Statistics
Progression in Maths

November 2016

Approved by GB: Nov 2016

Next review due: Nov 2019

Purpose of Policy

Statistics is a significant part of the Mathematics Primary Curriculum. This policy will form the basis upon which we map out the learning the teaching of statistics 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 Year Group Leaders 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 via the Teacher's Drive. Parents are also able to access a copy of the policy via the school website.

Aims and Outcomes

- To deliver lessons on understanding and analysising Statistics in meaningful contexts.
- To ensure that common errors and misconceptions regarding Statistics are addressed.
- To provide staff with an outline of the expectations in teaching Statistics.
- To provide parents with an outline of the expectations of Statistics.
- To ensure continuity and progression in the children's learning of Statistics, in relation to the following areas:

Statistics encompasses many skills and requires children to fully understand what a range of different representations show, as well as drawing conclusions and calculating further information using different mathematical skills. It is important that staff and pupils are aware of, and experience, a wide variety of statistical representations in real life and cross curricular contexts. As well as this, it is important that children have the opportunity to gather and present their own data, as this will not only be more meaningful, but will give them an insight into data collecting and its impact on the data representation.

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

a) Children have a balance of experience of different statistical representations and their benefit. Weighting must be given to interpretation and discussion.
b) Links are always made to real life contexts to give the learning meaning. However avoid common contexts of favourite food, pets, eye colour, modes of transport.
c) Teachers use all opportunities to model efficient methods of 'best fit' when representing data.
d) Children experience a balance of various forms of representing data.
e) Children have the opportunity to carry out investigations involving different statistics and cross curricular links are made where possible.
f) Children have the opportunity to use ICT to support their understanding of statistics.

g)	Children progress through the steps outlined, and do not repeat the same learning but build on their prior knowledge.
h)	Children are given opportunities to select and compare different ways of representing.
i)	Children have opportunities to generate and present data, as well as answer questions about existing data.
j)	Children have opportunities to generate lines of enquiry and decide which data to collect, and how best to represent it.
k)	Children are encouraged to annotate diagrams to assist in their interpretations.
l)	Children have the opportunities to make predictions of future patterns and results.

(i) Mathematical Vocabulary

Children need to acquire appropriate vocabulary so that they can participate in the activities and lessons that are part of classroom life. There is, however, an even more important reason: mathematical language is crucial to children's development of thinking. If children don't have the vocabulary to talk about data handling, they cannot make progress in understanding these areas of mathematical knowledge and the links between them.

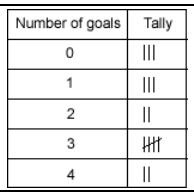
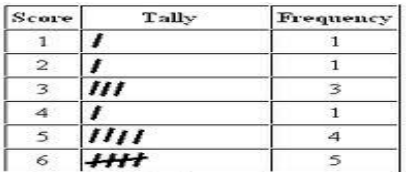
Teachers need to plan the introduction of new words in a suitable context, for example, with relevant objects, apparatus, pictures or diagrams. Explain their meanings carefully and rehearse them several times. Encourage their use in context, particularly through questioning. Use every opportunity to draw attention to the new words in whole class, group and individual contexts. The final stages are learning to read and write new mathematical vocabulary in a range of circumstances, ultimately spelling the relevant words correctly. Key words should be on display at all times during the learning, and their use during explanations and discussions should be encouraged and developed by the teacher as well as modelled by the teacher.

The following table outlines the progression of mathematical vocabulary in relation to Statistics.

