GROWING
Mathematically

Multiplicative Thinking

Teaching Tasks
(Zone 2)

Zone Two Activities

The tasks listed on the initial page(s) are rich tasks from **reSolve** and **Maths300** that may be used with multi-zone groups. The tasks that follow these pages are suitable for students who are working in Zone 2.

reSolve

Multiplication: Domino Arrays (Array/region based mental strategies);
reSolve Fruit Shop (More efficient strategies for counting groups)

Maths300

Cookie Count: Zones 2 – 5
This task introduces the idea of equal shares. Challenges occur at a range of levels with both whole numbers and fractions.

Halving Squares: Zones 2 – 3
This task begins as a spatial paper folding exercise involving halves to an open-ended exploration that leads to all sorts of mathematics.

Tackling Times Tables: Zones 2 – 6
This task builds the conceptual background using an array model and explores the number bonds associated with multiplication facts and the distributive law. It can be extended into algebraic reasoning using the structure of the array model.

Nine and Over: Zones 1 – 3
This task is designed to be revisited regularly to continue to develop deep understanding of place value through a continuous concept development approach. There is software available to support the conceptual development as well as additional place value resources.

Number Charts: Zones 1 – 4
This task covers additive strategies in Zones 1 and 2 and multiplicative strategies in Zones 3 and 4. The task seamlessly connects the inverse operations and uses reasoning strategies. Connects to Fractions and Fraction Charts and Algebra Charts.

Highest Number: Zones 1– 3
This task starts out as a simple, well-known place value game with cards, but develops into many other learning outcomes, including statistics and probability.

Making 1000: Zones 1 – 2
This task uses concrete materials to explore the number of ones, tens and hundreds in a thousand. It lays the foundation of the multiplicative nature of place value and extends into square and cube numbers.

LOTSA LIDS

Specific teaching focus

To introduce more efficient strategies for counting groups by developing place-value based strategies.

Materials/resources required

An increasingly large collection (in the hundreds) of juice and milk bottle lids (collected over time)

How to implement

1. Ask students to bring in juice and milk bottle lids throughout the year.

2. Each month, after estimating the number in the collection, ask students to count the collection. Each time, before counting discuss suitable methods to use, and after counting, review the suitability and efficiency of the method used.

3. Discuss with students that efficient ways to count large collections, that is, by using countable units of 10. E,g. stacks or piles of ten counted by 2s, 5s, or 10s. The count of ten being the countable unit.

Follow up suggestions

- For a given number of tops. E.g. 40, ask students what would the length be if the 40 tops are placed in a line, edge to edge, without gaps between?

- For a given number of tops. E.g. 50, what would the height of 50 bottle tops be if stacked on top of each other?

- How could we work out the length and height from the two previous investigations if we had only one bottle top?
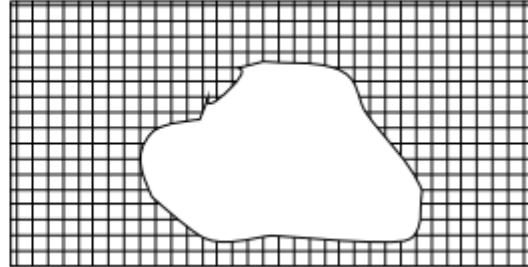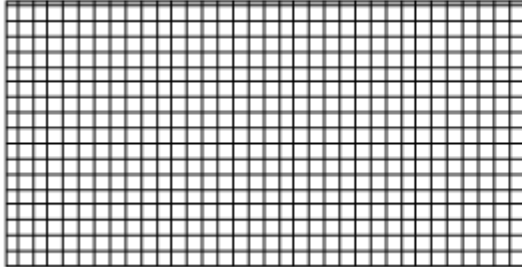
PAINT SPILL

Specific teaching focus

To introduce efficient strategies for solving problems where arrays and regions only partially visible.

