467,809 in the lottery. It would be much more useful and practical to say Jonathan has won £3·5 million. A digit in a number is significant if it gives some sense of quantity and accuracy. Zeros can be complicated – when do we count them? When do we leave them out? When zeros are used to determine the position of the decimal point or place value then they are **NOT** significant.

Examples

1) 38 rounded to 1 sig fig → 40 (Zero is here for place value.)

2) 45732 rounded to 2 sig figs → 46000 (Zeros are here for place value.)

3) 0·00694 rounded to 1 sig fig → 0·007 (Zeros for position of decimal point and place value.)

4) 0·050608 rounded to 3 sig figs → 0·0506 (Zeros for position of decimal point and place value. The 0 between the 5 and 6 is significant.)

5) 0·034002 rounded to 3 sig figs → 0·0340 (Zeros for position of decimal point and place value. The zero after the 4 is significant.)

Fractions, Decimal Fractions and Percentages

Third Level	Fourth Level
I can solve problems by carrying out calculations with a wide range of fractions, decimal fractions and percentages, using my answers to make comparisons and informed choices for real-life situations. **MNU 3-07a** ***I can show how quantities that are related can be increased or decreased proportionally and apply this to solve problems in everyday contexts.*** **MNU 3-08a** **Benchmarks** • ***Converts fractions, decimal fractions or percentages into equivalent fractions, decimal fractions or percentages.*** • ***Uses knowledge of fractions, decimal fractions and percentages to carry out calculations with and without a calculator.*** • ***Solves problems in which related quantities are increased or decreased proportionally.*** • ***Expresses quantities as a ratio and where appropriate simplifies, for example, 'if there are 6 teachers and 60 children in a school find the ratio of the number of teachers to the total amount of teachers and children'.***	***I can choose the most appropriate form of fractions, decimal fractions and percentages to use when making calculations mentally, in written form or using technology, then use my solutions to make comparisons, decisions and choices.*** **MNU 4-07a** ***Using proportion, I can calculate the change in one quantity caused by a change in a related quantity and solve real-life problems.*** **MNU 4-08a** **Benchmarks** • ***Chooses the most efficient form of fractions, decimal fractions or percentages when making calculations.*** • ***Uses calculations to support comparisons, decisions and choices.*** • ***Calculates the percentage increase or decrease of a value.*** • ***Uses knowledge of proportion to solve problems in real-life which involve changes in related quantities.***

Fractions

Pupils should be able to calculate fractions. Pupils are taught to divide by the denominator (bottom number) and multiply by the numerator (top number).

Example 1

$\frac{1}{3}$ of 12

= 12 ÷ 3

= 4

Example 2

$\frac{1}{5}$ of 70

= 70 ÷ 5

= 14

Example 3

$\frac{5}{7}$ of 21

= 21 ÷ 7 x 5

= 3 x 5

= 15

Example 4

$\frac{3}{4}$ of 176

= 176 ÷ 4 x 3

= 44 x 3

= 132

Pupils should be able to give fractions in simplified form. Fractions can be simplified by dividing the top and bottom number by the same common number. You can also find equivalent fractions by multiplying the top and bottom by the same number.

Example 5 Simplify

$$\frac{15}{20} \overset{\div 5}{\underset{\div 5}{=}} \frac{3}{4}$$

To simplify a fraction we simply divide the numerator and denominator by the highest common factor.

Example 6 Multiply the top and bottom number of the fraction by the same number to create a new equivalent fraction.

a) $\frac{2}{3} \overset{\times 2}{\underset{\times 2}{=}} \frac{4}{6}$

b) $\frac{2}{3} \overset{\times 3}{\underset{\times 3}{=}} \frac{6}{9}$

Percentages

Pupil should know that % means out of 100. Every percent can be written as a fraction or a decimal fraction. First of all we will look at calculating percentages without a calculator. Pupils should learn the following:

$100\% = \frac{100}{100} = 1 \qquad 10\% = \frac{1}{10} \qquad 1\% = \frac{1}{100}$

$50\% = \frac{50}{100} = \frac{1}{2} \qquad 25\% = \frac{25}{100} = \frac{1}{4}$

$12 \cdot 5\% = \frac{12 \cdot 5}{100} = \frac{1}{8}$

$33\frac{1}{3}\% = \frac{1}{3}$

$66\frac{2}{3}\% = \frac{2}{3}$

$75\% = \frac{75}{100} = \frac{3}{4}$

$20\% = \frac{20}{100} = \frac{1}{5}$

20%, 30%, 40%, 60% etc can be calculated by finding 10% and then multiplying.
e.g. 30% = 10% x 3,
70% = 10% x 7
2%, 3%, 4%, 6% etc can be calculated by finding 1% and then multiplying.
e.g. 4% = 1% x 4, 9% = 1% x 9
Note:
It is easier for some pupils to find 10% and then multiply by 2 to find 20%.
5% can also be found by finding 10% and dividing by 2.

