



Progression of Measurement in Mathematics

February 2017

Approved by GB: March 2017

Next review due: Feb 2020

Purpose of Policy

Measure is a significant part of the Mathematics Primary Curriculum. This policy will form the basis upon which we map out the learning for Measure in Mathematics at Key Stage 2. It will outline progression of across the year groups, and will inform new teachers of expectations.

Our policy recognises Mathematics as a functional tool and a valuable key life skill. We want all children leaving Churchfields Junior School to not only be numerate, but to be able to transfer their mathematical skills to other curricular areas and into everyday life. We want to impart to our children that Mathematics is not confined to just acquiring mathematical skills, but most importantly it is about fostering inquiring minds, inciting enthusiasm and valuing curiosity.

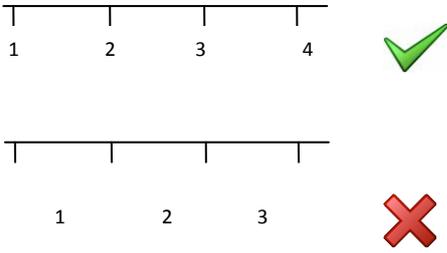
The policy reflects the views of all the staff of the school. It has been drawn up following consultation with and has full agreement of the Governing Body and staff. All staff are fully aware of their role in its implementation. Staff have access to the Policy via the school's server on the Teacher's Drive. Parents are also able to access to the Policy via the Churchfields Junior School website.

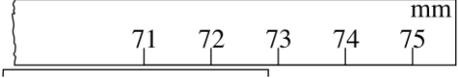
Aims and Outcomes

- To present Measure in meaningful contexts and to embed a range of practical activities designed to enhance children's mathematical experiences.
- To ensure that common errors and misconceptions in Measure are addressed.
- To provide staff with an outline of expectations in Measure.
- To provide parents with an outline of expectations in Measure.
- To ensure continuity and progression in the children's learning of Measure, in relation to the following areas:
 - (i) Avoiding misconceptions by ensuring varied questions (*page 3*)
 - (ii) Mathematical vocabulary (*page 5 and 6*)
 - (iii) Length and area (*pages 7, 8 and 9*)
 - (iv) Time (*pages 10 and 11*)
 - (v) Mass (*pages 12 and 13*)
 - (vi) Capacity (*pages 14 and 15*)
 - (vii) Temperature (*pages 16 and 17*)
 - (viii) Money (*pages 18 and 19*).

Measures – avoiding misconceptions

In order for children to gain sound knowledge and understanding of measures in general, we must adhere to the following principles, in order to avoid creating general misconceptions:

<p>a) Children understand that the point of measure is the line, not the space.</p>	<p>E.g.</p> 
<p>b) Children experience a wide variety of scales, not just increases of 1s and 10s.</p>	<p>E.g. scales increasing in multiples 2, 3, 5, 10, 0.5, 0.1 etc.</p>
<p>c) Children experience both imperial and metric units of measure.</p>	<p>E.g. both Kilometres and Miles etc.</p>
<p>d) Children routinely estimate before measuring and develop a keen sense of reasonableness.</p>	<p>E.g. If ruler is 30cm, then it is unreasonable to measure a book as 250cm.</p>
<p>e) Children understand the difference between estimating and approximating.</p>	<p>E.g. Estimating is guessing the size of something. "I think it will be about 3m." Approximating is rounding an exact measurement. "The table measures 1.8m, which is approximately 2m"</p>
<p>f) Children experience measures in real life contexts, using appropriate apparatus and equipment.</p>	<p>E.g. cooking, measuring long jump distances etc.</p>
<p>g) Children develop a set of real life benchmarks to help them understand and compare measures.</p>	<p>E.g. An apple weighs approximately 150g A swimming is 25m long A can of coke holds 355ml</p>
<p>h) Children know the unit of measure that 'best fits' any given object, and can also reverse the process, suggesting things that would be measured in a given unit.</p>	<p>E.g. Suggest the units that you would use to measure a football pitch. Suggest something that you would measure using millimetres.</p>

i) Children understand that in a problem solving context, the same unit of measure must be used to calculate.	E.g. To find the total distance of 5km and 3miles, you would need to convert 3miles into km before adding.
j) Children experience an equal balance of learning opportunities across length, capacity, time and mass.	The emphasis should not be on length.
k) Children experience the link between measures and fractions.	E.g. 1 and 1/4 m = 1.25m
l) Children must always be taught to write the unit, or abbreviation of the unit, after each recorded measurement.	E.g. 3g + 8g = 11g
m) Children experience scales of varying shapes and directions.	E.g.   
n) Children experience identifying measures that lie between the marked divisions.	E.g.  

