Lanark Grammar School

Numeracy Across The Curriculum

A Guide for Parents/Carers and Staff explaining how topics involving numbers are taught within Lanark Grammar School

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 Lanark Grammar School) deliver a consistent approach to "our" pupils. Pupils often have difficulties with transferable skills and if we can deliver consistent approaches of 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 Lanark Grammar School.

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.

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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 Process

Third Level	Fourth Level
I can use a variety of methods to solve number problems in familiar contexts, clearly communicating my process and solutions. ie + - x ÷ I can continue to recall number facts (eg multiplication tables) quickly and use my understanding of numbers less than zero (eg negative numbers) to solve simple problems in context. *MNU 3-03a*	Having recognised similarities between new problems I have solved before, I can carry out the necessary calculations to solve problems set in unfamiliar contexts. *MNU 4-03a*

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 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.

Primary School learning about place value is often forgotten and can be reinforced at home.

Remember

Millions M	Hundreds of Thousands HTh	Tens of Thousands TTh	Thousands Th	Hundreds H	Tens T	Units U	Decimal Point	tenths t	hundredths h
				3	5	6	·	7	8

From the table above the:
3 stands for 3 Hundreds or 300
5 stands for 5 Tens or 50
6 stands for 6 Units or 6
7 stands for 7 tenths or 0·7 or $\frac{7}{10}$
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 12·5 + 6·12

$$\begin{array}{r} 1\ \ 2\cdot5 \\ +\ 6\cdot1\ \ 2 \\ \hline 7\ \ 3\cdot7 \end{array} \ \times \qquad \begin{array}{r} 12\cdot50 \\ +\ 06\cdot12 \\ \hline 18\cdot62 \end{array} \ \checkmark$$

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 question correctly.

Example 2 How much does it cost altogether for a book costing £6·68 and a maths set at £12·43?

$$\begin{array}{r} +\ \ 6\cdot68 \\ 12\cdot43 \\ \hline 19\cdot11 \\ {\scriptstyle 1\ \ \ \ 1\ \ } \end{array}$$

For example we can put the carry on figure underneath the line.

It would cost <u>£19·11</u> altogether.

Note: Communicate your answer using words.

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?

$$\begin{array}{rcccc} & 1 & \overset{5}{\not{6}} & \cdot & {}^{1}7 \; 9 \\ - & 1 & 3 & \cdot & 8 \; 5 \\ \hline & 0 & 2 & \cdot & 9 \; 4 \\ \hline \end{array}$$

Note: Communicate your final answer using appropriate units.

The difference in price is <u>£2·94</u>.

We also expect pupils to carry out subtraction mentally.

- Counting on:

  eg to solve 41 – 27, count on from 27 until you reach 41

- Breaking up the number being subtracted:

  eg to solve 41 – 27, subtract 20 then subtract 7

At Lanark Grammar School when pupils are multiplying or dividing by 10, 100 or 1000 we instruct them to move the decimal point. A method used is **MR DL** which means if you **M**ultiply a number you make it larger by moving the decimal point to the **R**ight and when you **D**ivide you move it to the **L**eft.

The examples below will illustrate this.

Multiplication

We all must encourage 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?

$$
\begin{array}{r}
26\cdot7 \\
\times\ \ 8 \\
\hline
2{}_{5}1{}_{5}3\cdot6 \\
\hline
\end{array}
$$

Note: Communicate your final answer using appropriate units.

8 packets of crisps weigh <u>213·6</u> grams.

Example 2 David changed £600 to Euros before going on holiday to France. If the exchange rate was £1 = 1·35 Euros, how many Euros would David receive?

$$
\begin{aligned}
&600\times1\cdot35 \\
&=6\times100\times1\cdot35 \\
&=6\times135 \\
&=810
\end{aligned}
\qquad
\begin{array}{r}
135 \\
\times\ 6 \\
\hline
8{}_{2}1{}_{3}0 \\
\hline
\end{array}
$$

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

David would receive 810 Euros.

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 tables.

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

$$
\begin{array}{r}
0\,6\cdot4\,2 \\
7\,\overline{)\,4\,{}^{4}4\cdot{}^{2}9\,{}^{1}4}
\end{array}
$$

Note: Communicate your final answer using appropriate units.

Tony earns <u>£6·42</u> each hour.

