MIHSG

MANCHESTER ISLAMIC HIGH SCHOOL FOR GIRLS

"Inspiring 21st Century British Muslims"

Numeracy Across the Curriculum Policy Updated July 2018 MV

The numeracy coordinator is Mrs M Vorajee. Appointed July 2017.
1st Draft policy July 2017
2nd Revised Draft Policy July 2018
Checked and agreed by: Head Teacher and SLT members on: 10th July 2018
To be reviewed: July 2019
The aim is to have the policy up and running within 2 years by Sept 2019

Contents

Numeracy Across the Curriculum

"We have a numeracy problem in this country – we are a nation quite happy to admit to 'being bad at maths'; we see people almost wearing it as a badge of honour in a way they would never admit to saying they couldn't read or write."

Mary Marsh CBE (Numeracy Counts NAICE Feb 2011)

'A teacher must make a positive contribution to the wider life and ethos of the school'

Teachers' Standards – DfE (September 2012)

'Inspecting the teaching of literacy, including reading, and mathematics 38. Inspectors will consider the impact of teaching and outcomes across the range of the school's provision and will use the evidence they gather to inform the overall evaluation of learners' achievement, the quality of teaching, and the impact of leadership and management on raising standards. When making the key judgements, inspectors will give particular attention to the teaching of literacy, including reading, and mathematics.'

'Outstanding: Learners develop and apply a wide range of skills to great effect, in reading, writing, communication and mathematics. They are exceptionally well prepared for the next stage in their education, training or employment.'

School Inspection Handbook Dec 2012

RATIONALE:

Everyone needs to be numerate to maximise their life chances and to make a positive contribution to society. The UK needs a numerate population in order to build a strong economy and to compete globally. All teachers have a crucial role to play in supporting learners' numeracy development and in providing opportunities to engage with numeracy which will allow learners to succeed; not only through school and college but throughout their lives.

AIMS:

1. To develop awareness that a good level of numeracy is essential to maximising life chances and contribute to society.
2. To support learners' achievement in all subjects by empowering teachers to develop and enrich learners' numeracy skills
3. To enable all learners to reach and exceed their potential in numeracy
4. To raise learners' own expectations of achievement, thus raising and creating independent life-long learners
5. To recognise that, all teachers have a responsibility to develop learners for the next stage in their education, employment of training and hence all teachers are teachers of numeracy.

OBJECTIVES:

The aims of this policy will be met by:

- Ensuring that numeracy skills will be taught systematically, explicitly and consistently with generic skills mapped into departmental **schemes of work**.
- Recognising that all curriculum areas and all teachers have a crucial role to play in supporting learners' numeracy development
- Offering learners regular opportunities to consolidate their numeracy skills by using them purposefully in order to learn, in all areas of the curriculum.
- Ensuring that all subject areas **include numeracy objectives in their planning** where relevant and in their **schemes of work.**
- Promoting knowledge and understanding of learners' standards of achievement in numeracy
- Monitoring and evaluating the teaching of numeracy in all curriculum. (E.g During Head of department meetings, S.O.W, numeracy related question in exams/tests)
- Accurate and timely identification of learners for whom numeracy is a barrier to their learning with effective interventions being implemented and their impact closely monitored. (All staff member who has a concern informs numeracy coordinator)

Numeracy

The development of the concept of "numeracy":

Numeracy is defined as a word to represent the mirror image of literacy.

(Crowther report1959)

A numerate student is one who has the ability to cope confidently with the mathematical needs of adult life. There was an emphasis on the wider aspects of numeracy and not purely the skills of computation.

(Cockcroft report 1982)

A current definition of numeracy:

Numeracy is a proficiency which is developed mainly in mathematics but also in other subjects. It is more than an ability to do basic arithmetic. It involves developing confidence and competence with numbers and measures. It requires understanding of the number system, a repertoire of mathematical techniques, and an inclination and ability to solve quantitative or spatial problems in a range of contexts. Numeracy also demands understanding of the ways in which data are gathered by counting and measuring, and presented in graphs, diagrams, charts and tables.

(Framework for Teaching Mathematics – yrs 7 to 9 – DfES)

What does it mean to be numerate?

'Competent, confident and comfortable with one's judgements on whether to use mathematics in a particular situation and if so what mathematics to use, how to do it, what degree of accuracy is appropriate, what the answer means in relation to the content, whether/how to communicate the answer appropriately, and what (if any action) action to take in light of the analysis'

(Numeracy Counts : NIACE Committee of Inquiry on Adult Numeracy Learning 2011)

EXPECTATIONS:

OFSTED's expectations of numeracy:

When reporting on standards in mathematics, check attention to numeracy and learners' competence in using their knowledge, skills and understanding of number not only in mathematics but also in other subjects.

Teachers and Learning Co-ordinators should ensure that they:

- Make use of available data on learners' maths levels and CAT quantitative scores in order to make informed choices and to plan appropriate support for learners
- Ensure that they are familiar with correct mathematical language, notation, conventions and techniques, relating to their own subject, and encourage students to use these correctly.
- Be aware of appropriate expectations of students and difficulties that might be experienced with numeracy skills.
- Provide information for mathematics teachers on the stage at which specific numeracy skills will be required for particular groups.
- Provide resources for mathematics teachers to enable them to use examples of applications of numeracy relating to other subjects in mathematics lessons.
- Make links to numeracy and make learners aware of the numeracy content of lessons, wherever possible
- Adopt the school policy on use of calculators in lessons
- Provide planned opportunities across the curriculum for learners to:
    - Have a sense of the size of a number and where it fits into the number system.
    - Read numbers correctly form a range of meters, dials and scales
    - Know basic number facts and recall them quickly and confidently
    - Use what is known to work answers mentally
    - Use calculators and other ICT resources appropriately and effectively to solve mathematical problems.
    - Make sense of number problems, recognise the operation(s) needed and are available to work confidently with numbers
    - Know when answers are reasonable and give results to an appropriate degree of accuracy
    - Develop skills in managing personal finance, budgets and shopping
    - Are able to manipulate algebraic expressions and simple formulae
    - Understand and use correct mathematical notation and terminology

- Are able to explain methods, reasoning and conclusions
- Use units of measurement of length, angle, mass, capacity and time; can suggest suitable units for measuring, make sensible estimates of measurements and measure accurately using a range of instruments.
- Understand and use compound measures and rates.
- Use simple formulae and substitute numbers in them.
- Measure and estimate measurements, choosing suitable units and calculate simple perimeters, areas and volumes.
- Draw plane figures to given specifications and appreciate the concept of scale in geometrical drawings and maps.
- Understand the difference between the mean, median and mode and the purpose for which each is used.
- Collect data, discrete and continuous and draw, interpret and predict from graphs, diagrams, charts and tables.
- Understand probability and risk.

In addition, the Mathematics Department should ensure that it:

- Use effective assessment strategies and prior attainment data to identify learners ability levels and areas for development in mathematics
- Enables all learners to develop conceptual understanding of the mathematics they learn, its structures and relationships, and fluent recall of mathematical knowledge and skills to equip them to solve familiar problems as well as tackling creatively the more complex and unfamiliar ones that lie ahead.
- Liaises with the SEND officer to ensure that effective intervention strategies are put in place to remedy weak Numeracy skills
- Liaises with the SEND to monitor the impact of intervention strategies
- Plans and delivers lessons in which learners: understand important concepts and are able to make connections within mathematics; develop a broad range of skills in using and applying mathematics; show exceptional independence and take the initiative in solving problems in a wide range of contexts, including the new or unusual; think for themselves, and are prepared to persevere when faced with challenges, showing a confidence that they will succeed; embrace the value of learning from mistakes and false starts; when investigating mathematically, reason, generalise and make sense of solutions; show high levels of fluency in performing written and mental calculations and mathematical techniques; use mathematical language and symbols accurately in their work and in discussing their ideas with others; develop a sense of passion and commitment to the subject.
- Teaching is rooted in the development of all students' conceptual understanding of important concepts and progression within the lesson and over time. It enables students to make connections between topics and see the 'big picture'. Teaching nurtures mathematical independence, allows time for thinking and encourages discussion. Problem solving, discussion and investigation are seen as integral to learning mathematics. Constant assessment of each student's understanding through questioning, listening and observing enables fine tuning of teaching. Barriers to learning and potential misconceptions are anticipated and overcome, with errors providing fruitful points for discussion. Teachers communicate high expectations, enthusiasm and passion about their subject to students. They have a high level of confidence and expertise both in terms of their specialist knowledge and their understanding of effective

learning in the subject. As a result, they use a very wide range of teaching strategies to stimulate all students' active participation in their learning together with innovative and imaginative resources, including practical activities and, where appropriate, the outdoor environment.