(i) Mathematical Vocabulary

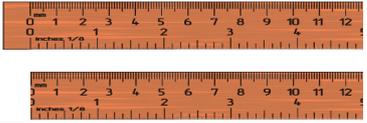
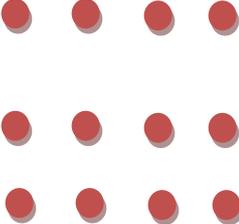
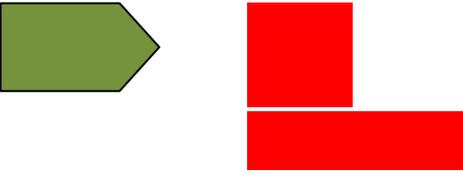
The following table outlines the progression of mathematical vocabulary in relation to Measurement, as set out in the Primary Advantage Maths programme.

	KS1	Year 3	Year 4	Year 5	Year 6
Generic	Measure Size Compare Guess, estimate Enough, not enough Too much, too little Too many, too few Nearly, close to, about the same as Just over, just under	Measuring scale About roughly estimate	Approximately Measurement Unit Standard unit Metric, imperial Convert		Conversion graph
Length and Area	Length, width, height, depth Long, short, tall High, low Wide, narrow Deep, shallow Thick, thin Longer, shorter, taller, higher Longest, shortest, tallest, highest Far, near, close	Further, furthest Centimetre Tape measure Metre Ruler, metre stick	Distance apart/between Distance to/from Kilometre Mile Breadth Edge, perimeter Millimetre Area, Covers Square centimetre	Square meter Square millimetre Yard, feet, foot, inch	Circumference radius diameter
Time	Time Days of the week Monday, Tuesday Day, week Birthday, holiday Morning, afternoon, evening, night Bedtime, dinnertime, playtime Today, yesterday, tomorrow Before, after, Next, last Now, soon, Early, late Quick, quicker, quickest, quickly Slow, slower, slowest, slowly Old, older, oldest New, newer, newest Takes longer, takes less time than Hour, o'clock Clock, watch, hands	O clock Am Pm duration quarter half past to Months of the year. Fortnight Minute, second Quarter to, quarter past Digital, analogue Seasons, Spring, Summer, Autumn, Winter Month, year Weekend Fast, faster, fastest How long ago? How long until? How long will it take? How often? Always, never, often, sometimes, usually, once, twice	Century Calendar Date am, pm earliest, latest leap year millennium date of birth noon timetable arrive depart	12-hour clock 24-hour clock Greenwich Mean Time British Summer Time	

Mass	Weigh, weighs, balances Heavy, light Heavier, lighter Heaviest, lightest Balance, scales Weight, mass	Kilogram Half a kilogram Gram Measuring scale	Mass Big, bigger Small, smaller	Gallon Tonne Pound Ounce	
Capacity	Full Half full Empty Holds Container	Capacity Contains Litre millilitre	Pint Measuring cylinder	Centilitre Volume	
Money	Coins Pence Pound Exchange		Convert Change		Conversion graph

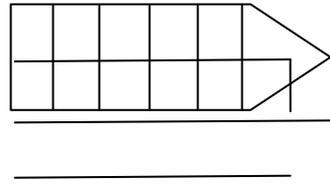
(ii) Length and Area

In order for children to gain sound knowledge and understanding of length and area, we must adhere to the following principles, in order to avoid creating general misconceptions:

a) Children understand that measuring tools do not always start at '0'.	E.g. 
b) Children experience measuring curved as well as straight lines.	E.g. Using string to measure the circumference of a clock.
c) Children routinely estimate before measuring and develop a keen sense of reasonableness.	E.g. I think the pencil case is 15cm long, so if I get a measurement of 135cm, I know something is not right!
d) Children understand the difference between estimating and approximating.	E.g. Estimating is guessing the size of something. "I think it will be about 3m." Approximating is rounding an exact measurement. "The table measures 1.8m, which is approximately 2m"
e) Children experience measures in real life contexts, using appropriate apparatus and equipment.	E.g. Measuring distances for long jumps etc.
f) Children link area to arrays in multiplication.	E.g. $3m \times 4m =$ 
g) Children find the area of a range of compound shapes.	E.g. 

