YuMi Deadly Maths

Year 4 Teacher Resource:

NA – Left overs

Prepared by the YuMi Deadly Centre
Faculty of Education, QUT

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ACKNOWLEDGEMENT

We acknowledge the traditional owners and custodians of the lands in which the mathematics ideas for this resource were developed, refined and presented in professional development sessions.

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Year 4 Number and Algebra

Left overs

Learning goal

Students will:

- investigate the relative position of numbers by modelling fractional numbers between whole numbers
- represent linear models of fractions along number lines and use these models to count and solve simple fraction addition problems.

Content description

Number and Algebra – Fractions and decimals

- Investigate equivalent fractions used in contexts (ACMNA077)
- Count by quarters, halves and thirds, including with mixed numerals. Locate and represent these fractions on a number line (ACMNA078)

Big idea

Number – counting, part-whole, re-naming

Resources

Small pieces of paper in rectangles, squares, circles and triangles; masking tape; numeral, fraction and word cards; cardboard strips representing $\frac{1}{3}$, $\frac{3}{4}$, $1\frac{1}{4}$, and their multiples written as mixed numbers where appropriate; 2 ten-strip mats, coloured paper, washing line (8 m), pegs, paper strips of different colours, board games, worksheet, fraction wall

Reality

Local knowledge

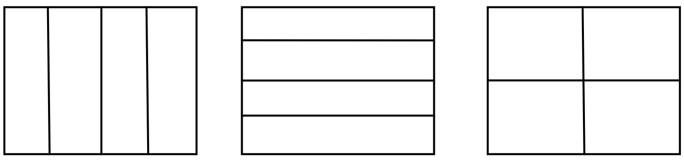
Describe times when not everything that was prepared was used – when there were left overs, e.g. cakes, pizzas, chocolate blocks, orange pieces at sports' games.

Prior experience

What type of fractions do you know? [unit, equivalent and mixed fractions e.g. $\frac{1}{3}$, $\frac{2}{4}$, $1\frac{3}{4}$]. Consolidate fractions equivalent to one and other whole numbers, e.g. $\frac{3}{3} = 1$; $\frac{4}{2} = 2$. Students understand that fractions may be left over from pizzas, cakes, sausages and so on.

Kinaesthetic

Distribute small pieces of paper rectangles. *Show me 1 whole. Fold that whole into halves. How many ways can this be done? Colour in one half. Now show me* $2\frac{1}{4}$ *paper rectangles. Show me 1 whole rectangle. How will you fold that whole into quarters?* [fold in half and half again]. *How many ways can this be done?* Investigate the different ways a piece of paper may be folded into quarters:



Students take two paper rectangles each folded into quarters. *How many quarters make a half?* [2]. *Show me* $1\frac{3}{4}$ *of the paper rectangles. How much is left? Cut it off. Colour in* $1\frac{1}{4}$. *How much is left? How can this fraction be said?* [two quarters or one half]. Establish that two quarters is the same as or equal to one half. *Show me 3 whole papers. Shade in* $2\frac{1}{4}$ *of the papers. How much is left?* Repeat this process to establish concept of thirds. Give many similar examples using different materials to ensure students understand fractions and mixed numbers using the area model: squares, rectangles, circles and triangles.

Put a long strip of masking tape (3–4 m) onto the floor. Randomly distribute to students small cards with the following symbols written on the cards: $0, \frac{1}{4}, \frac{1}{3}, \frac{2}{4}, \frac{3}{4}, 1, 1\frac{1}{4}, 1\frac{1}{3}, 1\frac{2}{4}, 1\frac{3}{4}, 2$. Also distribute corresponding word cards and pieces of apples cut into these fractions

Students with the small symbol cards place their card on one side of the masking tape number line in order from 0 to 1 (we are not ranking here). Talk about the placement of each card and adjust if necessary. *Note:* Where equivalence occurs, cards are placed side by side horizontally, not one underneath the other.