	KS1	Year 3	Year 4	Year 5	Year 6
Statistics	sort, set, represent, graph, table, list, count, label, most/least common/popular.	**KS1 words, plus:** chart, pictogram, diagram, tally, axis, title, classify, bar chart, interpret, present, scale, Venn diagram, Carroll diagram.	**KS1 and Year 3 words plus:** time graph, compare, difference, change over time, record,	**KS1, Year 3 and Year 4 words plus:** classify, maximum/minimum value, range, outcome, line graph, interpret, timetable,	**KS1, Year 3, Year 4 and Year 5 words plus:** statistics, average, distribution, mode, median, mean, pie chart, construct, angles, conversion graph, variables

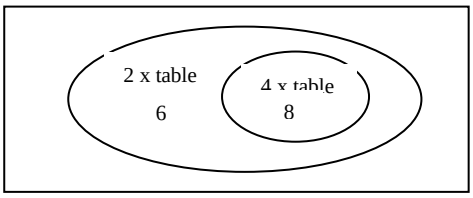
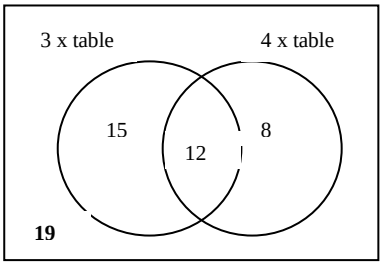
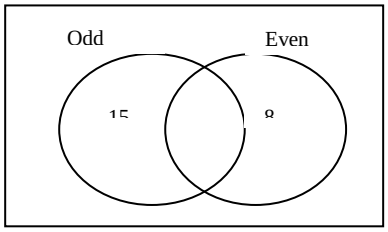
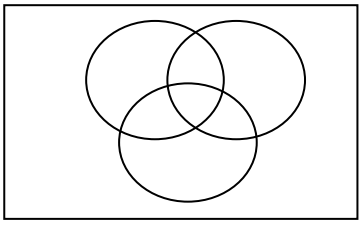
(ii) Tally and Frequency Charts

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

a) Children experience reading from as well as creating tally charts.	E.g.  How many teams scored 3 or more goals?
b) Children understand the value of grouping in 5s, and use this to count the total frequency.	E.g. children count in groups of 5, rather than individual tallies.
c) Children understand the difference between a tally chart and frequency chart.	E.g. 

(iii) Venn Diagrams

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

a) Children experience irregular, as well as regular Venn diagrams.	E.g. 
b) Children experience and know that not all data necessarily sits inside the circles.	E.g. 
c) Children experience deciding on the criteria to use themselves.	E.g. deciding how to sort a selection of 3D shapes.
d) Children experience that there will be times when it is not possible for data to sit in the centre.	E.g. 
e) Children experience using Venn diagrams with 3 criteria.	E.g. 

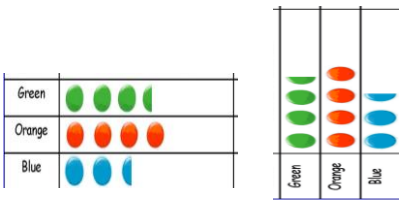
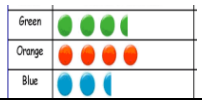
(iv) Carroll diagrams

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

a) Children experience deciding on the criteria to use themselves.	E.g. children decide how they could sort a selection of clothes.
b) Children understand that Carroll diagrams work on the basis of 'fits the criteria, does not fit the criteria'.	E.g. blue, not blue Multiple of 4, not multiple of 4
c) Children understand that **all** data should sit inside the table.	E.g. You could not have 'multiple of 3, multiple of 4', as there would be nowhere for multiples of both or neither to sit.
d) Children experience adding their own plausible labels to existing diagrams.	E.g. What could the criteria be? <table><tr><td></td><td>?</td><td>?</td></tr><tr><td>?</td><td>Circle Semi-circle</td><td>Square Triangle</td></tr><tr><td>?</td><td>Cone Cylinder</td><td>Cube Pyramid</td></tr></table>
e) Children discuss when Carroll diagrams are and are not useful and begin selecting their own way of sorting data.	

