Collective Vision Trust

Maths Curriculum

Maths Overview

Collective Vision Trust uses the White Rose Maths Scheme as the basis of its mathematics curriculum.

White Rose is a carefully sequenced scheme that builds up childrens' mathematical knowledge through clear explicit teaching. It makes good use of developing mathematical knowledge through using concrete apparatus to pictorial representation and, then, to abstract thinking. It is designed to support the development of reasoning and problem solving alongside fluency to support challenge and ambition.

We have used this curriculum to draw out the crucial knowledge that is the foundation of mathematical learning that gives children the fundamental building blocks to develop their mathematical understanding and progress. We have ensured that we build in lots of opportunities for children to recap their knowledge, in order to ensure it is firmly embedded and, that, their learning is part of their long term memory.

Curriculum Intent

White Rose Maths scheme has a clear rationale for the sequence of the topics. Maths learning requires some things to be learned before others, for example place value needs to be understood before working with addition and subtraction. Similarly, addition needs to be learnt before looking at multiplication. White Rose, quite rightly, puts the emphasis on number skills first in all year groups. Number is the crucial building block for all areas of mathematics and, so, must be prioritised.

For some topics (e.g. shape and statistics) the order is not crucial – they need to come after number, but don't depend on each other, and, so, they can be taught in any order. The sequencing of these is planned to give as wide a variety of topics for pupils as possible in each term and year.

Recap
Planned, quality recap is an essential feature of the curriculum. Teachers will incorporate recap into their daily and weekly plans. In addition, the following is worthy of note:

- On the spot accurate assessment is the key to good recap.
- Teachers will quickly move to longer recap of topic areas that pupils have not remembered.
- Differentiation of learning must be applied to recap work – some pupils will need more recap than others, which needs to happen without holding back the learning of the rest of the class.
- The first week in a half term is always a recap week. No new concepts are taught in recap weeks.
- Topic specific recaps are also in the White Rose plans.
- Teachers will also plan additional ongoing recaps as part of their weekly plans

Collective Vision Trust – Maths Curriculum

	Autumn	Spring	Summer
Year 1	– Recap - Reception – Number: Place Value (within 10) – Number: Addition and Subtraction (within 10) – Geometry: Shape – Number: Place Value (within 20) – Recap - Autumn Term	– Recap – Autumn Term – Number: Addition and Subtraction (within 20) – Number: Place Value (within 50) – Measurement: Length and Height – Measurement: Weight and Volume – Recap - Spring Term	– Recap – Autumn and Spring Term – Number: Multiplication and Division – Number: Fractions – Geometry: Position and Direction – Number: Place Value (within 100) – Measurement: Money – Measurement: Time – Recap – Year 1
Year 2	– Recap – Year 1 – Number: Place Value – Number: Addition and Subtraction – Measurement: Money – Number: Multiplication and Division – Recap – Autumn Term	– Recap – Autumn Term – Number: Multiplication and Division – Statistics – Geometry: Properties of Shape – Number: Fractions – Recap – Spring Term	– Recap – Autumn and Spring Term – Measurement: Length and Height – Geometry: Position and Direction – *Recap and application* – Measurement: Time – Measurement: Mass, Capacity and Temperature – Recap – Year 2
Year 3	– Recap – Year 2 – Number: Place Value – Number: Addition and Subtraction – Number: Multiplication and Division – Recap – Autumn Term	– Recap – Autumn Term – Number: Multiplication and Division – Measurement: Money – Statistics – Measurement: Length and Perimeter – Number: Fractions – Recap – Spring Term	– Recap – Autumn and Spring Term – Number: Fractions – Measurement: Time – Geometry: Properties of Shape – Measurement: Mass and Capacity – Recap – Year 3
Year 4	– Recap – Year 3 – Number: Place Value – Number: Addition and Subtraction – Measurement: Length and Perimeter – Number: Multiplication and Division – Recap – Autumn Term	– Recap – Autumn Term – Number: Multiplication and Division – Measurement: Area – Number: Fractions – Number: Decimals – Recap – Spring Term	– Recap – Autumn and Spring Term – Number: Decimals – Measurement: Money – Measurement: Time – Statistics – Geometry: Properties of Shape – Geometry: Position and Direction – Recap – Year 4
Year 5	– Recap – Year 4 – Number: Place Value – Number: Addition and Subtraction – Statistics – Number: Multiplication and Division – Measurement: Perimeter and Area – Recap – Autumn Term	– Recap – Autumn Term – Number: Multiplication and Division – Number: Fractions – Number: Decimals and Percentages – Recap – Spring Term	– Recap – Autumn and Spring Term – Number: Decimals – Geometry: Properties of Shape – Geometry: Position and Direction – Measurement: Converting units – Measurement: Volume – Recap – Year 5
Year 6	– Recap – Year 5 – Number: Place Value – Number: Addition, Subtraction, Multiplication and Division – Number: Fractions – Geometry: Position and Direction – Recap – Autumn Term	– Recap – Autumn Term – Number: Decimals – Number: Percentages – Number: Algebra – Measurement: Converting Units – Measurement: Perimeter, Area and Volume – Number: Ratio – Statistics – Recap – Spring Term	– Recap – Autumn and Spring Term – Geometry: Properties of Shape – *Recap and application, including SATs preparation* – *Recap and application, investigations and preparations for KS3*