- Exploit links between mathematics and other subjects and with mathematics beyond the classroom.
- Marking distinguishes well between simple errors and misunderstanding and tailors insightful feedback accordingly.
- The imaginative and stimulating mathematics curriculum is skilfully designed to match to the full range of students' needs and interests and to ensure highly effective continuity and progression in their learning and in the qualification pathways they follow, including into further study. Problem solving and investigative approaches are central to learning for all students. Clear guidance for teachers on activities and approaches that promote conceptual understanding, including the use of ICT, ensures all students benefit and experience breadth and depth in learning across the mathematics curriculum. Intervention and support are focused and finely tuned to students' individual needs so that they make rapid progress. Excellent links are forged with other agencies and the wider community to provide a wide range of enhancement and enrichment activities to promote students' learning and engagement with the subject. For example on going school activities which involve numeracy. Tuck shop, charity week, sports days.
- Provides advice, guidance and resources where possible, to other faculties and teaching staff, so that a correct and consistent approach is used in all subjects.

The SLT / lead role for Numeracy Mrs Pennington should ensure that s/he:

- Facilitates accurate and timely identification of Year 7 and other learners new to the school, who have weak numeracy skills and ensure that effective intervention strategies are put in place and their impact monitored
- Monitors the implementation of the Numeracy Policy across the curriculum and ensures that all staff consistently implement the policy and the Numeracy Action Plan. Monitors progress rates of identified learners with weak numeracy skills and reviews intervention programmes on a regular basis
- Liaises with parents to elicit their support in accelerating their daughter's numeracy skills
- Actively promotes and evaluates numeracy across the curriculum
- Provides CPD to staff to ensure correct and consistent use of approaches in all subjects
- Ensure quality of achievement, teaching and learning is outstanding in mathematics

Learners are expected to ensure that:

- They take responsibility for developing their numeracy skills
- They ensure they are equipped with a use of calculator, ruler and mathematical instruments

Role and use of calculators

The school expects all learners to bring their own scientific calculator to all lessons.
In deciding when learners use a calculator in lessons we should ensure that:

- Learners first resort should be mental methods;
- learners have sufficient understanding of the calculation to decide the most appropriate method: mental, pencil and paper or calculator;
- learners have the technical skills required to use the basic facilities of a calculator constructively and efficiently, the order in which to use keys, how to enter numbers as money, measures, fractions, etc.;
- learners understand the four arithmetical operations and recognise which to use to solve a particular problem;
- when using a calculator, learners are aware of the processes required and are able to say whether their answer is reasonable;
- learners can interpret the calculator display in context (e.g. 5.3 is £5.30 in money calculations);
- we help learners, where necessary, to use the correct order of operations – especially in multi-step calculations, such as (3.2 - 1.65) x (15.6 - 5.77).

APPENDICES

Guidance on number

Reading and writing numbers

Learners must be encouraged to write numbers simply and clearly. The symbol for zero with a line through it, ones which could be mistaken for 7 (1) and continental sevens (7̶) should be discouraged.
Most learners are able to read, write and say numbers up to a thousand, but often have difficulty with larger numbers. It is now common practice to use spaces rather than commas between each group of three figures. eg. 34 000 not 34,000 though the latter will still be found in many text books and cannot be considered incorrect.

In reading large figures learners should know that the final three figures are read as they are written as hundreds, tens and units.
Reading from the left, the next three figures are thousands and the next group of three are millions.

eg. 3 027 251 is three million, twenty seven thousand and fifty one.

Order of Operations

It is important that learners follow the correct order of operations for arithmetic calculations. Most will be familiar with the mnemonic: BODMAS.

Brackets, power Of, Division, Multiplication, Addition, Subtraction

This shows the order in which calculations should be completed. eg
5 + 3 x 4 means 5 + 12 = 17

The important facts to remember are that the Brackets are done first, then the Powers, Multiplication and Division and finally, Addition and Subtraction.

eg(i) (5 + 3) x 4
= 8 x 4 = 32

eg (ii) 5 + 36 ÷ 3 – 4
= 5 + 12 – 4
= 17 – 4= 13

Care must be taken with Subtraction.

eg	5 + 12 – 4		or	5 + 12 – 4
	= 17 – 4			= 5 + 8
	= 13	✓		= 13 x

eg	5 –12 + 4		but[1] 5 –12 + 4	
	= -7 + 4		= 5 – 16	
	= -3	✓	= -11	x

[1]For this to be correct it would have to be written: 5 – (12 + 4) so that the bracket is worked out first.

Calculators

Some learners are over-dependent on the use of calculators for simple calculations. Wherever possible learners should be encouraged to use mental or pencil and paper methods. It is, however, necessary to give consideration to the ability of the student and the objectives of the task in hand. In order to complete a task successfully it may be necessary for learners to use a calculator for what you perceive to be a relatively simple calculation. This should be allowed if progress within the subject area is to be made. Before completing the calculation learners should be encouraged to make an estimate of the answer. Having completed the calculation on the calculator they should consider whether the answer is reasonable in the context of the question.

Mental Calculations

Most learners should be able to carry out the following processes mentally though the speed with which they do it will vary considerably.

- recall addition and subtraction facts up to 20
- recall multiplication and division facts for tables up to 12 x 12.

Pencil & Paper Calculations

All learners should be able to use some pencil and paper methods involving simple addition, subtraction, multiplication and division. Some less able learners will find difficulty in recalling multiplication facts to complete successfully such calculations. In these circumstances it may be more useful to use a calculator in your subject to complete the task.

Before completing any calculation, learners should be encouraged to estimate a rough value for what they expect the answer to be. This should be done by rounding the numbers and mentally calculating the approximate answer.

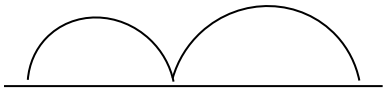
After completing the calculation they should be asked to consider whether or not their answer is reasonable in the context of the question.

There is no necessity to use a particular method for any of these calculations and any with which the student is familiar and confident should be used. Many families of schools are now discussing and beginning to agree common methods across schools.

The following methods are some with which learners may be familiar.

Basic mathematical equipment

All learners are expected to bring the following equipment to all lessons: pen, pencil, ruler, rubber, sharpener, protractor and compass.

Year	Addition	Subtraction
3/4	Example 1: 29 + 39 = 30 + 40 - 2 = 70 - 2 = **68** **or** 29 + 39 = 20 + 30 + 9 + 9 = 50 + 18 = 50 + 10 + 8 = 60 + 8 = **68**	Example 1: 90 - 37 = 90 - 40 + 3 = **53** **or** +3 +50  37 40 90 ∴ 90 – 37 = **53**
	Example 2: 287 + 45 200 + 80 + 7 + 40 + 5 200 + 120 + 12 = **332** **or** 287 287 +45 +45 200 12 120 120 12 200 **332** **332**	Example 2: 567 – 243 500 + 60 + 7 – 200 + 40 + 3 300 + 20 + 4 = **324** **or** 767 – 619 By 50 exchanging 700 + 60 + 17 a ten for ten 600 + 10 + 9 units 100 + 40 + 8 = **48**
5/6 7/8	Example: 8642 + 753 8000 + 600 + 40 + 2 700 + 50 + 3 8000 + 1300 + 90 + 5 = **9395** **or** 8000 + (600 + 700) + (40 + 50) + (2 + 3) = 8000 + 1300 + 90 + 5 **= 9395** **or** 8642 By this time they +753 *understand* **9395** carrying 1	Example: 2410 - 482 1000 1300 100 10 2000 + 400 + 10 + 0 400 + 80 + 2 1000 + 900 + 20 + 8 **= 1928** **or** 2410 - 482 Using what they -2 know about -70 negative numbers 2000 **1928** **or** 1 13 10 1 By now they 2410 understand - 482 *borrowing* **1928**

<table>
<tr><th>Year</th><th>Multiplication</th><th>Division</th></tr>
<tr><td>3/4</td><td>Learners will be taught multiplication tables up to 10 x 10 and associated facts, e.g.:

