YuMi Deadly Maths

Year 3 Teacher Resource:

NA – Wholes and parts

Prepared by the YuMi Deadly Centre
Faculty of Education, QUT

YuMi Deadly Maths Year 3 Teacher Resource: **NA – Wholes and parts**

QUT

YuMiDeadly
Growing community through education

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.

TERMS AND CONDITIONS OF YOUR USE OF THE WORK AND RESTRICTED WAIVER OF COPYRIGHT

Prepared by the YuMi Deadly Centre
Queensland University of Technology
Kelvin Grove, Queensland, 4059

ydc.qut.edu.au

Year 3 Number and Algebra

Wholes and parts

Learning goal

Students will:

- describe fractions as equal-sized parts of a whole
- represent halves, fourths and eighths of a whole shape or object.

Content description

Number and Algebra – Fractions and decimals

- Model and represent unit fractions including ½, ¼, ⅓, ⅛ and their multiples to a complete whole (ACMNA058)

Big idea

Number – part-whole; whole-part

Resources

Apple, orange, wraps, cakes, chocolate bars, liquorice strips, blunt knives, scissors, paper squares, circles, rectangles; paper multiples of half and other fraction shapes; chalk, cord or velour strips, pattern blocks; same-length strips of paper; other polygons; virtual shapes

Reality

Local knowledge

When do we cut up something that's big into smaller equal pieces? [cutting up one big whole fish, cakes, pizzas, pies, fruit, chocolate bars into smaller pieces to share]. *Where do we find halves in the local environment?* [half a glass of water, half a sandwich, halfway home].

Prior experience

Check students' understanding of a whole. (Any object that has had nothing removed from it. Note: this lesson does not include the set model.) *What are some things where we can use the whole object?* [We can eat a whole apple, a whole cupcake; use a whole pencil]. *What are some objects we share and cut into pieces? How many pieces do we get when we cut something into halves/quarters/eighths?* Check that students can count and know numbers and basic shapes.

Kinaesthetic

Teacher models one at a time, cutting an apple into halves, a liquorice strip into quarters and a cake into eighths. For each example, follow this sequence. Identify the whole: *This is a whole apple.* Emphasise that fractions have to have **equal** parts: *If I cut the apple into halves, how many parts will I get?* [two]. Cut the apple into two obviously unequal parts. *I have cut the apple into two parts but have I cut the apple into halves?* [no]. *Why not?* [halves mean that the two parts or pieces have to be the **same size**, one part has to be **equal** to the other part]. Name the parts: Hold up one piece then the other saying, *This is one half, this is one half.* Put them together, *Two halves give us the whole apple back*. (Repeat for quarters and eighths.) Select a number of parts, e.g. two halves, three quarters, five eighths etc. and show the parts taken out of the whole. For each example ask: *How many parts was the whole cut into? How many parts have I taken?* Name that fraction and show the symbol on a card in word and fraction form. In each case, the remaining part of the whole should be discussed, naming the remaining parts as halves, quarters, eighths, how many equal parts were left and then naming the fraction that was left. In each case ask: *What number in the fraction tells us how many equal parts to cut the whole into? What number in the fraction tells us how many of those parts to take?* Emphasise that the bottom number in the fraction symbol: 2, 4, or 8 tells how many parts the whole is being cut into and the top number in the fraction tells how many of those parts we are taking.

Groups of students rotate to cut whole unfilled wraps, chocolate bars, cakes etc. into halves, quarters and eighths according to the symbol at each station. *How many equal pieces do you need for ½, ¼, ⅛? What number tells you how many equal parts to cut the whole into?* [the bottom number: 2, 4, or 8; the bottom number tells the kind of part, halves, quarters, eighths]. *If you are asked to take 2 halves/quarters/eighths, what number tells you how many parts we are taking? What number tells you how many of those parts to take?* [the top number tells how many parts to take].

Reverse: Set up another rotation with multiple paper fractions in boxes, all fraction parts of equal size. One at a time, place one fraction part on the desks and name it, e.g. one half – ½, one quarter – ¼, one eighth – ⅛. Hold up the part e.g. *This is a half*. Have students repeat: *This is a half.* Teacher: *If this is one half, find the other half in the box to make the whole*. Ask students to check that the two halves are exactly the same. *How can we do this?* [put one half over the other half – they should fit exactly with no overlaps and no spaces left]. Now make 2½, ¾, ⅝ etc. Vary the sizes and shapes, e.g. small/medium/large using squares/circles/rectangles having a different size/shape at each station.