Materials/resources required

A3 size blank grid paper and irregular shaped paper cut-outs to act as a paint spill (see below)

How to implement

1. Use a blank A3 size grid paper (see above) to model a tiled floor.

2. Have a piece of paper to "throw" onto the grid to represent a paint spill on the tiles (see above).

3. Tell students, "The paint has stained the tiles and these will need to be replaced. How many tiles do we need to buy?"

4. Encourage students to look for arrays within the paint-spill area and use strategies other than counting by ones to determine the total.

MULTIPLICATION TOSS

Specific teaching focus

To introduce using arrays and regions (communicative principle) by developing the relationship between 3 fours and 4 threes.

Materials/resources required

- 1cm square grid paper
- Square counters or coloured pencils/Textas
- Two 6 or 10 sided dice

How to implement

1. Teacher models the roll of two dice for the class. E.g. A 3 and a 6 are thrown, this can be used to construct 3 sixes or 6 threes (3 rows of 6 or 6 rows of 3).

2. Using the counters or colouring in, the teacher places (or draws) an array on a grid to show this. Teacher explains that students will take turns to roll the 2 dice and construct (or record) arrays accordingly, progressively filling up the grid paper.

3. Students then take turns rolling the dice for themselves and record their rolls on their own grid, trying to cover their grid. Eventually the space on the grid paper will decrease. E.g, What if it won't fit as 3 sixes? Can it be placed as 6 threes?

4. After a time limit has expired, see who has managed to cover the most of their array grid.

Follow up suggestions

- Students can split a turn if this strategy will be more useful. E.g. 3 sixes can be placed on the grid as 1 six and 2 sixes (see below). This will help fill in some of the smaller gaps.
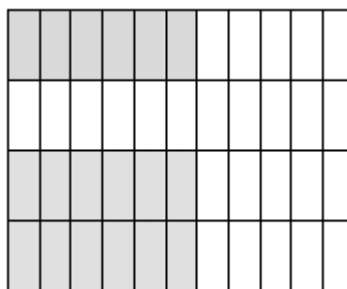
EXPLORING FACTS

Specific teaching focus

To introduce informal division strategies – through organising a collection into different arrays to further understand the relationship between multiplication and division.

Materials/resources required

- Counters
- Stickers

How to implement

1. Provide each student with 24 counters. Ask, "How many different ways can you share these 24 counters evenly with no counters left over?"

2. Ask students to display their thinking with the counters and record as arrays using stickers on a card or in workbooks. Label the arrays. Eg. 8 threes or 3 eights for 8 rows of 3 or 3 rows of 8 respectively.

3. Repeat with other collections. Eg. 36 and 48.

A CUP-CAKE COLLECTION

Specific teaching focus

To introduce informal division strategies through sharing collections into a given number of groups and using the think multiplication strategy.

Materials/resources required

- Cup-cake worksheet (see below)
- Counters
- Plates or serviettes

How to implement

1. Distribute a cup cake worksheet to students and explain they are going to share each tray of cupcakes equally with friends. Counters are used to model each situation (taken in turn). Students having difficulty can be given the appropriate number of 'plates' to put the counters on
.
2. There are 12 cupcakes on each tray.

   Share the 1st tray with 4 people. Discuss "4 whats? are 12."

   Share the 2nd tray with 3 people. Discuss "3 whats? are 12."

   Share the 3rd tray with 2 people. Discuss "2 whats? are 12."

   Share the 4th tray with 6 people. Discuss "6 whats? are 12"

Based on sharing with counters, students can show their understanding by cutting and pasting the printed cup-cakes into their books, and describe their thinking using as much mathematics as possible. Eg. "I can share 12 cupcakes with four people and each person gets 3 cakes. I know that 4 threes are 12."

PAINTING PROPORTIONS

Specific teaching focus

To introduce simple proportion problems through the use of non-numerical comparisons.

Materials/resources required

- Food dye
- Eye dropper
- 500ml measuring jug
- Cups for students to mix water and dye
- Water
- Paintbrushes
- Paper strips (10cm)

How to implement

1. Varying amounts of food dye with a set amount of water is used in order to see how the density of colour changes as more food dye is added. The suggested amount of water is 50ml. Food dye can be added by drops.