Crucial & Extended Knowledge by Component

Number: Place value

Crucial Knowledge	Extended Knowledge
Number: an amount • A number is an amount of something. • It can be shown in words, digits, symbols or pictures to show that amount. *six 6 VI ……* • We use numbers to count an amount. **Digit:** a numeral 0 to 9 • There are ten digits that we use. • A digit is any one of these symbols: 0 1 2 3 4 5 6 7 8 9 • The number 23 is written with two digits; 2 and 3. • Digits can be used to identify (show) something – like a telephone number or house number. **Place value:** placement of digit • Each digit holds a value. • The value of a digit depends on where it is within a number. • For example: 3 is ●●● • In 37 the three has a value of 30	**Number line:** a line with numbers placed in their correct position. Useful for: • Adding • Subtracting • Finding one more or one less **Roman Numerals** 1 = I 50 = L 2 = II 100 = C 3 = III 500 = D 4 = IV 1000 = M 5 = V 6 =VI 7 = VII 8 = VIII 9 = IX 10 = X

- In 307 the three has a value of 300

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

An **estimate** means to find a value close/near to the actual by making an observation or using some information we already know

Rounding:

- When the digit on the place value in question is 5 or above - round up
- When the digit on the place value in question is 4 or below – round down

Negative numbers: A real number that is less than zero often used to show a cold temperature

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Number: Addition and subtraction

Crucial Knowledge	Extended Knowledge
+ addition: put together • Adding is bringing two or more things together – they will make a new amount. • Addition can be used to count (adding one or more each time). • When adding the answer will always be greater than the parts being added. **- subtraction:** taking apart • Subtraction is taking apart or taking something away. • Subtraction can be used to count backwards (taking away one or more away each time). • The outcome of subtraction is the difference between two amounts (or numbers). **Total:** the final amount or answer **=** (often called equals) • This symbol means 'same as' • It is usually used to show an answer	Other words for **addition** include: • altogether • sum • in total Other words for **subtraction** include: • difference • take away • how many left • minus An **inverse** reverses the effect of another. • Addition is the **inverse** of subtraction • Subtraction is the **inverse** of addition • Inverse operations can be used to check answers • Eg. 20 – 4 = 16, so 16 + 4 = 20

> greater than

The larger amount is placed by the larger opening and the smaller amount by the tip where the lines meet

< less than

The smaller amount is placed where the lines meet and the larger amount by the larger opening where the lines are furthest apart