If 7 x 9 = 63
then 9 x 7 = 63
63 ÷ 9 = 7
63 ÷ 7 = 9

4 + 4 + 4 + 4 + 4 + 4 = 6 x 4

8 + 8 + 8 = 8 x 3

∴ 6 x 4 = 24
8 x 3 = 24

7 x 29 = (7 x 30) – (7 x 1)
= (7 x 3 x 10) – (7 x 1)
= 210 – 7
= 203

20 x 30 = (2 x 10) x (3 x 10)
Using = 2 x 3 x 10 x 10
multiples = 6 x 10 x 10
of 10 = 600</td><td>Recognition that division is the inverse of multiplication, e.g.:

63 ÷ 9 = 7
became 7 x 9 = 63</td></tr>
<tr><td>5/6</td><td>Example: 275 x 8
(200 x 8) + (70 x 8) + (5 x 8)
1600 + 560 + 40
= 2200
or
275 x 2 = 550
275 x 4 = 1100 (doubled)
275 x 8 = 2200 (doubled)
or
<table><tr><td>x</td><td>200</td><td>70</td><td>5</td></tr><tr><td>8</td><td>1600</td><td>560</td><td>40</td></tr></table> Grid method
= 1600 + 560 + 40
= 2200</td><td>Working on the idea that division is repeated subtraction. e.g.:

458 ÷ 3
Since 3 x 100 = 300 and
3 x 200 = 600
the answer must be between 100 and 200 (estimation).
3 x 100 = 300
2 x 50 = 150 (halving)
3 x 150 = 450
3 x 2 = 6
3 x 152 = 456
So: 458 ÷ 3 = 152 remainder 2</td></tr>
</table>

Percentages

Whilst learners should be familiar with many operations involving percentages in mathematics lessons it is not proposed to elaborate on all of them here. The following is a sample of operations which learners will be expected to use in other areas.

Calculating percentages of a quantity

Methods for calculating percentages of a quantity vary depending upon the percentage required. Learners should be aware that fractions, decimals and percentages are different ways of representing part of a whole and know the simple equivalents

eg 10% = 1/1012% = 0.12

Where percentages have simple fraction equivalents, fractions of the amount can be calculated.

eg. i) To find 50% of an amount, halve the amount.
ii)To find 75% of an amount, find a quarter by dividing by four and then multiply it by three.

Most other percentages can be found by finding 10%, by dividing by 10, and then finding multiples or fractions of that amount

eg. To find 30% of an amount first find 10% by dividing the amount by 10 and then multiply this by three.
30% = 3x10%
Similarly: 5% = half of 10% and 15% = 10% + 5%
Most other percentages can be calculated in this way.

When using the calculator it is usual to think of the percentage as a decimal. Learners should be encouraged to convert the question to a sentence containing mathematical symbols. ('of' means X)

eg. Find 27% of £350 becomes 0.27 X £350 =

and this is how it should be entered into the calculator.

Calculating the amount as a percentage

In every case the amount should be expressed as a fraction of the original amount and then converted to a percentage in one of the following ways:

i) What is 15 as a percentage of 60? (using simple fractions)

$\frac{15}{60} = \frac{1}{4} = 25\%$

ii) What is 27 out of 50 as a percentage? (using equivalent fractions)

$\frac{27 \times 2}{50 \times 2} = \frac{54}{100} = 54\%$

iii) What is 39 as a percentage of 57? (Using a calculator)

$\frac{39}{57} = 39 \div 57 = 0.684$ (to 3 d.p.) $= 68.4\%$

Guidance on Algebra

Algebra – a common approach

Algebra is often referred to as the language of mathematics. When working with algebra it is important that before attempting to perform any calculations learners translate the 'algebra' into 'English'.

Example: 5x + 3 = 18 means "five times a number plus three equals eighteen"

Solving Equations

There are three main methods for solving equations.

METHOD ONE – MACHINE/INVERSE METHOD

Example: Solve $5x + 3 = 18$

Solution: First we look at 'what is happening to *x*', in the correct order, to get 18.

$$x \rightarrow \boxed{\times 5} \rightarrow \boxed{+ 3} \rightarrow 18$$

We then push the "18" back through the machine in the reverse order performing the inverse operation e.g. $\boxed{+ 3}$ becomes $\boxed{- 3}$ and $\boxed{\times 5}$ becomes $\boxed{\div 5}$

We then get:

$$3 \leftarrow \boxed{\div 5} \overset{(15)}{\leftarrow} \boxed{- 3} \leftarrow 18$$

so

$$x = 3$$

This method can also be used effectively when **rearranging** simple equations.

Example

Rearrange the following equation, writing *v* in terms of *u*

$$v = \frac{u}{2} + 14$$

First we look at what is happening to *u*, in the correct order, to get *v*. We then reverse the flow diagram by putting the "*v*" back through the machine.

$$u \rightarrow \boxed{\div 2} \rightarrow \boxed{+ 14} \rightarrow v$$

Performing the inverse operations e.g. **+14** becomes **–14** and **÷2** becomes **×2**

$$2(v - 14) \leftarrow \boxed{\times 2} \leftarrow \overset{(V-14)}{\boxed{-14}} \leftarrow v$$

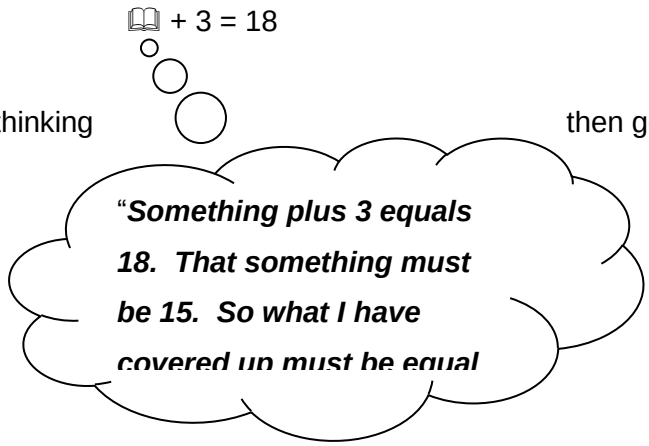
so $\boldsymbol{u = 2(v - 14)}$

METHOD TWO – COVER UP METHOD

Example

Solve: $5x + 3 = 18$

We first cover up the "5*x*" with something:



The thinking then goes something like this:

We can then write down: $5x = 15$

Five times something equals 15

So

$$\boldsymbol{x = 3}$$

METHOD THREE – BALANCING METHOD

Example

Solve: $\mathbf{5x + 3 = 18}$

The idea here is to consider the equals sign as a set of balancing scales, and therefore whatever you do to one side of the equals sign you have to do to other if the scales are to remain balanced. For example, if you add 3 to one side you must add 3 to the other; if you

divide by 4 on one side, you divide by 4 on the other. This is the mathematically conventional way of solving all equations and thus the one least liked by middle/low attaining learners.

So, to solve our equation: $5x + 3 = 18$

subtract 3 from both sides

$5x = 15$

divide both sides by 5

$\underline{\boldsymbol{x = 3}}$

Learners should check solutions by substituting answers back into the original equations

Substituting into formulae

Again, it is essential that learners write out what the formula means in "long hand", before replacing the letters with numbers. Stressing the importance of method is essential to obtaining the correct answer. It is expected that learners show all of the following working out exactly as detailed below, the equal signs all underneath each other.

Example: $v = u + at$ means '$v = u + a \times t$' (remembering to multiply first!)

So given $u = 4$, $a = -5$, $t = 10$, $v = ?$

We now *literally* replace the letters with the numbers and perform the calculation in the normal way, not forgetting to multiply first!

$v = 4 + (-5) \times 10$

$v = 4 + (-50)$ $\quad\quad$ $v = -46$

Note

Problems will occur if you provide the learners with values for *v*, *u* and *a* and ask them to find the value of *t*. This is quite a difficult question/concept for learners and will need reminding of the method.