Example 1 Without a calculator find:

a) $66\frac{2}{3}\%\ of\ £48$

$= \frac{2}{3} of\ 48$

$= 48 \div 3 \times 2$

$= 16 \times 2$

$= £32$

b) $30\%\ of\ 700m$

$= \frac{3}{10} of\ 700$

$= 700 \div 10 \times 3$

$= 70 \times 3$

$= 210m$

c) $9\%\ of\ 522ml$

$1\%\ of\ 522ml$

$= \frac{1}{100} of\ 522$

$= 522 \div 100$

$= 5.22ml$

$9\%\ of\ 522ml$

$= 5.22\ \times 9$

$= 46.98ml$

Percentage Calculations using a Calculator

To calculate percentages using a calculator we always change the percentage into a decimal by dividing by 100 and then multiply. WE NEVER SHOW PUPILS HOW TO USE A PERCENTAGE BUTTON ON A CALCULATOR.

Example 2 Using a calculator find:

a) 14% of £460
= (14 ÷ 100) x 460
= 64.4
= £64.40

b) 71.5% of £640
= (71.5 ÷ 100) x 640
= 457.6
= £457.60

Note: When dealing with money problems always give answers correct to 2 decimal places.

Changing Fractions to Percentages

To change a fraction into a percentage we change to a decimal fraction first by dividing and then multiply by 100.

Example 3 Audrey scored 24 out of 30 in her Maths test. Calculate her percentage.

Calculator

$\frac{24}{30}$

= 24 ÷ 30 x 100

= 80%

Non-Calculator

$\frac{\overset{8}{\cancel{24}}}{\underset{\cancel{3}\ 1}{\cancel{30}}} \times \frac{\overset{10}{\cancel{100}}}{1}\%$

= 80%

Audrey scored 80% in her Maths test.

Percentage Increases & Decreases

To find a percentage increase or decrease we first of all find the increase or decrease and then express it as a fraction of the original amount and then multiply by 100 to change into a percentage.

Example 4

A jacket cost £125 before a sale.
During a sale, it was reduced to £85.
Calculate the percentage decrease.

Decrease = £125 - £85 = £40

Fraction of original price = $\frac{40}{125}$

Percentage Decrease = $\frac{\overset{8}{\cancel{\overset{}{40}}}}{\underset{1}{\cancel{\underset{5}{\cancel{125}}}}} \times \frac{\overset{4}{\cancel{100}}}{1}\%$

= 32%

Example 5

Callum bought a flat for £75000.
Three years later he sold it for £82000
What was his percentage profit? (i.e. percentage increase)
Give your answer correct to two decimal places.

Increase = £82000 - £75000 = £7000

Fraction of original price = $\frac{7000}{75000}$

Percentage Profit = $\frac{7000}{75000} \times 100$
= 7000 ÷ 75000 x 100
= 9.3333 . . .
≈ 9.33% (to 2 d.p.)

Percentages In Action

Example 6

Last year a painting cost £2400. This year the painting increased in value by 12%.
How much is the painting now worth?

Old Price = £2400
Increase = 12% of £2400 = 12 ÷ 100 x 2400 = £288
New Price = £2400 + £288 = £2688

Example 7

The original price of a new tool kit costs £1860. Richard receives a trade discount of 40%. How much does Richard have to pay for his new tool kit?

Old Price = £1860

Decrease = 40% of £1860 = 40 ÷ 100 x 1860 = £744

New Price = £1860 - £744 = £1116

Ratio

A ratio is used to compare two or more related quantities. The "compared to" is replaced with two dots. For example "12 boys compared to 18 girls" can be written as 12:18. To simplify ratios, you divide both parts of the ratio by the highest common factor. For example 12:18 = 2:3 as you divide both sides by 6.

Example 1

Find the ratio of █ to ◊ in simplest form.

■ ■ ■ ■ ■ ◊ ◊ ◊
■ ■ ■ ■ ■ ◊ ◊ ◊

■ : ◊

10 : 6 (divide both sides by 2)

5 : 3

To share a quantity in a given ratio we add up the total parts of the ratio, e.g. 2:3 total 5 parts. We then need to work out one part by dividing the quantity by the total number of parts. We are then able to work out how the quantity is shared by multiplying the values of one part with the ratio values.

Example 2 £40000 is shared in the ratio 3:7 between Alistair and Stephen.
How much does each receive?

3 + 7 = 10 parts

10 parts = £40000

1 part = £40000 ÷ 10 = £4000

So Alistair gets 3 x £4000 = £12000 and

Stephen gets 7 x £4000 = £28000.

It is good practise to check that all the shares total the original figure:

£12000 + £28000 = £40000

Money

Third Level	Fourth Level
When considering how to spend my money, I can source, compare and contrast different contracts and services, discuss their advantages and disadvantages, and explain which offer best value to me. MNU 3-09a ***I can budget effectively, making use of technology and other methods, to manage money and plan for future expenses.*** MNU 3-09b **Benchmarks** • ***Demonstrates understanding of best value in relation to contracts and services when comparing products.*** • ***Chooses the best value for their personal situation and justifies choices.*** • ***Budgets effectively, using digital technology where appropriate, showing development of financial capability.*** • ***Demonstrates knowledge of financial terms, for example, debit/credit, APR, pa, direct debit/standing order and interest rate.*** • ***Converts between different currencies.***	***I can discuss and illustrate the facts I need to consider when determining what I can afford, in order to manage credit and debt and lead a responsible lifestyle.*** MNU 4-09a ***I can source information on earnings and deductions and use it when making calculations to determine net income.*** MNU 4-09b ***I can research, compare and contrast a range of personal finance products and, after making calculations, explain my preferred choices.*** MNU 4-09c **Benchmarks** • ***Applies understanding of credit and debit in relation to earnings and deductions.*** • ***Uses budgeting skills to manage income effectively and justifies spending and saving choices.*** • ***Calculates net income by selecting appropriate information.*** • ***Compares a range of personal finance products.*** • ***Communicates the impact of financial decisions.*** • ***Applies knowledge of currency conversion to determine best value.***

Best Buys

Pupils are encouraged to use unit amounts (i.e. find the value of 1) to decide which is the better value for money.