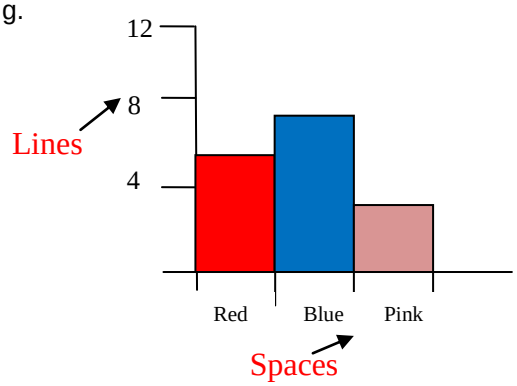
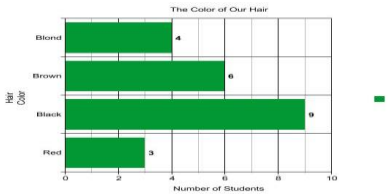
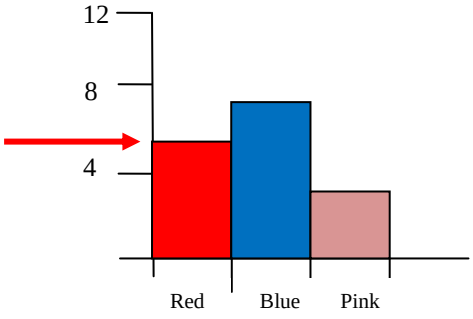
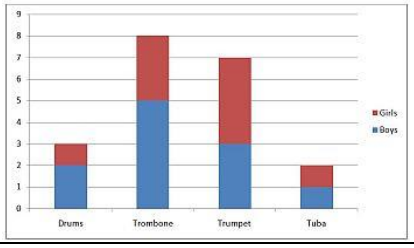
(v) Pictograms

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

a) Children experience horizontal and vertical pictograms.	E.g. 
b) Children experience constructing and reading pictograms with whole and part pictures.	E.g. = 4 = 1
c) Children experience a range of different keys with a variety of quantities represented by one picture.	E.g. See example above.
d) Children make links to fractions so they are able to make sense of part pictures.	E.g. If And I know that 2 is ¼ of 8, then
e) Children should have opportunities to suggest their own labels and titles for pictograms.	E.g. What pictogram  could this show?

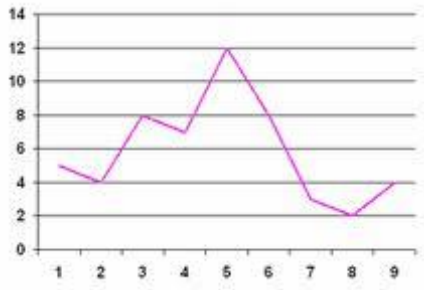
(vi) Bar Charts and Bar Line Graphs

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

a) Children understand when to label the line, and when to label the space.	E.g. 
b) Children experience vertical and horizontal bar charts.	E.g. 
c) Children experience a variety of scales and make informed decisions about selecting appropriate scales to use.	E.g. increasing in steps of 5 for data up to 30, but steps of 200 for data up to 100.
d) Children experience bars that are in between the marked scales.	E.g. 
e) Children experience labelling their own axes.	E.g. what could the above bar chart show?
f) Children experience finding the difference between different pieces of information shown on a bar chart. E.g. how many more more children chose red than pink?	
g) Children experience reading and interpreting bar charts which do not begin at zero (stacked column).	

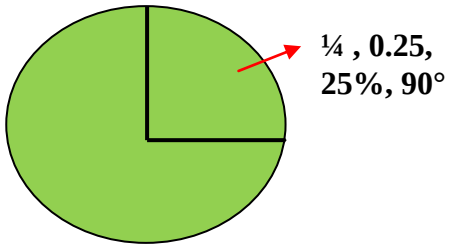
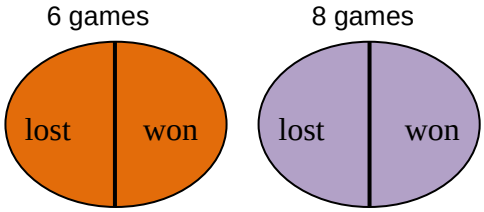
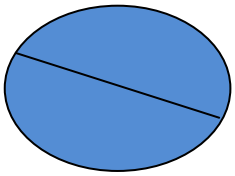
(vii) Line Graphs