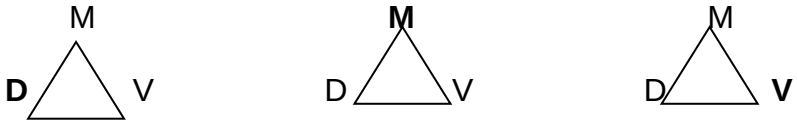
The most common use of algebra across the curriculum will be in the use of formulae. When transforming formulae learners will be taught to use the 'balancing' method where they do the same to both sides of an equation.

eg (i) $A = lb$ Make b the subject of the formula

[÷l] $\frac{A}{l} = b$

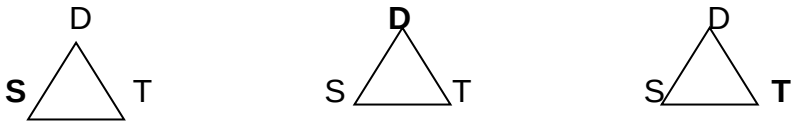
However , in some cases triangles can be useful for specific cases.

eg Density = $\frac{\text{Mass}}{\text{Volume}}$



Density = $\frac{\text{Mass}}{\text{Volume}}$, **Mass** = Density x Volume, **Volume** = $\frac{\text{Mass}}{\text{Density}}$

Similarly with **Distance, Speed and Time**



Speed = $\frac{\text{Distance}}{\text{Time}}$,**Distance** = Speed x Time, **Time** = $\frac{\text{Distance}}{\text{Speed}}$

Guidance on Accuracy in measurement & drawing

Learners should be expected to draw and measure accurately. It is an essential requirement in many subjects. For example:

- Reading scales in science and D&T
- Measuring and cutting materials in D&T
- Plotting points on graphs in geography
- Measuring distances and times in physical education

Equipment:

Learners should be actively encouraged to have with them at all times a ruler, protractor, a pair of compasses, a sharp pencil and an eraser so that they can work accurately.

Estimation:

Estimation is an important aspect of measurement and drawing. Learners should be encouraged whenever possible to make sensible estimates before measurement. Estimation can help learners avoid careless mistakes in measurement. Estimation can also be used to introduce discussion on appropriate and sensible degrees of accuracy.

Units:

The choice of units is also important particularly as many learners confuse the units of length, area and volume. (Note: in mathematics, cm^3 is called 'cubic centimetres' rather than 'centimetres cubed'). Learners also need to understand that in some contexts, millimetres are used as the principle unit of length rather than centimetres. Note: learners are taught about commonly used imperial units and their metric conversions.

Checking accuracy:

Learners involved in measurement tasks need to be clear about the level of accuracy required so their work can be checked and marked fairly. Peer assessment is a very useful strategy for improving accuracy and promotes self-evaluation.

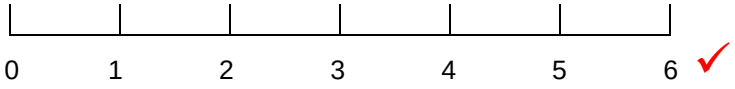
Tables, Charts and graphs:

For consistency and accuracy, drawing will usually be done in pencil, with straight lines drawn using a ruler, for example, in tables, graph axes, sketches and diagrams. Points and lines on graphs should be plotted and drawn using a sharpened pencil. Labelling of graphs and diagrams should normally be completed in ink, for example titles, axes labels etc. The use of a pencil and eraser can be a helpful way to improve drawing, for example in drawing curved line graphs. Sketches that do not need to be accurately measured still need to be neat and legible (as does numerical working and jottings).The most common use of algebra across the curriculum will be in the use of formulae.

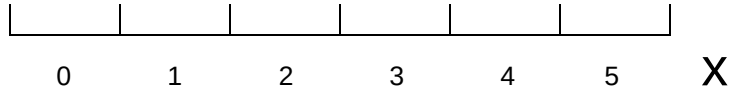
Plotting Points

When drawing a diagram on which points have to be plotted some learners will need to be reminded that the numbers written on the axes must be on the lines not in the spaces.

eg



NOT



Axes

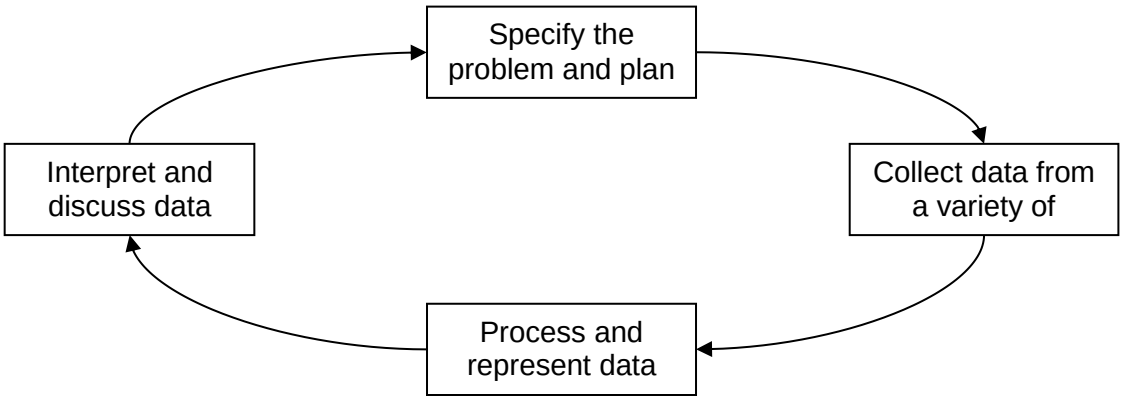
When drawing graphs to represent experimental data it is usual to use the horizontal axis for the variable which has a regular class interval.

eg In an experiment in which temperature is taken every 5 minutes the horizontal axis would be used for time and the vertical axis for temperature.

Having plotted points learners can sometimes be confused as to whether or not thy should join the points. If the results are from an experiment then a 'line of best fit' will usually be needed. Further details appear in the following section on Data Handling.

Guidance on statistics

Throughout the mathematics curriculum the clear message is that data handling is best taught in the context of real statistical enquiries, in a coherent way so that teaching objectives arise naturally from the whole cycle, as represented in the following diagram:



Other subjects across the curriculum have similar descriptions for the role of carrying out investigations within their subject-specific contexts:

Science: Test explanations by using them to make predictions and by seeing if evidence matches the predictions. Use first-hand and secondary data to carry out a range of scientific investigations, including complete investigations;

Information and Communications Technology (ICT): Learners should be taught how to collect, enter, analyse and evaluate information relevant to the enquiry and reach conclusions;

History: Identify, select and use a range of appropriate sources of information, evaluate the sources used, select and record information relevant to the enquiry and reach conclusions;

Geography: Collect, record and present evidence, analyse and evaluate evidence and draw and justify conclusions;

Citizenship: Research a topical political, spiritual, moral, social or cultural issue, problem or event by analysing information from different sources, including ICT-based sources, showing an awareness of the use and abuse of statistics;

1. Specifying the problem and planning

In order to specify a problem, learners need to suggest a conjecture (hypothesis) that could be investigated.
A conjecture is a hypothesis. This means that it is a statement about something you're going to investigate, eg:

- tallest athletes jump best
- the cost of a car has an effect on its speed

2. Collecting Data

It is important that data are collected for a purpose. Data are found as either:

a) Primary data – data you collect yourself using a survey or experiment; or

b) Secondary data – data that is already collected for you. You can find secondary data in books or on the internet.

Example: Survey/Questionnaire

To decide whether traffic outside school can be reduced, the Maypole High Governors want to ask drivers:

- How far is it to school?
- Do you drive in every day?
- Why do you drive your children to school?
- How long does your car journey take?
- How many people do you bring to school?
- Do any other learners live near you?
- What do you think of the traffic outside school?
- What buses go from near your house?

Some of the questions have yes or nor answers:

- Do you drive in every day?
- Do any other learners live near you?

Others have numerical answers:

- How far is it to school?
- How long does your car journey take?
- How many people do you bring to school?