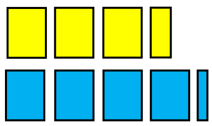
Students with the word cards place them on the other side of the masking tape opposite the same value on the numeral card. Students with apple segments place these next to the word cards. Students take turns to step out the fractions from 0 to 2 counting as they go. Also have students walk to a given fraction, e.g. *Start at zero and walk to* $1\frac{2}{4}$ *of the tape*.

Abstraction

Body

Show me half of your body. Students may cut a horizontal line around hip height or “draw” a vertical line of symmetry. From the horizontal, ask students to show quarter, three quarters, one third, two thirds.

Fraction hop: Using two ten-strip mats one underneath the other, have one student hop $3\frac{1}{2}$ squares along the first mat followed by a student covering the squares with 3 whole squares of coloured paper and half a square of coloured paper. Another student hops $4\frac{1}{4}$ squares on the second mat followed by a student who covers 4 whole squares and a quarter square of coloured paper. *How many squares have been covered?* [$3\frac{1}{2}$ and $4\frac{1}{4}$ squares]. *What should we do to find out how much that is altogether? How many wholes? How many parts?* [Put the whole squares together and the fraction squares together.] Draw a Whole/Part chart on the cement as below:



Whole	Part
3	$\frac{1}{2}$
4	$\frac{1}{4}$
7	$\frac{3}{4}$

Discuss one half being the same/equal to two quarters. Repeat using different examples and extend to eighths.

For length model, go outside and walk alongside the building – stop halfway, one quarter of the way and so on.

Washing line with pegs holding fraction cards in thirds: Students apply their partitioning and knowledge of adding halves and quarters to adding thirds by pegging the fraction cards $0, \frac{1}{3}, \frac{2}{3}, 1, 1\frac{1}{3}, 1\frac{2}{3}, 2, 2\frac{1}{3}, 2\ \frac{2}{3}, 3, 3\frac{1}{3}, 3\frac{2}{3}, 4$ on the washing line and then calculating simple additions as for halves and quarters.

Hand

Students build simple fraction addition problems using materials of different colours of whole paper strips and fraction strips they have made by partitioning the wholes into halves and quarters or thirds/sixths, adding various strips together, then recording the results in a Whole/Part chart.

Mind

Students visualise a number line between 0 and 5 and the position of mixed numbers (half, quarters, thirds) between pairs of consecutive whole numbers.

Creativity

Students create a game board or race track using wholes and fractions, halves, quarters and thirds, or show their understanding by collecting the left overs after a party.

Mathematics

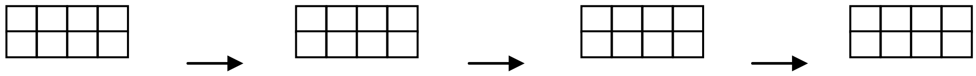
Language/ symbols

whole numbers, consecutive numbers, benchmark numbers, half, halves, quarters, thirds, sixths, eighths, partition, mixed numbers, horizontally, vertically

Practice

1. **Sandwich relish**. Rules: Each player has a game board with four rectangles divided into eighths. A die is thrown in turn by each player (here the numbers on the die stand for eighths). The same number of eighths are shaded on the board as the number on the die. Players state how many eighths they have thrown and, progressively, how many wholes and eighths they have shaded in total (e.g. give the total fraction shaded across

the board as a mixed number). If stated incorrectly, the player misses a turn. The first player with all four whole rectangles shaded wins.



2. **Card games**. Use the fraction discs, Whole/Part charts and cards with appropriate fraction names (e.g. 3 quarters, 2 eighths) for the following games. "Lose 5 ones": Students start with 5 wholes on the Whole/Part chart, take turns in drawing a card and taking away that number of quarters, eighths, etc. Students have three turns each, compare numbers when finished and winner is the one who has the smallest number. "Win 5 ones": The opposite to the game above – start with zero and build to 5 ones. The game can be adapted to thirds, sixths and ninths; or fifths and tenths.
3. **Race track**. This is similar to Sandwich relish. On the game board, draw five rectangles in the shape of a pentagon and divide them into sixths or eighths/ninths/tenths. Start at the bottom left-hand corner, throw a die to move the player's car the same number (e.g. sixths) stating how many sixths were thrown and, progressively, how many wholes and sixths they have moved in total (e.g. give the total fraction across the board as a mixed number). If stated incorrectly, the player misses a turn. The first player to get back to the start/finish is the winner.
4. Worksheet to identify unit fractions, equivalent fractions and mixed numbers under the appropriate column.
5. Practise solving simple addition of fractions by counting fractions along number lines.
6. Build a fraction wall and shade the equivalent fractions.