Example 1 The same brand of coffee is sold in two different sized jars as shown.
Which jar represents better value for money?

- Find the cost per gram for both jars.

  100g costs 185p so 185 ÷ 100 = 1·86p per gram.
  250g costs 315p so 315 ÷ 250 = 1·26p per gram.

- 1·26p per gram is less than 1·86p per gram, so the large jar is better value for money.

Wages and Salaries

Pupils will learn that people earn money in all sorts of ways, e.g. hourly, weekly, monthly or yearly (salary).

Remember: 52 weeks in a year, 12 months in a year and "annual" means yearly.

Note: 4 weeks should not but used in place of a month.

Basic rate/pay is the amount you are paid before any deductions are made.

Example 1 Alison gets paid £19760 per annum. What is her weekly wage?

£19760 ÷ 52 = **£380**

Alison earns £380 each week.

Example 2 Kathleen is a chef. Her wage last week was £249 for working 30 hours.

a) Calculate her hourly rate of pay?

Hourly rate = £249 ÷ 30 = **£8·30**

b) This week she worked 38 hours. How much did she earn?

This week she earned 38 x £8·30 = **£315·40**

Gross Pay, Net Pay and Deductions

Gross pay is the total amount that an employer pays you including any overtime, bonuses or commission.

Deductions are taken from your gross pay and include things like:-

- Superannuation – a type of extra pension for when you retire.
- National Insurance (NI) – to pay for loss of earnings if you are sick / unemployed.
- Income Tax – paid to the government to pay for education, health, transport etc.
- Pension – to provide for when you retire

Net pay is the amount that is paid into your bank account after deductions are made.

Net Pay = Gross Pay – Deductions

Example 1 Malcolm has a gross pay of £26000 per annum. He pays £4892 in deductions.

a) Calculate his annual net pay.

Net pay = £26000 - £4892 = £21108

b) Calculate his monthly take home pay.

Monthly pay = £21108 ÷ 12 = £1759

Overtime

In some jobs the rate of pay is higher for people working at night, weekends or holidays. This is called overtime.

- Double time is the basic rate x 2
- Time and a half is the basic rate x 1·5

Example 1 Alan is a long distance lorry driver with a basic rate of £14·50 per hour. His overtime pay is paid at double time.
Calculate what he gets for 7 hours overtime.

Overtime rate = 2 x £14·50 = £29
Overtime pay = 7 x 29 = £203

Alan is paid £203 in overtime.

Example 2 Joanne works in a petrol station, her basic rate is £9 per hour. Her overtime rate is time and a half. Calculate her total pay for a week in which she works 34 hours plus 5 hours overtime.

Basic Pay = 34 x £9 = £306
Overtime = 5 x (1·5 x £9) = £67.50
Total pay = £306 + £67.50 = £373.50

The total pay for Joanne that week was £373.50.

Commission

Some people, particularly salespeople, receive a lower basic wage, but increase their earnings by adding on a percentage of their total sales – this is called commission.

Example 1 Lesley sells kitchens. She works 40 hours each week earning £8·50 per hour. She also earns 4·5% commission on each kitchen she sells. In one week Lesley sells a kitchen worth £3000. Calculate her total wage for this week.

Commission = 4·5% of £3000
= 4.5 ÷ 100 x 3000
= £135

Basic Pay = 40 x £8·50
= £430

Total Pay = £135 + £430
= £525

Bonus

A bonus is an extra "one off" payment paid to employees usually as a result of good performance. A bonus can be a set amount or may be a percentage of earnings or company profits.

Example 1 John receives a bonus of 2% of his annual salary. He earns £45000 per annum. Calculate his bonus.

Bonus = 2% of £45000
= 2 ÷ 100 x 45000
= £900

Hire Purchase

Hire Purchase (HP) is a way of paying for an item over a period of time.
Hire purchase works as follows:-

- A deposit is sometimes paid and the item can be taken by the customer.
- The customer pays weekly or monthly instalments until the item is fully paid.
- When an item is bought through hire purchase, it usually ends up costing more than it would have if the item had been bought at the cash price. This cost is called interest.

Example 1 The cash price for a sofa is £1100. To pay for the sofa through hire purchase a 15% deposit has to be paid then twelve monthly instalments of £90.

a) How much will the deposit be?

Deposit = 15% of £1100
= 15 ÷ 100 X 1100
= £165

b) How much would be paid for all 12 instalments?

Instalments = 12 x £90
= £1080

c) What is the total hire purchase price of the sofa?

HP Price = £165 + £1080
= £1245

d) How much more is the H.P price than the cash price?