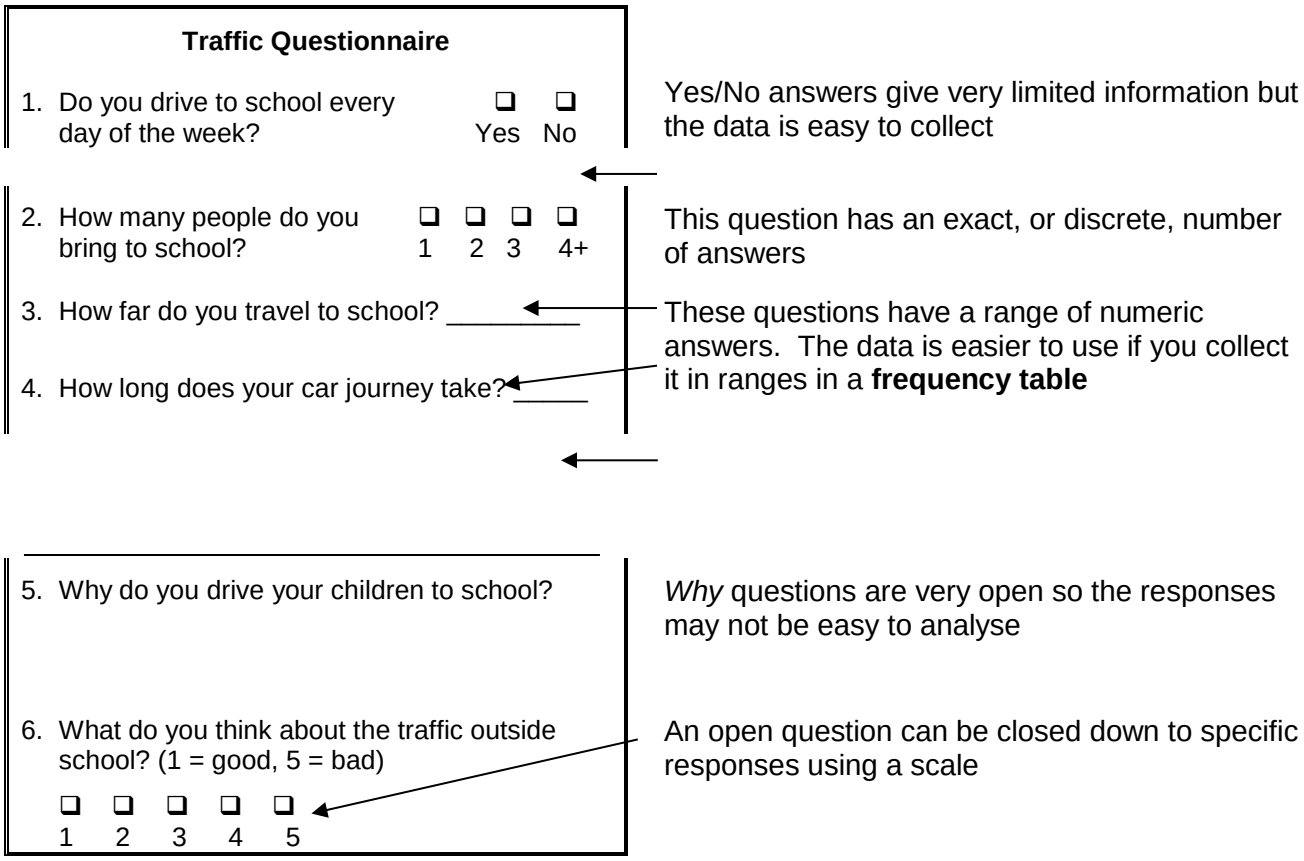
These have many different answers:

- Why do you drive your children to school?
- What buses go from near your house?
- What is your opinion on the traffic outside school?

*These are **closed** questions. They have particular answers. You could use tick boxes to collect this data*

*These are **open** questions. They can include answers you haven't thought of.*

The governors develop a questionnaire for their questions:



You can use a questionnaire to conduct a survey. Open questions invite any response. Closed questions invite choice.

To understand how to collect data properly, it is necessary to consider different types of data, so that collection and handling activities can take place. One key idea, important to the proper collection of data, is that of sampling.

The Vocabulary of Sampling

Population: The entire group of people, animals, or things about which we want information

Sample: A part of the *population* from which we actually collect data/information, used to draw conclusions about the whole

IMPORTANT:

In order for a sample to be suitable,
at least 30
pieces of information need to be collected.

3. Representing data and interpretation

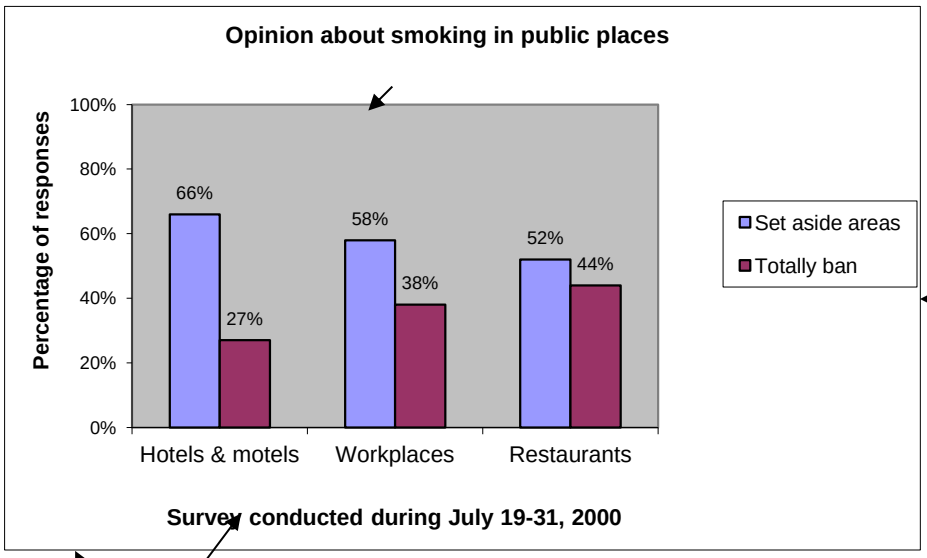
Representing data in an orderly and easy-to-read/understand form is paramount to Handling Data. Charts and diagrams without headings, labels and an appropriate scale are useless.

The representations synthesise the raw data into summary information. We will be looking at how to draw the most common charts: bar charts, pie charts and scatter diagrams. Also a brief look at averages.

Bar Charts:

A bar chart uses bars to represent data. Each bar represents a category or class.

Title



Key if required

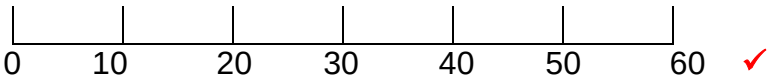
Both axes labelled

INTERPRETATIONS

- The bar chart shows that more people would set aside areas for smokers in public places than would ban them completely.
- The more enclosed the space, the more would actually ban smoking totally
- None of the bars add to 100%, so it is assumed that the rest of the respondents 'didn't know' or perhaps they said smoking should be allowed everywhere.
- There is no information about who took part in the survey, such as whether it included smokers as well as non-smokers, and so it is difficult to draw any firm conclusions.

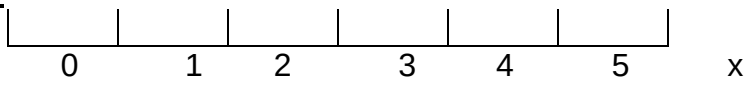
Where the data are continuous, eg. lengths, the horizontal scale should be like the scale used for a graph on which points are plotted.

