YuMi Deadly Maths

Year 2 Teacher Resource:

NA – How many clumps?

Prepared by the YuMi Deadly Centre
Faculty of Education, QUT

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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 2 Number and Algebra

How many clumps?

Learning goal

Students will:

- represent multiplication and division
- connect division and multiplication using part-part-whole terms

Content description

Number and Algebra – Number and place value

- Recognise and represent multiplication as repeated addition, groups and arrays (ACMNA031)
- Recognise and represent division as grouping into equal sets and solve simple problems using these representations (ACMNA032)

Big idea

Number – factor-factor-product

Resources

Hoops, Maths Mat, elastics, number line, counters, cubes

Reality

Local knowledge

Students identify from their local environment where they see equal groups combined to make a total, e.g. equal number of lollies put into party bags; items that are seen in rows or packs such as rows of children in a choir/band, seats at the movies, packs of bottled water, small packs of sultanas.

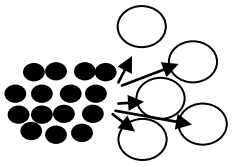
Prior experience

Check that students understand addition. Revise 2 + 3, group of 2 students and group of 3 students. *How many? How do you know it's 5?* Physically put the groups together so the addition process is seen as joining groups. *Tell me other addition stories*.

Kinaesthetic

Check that students can model both addition and multiplication, e.g. 3 + 4 and 3 × 4. *What is the same about them, what is different?* [same numerals, different operations]. *Addition is joining 3 and 4 but multiplication is lots of 4, the 3 is seen in how many lots of 4 we have*. When students have grasped multiplication, use the students to act out the set model of division. Play the "clumps" game – clumps of 4 students, 6 students, etc. *How many clumps?*

Place out 5 hoops with 3 students discussing their favourite TV show in each hoop. *How many altogether? 5 lots of 3, 5 × 3 = 15*. Reverse: 3 rectangles with 5 students in each; *3 lots of 5 students, 3 × 5 = 15*. Tell other stories with the 3 × 5 = 15 family of facts. Give other examples of multiplication using the set model so that students understand that multiplication means "clumps or groups" of an equal number in the clump or group.



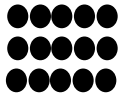
Compare the operations of subtraction and division (subtraction is taking away, division is making equal groups). Set model (15 ÷ 5 = 3 – sharing). Count out 15 students and get them to model being shared equally into the 5 activity groups. *How many are in each group?* Provide other examples of division, connecting to the factor-factor-product big idea.

Abstraction

Body

Array model of multiplication: On the Maths Mat, form lines of students who like these sports: 5 students in a line who like playing football, 5 students behind them who like playing netball, 5 students behind them who like swimming. Link to addition: 5 + 5 + 5. *Today we are going to see a deadly way of seeing how many there are in these sports. How many rows do we have? How many in each row? Use the doubles plus another lot to calculate the whole: 2 lots of 5 plus another 5*. Reverse: *What would happen if we had 3 students playing football, 3 playing netball, 3 swimming, 3 playing soccer, 3 playing tennis?*

Do we have the same number playing sports? What does that tell us? 3 × 5 is the same as 5 × 3 and both parts make 15. These are a family of facts – 3 and 5 are the parts and when multiplied together, they always give 15 as the total or whole.



Use other students to link the multiplication array made above to division.

15 ÷ 3 = 5: 15 has been made into 3 rows of students with 5 in each row (horizontal).
15 ÷ 5 = 3: 15 can be seen as 5 groups (vertical) with 3 students in each group or column.

Use elastics on the mat to demonstrate other triads for multiplication and division.

Hop along the number line: Students take hops in threes and count: 3, 6, 9, 12, 15. *How many hops?* [5] *How many in each hop?* [3] *What does 5 lots of 3 make?* [15] Reverse: Students take extra big hops in fives and count: 5, 10, 15. Repeat questions.

Use hops on the number line to demonstrate the concepts of division. How many groups of 3/5 in 15 is easy to show as students can count in threes (or fives), put a marker at each group of 3 or 5, and then count the markers showing that there are 5 groups of 3 or 3 groups of 5.

Sharing is a more difficult process because to share an amount among 5 people means that how many each of the 5 people get is unknown initially. On the number line, this can only be done by trial and error, guessing. A better way is to have the 5 people in a line and distribute the whole by giving each person one at a time until the whole has been given out.

Hand

Students use counters and/or Unifix cubes to represent multiplication and division stories using the set and array models. Start from any of the representations: i.e. stories→ acting out→ pictures→ language→ symbols and proceed to cover all representations from any given point. Students should then have a bank of number facts in their books.

Mind

Students visualise multiplication and division stories with their eyes closed. It is important to provide opportunities for students to give these stories.

Creativity

Students choose their own medium to represent multiplication and division. They share their stories with their partner or class.

Mathematics

Language/ symbols

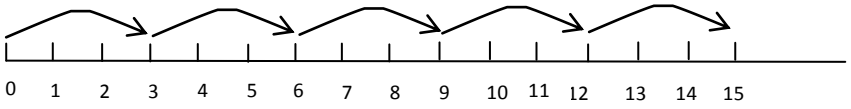
multiplication, groups, equal-sized groups, groups of, equal, not equal, arrays, rows, columns, number line, repeated, left overs, altogether, division, share, equal shares, parts, whole, factor, product, ×, ÷, =

Practice

1. Give examples of multiplication and division stories using the number line. For example:

   (a) Multiplication: *5 runners in a marathon team race had to run laps that were 3 km each. How long was the race altogether?*

   (b) Division: *The marathon was 15 km and each lap was 3 km long. How many runners would be needed for the team?* [How many 3s in 15 so count off in 3s, 15 ÷ 3 = 5.] Students can group since there are 3 spaces (km) in each lap. Reverse: *The marathon was 15 km and there were 5 runners in the team. How far did each runner have to run?* (This is harder as it needs to be done by trial and error.) *Will each runner need to run 1 km, 2 km, 3 km?* 15 ÷ 5 = 3 in terms of sharing is found by acting out an amount for each of the 5 laps.