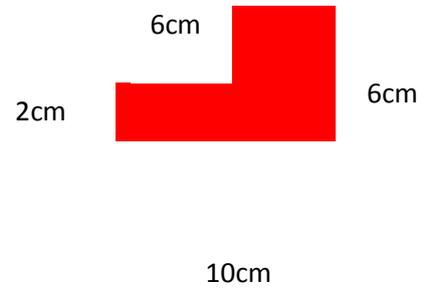
h) Children understand that counting squares and fractions of squares also calculates the area.

E.g.



i) Children calculate perimeters when not all sides are labelled.

E.g.



Length and Area

Throughout primary school, the children must progress through the following skills and stages in order to be confident in understanding and calculating distances and area.

Year 1:

- Answer questions about lengths and heights using vocabulary such as long/short, longer/shorter, tall/short, double/half.
- Measure and begin to record length and height using cm and m.

Year 2:

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm).

Year 3:

- Measure the perimeter of simple 2-D shapes
- Measure, compare, add and subtract: lengths (m/cm/mm).

Year 4:

- Convert between different units of measure, for example, kilometre to metre.
- Find the area of rectilinear shapes by counting squares.
- Measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres.

Year 5:

- Convert between different units of measure, for example, kilometre to metre, centimetre and millimetre.
- Understand and use approximate equivalences between metric units and common imperial units such as inches.
- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres
- Calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm²) and square metres (m²) and estimate the area of irregular shapes
- Use all four operations to solve problems involving measure using decimal notation.

Year 6:

- Convert between miles and kilometres
- Use conversion graphs to convert between metric and imperial measurements.
- Recognise that shapes with the same areas can have different perimeters and vice versa.
- Recognise when it is possible to use formulae for area of shapes.
- Calculate the area of parallelograms and triangles
- Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate
- Use, read, write and convert between standard units, converting from a smaller unit of measure to a larger unit, and vice versa, using decimal notation up to three decimal places

(i) Time

In order for children to gain sound knowledge and understanding of time, we must adhere to the following principles, in order to avoid creating general misconceptions:

a) Children understand that time is in base 60, not base 100.	E.g. there are 60 minutes in an hour, as oppose to 100.
b) Children know and can instantly recall facts about time.	E.g. There are 60 seconds in a minute There are 60 minutes in an hour There are 24 hours in a day There are 7 days in a week There are 12 months in a year There are 4 seasons in a year etc.
c) Children experience telling and managing time throughout the day, in context.	E.g. How long is it until lunch? How much time do we get for play? What time is home time?
d) Children experience a wide range of timetables, presented in a variety of ways.	E.g. Train/bus timetables Lesson timetables TV guides.
e) Children make the link between time and fractions in both analogue and digital contexts.	E.g. $\frac{1}{4}$ of an hour = 15 minutes $\frac{1}{2}$ an hour = 30 minutes etc.
f) Children experience a balance of analogue and digital times, and can convert between the two.	E.g.  
g) Children link time to their 5 times tables.	E.g. If the big hand is pointing to the 4, that means 4 x 5 minutes, so it is 20 minutes past the hour.

Time

Throughout primary school, the children must progress through the following skills and stages in order to be confident in reading time in different formats and calculating duration.

Year 1:

- Answer questions about time using vocabulary such as quicker, slower, earlier, later.
- Tell the time to the hour and half past and draw these onto a clock face.
- Sequence events in chronological order using language [for example, before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening].
- Recognise and use language relating to dates, including days of the week, weeks, months and years.

Year 2:

- Compare and sequence intervals of time
- Tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times
- Know the number of minutes in an hour and the number of hours in a day.

Year 3:

- Tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks
- Estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as o'clock, a.m./p.m., morning, afternoon, noon and midnight
- Know the number of seconds in a minute and the number of days in each month, year and leap year
- Compare durations of events [for example to calculate the time taken by particular events or tasks].