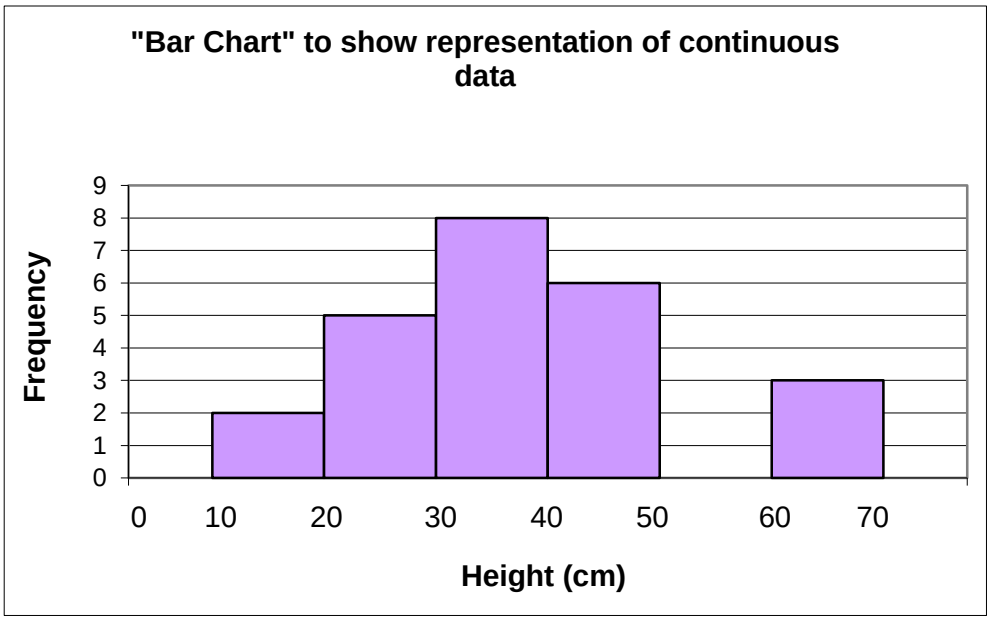
eg



✓

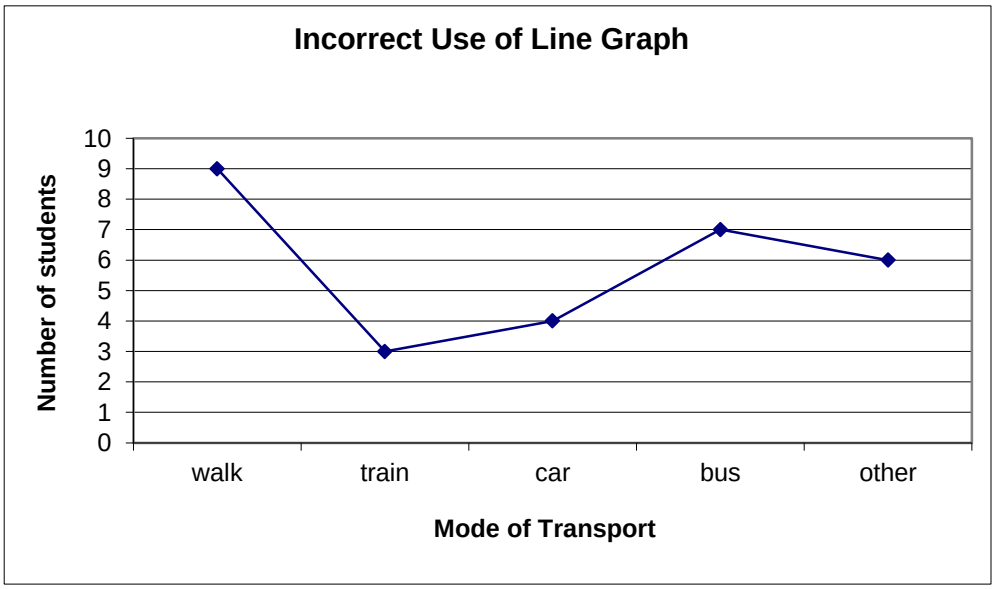
NOT





Line Graphs

Line graphs should only be used with data in which the order in which the categories are written is significant.
Points are joined if the graph shows a trend or when the data values between the plotted points make sense to be included. For example the measure of a patient's temperature at regular intervals shows a pattern but not a definitive value.



Computer Drawn Graphs & Diagrams

Learners throughout the school should be able to use **Excel** or other spreadsheets to draw graphs to represent data. Because it is easy to produce a wide variety of graphs there is a tendency to produce diagrams that have little relevance. Learners should always be encouraged to write a comment explaining their observations from the graph.

PIE CHARTS

A pie chart uses a circle to show data. Each class or category has a slice of the circle.

Example: Draw a pie chart to illustrate the following information.

Type of transport	Train	Coach	Car	Ship	Plane
Frequency	48	28	125	22	27

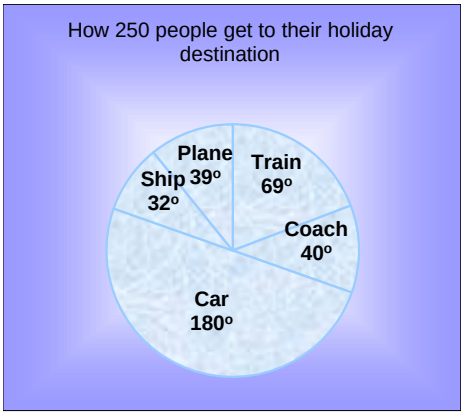
We need to find the fraction of the total, which represents each type of transport, and express this as a decimal. Many learners prefer to remember that we simply divide each frequency by the total. This decimal is called the 'multiplying factor'. To find the angle we then multiply 360 degrees by the multiplying factor.

Type of transport	Frequency	Multiplying Factor	Angle
Train	48	48 ÷ 250 = 0.192	360× 0.192 ≈ 69°
Coach	28	28 ÷ 250 = 0.112	360× 0.112 ≈ 40°
Car	125	125 ÷ 250 = 0.5	360× 0..5 ≈ 180°
Ship	22	22 ÷ 250 = 0.088	360× 0.088 ≈ 32°
Plane	27	27 ÷ 250 = 0.108	360× 0.108 ≈ 39°
Totals	**250**	**1**	**360°**

Notice:

- We use the total of 250 to calculate each fraction
- We round off each angle to the nearest degree
- We check that the sum of all the angles is 360°

The pie chart can now be drawn. Remember, it is always good practice to draw the smallest angle first, then the next smallest, and so on, until the last angle will automatically be the largest. This reduced the effect that the successive additions of error have on the accuracy of the last angle drawn.

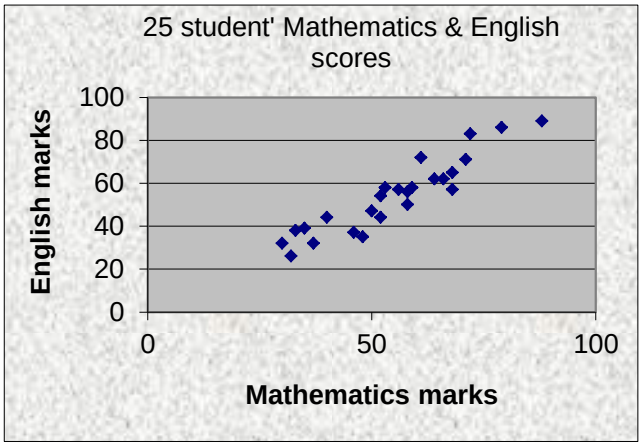


INTERPRETATIONS

- Most people travel to holiday by car
- Less than a quarter go by train
- If 1000 people went on holiday, about 160 would go by coach
- There is no information about who took part in the survey, so is the pie chart representative of the population?

SCATTER DIAGRAMS

A scatter diagram is a method of comparing two sets of data, and discovering if there is a link (relationship) between them, e.g.

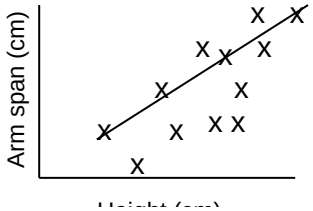


Looking at relationships, scatter diagrams tell us whether there is a **correlation** (link) between the two data sets. It is quite common when using scatter diagrams to include a line of best fit (a straight line), which goes through the middle of the data, passing as close to as many points as possible. This would allow us to make estimates for certain cases.

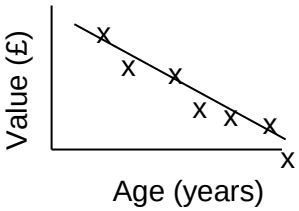
Here are three statements that may or may not be true.

- The taller people are, the wider their arm span is likely to be.
- The older a car is, the lower its value will be.
- The distance you live from your place of work will affect how much you can earn.

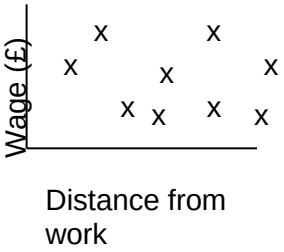
Collecting data and plotting the data on a scatter diagram could test these relationships. For example, the first statement may give a scatter diagram like that on the right. This has a **positive correlation** because the data has a clear 'trend' and we can draw a line of best fit that passes quite close to most of the points. From such a scatter diagram we could say that the taller someone is, the wider the arm span.



Testing the second statement may give a scatter diagram like that on the right. This has a **negative correlation** because the data has a clear 'trend', and we can draw a line of best fit that passes quite close to most of the points. From such a scatter diagram we could say that as a car gets older, its value decreases.