2. Give examples of multiplication and division stories where students may choose to represent the operation in any of the models and then write the symbols. Reverse: Give models and students write the missing parts (story and symbol) or give symbol. For example, 4 × 6 and students write/tell the story and give one/all of the models (set, array or number line).

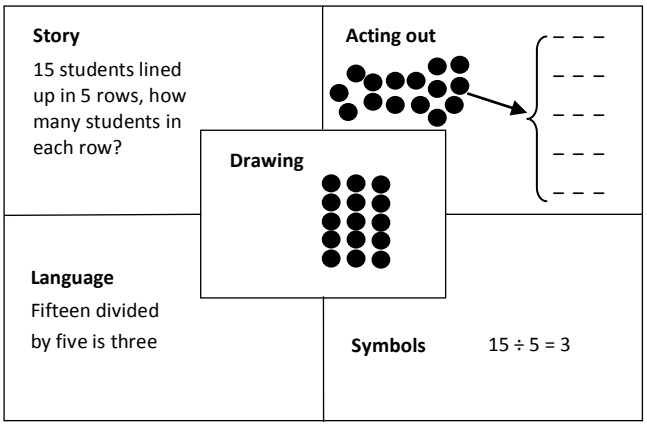
Connections Relate to place value and link arrays to area and fractions.

Reflection

Validation Students check and find situations where multiplication and division stories happen in their life; e.g. buying items so that each sibling has the same amount; sharing lollies so that each child has an equal amount.

Application/ problems Provide applications and problems for students to apply to different contexts independently; e.g. thinkboard stories/problems where one part is missing. Ensure that:

- **all meanings and models are covered** – that is, multiplication, division (group and sharing) and set, number-line and array models;
- **all connections are both ways** – that is, students can write a story for language or symbols, and can interpret a drawing in a story or symbols;
- **stories are for a variety of situations** – that is, students can write shopping, sporting, fishing, driving, TV stories, and so on; and



- **operations are generic** – that is, students understand that 5 × 3 = 15 means that 5 bags of 3 fish is 15 fish, 5 bottles at $3 each is $15, 5 people run 3 km each to run the 15 km, and so on. Thus, 5 × 3 = 15 holds for every set of objects and every measure in the world.

Extension **Flexibility**. Students are able to identify multiplication and division in any of the forms.

Reversing. Provide opportunities for students to begin from any of the representations and complete the others: stories→ acting out→ pictures→ language→ symbols.

Generalising. *In multiplication, one of the numbers (factors) refers to a quantity of things and the other number (factor) is the number of groups of those things. Multiplication involves the combination of equal groups. Division is a situation when the product and one part (factor) is known and the other part (factor) is wanted*.

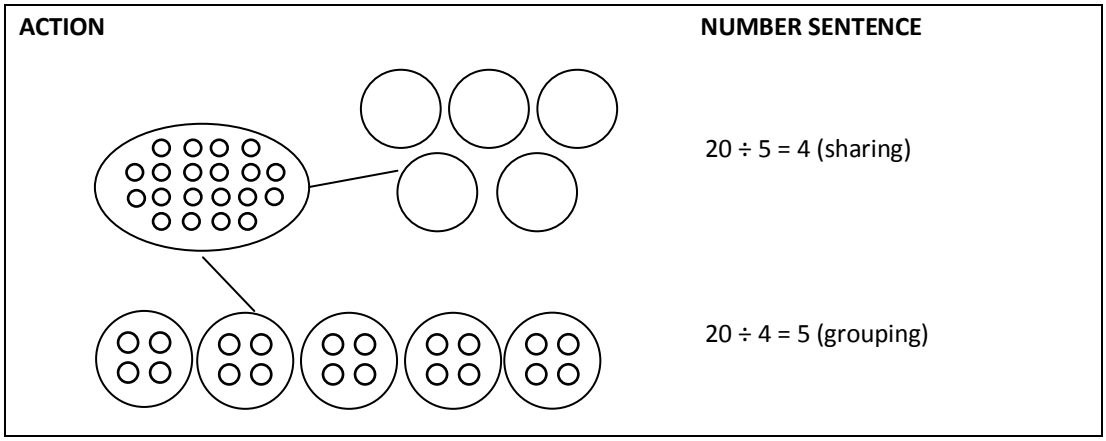
Changing parameters. Consider multiplying by the identity element for multiplication, i.e. multiplying by 1 gives the same amount. Multiplying by 0 results in zero.

Teacher's notes

- This resource has shown the array, set and number-line models which is acknowledged to be too much for one lesson. The teacher resources offer ideas that can be taken and used over a number of lessons.
- It is important to show the link between addition and multiplication, that 4 + 4 + 4 is the same as 3 lots of 4. Students must be able to see that 4 individual cubes and 4 individual cubes and 4 individual cubes added together make a total of 12. However, 3 lots of 4 cubes is seen in having 3 stacks of 4 cubes

where 4 is seen by counting how many in each stack but the 3 is seen by counting how many stacks (groups) of 4 there are. Subtraction and division are also linked.

- Discuss the concepts of sharing and grouping: sharing (partition) is how many groups whereas grouping (quotation) is how many in each group (see diagram below).



- 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.