Example 2 Robert received £167·20 from 40 sales. What was the average amount from each sale?

$$167 \cdot 20 \div 40$$
$$= 167 \cdot 20 \div 10 \div 4$$
$$= 16 \cdot 72 \div 4$$
$$= 4 \cdot 18$$

$$\begin{array}{r} 0\,4 \cdot 1\,8 \\ 4\,\overline{)\,1\,{}^{1}6 \cdot {}^{3}7\,2} \end{array}$$

The average amount for each sale was <u>£4·18</u>.

Note: Communicate your final answer using appropriate units.

Pupils sometimes have difficulty in reading a question and interpreting what to do. The tables below will help your son/daughter understand the vocabulary that can be used and what operation to carry out.

Addition	**Subtraction**
+	-
add	subtract
the sum of	take away
the total of	the difference between
altogether	how many more
	how many less
	how much left

Multiplication	**Division**
×	÷
multiply	divide
times	share
product	how many per
	how much each

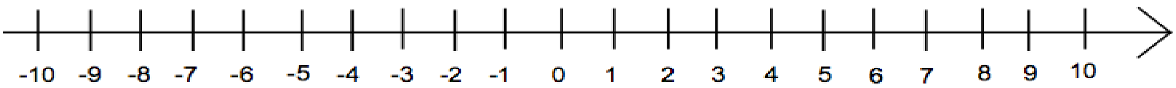
Negative Numbers

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:

  - One morning in Carluke the temperature was -1°C. In Aberdeen it was 5°C colder. What was the temperature in Aberdeen?

Since it was colder, the temperature in Aberdeen was 5°C <u>less</u> than -1°C so the calculation is: (-1) - 5 = <u>- 6°C</u>

  - 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 <u>added</u> so the calculation is: (-400) + 1100 = <u>£700</u>

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*	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*

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 ie

$18 \times 19 \approx 20 \times 20 = 400\text{p} = £4.00$

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 ie

$48 \times 32{\cdot}5 \approx 50 \times 30 = 1500\text{ g} = 1{\cdot}5\text{ kg}$

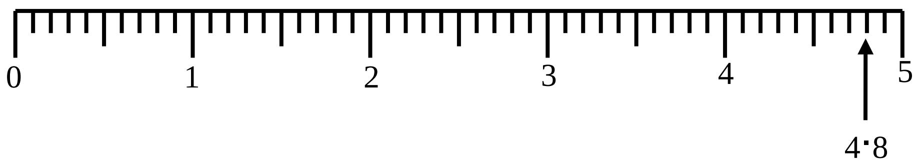
Pupils can practise estimating sensibly and getting the feel of large and small weights, heights and distances and using money in a practical way.

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

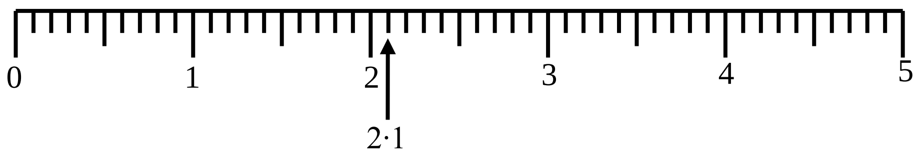


It is nearer 5 cm.

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 2 cm
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 (eg round up) 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 off an amount like £3·968 you look at the pence

£3·968 Any number after the pence means 'a bit more'.

Since the 8 is bigger than 5 we round up to 97 pence

This is the pence

£3·968 = £3·97 (to the nearest penny)

Example 2 Round £2·593 to the nearest penny.

£2·593164

Any number after the pence means 'a bit more'

This is the pence

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

£2·593 = £2·59 (to the nearest penny)

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

£7·402 Any number after the pence means 'a bit more'.

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

This is the 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. John won £3,467,809 in the lottery. It would be much more useful and practical to say John 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, decimal fractions and percentages, using my answers to make comparisons and informed choices for real life situations. *MNU 3-07a* I can show quantities that are related can be increased or decreased proportionally and apply this to solve problems in everyday contexts. *MNU 3-08a*	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 quantity caused by a change in a related quantity and solve real-life problems. *MNU 4-08a*

Fractions

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

Example 1 $\frac{1}{3}$ of 12 = 4 (12 ÷ 3)

Example 2 $\frac{1}{5}$ of 70 = 14 (70 ÷ 5)

Example 3 $\frac{3}{7}$ of 21 = 9 (21 ÷ 7 × 3)

Example 4 $\frac{3}{4}$ of176 = 132 (176 ÷ 4 × 3)

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 a) $\frac{15}{20} = \frac{3}{4}$ (÷ 5 top and bottom)

Top and bottom can be divided by 5 here.