Testing the third statement may give a scatter diagram like that on the right. **This scatter diagram has no correlation.** It is not possible to draw a line of best fit. It could therefore say that there is no relationship between the distance a person lives from his or her work and how much the person earns.



Averages

This is a number that is used to represent a set of data. There are three main averages used in different circumstances. You have to choose the most appropriate average to use.

MEAN*:* The sum of all the values divided by the number of values, eg Find the mean of 6, 3, 1, 4

$$\text{Mean} = \frac{6 + 3 + 1 + 4}{4}$$

$$= 14 \div 4 \qquad \mathbf{= 3.5}$$

MEDIAN*:* The value in the middle of the data after it has been arranged in size order. If we have an even number of data, then we find the mean of the middle two values.

Example 1. Find the median of 4, 6, 3, 2, 1

6, 4, ③, 2, 1 ∴ **Median is 3**

Example 2. Find the median of 4, 6, 3, 2, 1, 2

6, 4, (3, 2,) 2, 1 ∴ $\text{Median} = \frac{3 + 2}{2}$

= 2.5

Mode*:* The value in the data that occurs most frequently, e.g.

Find the mode of : 3, 15, 0, 3, 1, 0, 4, 3 **Mode = 3**

If there is no number that occurs most often, there is no mode.

The **range** is the spread of data, i.e. the largest value subtract the smallest value, e.g.:

7, 6, 8, 12, 9 **Range = 12 – 6 = 6**

The mean is a good average when the range is small. The median is a useful average when the range is large.

Expected knowledge and skills across mathematics curriculum

Numeracy across the curriculum	Start of Year 7	Year 7	Year 8	Year 9 (including *extension objectives*)
Have a sense of the size of a number and where it fits into the number system	Place value, ordering and rounding • Recognise and extend number sequences. • Estimate by approximating (round to nearest 10, 100 or 1000).	Place value, ordering and rounding • Compare and order decimals; know that when comparing measurements they must be in the same units. • Round positive whole numbers to the nearest 10, 100 or 1000 and decimals to the nearest whole number or one decimal place.	Place value, ordering and rounding • Round decimals to the nearest whole number or to one or two decimal places. Integers, powers and roots • Use squares, positive and negative square roots, cubes and cube roots, and index notation for small positive integer powers.	Place value, ordering and rounding • Multiply and divide by any integer power of 10. • *Understand upper and lower bounds; round numbers to three decimal places and a given number of significant figures.* • *Begin to write numbers in standard form.* Integers, powers and roots • Use simple instances of the index laws.
Recall mathematical facts confidently Calculate accurately and efficiently, both mentally and with pencil and paper, drawing on a range of calculation strategies	Calculations with whole numbers and decimals • Understand and use the relationships between the four operations, and the principles of the arithmetic laws. • Use brackets. • Add and subtract two two-digit numbers mentally. • Use column addition and subtraction of numbers involving decimals. • Know multiplication facts to 10×10, and quickly derive associated division facts. • Multiply a two-digit number by a single-digit number mentally.	Calculations with whole numbers and decimals • Know and use the order of operations, including brackets. • Use standard column procedures to add and subtract whole numbers and decimals with up to two places. • Multiply and divide three-digit by two-digit whole numbers; extend to multiplying and dividing decimals with one or two places by single-digit whole numbers.	Calculations with whole numbers and decimals • Use the order of operations, including brackets, with more complex calculations. • Use standard column procedures for multiplication and division of integers and decimals; understand where to position the decimal point by considering equivalent calculations.	Calculations with whole numbers and decimals • Understand the effects of multiplying and dividing by numbers between 0 and 1.
Calculate using fractions, decimals and percentages and use proportional reasoning to simplify and solve problems	Fractions, decimals, percentages, ratio and proportion • Reduce a fraction to its simplest form by cancelling common factors. • Use a fraction as an 'operator' to find fractions of numbers or quantities. • Order a mixed set of numbers or measurements with up to three decimal places. • Understand percentage as the number of parts in every 100. • Find simple percentages of small whole-number quantities.	Fractions, decimals, percentages, ratio and proportion • Simplify fractions by cancelling all common factors. • Recognise the equivalence of percentages, fractions and decimals. • Calculate simple percentages and fractions of quantities. • Use ratio notation, reduce a ratio to its simplest form, and divide a quantity into two parts in a given ratio. • Solve simple problems about ratio and proportion using informal strategies.	Fractions, decimals, percentages, ratio and proportion • Add and subtract fractions by writing them with a common denominator; calculate fractions of quantities. • Calculate percentages and find the outcome of a given percentage increase or decrease. • Reduce a ratio expressed in different units to its simplest form; divide a quantity into two or more parts in a given ratio. • Use the unitary method to solve simple word problems involving ratio and direct proportion.	Fractions, decimals, percentages, ratio and proportion • Add, subtract, multiply and divide fractions; cancel common factors before multiplying or dividing. • Compare two ratios; interpret and use ratio in a range of contexts. • Use proportional reasoning to solve a problem, choosing the correct numbers to take as 100%, or as a whole.
Use calculators appropriately and efficiently, and select from the display the number of figures appropriate to the context of a calculation	Calculator methods • Develop calculator skills and use a calculator effectively.	Calculator methods • Carry out calculations with more than one step using brackets and the memory; use the square root and sign change keys. • Enter numbers and interpret the display in different contexts (decimals, percentages, money, metric measures).	Calculator methods • Carry out more difficult calculations effectively and efficiently using the function keys for sign change, powers, roots and fractions; use brackets and the memory. • Enter numbers and interpret the display (negative numbers, fractions, decimals, percentages, money, metric measures, time).	Calculator methods • Use a calculator efficiently and appropriately to perform complex calculations with numbers of any size, knowing not to round during intermediate steps of a calculation. • Use the constant, π and sign change keys, function keys for powers, roots and fractions, brackets and the memory.

Expected knowledge and skills across mathematics curriculum

Numeracy across the curriculum	Start of Year 7	Year 7	Year 8	Year 9 (including *extension objectives*)
Use simple formulae and substitute numbers in them	Reasoning and generalising • Develop from explaining a generalised relationship in words to expressing it in a formula, using letters as symbols.	Equations, formulae and identities • Use simple formulae; substitute positive integers into simple linear expressions and formulae and, in simple cases, derive a formula.	Equations, formulae and identities • Use formulae; substitute integers into simple formulae, including examples that lead to an equation to solve.	Equations, formulae and identities • Use more complex formulae; substitute numbers into expressions and formulae; derive a formula and, in simple cases, change its subject.
Measure and estimate measurements, choosing suitable units and reading numbers correctly from a range of meters, dials and scales	Measures • Use, read and write standard metric units. • Convert smaller to larger units, and vice versa. • Know rough equivalents between common metric and imperial units. • Record estimates and readings from scales to a suitable degree of accuracy.	Measures and mensuration • Measure, estimate, calculate and solve problems involving length, area, mass, capacity and angle. • Read and interpret scales on a range of measuring instruments. • Convert one metric unit to another (e.g. g to kg).	Measures and mensuration • Measure, estimate, calculate and solve problems involving length, area, volume, capacity, mass, angle and bearings. • Know rough metric equivalents of imperial measures in daily use (feet, miles, pounds, pints, gallons).	Measures and mensuration • Measure, estimate, calculate and solve problems in a variety of contexts. • Convert between area measures (mm^2 to cm^2, cm^2 to m^2, and vice versa). • *Recognise that measurements given to the nearest whole unit may be inaccurate by up to one half of the unit in either direction.*
Calculate simple perimeters, areas and volumes, recognising the degree of accuracy that can be achieved	Measures • Calculate the perimeter and area of simple compound shapes that can be split into rectangles.	Measures and mensuration • Use the formula for the area of a rectangle; calculate the perimeter and area of shapes made from rectangles. • Calculate the surface area of cubes and cuboids.	Measures and mensuration • Use formulae for the area of a triangle, parallelogram and trapezium. • Use the formula for the volume of a cuboid.	Measures and mensuration • Use the formulae for the circumference and area of a circle. • Calculate the surface area and volume of right prisms.
Understand and use measures of time and speed, and rates such as £ per hour or miles per litre	Measures • Appreciate different times around the world. • Solve problems using time.	Measures and mensuration • Measure, estimate, calculate and solve problems involving time. Sequences, functions and graphs • Begin to plot and interpret the graphs of simple linear functions arising from real-life situations.	Measures and mensuration • Measure, estimate, calculate and solve problems involving time. Sequences, functions and graphs • Plot the graphs of linear functions arising from real-life problems; discuss and interpret graphs arising from real situations.	Measures and mensuration • *Understand and use measures of speed, and other compound measures such as density and pressure.* • *Solve problems involving constant or average rates of change.* Sequences, functions and graphs • Plot graphs of functions arising from real-life problems; interpret graphs arising from real situations, including distance–time graphs.
Draw plane figures to given specifications and appreciate the concept of scale in geometrical drawings and maps	Construction • Measure and draw lines to nearest mm. • Measure and draw acute and obtuse angles to the nearest degree. Coordinates • Read and plot coordinates in all four quadrants. Transformations • Recognise where a shape will be after: reflection; two translations; a rotation of 90° about one of its vertices.	Construction • Use a ruler and protractor to measure and draw lines to the nearest millimetre and angles to the nearest degree. Coordinates • Use coordinates in all four quadrants. Transformations • Recognise reflection symmetry and rotation symmetry in 2-D shapes. • Recognise translations of 2-D shapes.	Construction • Use straight edge and compasses to construct: the mid-point and perpendicular bisector of a line segment; the bisector of an angle; the perpendicular from a point to a line; the perpendicular from a point on a line. Lines, angles and shapes • Begin to use plans and elevations. Transformations • Enlarge 2-D shapes, given a centre of enlargement and a positive whole-number scale factor. • Make simple scale drawings.	Construction • Use straight edge and compasses to construct triangles. Lines, angles and shapes • Analyse 3-D shapes through 2-D projections, including plans and elevations. Transformations • Identify the scale factor of an enlargement. • Use and interpret maps and scale drawings. •
Understand the difference between	Handling data • Begin to find the median and mean of a	Handling data • For small sets of discrete data: find the	Handling data • Calculate statistics, including with a	Handling data • *Find the median and quartiles for large*