Number bonds:

- Two numbers that make a set amount
- (7 + 3 = 10,   9 + 1 = 10,   4 + 6 = 10)
- Number bonds are used in addition and subtraction

Column addition and subtraction: Numbers are written in place value columns underneath one another

- Start adding or subtracting the column on the right and work across to the left
- When adding, this can be done in any order (ie smallest or largest first)
- For subtraction the number you are taking away must go underneath the number you are starting with

Number: Multiplication and division

Crucial Knowledge	Extended Knowledge

X multiplication: groups of
 	
• Multiplication is sometimes called multiplying.
• It is 'groups of', the same as repeated addition.
• 5 x 3 is
• or 5 + 5 + 5
 	
÷ division: splitting into parts
 	
• Splitting in to equal parts is also 'fair sharing'.
• For example:
       12 treats between 3 dogs is
       12 ÷ 3 = 4
 	
They have 4 treats each.
 	
• Sometimes there may be an amount that is 'left over' this is called a 'remainder'
	Array: things (objects or numbers) are arranged in rows and columns.
	
	Rows are something going across
	
	Columns are something going down
	
	Multiplying by 10 moves all the digits in a number one column to the left, eg 53 x 10 = 530
	
	Multiplying by 100 moves all the digits in a number two columns to the left, eg 53 x 100 = 5300
	
	Dividing by 10 moves all the digits in a number one column to the right, eg 5300 ÷ 10 = 530
	
	Dividing by 100 moves all the digits in a number two columns to the right, eg 5300 ÷ 100 = 53
	
	Multiplying by 1 does not change the number, eg 53 x 1 = 53
	
	Multiplying by 0 always gives an answer of 0, eg 53 x 0 = 0
	
	Dividing by 1 does not change the number, eg 53 ÷ 1 = 53

Multiplication tables: multiplication facts for a given number

- Multiplication tables start with 1x the number and finish with 12 x the number
- Multiplication tables can be used to answer both multiplication and division questions

Double is adding the same amount again (double 2 is 2 + 2)

Half is sharing equally by 2 (half of 6 is 6 shared by 2)

Partition: means to split into smaller parts.

Factors are numbers that divide into another number equally without anything left over.

- They usually come in pairs (1 and 12, 2 and 6, 3 and 4 are all factors of 12)

Multiples are the result after multiplying

- 12 is a multiple of 2 as 6 x 2 = 12

Prime Numbers:

- only have two factors - itself and 1
- 1 is not a prime number

Square numbers are when a number is multiplied by itself to make a square

- One row and one column would make one square (or 1 x 1 = 1, so 1 is a square number)

Dividing by the number itself always gives an answer of 1, eg $53 \div 53 = 1$

Indices (powers) tell us how many times to use the number in a multiplication.

- Eg. $8^3 = 8 \times 8 \times 8$

Order of operations is the rule to say which calculations we should do first.

The rule is **BIDMAS**:

- **B**rackets
- **I**ndices
- **D**ivision
- **M**ultiplication
- **A**ddition
- **S**ubtraction

- Two rows and two columns would make four squares (or 2 x 2 = 4, so 4 is a square number
- Three rows and three columns would make 9 squares (or 3 x 3 = 9, so 9 is a square number)

Cube numbers are when a number is multiplied by itself three times to make a cube.

- length x height x width eg 3 x 3 x 3 = 27, so 27 is a cube number

Brackets show that things go together

Calculate: solving

- We can use + - x ÷ to calculate (solve) maths questions and problems.