Interest = H.P. price – Cash price
Interest = £1245 - £1100
= £145

Foreign Exchange

The rate of exchange for each currency will normally be given by an amount per £ and it changes daily. Great Britain uses the pound (GBP) as its currency. Many European countries use the Euro.

Foreign Money = Number of Pounds x Exchange Rate
Number of Pounds = Foreign Money ÷ Exchange Rate

In Sept 2019 the exchange rate was: £1 ⟶ €1·07

Example 1 Gareth goes on holiday to Paris and takes £600 spending money with him. Using the exchange rate above how many Euros would he get?

Euros = 600 x 1·07 = €642

Example 2 Fiona returns from a school trip to Germany with €85. Use the exchange rate above to find out how many pounds she will get back.

Pounds = 85 ÷ 1·07 = £79·4392 . . . ≈ £79·44

Value Added Tax (VAT)

The government raises money by charging VAT. Most items that we purchase include VAT (usually at 20%).

Example 1 Find the total cost of a car costing £7800 + VAT.

VAT = 20% of £7800
= 20 ÷ 100 X 7800
= £1560
Total = £7800 + £1560
= £9165

Insurance

Questions on insurance usually involve reading values from tables and performing calculations. The cost of insurance is referred to as a Premium. There are many different types of insurance:

Building Insurance

A building insurance policy will normally protect against:

- Fire damage
- Storm damage
- Flooding
- Burst pipes etc.

Contents Insurance

Household contents insurance protect the items in the household from:

- Theft
- Accidental damage

Both Buildings and Contents insurance are often quoted based on £1000 worth of cover.

Life Assurance (Whole life)

Some people choose to take out Life Assurance policies so that if they die during the policy term their loved ones will be left with money which could be used to cover the cost of a funeral or provide financial stability for those left behind.

Car Insurance

It is illegal in the UK to drive a car without insurance. There are two levels of car insurance, Fully Comprehensive and Third Party, Fire and Theft. The cost of car insurance depends on many factors:

- Type of cover
- Make, model and age of car
- Age of driver
- Driving experience
- Previous claims/No Claims discount
- What the car is used for
- Where the car is located etc

Travel Insurance

Travel insurance can cover against many things depending on the level of cover purchased. Travel insurance will often cover:

- Cancellation
- Extensive delays
- Lost luggage
- Medical care

Factors which affect the cost of travel insurance include:

- Length of stay
- Destination
- Age
- Previous health conditions
- Type of holiday – sporting for example

Time

Third Level	Fourth Level
Using simple time periods, I can work out how long a journey will take, the speed travelled at or distance covered, using my knowledge of the link between time, speed and distance. **MNU 3-10a** **Benchmarks** • ***Applies knowledge of the relationship between speed, distance and time to find each of the three variables.*** • ***Calculates time durations across hours and days.***	***I can research, compare and contrast aspects of time and time management as they impact on me.*** **MNU 4-10a** ***I can use the link between time, speed and distance to carry out related calculations.*** **MNU 4-10b** **Benchmarks** • ***Demonstrates effective time management skills, for example, working with different time zones or making plans, including across midnight.*** • ***Carries out calculations involving speed, distance and time involving decimal fraction hours.*** • ***Calculates time durations across hours, days and months.***

Units of Time

- 1 century = 100 years
- 1 decade = 10 years
- 1 year = 12 months = 52 weeks = 365 days (366 in a leap year)
- 1 week = 7 days
- 1 day = 24 hours
- 1 hour = 60 minutes
- 1 minute = 60 seconds

30 days have September, April, June and November. All the rest have 31 except February alone, which has 28 days clear and 29 in each leap year.

12 hour clock

- Uses am for morning, pm for afternoon/evening
- Midday = noon = 12.00 pm
- Midnight = 12.00 am
- The digits should have a point between the hours and minutes, so 9.20 am is twenty past nine in the morning

24 hour clock

- Has to have four digits, doesn't have a point, no am/pm
- 2 blocks of 2 numbers, first block for hours, second block for minutes
- Hours bigger than 12 indicate pm
- Midday = 1200 hours
- Midnight = 0000 hours

- 0920 is twenty past nine in the morning
- 2120 is twenty past nine in the evening

Example 1 Change from 12 hour clock into 24 hour clock

a) 6.30 am = 0630 hours

b) 10.15 pm = 2215 hours

c) five to nine in the morning = 0855

d) five past seven in the evening = 1905

Example 2 Change from 24 hour clock into 12 hour clock

a) 0715 hours = 7.15 am

b) 2035 hours = 8.35 pm

c) 0010 hours = 12.10 am

Time Intervals

A number line can help when calculating time intervals. The easiest way of finding how long something lasts is by "counting on".

Example 1 How long is it from 0755 to 0948 ?

$$0755 \xrightarrow{} 0800 \xrightarrow{} 0900 \xrightarrow{} 0948$$

(5mins) + (1hr) + (48 mins)

Total time = 1 hr 53 minutes

Changing Units

To change decimals/fractions of an hour into minutes multiply by 60. Pupils often make mistakes with this for example, they think 2·5 hrs is 2 hours 5 minutes or 1·25 hrs is 1 hour 25 minutes. To change minutes to a decimal of an hour you divide by 60.