5 is known as 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) $\frac{2}{3} = \frac{4}{6}$ (top $\times 2$, bottom $\times 2$)

b) $\frac{2}{3} = \frac{6}{9}$ (top $\times 3$, bottom $\times 3$)

Percentages

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

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

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

$12\cdot5\% = \frac{12\cdot5}{100} = \frac{1}{8}$

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

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

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

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

20%, 30%, 40%, 60% etc can be calculated by finding 10% and then multiplying.
Eg 30% = 10% X 3,
70% = 10% X 7

2%, 3%, 4%, 6% etc can be calculated by finding 1% and then multiplying.
Eg 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)

$66\frac{2}{3}\%\ of\ £36$

$= \frac{2}{3} of\ 36$

$= £24\ (36 \div 3 \times 2)$

b)

$30\%\ of\ 500cm$

$10\%\ of\ 500$

$= \frac{1}{10} of\ 500$

$= 50$

$30\%\ of\ 500$

$= 50 \times 3$

$= 150cm$

c)

$9\%\ of\ 720ml$

$1\%\ of\ 720ml$

$= \frac{1}{100} of\ 720$

$= 7.2$

$9\%\ of\ 720$

$= 7.2 \times 9$

$= 64.8ml$

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

a) 14% of £360
= (14 ÷ 100) × 360
= 50·4
=£50·40

b) 68·5% of £500
= (68·5 ÷ 100) × 500
= 342·5
=£342·50

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

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

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

$$\frac{24}{30}$$

$$\text{Percentage} = (24 \div 30) \times 100$$
$$= 80\%$$

Sandra scored 80% in her Maths test

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 is reduced to £85. Calculate the percentage decrease.

Decrease = £125 - £85 = £40

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

Percentage Decrease = $\frac{40}{125} \times 100 = 32\%$

Example 5 Matthew bought a flat for £55000.
Three years later he sold it for £60000
What was his percentage profit? (ie percentage increase)
Give your answer correct to two decimal places.

Increase = £60000 - £55000 = £5000

Fraction of original price = $\frac{5000}{55000}$

Percentage Profit = $\frac{5000}{55000} \times 100$
$= 9.09090909....$
$= 9 \cdot 09\%$

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)	= £288	(12 ÷ 100 X 2400)
New Price (£2400 + £288)	**= £2688**	

Example 7 The original price of a new tool kit costing £1860. John receives a trade discount of 40%. How much does John have to pay for his new tool kit?

Old Price	= £1860	
Decrease (40% of £1860)	= £744	(40 ÷ 100 X 1860)
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 instructed 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 Bob and Andy.
How much does each receive?

3 + 7 = 10 parts

10 parts = £40000
1 part = £40000 ÷ 10 = £4000

So Bob gets 3 X £4000 = £12000 and
Andy gets 7 X £4000 = £28000.

It is good practice 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*	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*

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 Isobel gets paid £19760 per annum. What is her weekly wage?

£19760 ÷ 52 = **£380**

Isobel earns £380 each week.

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

a) Calculate his hourly rate of pay?

Hourly rate = £249 ÷ 30 = **£8·30**

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

This week he 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.

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

Net Pay = Gross Pay – Deductions

Example 1 Blair 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 Stuart 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

Stuart is paid £203 in overtime.

Example 2 Janet works in a petrol station, her basic rate is £6 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 £6 = £204

Overtime = 5 X (1·5 X £6) = £45

Total pay = £204 + £45 = £249

The total pay for Janet that week was £249.