Year 4:

- Convert between different units of measure for example, seconds to minutes.
- Read, write and convert time between analogue and digital 12- and 24-hour clocks.
- Solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days.

Year 5:

- Solve problems involving converting between units of time.
- Use all four operations to solve problems involving measure using decimal notation.

Year 6:

- Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate.
- Use, read, write and convert between standard units, converting from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places.

(ii) Mass

In order for children to gain sound knowledge and understanding of mass, we must adhere to the following principles, in order to avoid creating general misconceptions:

a) Children understand that the biggest is not always the heaviest object, and mass is in no way linked to size or shape.	E.g. a large empty cardboard box is lighter than a small bucket of sand.
b) Children routinely estimate before measuring and develop a keen sense of reasonableness.	E.g. If an apple weighs 150g, then I estimate a banana to be about 100g. If I measure it to be 10g, I know something is not right!
c) Children understand the difference between estimating and approximating.	E.g. Estimating is guessing the size of something. "I think it will be about 3Kg." Approximating is rounding an exact measurement. "The bag of sugar weighs 987g, which is approximately 1kg."
d) Children experience measures in real life contexts, using appropriate apparatus and equipment.	E.g. weighing out ingredients when cooking.
e) Children link mass to science topics involving mass, weight and gravity.	E.g. Discussing the fact that our mass will stay the same wherever we are in the universe, but our weight will change depending on how much gravity is acting on our mass. Therefore on the moon, our mass is the same, but our weight will change.
f) Children understand the difference between mass and weight.	E.g See above.
g) Children experience a range of scales, including balances.	E.g 

Throughout primary school, the children must progress through the following skills and stages in order to be confident in understanding and calculating mass using different units.

Year 1:

- Answer questions about mass/weight using vocabulary such as heavy/light, heavier than, lighter than.
- Measure and begin to record weight using scales.

Year 2:

- Choose and use appropriate standard units to estimate and measure mass (kg/g) to the nearest appropriate unit, using scales.
- Compare and order lengths and record the results using $>$, $<$ and $=$

Year 3:

- Measure, compare, add and subtract mass (kg/g).

Year 4:

- Convert between different units of measure for example, kg to g.

Year 5:

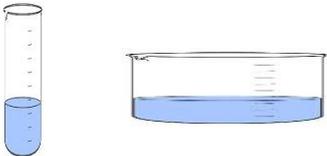
- Convert between different units of measure for example, kg to g.
- Understand and use approximate equivalences between metric units and common imperial units such as pounds.
- Use all four operations to solve problems involving measure using decimal notation.

Year 6:

- Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate
- use, read, write and convert between standard units, converting from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places.

(iii) Capacity

In order for children to gain sound knowledge and understanding of capacity, we must adhere to the following principles, in order to avoid creating general misconceptions:

a) Children understand that the tallest container is not always the one with the largest capacity.	E.g. 
b) Children routinely estimate before measuring and develop a keen sense of reasonableness.	E.g. If a can of coke holds 355ml, then I estimate a small bottle to be about 500ml. If I measure it to be 50g, I know something is not right
c) Children understand the difference between estimating and approximating.	E.g. Estimating is guessing the size of something. "I think it will be about 500ml." Approximating is rounding an exact measurement. "The bottle holds 994ml, which is approximately 1l."
d) Children experience measures in real life contexts, using appropriate apparatus and equipment.	E.g. measuring milk and water when cooking.
e) Children understand the link and difference between capacity and volume.	E.g. Capacity is the amount that an empty container is able to hold. Volume is the amount of space an object occupies. You can measure the volume of a solid object.
f) Children experience both imperial and metric units of measure.	E.g. Children measure in litres and pints.

Throughout primary school, the children must progress through the following skills and stages in order to be confident in understanding and calculating capacity in different contexts and units.

Year 1:

- Answer questions about capacity and volume using vocabulary such as full/empty, more than, less than, half, half full, quarter.
- Measure and begin to record using measuring cylinders and jugs.

Year 2:

- Choose and use appropriate standard units to estimate and measure capacity (litres/ml) to the nearest appropriate unit, using measuring vessels.
- Compare and order volume/capacity and record the results using $>$, $<$ and $=$

Year 3:

- Measure, compare, add and subtract volume/capacity (l/ml)

Year 4:

- Convert between different units of measure for example, ml to l.