Method is a way of doing something

Reasoning: to make sense

- Reasoning is making sense of maths by using maths skills and knowledge.
- Think about the information given and the maths skills you already know to find an answer (solution).
- E.g.
  If two pens cost 20p, one pen must cost 10p
  - *I know there are two pens and the total cost is 20p.*
  - *If I separate the pens into singles, I have two groups of pens with one pen in each group.*
  - *If I separate the money in the same way – I separate the 20p in to two groups, I will have two 10ps, so each pen costs 10p*

Number: Fractions

Crucial Knowledge	Extended Knowledge
Fraction: part of a whole (½ , ¾) • The bottom number (denominator) is the total number of parts. • The top number (numerator) is how many parts being used (looked at). • Some fractions can be the same (equivalent) to other fractions. E.g. 2/4 = ½ **Adding fractions**: • Only add the top number (numerator). • *If the bottom number is the same, it stays the same*. $\frac{2}{8} + \frac{4}{8} = \frac{6}{8}$ • If the bottom number isn't the same, find a new number that relates to both denominators. $\frac{1}{3} + \frac{1}{4} = \frac{4}{12} + \frac{3}{12} = \frac{7}{12}$ **Subtracting fractions**: • Only subtract the top number (numerator). • *If the bottom number is the same, it stays the same*. $\frac{4}{8} - \frac{2}{8} = \frac{2}{8}$	A **half** is when a whole has been split into two equal pieces. One of the pieces is a half. A **quarter** is when a whole has been split into four equal pieces. One of the pieces is a quarter. A **third** is when a whole has been split into three equal pieces. One of the pieces is a third. A **unit fraction** is one equal part of a whole. • The numerator in a unit fraction is always 1. Fractions are **equivalent** (equal to) if they show the same part of the whole. • Eg ½ is equivalent to $^2/_4$ • You get **tenths** when you split one whole one into 10 equal parts. Each part is one tenth or $^1/_{10}$. You have a **whole one** when the numerator (top number) is the same as the denominator (bottom number). An **improper fraction** is a fraction where the numerator (top number) is bigger than the denominator (bottom number). It means the value is more than one whole one.
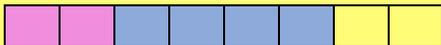
- If the bottom number isn't the same, find a new number that relates to both denominators.

$$\frac{1}{3} - \frac{1}{4} = \frac{4}{12} - \frac{3}{12} = \frac{1}{12}$$

Multiplying fractions:

- Multiply the top number (numerator) **and** the bottom number (denominator)
- If the bottom number isn't the same, find a new number that relates to both denominators.

$$\frac{2}{3} \times \frac{1}{4} = \frac{2 \times 1}{3 \times 4} = \frac{2}{12}$$

Dividing fractions:

- **Keep** the first fraction, **change** the divide to a multiply, **flip** the second fraction
- For example

$$\frac{2}{3} \div \frac{1}{4} = \frac{2}{3} \times \frac{4}{1} = \frac{8}{3}$$

A **mixed number** is where you have a whole number and a fraction combined. Eg 1 ½ - one and a half.

You can find a **fraction of an amount** by dividing the amount by the denominator and multiplying this answer by the numerator.

Number – Decimals

Crucial Knowledge	Extended Knowledge
Decimals: smaller than one	**Fractions** can be written as **decimals**.

Decimals: smaller than one

- A decimal is a value smaller than one
- A decimal is shown to the right of a decimal point
- A decimal point is a dot showing that a value smaller than one is to follow
- For example: 0.42 shows four tenths and two hundredths
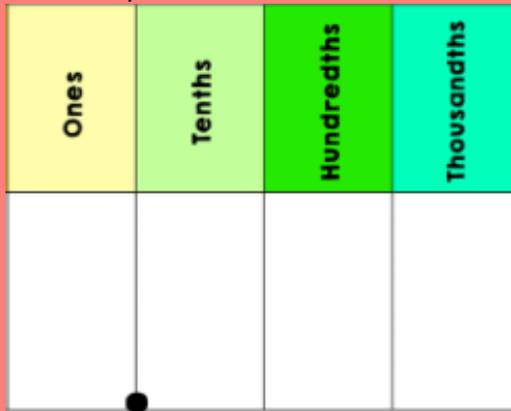
- Tenths are ten parts of one whole.
- Hundredths are one hundred parts of one whole.