Pupils should learn that:

$\frac{1}{2}$ hour = 0.5 hour = 30 minutes

$\frac{3}{4}$ hour = 0.75 hour = 45 minutes

$\frac{2}{3}$ hour = $0.\dot{6}$ hour = 40 minutes, *

$\frac{1}{4}$ hour = 0.25 hour = 15 minutes

$\frac{1}{3}$ hour = $0.\dot{3}$ hour = 20 minutes, *

$\frac{1}{5}$ hour = 0.2 hour = 12 minutes

*(Note: $0.\dot{3}$ means 0.3333333 . . . it is called a recurring decimal.)

Example 1 Change 0·8 hour into minutes.

0·8 hour = 0·8 x 60 min = 48 minutes.

Example 2 Change 27 minutes into hours.

27 min = 27 ÷ 60 min = 0·45 hours.

Example 3 Change 2.6 hours into hours and minutes.

0·6 hour = 0·6 x 60 min = 36 minutes.
Total time is 2 hours and 36 minutes.

Time is a life skill which everyone uses every day of their life. Parents/carers can encourage their children to use time calculations in the home or planning journeys through looking at timetables.

Speed Distance and Time

The following three formulae are used to calculate Speed, Distance and Time.

$$D = S \times T \qquad S = \frac{D}{T} \qquad T = \frac{D}{S}$$

Example 1

Nathalie jogs at an average speed of 6km/h for 3 hours.
What distance does she jog?
S = 6km/h T = 3 hours

D = S x T
  = 6 x 3
  = 18 km

Example 2

A hot air balloon travelled 25 kilometres at an average speed of 10 km/hr.
For how long was the balloon in the air?
D = 25km S = 10km/h

T = $\frac{D}{S}$
  = $\frac{25}{10}$
  = 2.5 hours
  = 2 hours 30 minutes

Example 3

Elaine can walk to the office in 30 minutes. The distance from her house to her work is 2·5 miles. Work out Elaine's average speed in miles per hour.

D = 2.5 miles T = 30 mins = 0.5 hour

$$S = \frac{D}{T}$$
$$= \frac{2.5}{0.5}$$
$$= 5\text{mph}$$

Note: When doing speed, distance and time questions it is important that the units correspond. For example, if the speed is in km/hr and the time is in minutes, to answer you must change the unit of time into hours.

Measurement

Third Level	Fourth Level
I can solve practical problems by applying my knowledge of measure, choosing the appropriate units and degree of accuracy for the task, and using a formula to calculate area or volume when required. *MNU 3-11a* **Benchmarks** • ***Chooses appropriate units for length, area and volume when solving practical problems.*** • ***Converts between standard units to three decimal places and applies this when solving calculations of length, capacity, volume and area.***	***I can apply my knowledge and understanding of measure to everyday problems and tasks and appreciate the practical importance of accuracy when making calculations.*** *MNU 4-11a* **Benchmarks** • ***Demonstrates understanding of the impact of truncation and premature rounding.***

Choosing Units of Measurement

Length

- a doorway is about **2m** high
- a door handle is about **1 metre** off the ground
- a small ruler is about **15cm** long
- a CD is about **1mm** thick

Weight

- a bag of sugar weighs **1kg** (or 1000g)
- a small bag of crisps weighs about **30g**
- a medium sized apple weighs about **150g**
- an average man weighs about **85kg**

Volume/Capacity

- a can of coke holds **330ml**
- a medicine spoon holds **5ml**
- a bucket holds about **10 litres** of water
- fresh orange juice is usually sold in **1 litre** cartons

Pupils should pick up a lot of these skills at home while helping out in the kitchen or while discussing DIY jobs about the home.
Pupils can be made aware at home of metric and imperial weights and measures and measure their own height and weight in both.

Units of Measurement

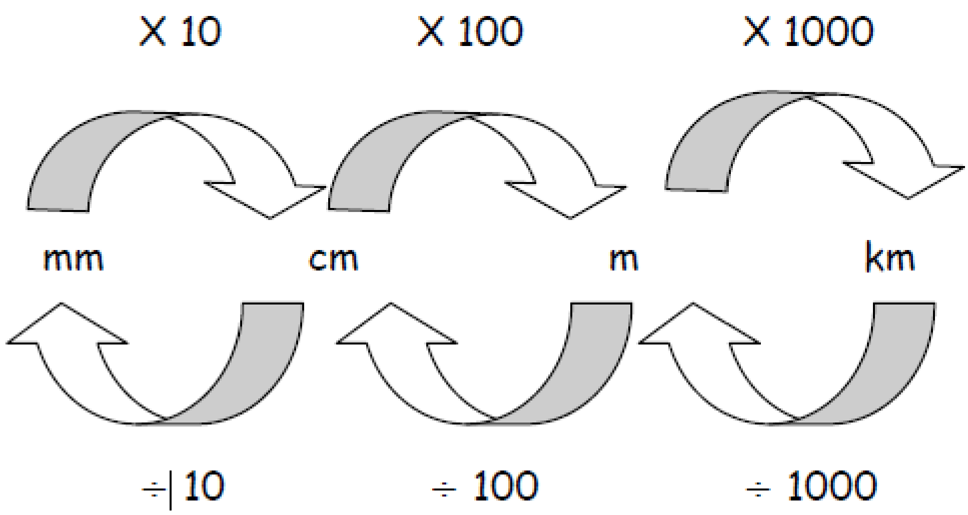
The following table should be learned by all pupils. Pupils have to be able to convert units to help solve practical problems.