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 Sally sells kitchens. She works 40 hours each week earning £7·50 per hour. She also earns 4·5% commission on each kitchen she sells.
In one week Sally 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 £7·50
= £390

Total Pay = £135 + £390
= £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 Henry 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. This is useful as people can buy an item and pay it off over 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 May 2010 the exchange rate was: £1 ⟶ €1·15

Example 1 Robert 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 1·15 = €690

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

Pounds = 85 ÷ 1·15 = £73·9130... = £73·91

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*	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*

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 ⟶ 0800 ⟶ 0900 ⟶ 0948

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

Total time = 1 hr 53 minutes

Changing Units

To change decimals/fractions of 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, $\frac{1}{4}$ hour = 0·25 hour = 15 minutes,

$\frac{3}{4}$ hour = 0·75 hour = 45 minutes, $\frac{1}{3}$ hour = $0{\cdot}\dot{3}$ hour = 20 minutes, *

$\frac{2}{3}$ hour = $0{\cdot}\dot{6}$ hour = 40 minutes, $\frac{1}{5}$ hour = 0·2 hour = 12 minutes

* (Note: $0{\cdot}\dot{3}$ means 0·33333333…… 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 1 Change 2.6 hour into minutes.
0·6 hour = 0·6 X 60 min = 36 minutes.

Total time is 2 hours and 36 minutes.

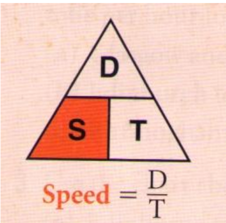
Time is a life skill which everyone uses every day of their life. Parent/carers can encourage their children to use time calculations in the home or planning journeys through looking at timetables.

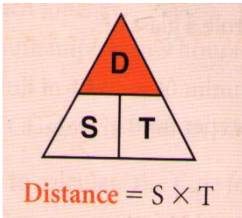
Speed Distance and Time

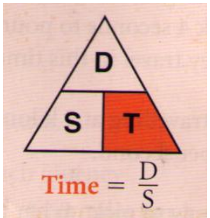
The following three formulae are used to calculate Speed, Distance and Time.

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

These formulae can be easily remembered by putting the letters D, S and T in alphabetical order into a triangle as follows. To help you work out the formula, place your finger over the quantity you want to find and the position of the remaining letters leaves you the formula you require.







Example 1 Alison jogs at an average speed of 6km/h for 3 hours.
What distance does she jog?

$S = 6km/hr$

$T = 3hours$

$D = ?$

$D = S \times T$

$D = 6 \times 3$

$D = 18km$

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?

$D = 25km$

$S = 10km/hr$

$T = ?$

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

$T = \frac{25}{10}$

$T = 2{\cdot}5 \text{ hours} = 2 \text{ hours } 30 \text{ minutes}$

Example 3 George can walk to the office in 30 minutes. The distance from his house to his work is 2·5 miles. Work out George's average speed in miles per hour.

$T = 30 \text{ mins} = 0{\cdot}5hr$

$D = 2{\cdot}5 \ miles$

$S = ?$

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

$S = \frac{2{\cdot}5}{0{\cdot}5}$

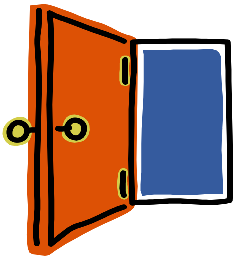
$S = 5mph$

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 formula to calculate area or volume when required. *MNU 3-11a*	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*

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 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

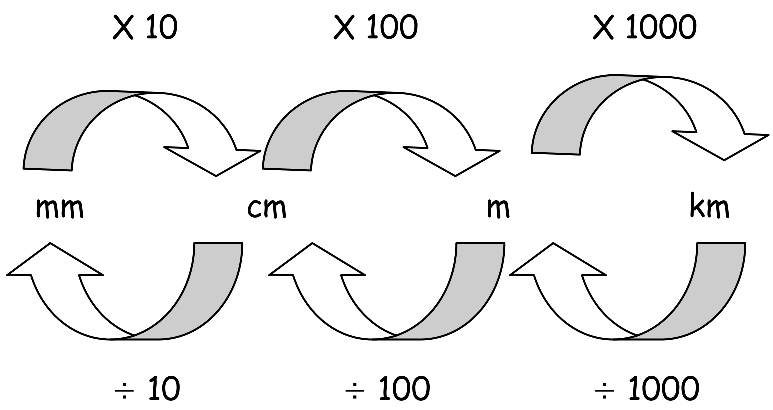
The following table should be learned by all pupils. Pupils have to be able to convert units to help solve practical problems.

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

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.