Year 5:

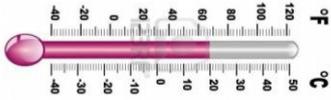
- Convert between different units of measure for example, ml to l.
- Understand and use approximate equivalences between metric units and common imperial units such as pounds.
- Estimate volume [for example, using 1 cm³ blocks to build cuboids (including cubes)] and capacity [for example, using water]
- Use all four operations to solve problems involving measure using decimal notation.

Year 6:

- Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm³) and cubic metres (m³), and extending to other units [for example, mm³ and km³].
- Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate
- Use, read, write and convert between standard units, converting from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places.

(iv) Temperature

In order for children to gain sound knowledge and understanding of temperature, we must adhere to the following principles, in order to avoid creating general misconceptions:

a) Children experience a range of positive and negative temperatures.	E.g. 
b) Children experience temperature scales in varying shapes and orientations.	E.g. 
c) Children experience a wide variety of scales, not just increases of 1s and 10s.	E.g. increments of 0.5°, 2°, 5° etc.
d) Children have the opportunity to look at the differences in temperature of real places around the world.	E.g. The temperature in the UK compared to Countries in Africa.
e) Children know benchmark temperatures to use as comparisons and to develop a sense of reasonableness.	E.g. knowing that room temperature is approximately 18°, water boils at 100° etc.
f) Children experience temperature in degrees Celsius, degrees Fahrenheit, and in some contexts, kelvin.	E.g. Temperatures in Antarctica are likely to be measured in Kelvin as they are so low

Throughout primary school, the children must progress through the following skills and stages in order to be confident in understanding and calculating temperature in different contexts and units.

Year 2:

- Choose and use appropriate standard units to estimate and measure temperature ($^{\circ}\text{C}$) using, thermometers with appropriate intervals.

Year 3:

- Choose and use appropriate standard units to estimate and measure temperature ($^{\circ}\text{C}$) using, thermometers with appropriate intervals.

Year 4:

- Choose and use appropriate standard units to estimate and measure temperature ($^{\circ}\text{C}$) using, thermometers with appropriate intervals.

Year 5:

- Solve word problems involving differences in temperature.
- Read temperature scales with missing numbers and varying scales.

Year 6:

- Pupils use, add and subtract positive and negative integers for measures such as temperature.
- Pupils use conversion graphs to convert between units of temperature (metric/imperial).

(ix) Money

In order for children to gain sound knowledge and understanding of money, we must adhere to the following principles, in order to avoid creating general misconceptions:

a) Children experience a range of different coins when calculating with money.	e.g. different ways of making 20p, £1.50 etc.
b) Children deal with money in terms of more and less than.	
c) Children to experience questions analysing the worth of each coin and whether more coins = more money. Children to understand conversion between pence and pounds and how many pence = 10p, 20p etc. Same value different appearance.	e.g. is 5 20ps more or less than £1? More coins = more money – true or false?
d) Children experience calculating change from a range of different amounts, not just a multiple of 10.	e.g. John pays for his meal with £4.50. How much change does he get?

Throughout primary school, the children must progress through the following skills and stages in order to be confident in understanding and calculating with money in different contexts.

Year 1:

- Recognise and know the value of different denominations of coins and notes

Year 2:

- Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- Find different combinations of coins that equal the same amounts of money
- Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change

Year 3:

- Add and subtract amounts of money to give change, using both £ and p in practical contexts.

Year 4:

- Convert between different units of measure for example pounds to pence.
- Estimate, compare and calculate different measures, including money in pounds and pence

Year 5:

- Use all four operations to solve problems involving measure using decimal notation.

Year 6:

- Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate
- Use, read, write and convert between standard units, converting from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places.
- Use conversion charts to convert between currencies.

Review

This policy is monitored through:

- Regular scrutiny of children's books
- Regular monitoring of teaching plans
- Evaluation and review of assessment data
- Lesson observations to monitor the quality of teaching and implementation of teaching plans
- Pupil interviews

This policy is reviewed by staff and governors every three years. The next review is due February 2020. Parents are most welcome to view copies of this document via the school's website and comments are invited from anyone involved in the life of the school.