Fractions can be written as **decimals**.

- ½ is 0.5 as a decimal
- ¼ is 0.25 as a decimal
- $\frac{1}{10}$ is 0.1 as a decimal
- $\frac{1}{100}$ is 0.01 as a decimal

Number – Percentages

Crucial Knowledge	Extended Knowledge
Percentage: part of a 100 • Per cent means out of 100 • % this symbol means percent • 40% means 40 out of 100 • 11% means 11 out of 100	**Percentages** can be written as **fractions** or **decimals**. • Eg 41% = $^{41}/_{100}$ = 0.41 • 50% = ½ = 0.5 • 25% = ¼ = 0.25 • 20% = $^{1}/_{5}$ = 0.2 • 40% = $^{2}/_{5}$ = 0.4 • 10% = $^{1}/_{10}$ = 0.1 • 1% = $^{1}/_{100}$ = 0.01 To find **10%** of an amount you divide by 10. To find **1%** of an amount you divide by 100.

Number – Ratio

| Crucial Knowledge	Extended Knowledge
Ratio: compare values • Ratio compares values (numbers) in a set order. • Example: The ratio of dogs to cats is. 3:1 or The ratio of cats to dogs is. 1:3 • **:** this symbol is used to separate the values in a ratio	

Number – Algebra

| Crucial Knowledge	Extended Knowledge

Algebra: showing a number
 	
• Using a letter or symbol to show a number
      y + 3 = 10
      so here y = 7
• To **solve** algebra inverse (opposite) instructions are used
• **Inverse** means the opposite
    • Inverse of + is −
    • Inverse of − is +
    • Inverse of x is ÷
    • Inverse of ÷ is x
	An **expression** are a group of numbers letters and operations. Examples:
	    • x + 3
	    • 4y
	    • 2x − 5
	
	Substitution is putting values (numbers) where letters are.
	
	A **formula** is a rule written with mathematical symbols.
	    • Eg. P = 2l + 2w
	
	An **equation** says that two things are equal
	    • Eg. 4

Measurement

| Crucial Knowledge	Extended Knowledge
Measure: the size of something • To find out the size or amount of something. • We can measure: distance, area, time, mass and volume. • We often use a ruler to measure a length or height **Length** is long **Width** is wide **Height** is tall **Weight** is often used to describe the mass of an object – how heavy something is **Volume** is the amount of space within something. **Money** tells us how much something costs • We use pounds (£) and pence (p) • 100p is the same amount of money as £1 **Time** is how long something takes.	We use a **ruler** to measure a length in centimetres (**cm**) The block is 6cm long We measure lengths, widths and heights in mm, cm, m and km. **Coins** we use are: 1p, 2p, 5p, 10p, 20p, 50p, £1, £2 **Notes** we use are £5, £10, £20 and £50 There are **7** days of the week: Monday, Tuesday, Wednesday, Thursday, Friday, Saturday and Sunday.
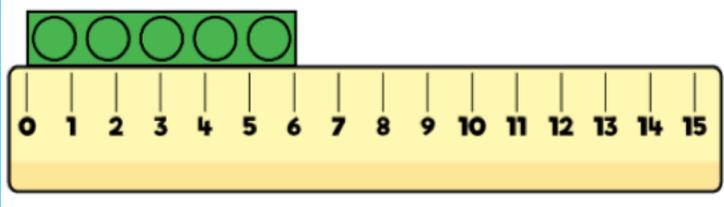
There are **12** months of the year: January, February, March, April, May, June, July, August, September, October, November, December.