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

a) Children understand that line graphs represent continuous data rather than discrete data.	E.g. temperature, time, mass, capacity, age etc.
b) Children recognise the link between line graphs and co-ordinate grids.	E.g. the horizontal and vertical axes work in the same way.
c) Children experience a variety of scales and make informed decisions on appropriate scales to use.	E.g. increase in steps other than 1, 2, 5 and 10. Use steps of decimal numbers.
d) Children link line graphs to a 'story' or narrative over time.	E.g. The line is going up gradually as the bath is being run, the part that is horizontal is where the person is in the bath. She then let out a little bit of water and added some more hot, which is why the graph dips slightly then goes back up. She then lets all the water out which is where the graph gradually decreases to 0.
e) Children experience that line graphs are not always over time (e.g. conversion graphs).	E.g. Euros to pounds
f) Children experience labelling their own axes.	E.g. what could the story of this graph be? Add the labels. 

(viii) Pie Charts

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

a) Children make the links between pie charts and fractions, decimals, percentages and angles.	E.g. 
b) Children experience comparing pie charts with different overall totals.	E.g.  Which team won the most games?
c) Children experience pie charts which are not aligned to the 12 o'clock position.	E.g. 

Progression in Statistics.

Although children should be exposed to variation in all kinds of data representation and statistical analysis to avoid misconceptions mentioned above, it is important that the children have the opportunity to build on prior knowledge. Therefore it is important that the children are secure in the expectations of their year group and are challenged and extended through mastery and begin to work at greater depth. The following table outlines the progression of the different areas of Statistics throughout each year group, in line with the PA Maths document.

	Year 2	Year 3	Year 4	Year 5	Year 6
Tally and frequency charts	Creating own tables and introducing frequency tables. Read off of existing tables.	Selecting when to when it is appropriate to use tally and frequency charts.	Use and apply tally and frequency charts independently.		
Venn Diagrams	Use pre-made diagrams. Sort using two overlapping criteria. Read off of existing diagrams.	Create own diagrams. Sort using three overlapping criteria. Read off of existing diagrams.	Begin to introduce irregular venn diagrams.	Select when it is appropriate to use a Venn diagram. Use and apply Venn diagrams independently.	
Carroll Diagrams	Use pre-made diagrams. Use two 'fits the criteria, does not fit the criteria' Read off of existing diagrams.	Create own Carroll diagrams to sort and classify objects Decide on own criteria.	To use Carroll diagrams to record data.	Select when it is appropriate to use a Carroll diagram. Use and apply Carroll diagrams independently.	
Pictograms	Read pictograms using one picture for one item.	Construct pictograms using one picture to represent multiple items. Half and quarter pictures also used. Introduce standardised symbols.	Select when it is appropriate to use a pictogram. Use and apply pictograms independently.		
Bar/ graphs	Construct bars on to pre made axes using concrete resources Scale increases in steps of one. To understand what a bar graph is showing – discrete data.	Construct own bar charts from own data and given data (in a table)Scales increase in steps other than one. Answer questions about what the bar chart shows.	Construct own bar charts from own data and given data (in a table) Scales increase in steps other than one. Answer questions about what the bar chart shows.	Introduce double bar charts data. Children explain purpose of bar chart and select when appropriate.	Manipulate data by adjusting scales. Construct one graph to show more than one set of data: children to draw and interpret graphs relating to 2 variables. Children to interpret bar graphs showing average data,

Line graphs			Interpret data from line graph. Construct/present data in a time graph. Interpret change over time from a line graph. Record change over time.	Year 5: To interpret data shown in a line graph – compare data, calculate totals, calculate differences, Make links with coordinates. Construct line graphs with differing scales. Year 6: Experience scales that do not start at zero. Experience graphs representing more than one set of data. To interpret data shown in a line graph – compare data, calculate totals, calculate differences, Link line graphs to scatter graphs. Discuss positive and negative correlations.
Pie charts				Year 6 : Interpret data from simple pie charts involving halves, quarters and thirds. Interpret data from pie charts involving more complex proportions. Compare pie charts with different values for the whole. Construct pie charts from data tables.

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 November 2019. Parents are most welcome to view copies of this policy on the website and comments are invited from anyone involved in the life of the school.