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| Fractions, decimals and percentages Calculation Policy |
| Mayespark Primary School |
| Mrs K Murphy and Mrs A Monteiro (May 2021) |

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| **EYFS** | **Concrete** | **Pictorial** | **Conceptual** | **Using and applying** |
| Solves problems, including doubling, halving and sharing (ELG). (Numbers) | Using objects to show double.  Image result for Solves problems, including doubling, halving and sharing (ELG). (Numbers)  Using objects to show half and to share.  Image result for reception maths halving | Drawing pictures to show double and to half or ‘share’.  Image result for doubling in eyfs | Can I have half of your apple?  Image result for halving in eyfs | Discussions about sharing objects or halving fruit.  If Megan has 3 toys and Maheen has 3 toys, how many toys do they have altogether? |
| **Year 1** | **Concrete** | **Pictorial** | **Conceptual** | **Using and applying** |
| Recognise, find and name a half as one of two equal parts of an object, shape or quantity  *-Children may think that all parts no not need to be equal.*  *-Children may not recognise different representations of ½ or ¼ .*  Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity | Using familiar objects and resources.  Sharing quantities into equal groups. | Using a variety of models and images | Recognise unit fraction notation:  ½ and ¼ | I had 8 balloons.  I gave ¼ of them away.  How many balloons did I give away?  How many do I have left?  Use the numbers 1 to 20.  Which numbers can you find ½ / ¼ of?  What do you notice about your answers?  **Possible misconceptions**  *-Children may think that all parts do not need to be equal.*  *- Children may think the bigger the denominator the bigger the part.* |
| Y**ear 2** | **Concrete** | **Pictorial** | **Conceptual** | **Using and applying** |
| Recognise, find, name and write fractions one third , one quarter , 2 quarters and three quarters of a length, shape, set of objects or quantity. | Using familiar objects and resources.  Sharing quantities into equal groups. | Using a variety of models and images  Image result for fractions | Recognise unit and non-unit fraction notation:  ½ and ¼  2 quarters, three quarters | I had 20 balloons.  I gave one two quarters of them away.  How many balloons did I give away?  How many do I have left?  2/4 is the same as …?  What other fractions are equivalent to 2/4? |
| Write simple fractions for example, half of 6 = 3 and recognise the equivalence of 2 quarters and one half. | Using familiar objects and resources.  Sharing quantities into equal groups. | Image result for fractions  Sharing and grouping.  E.g. one quarter of 8  Image result for sharing maths  One third of 12  Image result for grouping maths | Find fractions of quantities:  ½ of 20  1/3 of 18  2 quarters of 24 | 2/4 is the same as …?  What other fractions are equivalent to 2/4?  Jacob had 24 sweets. He gave one third to his mum, one third to his dad and he kept one third for himself. How many did they have each?  Alice, Adam and Maheen have ¾ of a cake. How much of the cake is left?  ***Possible misconceptions***  *-Children may think that all parts no not need to be equal.*  *- Children may think the bigger the denominator the bigger the part.*  *- Children may read fractions incorrectly e.g. thinking that ¼ is one part shaded, 4 parts not* |

Lower Key Stage 2:

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| **Year 3** | **Concrete** | | **Pictorial** | **Conceptual** | **Using & applying** |
| Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10 | Using practical resources and objects.  Image result for counting in tenths objects | | Structured visual images  Image result for counting in tenths  Use of number lines | Continue the pattern:  0, 1/10, 2/10, 3/10….. | ***Possible misconceptions***  *-Children may not realise it is the denominator which stays the same and the numerator changes.*  *-Children may not realise that 10 parts make a whole.* |
| Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators.  Recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators | Using familiar objects and resources.  Sharing quantities into equal groups. | | Image result for non unit fractions of objects  Drawing arrays to support finding fractions of objects and numbers. | ¼ of 24 is 6  one fifth of 30 is 6  two fifths of 30 is 12  three quarters of 28 | Ms Davies has a packet of 32 stickers. She uses three quarters of the pack at lunchtime. How many stickers does she have left?  I have 7 sweets left. I have eaten ¼ of the total bag. How many sweets did I have in the beginning? |
| Recognise and show, using diagrams, equivalent fractions with small denominators | Use physical objects and resources to recognise equivalence. | | Equivalence on a bar model  Image result for recognise and show, using diagrams, equivalent fractions with small denominators  Image result for recognise and show, using diagrams, equivalent fractions with small denominators | Two quarters is the same as…? | Hassan had five eighths of a pizza. Dylan had one half of a pizza. Who had the most pizza? |
| **Year 4** | **Concrete** | **Pictorial** | | **Conceptual** | **Using and applying** |
| Recognise and show, using diagrams, families of common equivalent fractions | Explore fraction walls.  Image result for FRACTION WALL  Find different fractions of the same thing (e.g. a square or rectangle (on squared paper for ease) or a strip of paper.  Match the pieces that are the same size (children can cut out pieces)      Using lego. | Structured visual images    Use of number line:  Image result for ordering fractions on a number line | | Find different fractions of the same number and compare which fractions give the same answer.  ¼ of 8 = 2  2/4 of 8 = 4  ¾ of 8 = 6  ½ of 8 = 4  Which two match? | Which fractions are equivalent? How do you know? Can you show me that one quarter is equivalent to four sixteenths?    How are these the same?  How are they different?  ***Possible misconceptions***  *-Children may not be able to represent fractions pictorially.*  *-Children may think that the larger the denominator, the larger the fraction.*  *-Children may not realise the importance of finding the unit fraction before moving on to find the non-unit fraction.*  *-Children struggle to use different representations to show a fraction.* |
| Recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten | Use Dienes equipment.  Image result for pictorial representation of 1 hundredth    What fraction is each piece?  How many hundredths make one 1/10?  How many hundredths make one whole?  Multilink can also be used where children physically break up the unit.  Image result for multilinks 100 cube | Place value chart. | | 1 ÷ 100 = 1/100  2 ÷ 100 = 2/100  3 ÷ 10 = 3/10  27 ÷ 100 = 27/100 | **What do you notice?**  1/10 of 100 = 10  1/100 of 100 = 1  2/10 of 100 = 20  2/100 of 100 = 2  How can you use this to work out 6/10 of 200?  6/100 of 200?  ***Possible misconceptions***  *-Children may think that the larger the denominator, the larger the fraction.*  *-Children may not make the relationship between 1/10 and 10/100.* |
| Count up and down in hundredths. | Review counting in tenths before moving onto hundredths.  Using the dienes rods, where 1 flat = 1 whole, 1 rod = 1 tenth. 1 unit = 1 hundred – children to physically move a unit piece and count in hundredth.  Children to then recognise that 1 rod is the same as 10/100.  If the start from 25/100 children to then add 1 unit rod whilst counting in hundredth.  Image result for unit dienes  Use beads string to count up in 10th and 100ths. | Structured visual images  Use of number lines | | Continue the pattern:  0, 22/100, 23/100, 24/100, 25/100…..  Count in hundredths from zero, then from any whole number, any hundredth and then any number (e.g. 2 and a half, 2 and 51 hundredths…)  Which is greatest: one tenth or one hundredth? | **Spot the mistake**  sixty tenths, seventy tenths, eighty tenths, ninety tenths, twenty tenths  … and correct it.  **What comes next?**  83/100, 82/100, 81/100, ….., ….., …..  ***Possible misconceptions***  *-Children may not realise when counting up, denominator stays the same and the numerator changes.*  *-Children may not realise that 100 parts make a whole.*  *Children may not recognise that 1/10 is bigger than 1/100* |