On a clock the **hour hand** is the **shorter** hand, and the **minute hand** is the **longer** hand. Some clocks also have a **second hand**, this is also a longer hand, but you can see it move more quickly than the others.
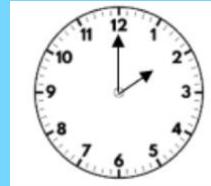
Eg. Two o'clock   half past two
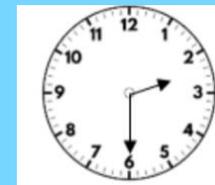
There are **24 hours** in **1 day.**

There are **60 minutes** in **1 hour.**

There are **60 seconds** in **1 minute.**

Years:
- All years (except for leap years) have 365 days.
- A leap year has 366 days
- Leap years happen every 4 years

Twelve hour clock is where time is told using the twelve ours from midnight to midday (**am** times – **a**fter **m**idnight) and the twelve hours from midday to midnight (**pm** times – **p**ast **m**idday).

Mass is how heavy an object is
- It is similar to weight

Capacity is how much something holds
- Capacity is usually a measure of liquid or gas

Temperature is how hot or cold something is

Perimeter is the length all the way around the edge of a shape
- You can find a perimeter by adding the lengths of all of the sides of the shape together

Area is measurement of a flat space.
- Area is the number of squares inside a shape

A **compound shape** is two or more shapes put together to make one shape.

Converting units means changing from one unit to another
- You need to know the facts of how units are related to one another

Volume is the amount of space within something
- Volume is the number of cubes inside something

Twenty four hour clock is where time is told using the full 24 hours in a day

We measure **mass** in **grams (g)** and **kilograms (kg)**
- There are **1000g in 1 kg**

We measure **capacity** in **millilitres (ml)** and **litres (l)**
- There are **1000ml in 1 l**

We measure **temperature** in **degrees Centigrade (ºC)**

100cm is the same as **1m**
There are **10mm** in **1 cm**
There are **1000m** in **1 km**

Geometry - Shape

Crucial Knowledge	Extended Knowledge
Shape is an outline or form of an object. **Dimension** is a measurement • 2D (two dimensions) is a shape that has two measurements (e.g. width and height). It can't be picked up. • 3D (three dimensions) is a shape that has three measurements (width, height, depth). It can be picked up. Some shapes have **names** **Properties** are things that all shapes with the same name have in common	Names of **2D** shapes: • **Rectangle** • **Square** • **Triangle** • **Circle** 2D shapes have **sides** and **vertices**. • a **side** is each line on the shape • a **vertex** is a point where two lines meet A **polygon** is a shape with straight sides. An **equilateral triangle** is a triangle with all three sides the same length. All the angles in an equilateral triangle are 60º.

An **isosceles triangle** is a triangle with two equal sides. The angles opposite the equal sides are also equal.
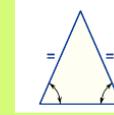
A **scalene triangle** is a triangle with all sides of different lengths. The angles are different too.

A **quadrilateral** is a four sided shape. Some quadrilaterals have special names:

- **square** has all of the sides the same length and all of the angles 90° (right angles).
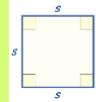
- **rectangle** has opposite sides the same length and all of the angles are 90° (right angles).
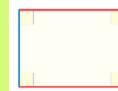
- **rhombus** has all sides the same length. The angles are **not** right angles. Opposite angles are equal.

- **parallelogram** has opposite sides the same length. The angles are **not** right angles. Opposite angles are equal.
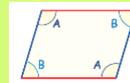
- **trapezium** has one pair of sides parallel.
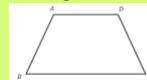
Names of **3D** shapes:

- **Cube**
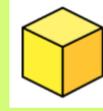
- **Cylinder**

- **Cuboid**

- **Pyramid**

- **Cone**

- **Sphere**

3D shapes have **faces, edges** and **vertices**.

- a **face** is each flat surface on the shape
- an **edge** is a line from one corner to another
- a **vertex** is a point where two edges meet (a corner)

An **angle** is a space where two lines meet

Regular means all the same.
- A regular shape means all sides are the same

Irregular means not the same.
- An irregular shape means all sides are not the same

A **net** is a pattern that you can cut out and fold to make a model of a 3D shape.