Expected knowledge and skills across mathematics curriculum

Numeracy across the curriculum	Start of Year 7	Year 7	Year 8	Year 9 (including *extension objectives*)
the mean, median and mode and the purpose for which each is used	set of data. • Find the mode and range of a set of data.	mode, median and range, and the modal class for grouped data; calculate the mean, using a calculator for a larger number of items. • Compare two simple distributions using the range and one of the mode, median or mean.	calculator; recognise when it is appropriate to use the range, mean, median and mode and, for grouped data, the modal class; calculate a mean using an assumed mean; construct and use stem-and-leaf diagrams. • Compare two distributions using the range and one or more of the mode, median and mean.	*datasets.* • Compare two or more distributions and make inferences, using the shape of the distributions, the range of data and appropriate statistics.
Collect data, discrete and continuous, and draw, interpret and predict from graphs, diagrams, charts and tables	Handling data • Solve a problem by representing, extracting and interpreting data in tables, graphs, charts and diagrams.	Handling data • Collect small sets of data from surveys and experiments. • Construct, on paper and using ICT: bar-line graphs; frequency diagrams for grouped discrete data; pie charts. • Interpret diagrams and graphs, and draw simple conclusions.	Handling data • Collect data by observation, controlled experiment (including data logging), or questionnaire. • Construct, on paper and using ICT: pie charts for categorical data; bar charts and frequency diagrams for discrete and continuous data; simple line graphs for time series; simple scatter graphs. • Interpret tables, graphs and diagrams for both discrete and continuous data.	Handling data • Gather data from specified secondary sources, including printed tables and lists from ICT-based sources; determine sample size; design data collection sheets. • Construct, on paper and using ICT: scatter graphs; line graphs for time series; *lines of best fit*. • Have a basic understanding of correlation.
Have some understanding of the measurement of probability and risk	Probability • Use the language associated with probability to discuss events, including those with equally likely outcomes.	Probability • Use the vocabulary and ideas of probability, drawing on experience. • Use the probability scale from 0 to 1.	Probability • Use the vocabulary of probability when interpreting the results of an experiment; appreciate that random processes are unpredictable. • Know that if the probability of an event occurring is p, then the probability of it not occurring is $1 - p$. • Estimate probabilities from experimental data.	Probability • Use the vocabulary of probability in interpreting results involving uncertainty and prediction. • *Understand relative frequency as an estimate of probability and use this to compare outcomes of experiments.*
Use and apply mathematics to solve problems Explain methods and justify reasoning and conclusions, using correct mathematical terms Judge the reasonableness of solutions and check them when necessary Give results to an appropriate degree of accuracy	Applying mathematics • Identify and use appropriate operations (including combinations of operations) to solve word problems involving numbers and quantities. • Explain methods and reasoning. Checking results • Check the results of calculations.	Applying mathematics • Solve word problems and investigate in a range of contexts. • Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations, methods and resources. • Explain and justify methods and conclusions, orally and in writing. Checking results • Check a result by considering whether it is of the right order of magnitude and by working the problem backwards.	Applying mathematics • Use logical argument to establish the truth of a statement. • Represent problems and interpret solutions in algebraic, geometric or graphical form, using correct notation and appropriate diagrams. • Give solutions to an appropriate degree of accuracy in the context of the problem. Checking results • Check a result by considering whether it is of the right order of magnitude and by working the problem backwards.	Applying mathematics • Solve substantial problems by breaking them into simpler tasks, using a range of efficient techniques, methods and resources, including ICT. • Give solutions to an appropriate degree of accuracy, *recognising limitations on the accuracy of data and measurements*. Checking results • Check results using appropriate methods.

Audit

The number in the second column of the table gives the level of each item in the Mathematics National Curriculum. The table below indicates the highest overall level of work that the majority of learners in the various ability groups are likely to cover in mathematics lessons.

	Year 7	Year 8	Year 9
Set 1	5/6	6/7	7/8
Set 2	5	5/6	6/7
Set 3	4/5	4/5	5/6
Set 4	2/3/4	3/4/5	4/5/6

Subject Key

Dt – Design Technology
En – English
Gg – Geography
Hi – History
It – Information and Communication Technology
La – Languages
Ma – Mathematics
Mu – Music
Pe – Physical Education
Rs – Religious Education and Life skills
Sc – Science

Mathematical Skills	N.C. Level	NNS Year	Year 7	Year 8	Year 9
Handling data					
Sort and classify objects by more than one criterion	2	4			
Record results in simple lists, tables and block graphs	2	2			
Interpret simple tables and lists	3	3			
Interpret pictograms & draw pictograms	3	3, 4			
Interpret & draw bar graphs	3	4, 5, 6			
Collect data and record them using frequency tables	4	4, 5, 6			
Understand and use the mode, the median and the range of a set of data	4	4, 5			
Group collected data into equal class intervals	4				
Draw frequency diagrams using grouped data	4	6			
Interpret line graphs	4	5, 6			
Select and use appropriate scales for axes					
Draw line graphs	4	5, 6			
Use the vocabulary of Probability	4				
Understand and use the mean of a set of data	5	6			
Use averages and ranges to compare two sets of data	5				

	N.C. Level	NNS Year	Year 7	Year 8	Year 9
Interpret pie charts	5	6			
Understand and use the probability scale from 0 to 1	5				
Find probabilities using equally likely outcomes or experiment	5				
Create frequency tables with equal class intervals to record continuous data	6				
Interpret frequency diagrams	6				
Draw frequency diagrams	6				
Draw pie charts	6				
Draw scatter diagrams	6				
Understand simple correlation	6				
Use two-way tables to record all the possible outcomes of two events	6				
Use the fact that the total probability of all mutually exclusive outcomes of an experiment is 1	6				
Specify and test hypotheses using appropriate methods and taking account of variability and bias	7				
Find modal class of grouped data	7				
Estimate the mean, median and range of grouped data	7				
Use averages and ranges and frequency polygons to compare two sets of data	7				
Draw a line of best fit on a scatter diagram	7				
Use relative frequency to estimate probability	7				
Interpret cumulative frequency tables and diagrams	8				
Construct cumulative frequency tables and diagrams	8				
Estimate the median, quartiles and inter-quartile range from a cumulative frequency diagram	8				
Interpret histograms with unequal class intervals	EP				

	N.C. Level	NNS Year	Year 7	Year 8	Year 9
Understand and use sampling	EP				
Draw histograms with unequal class intervals	EP				
Use Spearman's coefficient of correlation	EP				