| **Year 4** | **Concrete** | **Pictorial** | | **Conceptual** | **Using and applying** |
| Recognise and write decimal equivalents of any number of tenths or hundredths. | Image result for pictorial representation of 1 hundredth  0.1 0.01 | 1 1  O . 10 100  O . 1 = 1/10  0 . 2 = 2/10  O . O 1 = 1/100 | |  | **Complete the pattern by filling in the blank cells in this table:**   |  |  |  |  | | --- | --- | --- | --- | | 1  10 | 2  10 | 3  10 |  | | 10  100 | 20  100 |  | 40  100 | | 0.1 |  | 0.3 |  |   **Another and another**  Write a decimal numbers (to one decimal place) which lies between a half and three quarters?  … and another, … and another,  ***Possible misconceptions***  *Children may not recognise the bigger the denominator the smaller the parts.*  *Children may think that 0.01 is bigger than 0.1.* |
| Recognise and write decimal equivalents to ¼ , ½ , ¾ | Use a counting stick marked in divisions of 0.5 to familiarise children with counting forwards and backwards in steps of 0.5 (link to counting forwards and backwards in ½).  What fraction does this present?  Image result for COUNTING STICK | Use 10x10 grids and establish each square is one hundredth (o.01). Find fractions of the square (100) and use it to write decimal equivalents. | | Continue the pattern –  0.25, 0.5, 0.75, 1, 1.25, 1.5…..  Counting on the counting stick in ¼ and 0.25.  Missing numbers. | **Ordering**  Put these numbers in the correct order, starting with the smallest.  ¼ 0.75 5/10  Explain your thinking  ***Possible misconceptions***  *Children ½ is the same as 5/10 which is the same as 0.5.*  *Children may not recognise that 0.25 is half of 0.5.* |
| Compare numbers with the same number of decimal places up to two decimal places. | Help children become aware of the relative size of decimal numbers by ordering a set of amounts of money or lengths.  £1.23  .  £1.03  . | Position decimals on a number line for children to get a sense of size.  0.3 0.6 | | Put these numbers in descending order:  1.23, 1.03, 1.31, 1.32, 1.02  Include numbers to overcome  misconceptions such as mistaking the  length of the number with its size, for  example thinking that 4.05 is larger  than 4.5. | **Missing symbol**  Put the correct symbol < or > in each box  3.03 3.33  0.37 0.32  What needs to be added to 3.23 to give 3.53?  What needs to be added to 3.16 to give 3.2?  Which is the larger amount, £0.75 or 90p? Which is longer, 3.06 m or 3.6 m? Which is larger: 239p or £2.93? Why?  ***Possible misconceptions***  *Children may think that 0.09 is bigger than 0.2 because ‘9’ is larger than ‘2’.* |
| Round decimals with one  decimal place to the nearest whole  number | Present children with a number line and digit cards (whole numbers).    Call out a number – children to hold up the digit cards the number is closest to. | Children to place digits on a number line, draw how many jumps to the whole numbers either side. | | 1.7 2  2.5 3  1.4 1  8.2 8 | What is 4.7 rounded to the  nearest whole number? I rounded my  number to 3. What number (with one  decimal place) could it have been?  What is the biggest/smallest number I  would round to 2? Simon rounded 1.6  to 2. Was he right? Explain how you  know. Show me why I would round 2.3  to 2. My chair is nearly 1 m high. How  tall could it be?  **Do, then explain**  Circle each decimal which when rounded to the nearest whole number is 5.  5.3 5.7 5.2 5.8  Explain your reasoning  ***Possible misconception***  *-Children may find the next multiple instead of the closest multiple.* |
| Find the effect of dividing  a one- or two-digit number by 10 and  100, identifying the value of the digits  in the answer as ones, tenths and  hundredths. | Use place value grids. | ITP | | Create numbers and look at effect of dividing by 10 and 100. Explore the visual pattern of the digits within division. | What is … ÷ 10/÷ 100 ?  How do you know? Can you show me?  How to divide by ten? What mistake  Have I made here?  ***Possible misconceptions***  *-Children may not be secure with what way to move the digits on the place value chart.*  *-When dividing or multiplying a number with a 0 in between other digits i.e. 403, children may remove the 0.* |