Connections Relate fractions to division and measuring with units in money and measurement.

Reflection

Validation Students check where mixed numbers occur in the environment, e.g. $2\frac{1}{3}$ m of dress material, left-over pizzas, new pencils and sharpened pencils, building materials.

Application/ problems Provide applications and problems for students to apply to different real-world contexts independently; e.g. Students design an obstacle course that has obstacles at thirds, sixths and ninths over a 5 km course.

Extension **Flexibility**. Students can understand and record whole numbers and fractions in many ways – symbols, words, equivalent fractions – and use fractions in many contexts.

Reversing. One of the very important aspects of teaching the fraction meaning is to reverse the process – to ensure that teaching covers **all** the following:

- WHOLE → PART (give students a paper square, say it is one whole, and ask them to fold to get $\frac{3}{4}$)
- PART → WHOLE (give students a paper square, say it is $\frac{3}{4}$, and ask them to make one whole)
- WHOLE/PART → WHOLE/PART (give students a paper square, say it is $1\frac{1}{4}$, and ask them to construct $\frac{1}{2}$).

Generalising. *When we take a whole and break it into "q" equal parts and shade "p" of them, the fraction is "p qths" or $\frac{p}{q}$. Equivalent fractions are made by multiplying the given fraction, e.g. $\frac{1}{2}$, by 1 in any of its fraction forms: $\frac{2}{2}, \frac{3}{3}, \frac{4}{4}, \frac{5}{5}, \frac{6}{6}$ … to give: $\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}, \frac{1}{2} \times \frac{3}{3} = \frac{3}{6}$ and so on.*

Changing parameters. Students continue to apply halving thirds to locate, label and count by twelfths including mixed numbers. Students apply the same principles to halves, quarters, eighths, twelfths, and fifths, tenths.

Teacher's notes

- Ensure students understand the unit fraction partitioning before proceeding to improper fractions and mixed fractions.
- It is crucial to ensure that students maintain the whole throughout. When a paper rectangle is folded into four, some students see four wholes not one whole. Thus, we spend time at the start stressing what the whole is and keep a coloured whole to compare the part with. Other methods to do this are running a finger around the whole while saying "this is one whole". The idea is to act out the formation of the whole, so that the kinaesthetic sense is in action as well as sight, hearing and touch.
- The two notions that underlie the teaching of fraction are unitising, making a whole out of parts (even if only in the mind), and partitioning, making parts out of a whole.
- Students need to be taught the skill of visualising: closing their eyes and seeing pictures in their minds, making mental images; e.g. show a picture of a kookaburra, students look at it, remove the picture, students then close their eyes and see the picture in their mind; then make a mental picture of a different bird.
- Suggestions in Local Knowledge are only a guide. It is very important that examples in Reality are taken from the local environment that have significance to the local culture and come from the students' experience of their local environment.
- Useful websites for resources: www.rrr.edu.au; https://www.qcaa.qld.edu.au/3035.html
- Explicit teaching that **aligns with students' understanding** is part of every section of the RAMR cycle and has particular emphasis in the Mathematics section. The RAMR cycle is not always linear but may necessitate revisiting the previous stage/s at any given point.
- Reflection on the concept may happen at any stage of the RAMR cycle to reinforce the concept being taught. Validation, Application, and the last two parts of Extension should not be undertaken until students have mastered the mathematical concept as students need the foundation in order to be able to validate, apply, generalise and change parameters.