Length	**Volume(Capacity)**	**Weight**
10mm = 1cm	1000ml = 1 litre	1000mg = 1g
100cm = 1m	$1cm^3$ = 1ml	1000g = 1kg
1000m = 1km	$1000cm^3$ = 1000ml = 1 litre	1000kg = 1 tonne

Converting Units

- If changing from small units to large units (for example, g to kg), we divide.
- If changing from large units to small units (for example, km to m), we multiply.

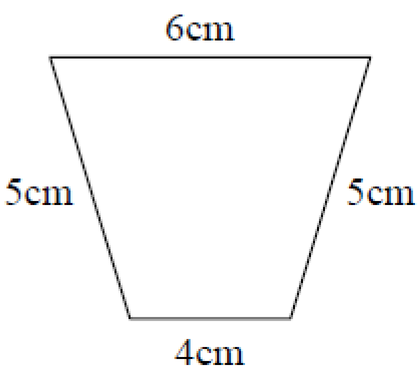
The diagram below will hopefully help you convert metric lengths.



Perimeter

The total distance around the outside edge of a shape is called the perimeter.
The units in the perimeter calculation should be the same.

Example 1 Calculate the perimeter of the shape below.



P = 6 + 5 + 4 + 5 = 20cm

Area

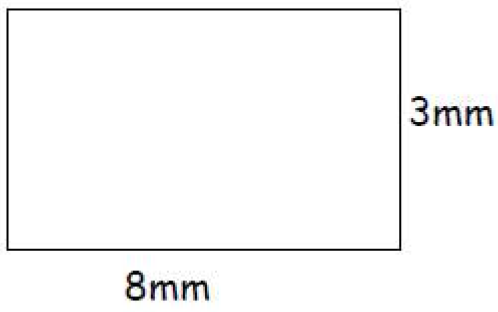
Area is defined as the surface covered by a 2D shape. Again like perimeter before we perform any calculations you have to check that all the units are consistent.

The area of a rectangle is given by $A = l \times b$ (length times breadth).

The area of a triangle is given by $A = \frac{1}{2} \times b \times h$ (half times the base times the height).

Note that base and height of a triangle must be perpendicular (at right angles to each other).

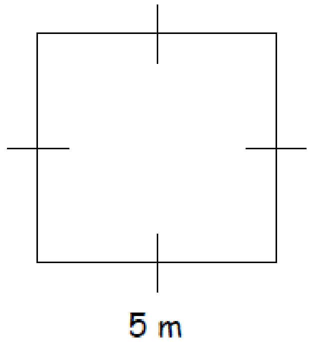
Example 1 Calculate the area of the rectangle.



$$A = l \times b$$
$$= 8 \times 3$$
$$= 24mm^2$$

The area of the rectangle is 24mm^2

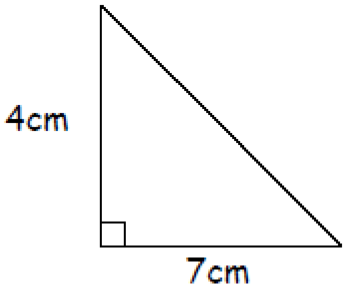
Example 2 Calculate the area of the square.



$$A = l \times b$$
$$= 5 \times 5$$
$$= 25m^2$$

The area of the square is 25m^2

Example 3 Calculate the area of the triangle.

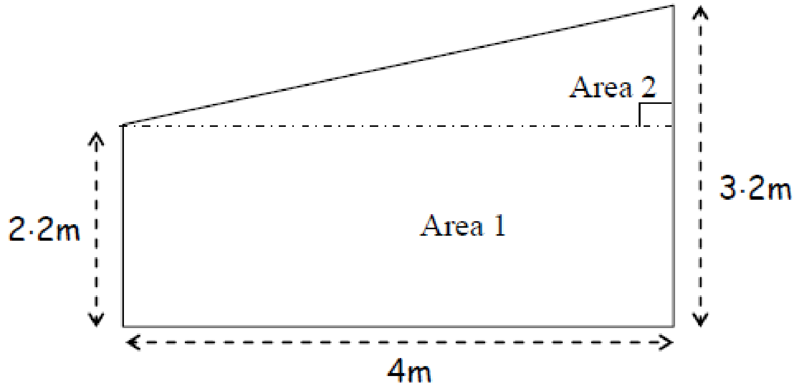


$$A = \frac{1}{2} \times b \times h$$
$$= \frac{1}{2} \times 7 \times 4$$
$$= 14cm^2$$

The area of the triangle is 14cm^2

Note: More complicated shapes can be split up into separate shapes.

Example 4 Calculate the area of the shape below.