Abstraction

Body

Have large squares, circles, rectangles drawn in chalk in one row on the cement. Take each shape one at a time and have students cut each shape into halves using cord or velour strips. *How many equal parts will I have in the square/circle/rectangle?* [two equal parts]. *Are the two parts equal? Can I put the cord in another way and still get two equal parts? See if you can find other ways to put the cord so that we still get two equal parts, two halves*. After each attempt, ask: *Are the parts equal? Do we have halves?* After the shapes have been divided into halves in as many ways as possible, say: *If I want to show one half of the shape*, *how many pieces am I talking about*? [one]. *What number in the fraction tells me that I am talking about just one half?* [the top number]. Have one student go and stand/lie in just one half of the shape*. We have one student standing/lying in one half of the shape and one half of the shape is empty.* Repeat process for quarters and eighths representing unit fractions and their multiples. *We call quarters "fourths" because the whole is cut into four pieces to make quarters. How many pieces is the whole cut into to make halves?* [two equal parts]. *Could we call halves "twoths" because the whole is cut into two equal parts?*

Hand

Fold square, rectangular, circular paper sheets/strips into halves. *Are there different ways you can cut the shapes into two equal parts?* Students cut each shape into halves in as many ways as they can. *How many equal parts do you need to make halves? Describe the two parts. Are they equal? Check to see whether your parts are equal. How will you do this?* Students then paste the whole on a piece of paper, name it, "whole", and paste the halves (in as many ways as possible) underneath the whole, naming them, "half of the whole". Repeat making quarters and eighths.

Students use pattern blocks to:

(a) start from the whole, and find half/quarter;

(b) start from a half/quarter, and make the whole.

Mind

Close your eyes and in your mind see a whole circle, see ½, ¼, ¾, ⅜, ⅝, ⅞, and so on. Use other polygons in the same way. *With your eyes closed, draw ½, ¼, ¾, ⅜ of a circle*.

Creativity

Students make drawings of flowers, oranges, bun loaves etc. and insert lines to cut the shapes into halves, quarters, eighths.

Mathematics

Language/ symbols

fraction, partition, equal, not equal, parts, pattern, half, halves, halving, "twoths", quarter, fourth, quarters, fourths, eighths, whole, same, shape, object, area, relationship

Practice

1. Blank sheet of paper: glue one whole strip; write "1, whole" beside it. Fold a whole strip into two halves; cut into two pieces and glue one half under the whole; write "½, half, twoth" beside it. Repeat process for other fractions.
2. Worksheet with four columns: (a) rectangle/strip shaded, (b) circle shaded, (c) language – e.g. three quarters, (d) symbol – e.g. ¾; fill in only one column (different for each example) – students fill in other columns.
3. Play games like Mix-and-match cards and Bingo.
4. Virtual activities.

Connections	Relate fractions to division and measuring with units.

Reflection

Validation	Students check where they need to cut whole pieces into smaller bits, e.g. cutting up oranges to share at sport competitions. Search for examples of fractions in the local environment, e.g. window divided into four equal parts.
Application/ problems	Provide applications and problems for students to apply to different real-world contexts independently; e.g. survey the class to find out the students' preferred type of pizza. Write the name of the pizza and the number of students who like it. (There can be no more than 8 in a group.) Draw a pizza for each group and cut it so that each student in the group gets an equal share. (The number of equal parts depends on how many students like that particular type of pizza.) *Which group gets the biggest slice? Which group gets the smallest slice? What does this tell you?*
Extension	**Flexibility**. Students are able to make fractions in more than one way using a variety of shapes. Students look for all the different places/objects where fractions can be used. **Reversing**. Students can start from any point and give other forms: make models, tell stories, write symbols and words and start from the whole to make fractions or given the fraction, make the whole. • WHOLE → PART (give students a paper square, say it is one whole, and ask them to fold to get ¾); • PART → WHOLE (give students a paper square, say it is ¾, and ask them to make one whole). **Generalising**. Students know that when a whole is partitioned/cut into equal pieces, the fractions/pieces are described by the number of pieces there are. The bottom number of the fraction tells how many pieces the whole has been partitioned/cut into and the top number tells how many of those pieces we have taken. **Changing parameters**. Students continue halving models and materials to explore equivalent fractions connected to the halving family. *What would we call fractions that are broken into 6, 9, 11 bits?* *Are all wholes the same?* [no – e.g. two different-sized apples, two different-sized ropes, different family groups]. *Are all halves the same?* [yes, if they're part of the same whole; no, if the halves come from different wholes]. *If we divided a whole into "Fred" bits, what would we call the bits?* ["Fredths"].

Teacher's notes

- Ensure that students know that halves are made when we have two **equal** pieces made from the whole and similarly for other fraction types. Halves are equal when they are part of the same 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.