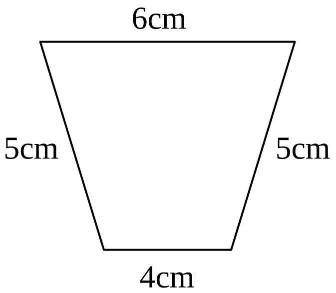


Perimeter

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

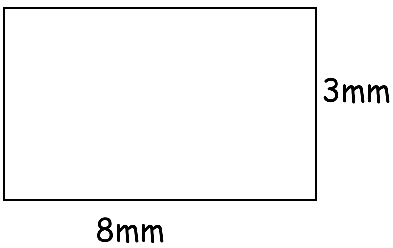
Area is defined as the surface covered by a 2D shape. Again like perimeter before we perform any calculations you have to check that all the units are consistent with perimeter.

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

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

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

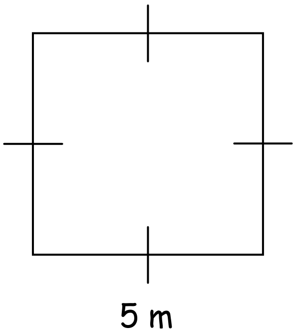
Example 1 Calculate the area of the rectangle.



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

The area of the rectangle is $24mm^2$

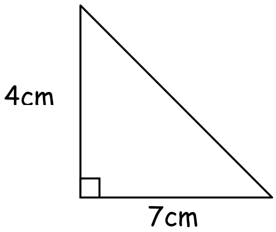
Example 2 Calculate the area of the square.



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

<u>The area of the square is 25m^2</u>

Example 3 Calculate the area of the triangle.



$$A = \frac{1}{2} \times b \times h$$

$$A = \frac{1}{2} \times 7 \times 4$$

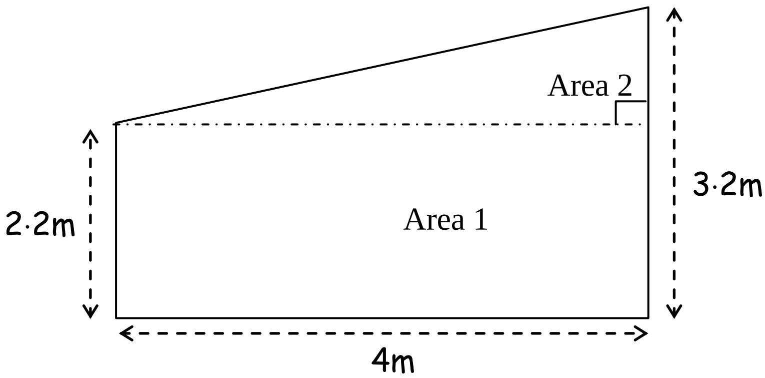
$$A = \frac{1}{2} \times 28$$

$$A = 14cm^2$$

<u>The area of the triangle is 14cm^2</u>

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

Example 4 Calculate the area of the shape below.



Area 1 = l x b
A = 4 x 2·2
A = 8·8

Area 2 = ½ x b x h   h = 3·2 – 2·2
A = ½ x 4 x 1   h = 1
A = 2

Total area = 8·8 + 2
= 10·8m^2

Volume

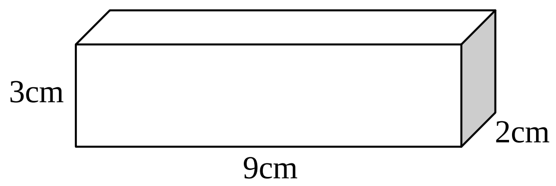
The volume of a shape is simply the "amount of space" it takes up and is three dimensional.

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 calculate by multiplying the length by the breadth by the height, the formula is V = l x b x h.

All the units in the calculation should be the same through out.

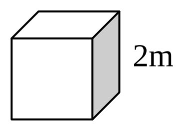
Example 1 Calculate the volume of the cuboid.



V = l x b x h
V = 9 x 2 x 3
V = $54cm^3$

The volume of the cuboid is $54cm^3$

Example 2 Calculate the volume of the cube with side 2 metres.



V = l x l x l
V = 2 x 2 x 2
V = $8m^3$

The volume of the cube is $8m^2$

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*	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*

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

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

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

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.

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*	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*

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.

0	½	1
Impossible	50/50 Chance	Certain

To find the probability of an event, we use:

Probability (event) = $\dfrac{\text{number of favourable outcomes}}{\text{total number of possible outcomes:}}$

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 leave 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.

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

<u>Approximately 50 fives will be obtained.</u>