Area 1 $= \boldsymbol{l \times b}$
$= \mathbf{4 \times 2.2}$
$= \mathbf{8.8}\boldsymbol{m}^{\mathbf{2}}$

Area 2 $= \frac{1}{2} \times \boldsymbol{b} \times \boldsymbol{h}$

$= \frac{1}{2} \times 4 \times 1$

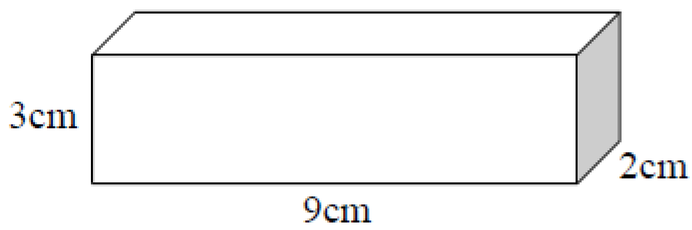
$= 2\boldsymbol{m}^2$

Total Area = 8.8 + 2
= 10.8m^2

Volume

The volume of a shape is simply the "amount of space" it takes up and is three dimensional. A small cube measuring 1cm by 1cm by 1cm has a volume of 1 cubic centimetre or 1cm^3. This space is equivalent to 1ml of liquid.
The volume of a cuboid is calculated by multiplying the length by the breadth by the height, the formula is $\boldsymbol{V = l \times b \times h}$.
All the units in the calculation should be the same through out.

Example 1 Calculate the volume of the cuboid.



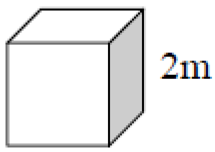
$\boldsymbol{V = l \times b \times h}$

$= \mathbf{9 \times 2 \times 3}$

$= \mathbf{54}\boldsymbol{cm}^{\mathbf{3}}$

The volume of the cuboid is 54cm^3.

Example 2 Calculate the volume of the cube.



$\boldsymbol{V = l \times b \times h}$
$= \mathbf{2 \times 2 \times 2}$
$= \mathbf{8}\boldsymbol{m}^{\mathbf{3}}$
The volume of the cube is 8cm^3.

When using area or volume formulae pupils are expected to:
- ⇨ Write down the formula
- ⇨ Substitute appropriate values
- ⇨ Calculate answers with appropriate units

Data Analysis

Third Level	Fourth Level
I can work collaboratively, making appropriate use of technology, to source information presented in a range of ways, interpret what it conveys and discuss whether I believe the information to be robust, vague or misleading. *MNU 3-20a* **Benchmarks** • ***Sources information or collects data making use of digital technology where appropriate.*** • ***Interprets data sourced or given.*** • ***Describes trends in data using appropriate language, for example, increasing trend.*** • ***Determines if information is robust, vague or misleading by considering, for example, the validity of the source, scale used, sample size, method of presentation and appropriateness of how the sample was selected.***	***I can evaluate and interpret raw and graphical data using a variety of methods, comment on relationships I observe within the data and communicate my findings to others.*** *MNU 4-20a* **Benchmarks** • ***Interprets raw and graphical data.*** • ***Uses statistical language, for example, correlations, to describe identified relationships.***

Graph Drawing

Nowadays pupils are encouraged to draw graphs using software packages, but from time to time pupils have to draw graphs by hand. The following list is a guide to help them.

We expect pupils to

- use a sharpened pencil and ruler at all times
- give the graph a title
- label the axes with numbers and units
- label the frequency (up the side ie vertical axis) on the lines not on the spaces
- in bar graphs, label the bars in the centre of the bar (each bar has an equal width) and make sure to leave an even space between each bar
- if it is a line graph to plot the points neatly (using a cross or a dot)
- if asked to draw a line of best fit then the line should have the same number of points above the line as below it
- remember to show a key when drawing a pictograph or Stem and Leaf diagram
- if necessary, make use of a jagged line to show that the lower part of the graph has been missed out
- when drawing a pie chart label all the sections or include a key

Averages

There are three types of average: mean, median and mode.

Mean = $\frac{sum\ of\ all\ the\ values}{number\ of\ values}$

Median: the middle number in a set of ordered data.

Mode: the number which occurs the most often.

It is important to make an appropriate choice of mean, median or mode.

- The **mean** is useful when a "typical" value is wanted. Be careful not to use the mean if there are extreme values.
- The **median** is a useful average to use if there are extreme values.
- The **mode** is useful when the most common value is needed.

The range is used to help us decide how spread out the data is. The range is calculated as follows.

Range = Highest Number - Lowest Number

When the range is small that means that your data is close together or consistent.
If the range is large then your data is spread out and more varied.