A **right angle** is a quarter turn

An **acute angle** is smaller than a right angle

An **obtuse angle** is larger than a right angle

We measure angles using **degrees (º).**
- A **right angle** is 90º.
- An **acute angle** is more than 0º but smaller than 90º.
- An **obtuse angle** is more than 90º but smaller than 180º.
- A **straight angle** is 180º
- A **reflex angle** is more than 180º but smaller than 360º.

We use a **protractor** to measure angles
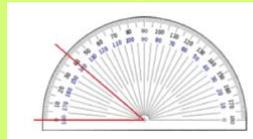
Two right angles will make a **straight line** or 180º.

Angles that make a straight line will always add up to **180º**.

Four right angles will make a **full turn** or 360º.

Angles that make a full turn will always add up to **360º**.

Two lines that make a right angle are called **perpendicular.**

	Horizontal lines go from side to side. **Vertical lines** go from up and down. Lines are **parallel** if they are always the same distance apart.

Geometry – Position and Direction

Crucial Knowledge	Extended Knowledge
Position is where something is. **Direction** tells you how to get to a position **Symmetry** is when a shape is exactly like another shape when it is moved: rotated (turned) or flipped. **Reflection** is when a shape flips to a mirror image • It is identical in form but reversed like in a mirror **Translation** moves a shape. It can move up, down or to the side • It never changes its form or shape in any way Grid **co-ordinates** must always be given in the following order: • The x axis (row) is always shown first, followed by the y axis (column)	A **full turn** is moving something around all the way in a circle . It is in the same position as it started at the end of the full turn. A **half turn** is moving something around a half circle. A **quarter turn** is moving something a quarter of a circle. It is at right angle to where it started from at the end of a quarter turn. **Clockwise** is turning in the same direction as the hands of a clock. **Anti-clockwise** is turning in the opposite direction as the hands of a clock.

Statistics

| Crucial Knowledge	Extended Knowledge
Data is information. **Statistics** is looking at data • Statistics is collecting and showing information (data) so that we can talk about it. A **table** is list to record the information collected. • A table has rows (go across) and columns (go down) A **graph** is a picture to show the information (data).	A **tally chart** is used to collect data. _Fruit tally chart:_ A **pictograph** shows data by drawing pictures. A pictograph has a **key** that tells you how much each picture represents.

Tally chart:

Fruit	Tally
Banana	IIII I
Grape	IIII
Pear	IIII III
Apple	III

Pictograph:

Animal	Number on farm
Pigs	★★★★★★
Sheep	★★★★⯪
Horses	★
Chickens	★★★⯪
Cows	★★★★★★★★

★ = 10 animals

Block diagrams use blocks to show data

Boys Girls
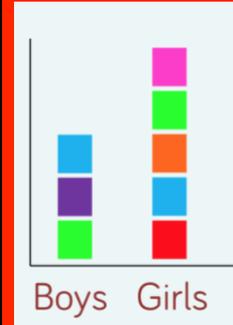
A **bar chart** shows data in bars. It uses a **scale**, which is the equal amounts that the data goes up in.
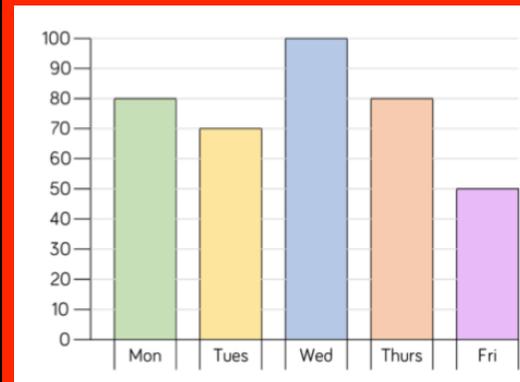
The scale on the left shows the data going up in 10s.

A **line graph** is a graph with points connected by lines to show how something changes in value.