| Add and subtract fractions  with the same denominator | Use fraction cards to model the process.  Using lego:    Numicon  2 + 6 = 8  9 9 9  ../../../../../Users/ameetamohal/Desktop/Screen%20Shot%202017-04-  6 - 2 = 4  6 6 6  ../../../../../Users/ameetamohal/Desktop/Screen%20Shot%202017-04- | 1 + 2 = 3  5 5 5    6 + 3 = 9  12 12 12 | | 1 + 2 = 3  5 5 5  6 + 3 = 9  12 12 12 | **What do you notice?**  5 – 1 = 4  5 5 5  4 – 1 = 3  5 5 5  **Continue the pattern**  ***Possible misconceptions***  *-Children may not be secure in understanding why the denominators doesn’t change resulting in them adding or subtracting them.* |

Upper Key Stage 2:

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| Y**ear 5** | **Concrete** | **Pictorial** | | **Conceptual** | **Using and applying** |
| Compare and order fractions with denomina-tors that all have multiples of the same number. | Use fraction cards or a fraction wall to physically compare the sizes of fractions.    Make links between the fraction sign and division.  Use a calculator to perform the division and compare the decimal numbers, then relate them to the original fraction. | Draw objects which are the same size to compare.    Use of number line to compare fractions. | | Use knowledge of simplifying and finding a common denominator to compare fractions with denominators that all have multiples of the same number. | Give an example of a fraction that is more than three quarters.  Now another example that no one else will think of.  Explain how you know the fraction is more than three quarters.  ***Possible misconceptions***  *-Children may not be secure in finding equivalent fractions.*    *Children may not find the lowest common denominator resulting in them working in efficiently.* |
| Identify, name and write  equivalent fractions of a given fraction,  represented visually, including tenths and  hundredths | Use various models and images to represent fractions in different ways. | Use of fraction wall to find equivalence  Image result for FRACTION WALL | | Investigate using multiplication and division to create equivalent fractions and to simplify fractions to find simplest equivalent. | **Odd one out.**  Which is the odd one out in each of these collections of 4 fractions:  6 3 18 9  10 5 20 15  30 3 6 3  100 10 20 9  Why?  ***Possible misconceptions***  *-Although children may be able to find equivalent fractions, they may not fully understand they represent the same the size of a given value – lots of practical example will support their understanding of equivalent fractions.*  *-Children may struggle to recognise common multiples.*  *-Children may struggle to visualise when two fractions are equivalent.* |
| **Year 5** | **Concrete** | | **Pictorial** | **Conceptual** | **Using and applying** |
| Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents. | Blow up’ dienes so 1 cube represents 1 whole, and therefore unit cubes represent one thousandths. | |  | 3.652 = ‘three point six five = three units, six tenths, 5 hundredths and 2 thousandths = 3652 thousandths | How would you read this number  1.234? What is the place value of each digit?  How many units are there? How many tenths? How many hundredths? How many thousandths?  ***Possible misconceptions***  *-Children may not recognise that 1/100 is bigger than 1/1000.*  *-Children may not make the relationship between 1/100 and 10/1000.*  *-Children may think that 0.001 is bigger than 0.1 because it has more digits.* |
| Recognise mixed numbers and  improper fractions and convert from one form to the other. | 1. or ¼ 1 ¼ or 5 1 1 or ¼   4 2    How many quarters make a whole?  Use knowledge of  counting to mark numbers on number lines.    Numicon stack  ../../../../../Users/ameetamohal/Desktop/Screen%20Shot%202017-04-  With the whole as ten, each peg represents 1/10 . Children can then stack up the numicon to show any improper fractions. For example, the picture above shows 1 3/10 or 13/10 | | How many quarters are there in 2 and ¾?  2 1 = 7  3 3 | How many groups of 3 are there in 7?  What us the remainder?  Or  7 ÷ 3 = 2 r 1  3 | Tell me a fraction that is bigger than 3. How  else could we write it?  Show me what eight thirds looks like. What is  equivalent to it? How can you prove it?  ***Possible misconceptions***  *-Children may not consider that a fraction can be larger than a whole.*  *- Children may think that mixed numbers are larger than improper fractions.* |