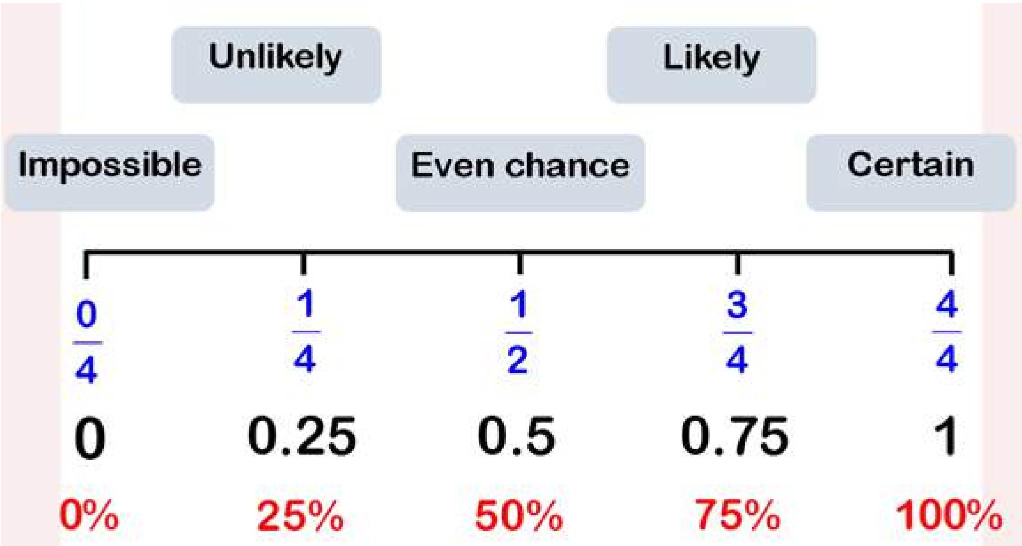
Ideas of Chance and Uncertainty

Third Level	Fourth Level
I can find the probability of a simple event happening and explain why the consequences of the event, as well as its probability, should be considered when making choices. *MNU 3-22a* **Benchmarks** • ***Uses the probability scale of 0 to 1 showing probability as a fraction or decimal fraction.*** • ***Demonstrates understanding of the relationship between the frequency of an event happening and the probability of it happening.*** • ***Uses a given probability to calculate an expected outcome, for example, 'the probability of rain in June is 0·25 so how many days do we expect it to rain?'.*** • ***Calculates the probability of a simple event happening, for example, 'what is the probability of throwing a prime number on a 12 sided die?'.*** • ***Identifies all of the mutually exclusive outcomes of a single event and calculates the probability of each.*** • ***Investigates real-life situations which involve making decisions on the likelihood of events occurring and the consequences involved.***	***By applying my understanding of probability, I can determine how many times I expect an event to occur, and use this information to make predictions, risk assessment, informed choices and decisions.*** *MNU 4-22a* **Benchmarks** • ***Calculates the probability and determines the expected occurrence of an event.*** • ***Applies knowledge and skills in calculating probability to make predictions.***

Probability

Probability is a measure of how likely an event is to happen.
It is measured between 0 and 1 and can be shown as a fraction or a decimal.

Probability Scale



To find the probability of an event, we use:

Probability (event) = $\frac{number\ of\ favourable\ outcomes}{total\ number\ of\ possible\ outcomes}$

Example 1 What is the probability of picking a black counter from a bag containing 5 red, 3 blue and 2 black counters?

Number of favourable outcomes = 2 (number of black counters)
Number of possible outcomes = 5 + 3 + 2 = 10 (total number of counters)

P(black) = $\frac{2}{10} = \frac{1}{5}$ Always give your fraction in its simplest form.

Example 2 If a die (singular of dice) is thrown 300 times, approximately how many fives are likely to be obtained?

$P(5) = \frac{1}{6}$

We multiply 300 by $\frac{1}{6}$ since 5 is expected $\frac{1}{6}$ of the time.

$\frac{1}{6} \times 300 = 50$ fives

Approximately 50 fives are likely to be obtained.

Dice Games to Help Your Child with Numeracy

Multiply Fly **Requires**: 2 dice

Roll 2 dice and add together. Now roll 1 of the dice and multiply your total by this. Continue to roll 1 dice and continue to multiply your total until you reach a 4 digit answer.(i.e. 1000 or more). Can be played alone to practise multiplication skills or in pairs/groups and begin with 3 lives – lose a life each time an error is made, the others need to be checking. The player left with lives is the winner.

Killer Dice **Requires**: 2 dice and pen/paper

All players begin with 5 lives. The first player rolls 3 dice and multiplies them together. The next player does the same and if they don't beat the previous score they lose a life.
The player left is the winner.

Divide & Conquer **Requires**: several dice and pen/paper

One person rolls 6 dice, add them all together, this number will be your numerator. Now roll 1 dice, this number is your denominator. Write the fraction obtained and change this to a whole number or mixed number. You could also convert the fraction obtained to a decimal fraction or percentage to practise these essential skills.

Double Dice **Requires**: 4 dice and pen/paper

Each person rolls 2 dice. Add Player A's dice together, add Player B's dice together and multiply the two totals.
First to shout the correct answer, gets a point. First to gain 12 points is the winner.

Darts Dice **Requires**: 3 dice and pen/paper

Each player begins with 301. Players take turns to roll 3 dice and multiply the 3 numbers together. As with darts, subtract the total from 301 and the player first to zero or less is the winner. If a mistake is made then that shot doesn't count.
Play until someone wins 3 games.

Card Games to Help Your Child with Numeracy

Pick Up Pairs – a game of memory
Place all cards on a desk face down. Take turns to randomly turn over 2 cards, If the numbers match, the player wins the two cards and takes another turn. If the cards don't match, they're flipped face down and play moves to the next player. The winner is the person with the most cards when all cards have been paired up.

Add 5 cards or more – addition strategies
Deal 5 cards face up. All players add up the total value of the cards. Check each other's totals and discuss the strategies used to add – "think, pair, share".
Variations – use more cards to increase the challenge or use less cards and multiplication instead of addition.

THINK, PAIR, SHARE
Work through the problem on your own, then, explain your thinking to your partner
Don't forget to: Listen to each other & ask questions