| Add and subtract fractions with  the same denominator and denominators that  are multiples of the same number and write  mathematical statements > 1 as a mixed  number [e.g. ⅖ + ⅘ = 6/5 = 1 ⅕] |  | | Subtracting fractions  2 - 1 =  3 2        Answer = 1  6 | +  5 + 3 = 8  15 15 15 | **What do you notice?**  ¾ and ¼ = 4/4 = 1  4 5  4 and ¼ =4 = 1 ¼  5 6  4 and ¼ = 4 = 1 ½  Continue the pattern up to the total of 2.  Can you make up a similar pattern for subtraction?  ***Possible misconceptions***  *-Children may add the denominators and numerators.*  *-Children may not use the lowest common multiple to convert the denominator.* |
| **Year 5** | **Concrete** | | **Pictorial** | **Conceptual** | **Using and applying** |
| Multiply proper fractions and  mixed numbers by whole numbers, supported  by materials and diagrams. | Use post it notes to multiply  1 1 x 2 =  4../../../../../Users/ameetamohal/Desktop/Screen%20Shot%202017-04- | | Image result for multiply proper fractions and mixed numbers by whole numbers pictorial  4 wholes and 4 quarters = 5      12 = 2 2  5 5 | 1 1 x 4 =  4  5 x 4 = 20 = 5  4 1 4 | **Continue the pattern**  ¼ x 3 =  ¼ x 4 =  ¼ x 5 =  Continue the pattern for five more number sentences. How many steps will it take to get to 3? |
| Read and write decimal numbers  as fractions [for example, 0.71 = 71/100] | Use Dienes to represent decimals numbers and compare to Dienes as fractions.    Numicon  ../../../../../Users/ameetamohal/Desktop/Screen%20Shot%202017-04-  With the whole as ten, each peg represents 1/10 (0.1). Children can then stack up the numicon to show any decimal number. For example the picture above shows 1.3 or 1 3/10 or 13/10. | | 2 4  Number line | 71 = 71 ÷ 100  100  Use place value chart to show this represents 0.71. | **Odd one out.**  Which is the odd one out in each of these collections of 4 fractions  6/10 3/5 18/20 9/15  30/100 3/10 6/20 3/9  Why?  **What do you notice?**  Find 30/100 of 200  Find 3/10 of 200  What do you notice?  Can you write any other similar statements?  ***Possible misconceptions***  *-Children may not recognise that 1/100 is bigger than 1/1000.*  *-Children may not make the relationship between 1/10 0and 10/1000.*  *-Children may think that 0.01 is bigger than 0.1 because it has more digits.*  *Children may not make the link between place value and fractions.* |
| Recognise the per cent symbol (%)  and understand that per cent relates to  ‘number of parts per hundred’, and write  percentages as a fraction with denominator  100, and as a decimal. | Using the bead bar.  Use the bead bar to discuss how many 10% we can get out of 100%.  How many parts out of the 10 does 10%/20%/30% represent?  Image result for bead bar  How can we write that as a fraction?  Using money.  Use money to show how 10p can be expressed as a percentage  and a fraction of £1. Give children the opportunity to use coins to convince themselves that, for example, 10p is 1/10 or  10% of £1 because they need ten 10p coins to make £1. | | Represent percentage pictorially on a 100 square.  Image result for representing % on 100 square ks2 10% = 1 = 0.5  10  Image result for representing % on 100 square ks2  1% = 1 =0.01  100  Images of everyday objects: | Percentage is a fraction out of 100.  1% = 1 = 0.01  100  70% = 70 = 0.7  100 | How can you model a percentage?  **Ordering**  Put these numbers in the correct order, starting with the largest.  7/10, 0.73, 7/100, 0.073 71%  Explain your thinking  Which is more:  20% of 200 or 25% of 180?  Explain your reasoning.  ***Possible misconceptions***  *-Children may not make the link between fractions percentages.*  *-Children may not be able to find equivalent fractions to make the denominator out of 100.* |
| Understand and use the  *Children may not make the link between fractions percentages.*  *Children may not be able to find equivalent fractions to make the denominator out of 100.*  *Children may not link fractions to place value chart.*  equivalence between percentages, fractions  and decimals (e.g. 100% is a whole quantity  and 1% is 1/100, 50% of 100 is 50) and relate  this to finding ‘fractions of’ to solve problems. | Counting stick to see the equivalence between the numbers.  Image result for counting stick  Find 50% of a metre. How many cm is this?  How could this be written as a fraction?  Use dienes to represent whole as 1 or 100% | | Using a number line | Use equivalence to represent fraction as part of 100.  Use place value chart to show how 25 ÷ 100 = 0.25  1 = 25 = 25% = 0.25  4 100 | Fill in the missing numbers in the  Grid    How do you know that 50% is the same as a half?  How can you show me? |
| **Year 6** | **Concrete** | | **Pictorial** | **Conceptual** | **Using and applying** |
| Use common factors to simplify  fractions; use common multiples to express  fractions in the same denomination. | Numicon to find common factors.  8 = 2  12 3 | | Use fraction wall to show equivalence of:  8 = 2  12 3 | Model dividing numerator and denomiator bu the same number:  8 (÷4) = 2  12 (÷4) 3 | What is the missing number?    How do you know?  Tell me a fraction that is equivalent to ½ but has a denominator of 9.  How did you do it?  Find the missing number:    Karen makes a fraction using two number  cards.  She says,  'My fraction is equivalent to ½ . One of the  number cards is 6'  ***Possible misconceptions***  *-Children may not recognise the lowest common denominator.* |
| Compare and order  fractions, including  fractions > 1 | Using strips of paper:  Which is greater 2 4 or 2 3 ?  5 8    Which is greater 5 or 1 1 ?  4 2  ../../../../../Users/ameetamohal/Desktop/Screen%20Shot%202017-04- | | Which is greater?  5 1 1  4 2  ../../../../../Users/ameetamohal/Desktop/Screen%20Shot%202017-04- | Find a common denominator:  5 1 1 = 1 2  4 2 4  Convert both into a mixed number or improper fraction. | Give an example of a **fraction** that is greater than 1.1 and less than 1.5.  Now another example that no one will think of. Explain how you know.  ***Possible misconceptions***  *-Children may not recognise that fraction can be more than one whole.*  *-Children may think the larger the denominator, the larger the part.*  *-Children may not recognise the lowest common denominator.* |
| Add and subtract fractions with  different denominators and mixed numbers,  using the concept of equivalent fractions | Use fraction wall cards :  11 - 1 =  12 3  Image result for fraction wall | | Bar modelling:    Find a common denominator: | 5 + 3 = 8  15 15 15 | Of the flags in Jackie's Flag  Shop, 3/5 are green and another 1/5 are teal.  What fraction of the flags are either green  or teal?  Sadie's milkshake recipe needs 3/4 of a scoop of ice cream and Robbie's  recipe needs for 1/4 of a scoop.  How many  more scoops of ice cream are used in Sadie's  recipe than in Robbie's recipe? |
| Multiply simple pairs of proper  fractions, writing the answer in its simplest  form. | Use post it notes (or cut up paper grids) to model the process of multiplying fractions.  2 x 1 = 2  3 2 6  ../../../../../Users/ameetamohal/Desktop/Screen%20Shot%202017-04- | | Draw grids to multiply, emphasise use of ‘of’ in place of x.    1 x 2 =  2 5    Fraction multiplied by a whole number:  Link multiplication to repeated addition.  Image result for multiplying unit fractions  Related image |  | The answer is 1/8 , what is the question (involving fractions / operations)  ***Possible misconceptions***  *-children may learn rule and not understand what the mathematics looks like.* |
| Divide proper fractions by whole numbers | Use post it notes (or cut up paper grids) to model the process of dividing fractions.  2 3 = 2  3 9  ../../../../../Users/ameetamohal/Desktop/Screen%20Shot%202017-04-  ../../../../../Users/ameetamohal/Desktop/Screen%20Shot%202017-04- | | ../../../../../Users/ameetamohal/Desktop/Screen%20Shot%202017-04- | 2 3 =  3  Discuss that dividing by 3 is the same as multiplying by 1.  3  2 3 = 2 x 1  3 3 3  2 x 1 = 2  3 3 9 | **Continue the pattern**  1 ÷ 2 = 1  3 6  1 ÷ 2 = 1  6 12  1 ÷ 2 = 1  12 24  ***Possible misconceptions***  *-children may learn rule and not understand what the mathematics looks like.* |