2. Teacher paints some strips. For example, one strip painted with 50ml of water and 1 drop of dye, and another strip painted with 50ml water and 8 drops of dye. (Note: keep the ingredients secret).

3. Students have 50ml of water to which they add food dye drop by drop. They paint strips each time they add a drop and try to match the density of colour on the strips to those the teacher has provided. Recording for each trial, how many drops were added.

4. Students write about and illustrate what they did, what they noticed and which two proportions best match the teacher's example and why they think this.

Follow up suggestions

- This activity could also be done using two colours of paint - for example, mixing yellow paint with an increasing proportion of red paint.

FOLDING FRACTIONS

Specific teaching focus

To introduce practical experience with both continuous and discrete, 'real-world' fraction models.

Materials/resources required

- Coloured kinder squares
- Play dough
- Icy pole sticks

How to implement

1. Supply students with coloured kinder squares.

2. Teacher holds a coloured kinder square and asks students, "How can this be folded in half?"

3. Showcase examples with the group. Discuss, number of parts, different shapes and the need for equality. Use this as an opportunity to look for any misconceptions.

4. Repeat this process for quarters. Ask students to explain their strategy for creating quarters. Eg. "I halved and halved it again."

5. Using play dough and icy pole sticks, teacher asks, "If I want to cut my play dough in half, what do I need to do?" Discuss cutting shapes in two. Cut different shapes, make some unequal to stimulate discussion of the need for equal parts.

6. Allow children to make their own shapes (eg, sausages, cakes) with the play dough and explore partitioning to show half.

7. Repeat this process for quarters.

8. Ask students to write about that they did and what they noticed.

A TALE OF TWO SPREADS

Specific teaching focus

To introduce practical experience with both continuous and discrete, 'real-world' fraction models.

Materials/resources required

- Salada biscuits
- Spreads
- Tray of baked slice

How to implement

1. Working with a small groups of students, teacher takes a Salada biscuit and spreads one half with Vegemite and asks, "What fraction of the biscuit has Vegemite on it?"

2. Spread peanut butter on a quarter of it, ask "What fraction is left?"

3. This activity can also be conducted using a slice of bread which lends itself to thirds.

4. Discuss with the students how these shares can be described. E.g. half, 2 quarters, 1 third.
   The focus is on the language, recognising that formal recording comes later.

Follow up suggestions:

- A small group of students can work together to make slice for afternoon tea.
- The slice is then used to support the following scenario: "Let's look at what happens when we cut this slice, so that we all get a piece." As the teacher cuts the slice (into progressively smaller parts) encourage students to observe and talk about what they notice.

For this activity, it's better to use something like slice in a tray rather than cutting a piece of paper, because each time the paper is cut, each piece looks like one whole.

This activity will facilitate understanding of the generalisation that as the number of parts increases the size of the part decreases or gets smaller.

LOTS OF COUNTERS

Materials/resources required

- Counters in clear plastic containers
- Container One: approx. 150
- Container Two: approx. 160
- Container Three: approx. 170
- Container Four: 180

Tuning in: Why do we need to efficiently count?

Explore and generate conversations about counting and why we need to efficiently count? (money, counting materials supplies when building (tiling, bricks), counting when cooking or baking, counting stock supplies)

Counting efficiently such as with 2s, 5s and 10s helps to support part-part-whole knowledge and allows us to trust the count by developing a deep understanding of numbers through flexible mental objects, we can develop the ability to see numbers flexibly – for example we know 10 is 5 or 5 or 5 lots of 2 or 9+1 - links to multiplicative thinking

Task 1

Distribute the containers with counters to each group and ask students to estimate how many counters are in the container and what strategies they used. Students are not allowed to open the container. Write each groups estimation on the board.

**When asking for their estimation, ask students to reason their estimations – What strategies did they use? Why?

Task 2

Ask students to empty their container on the floor, students must now estimate how many counters they think there are without physically counting. Ask students what their new estimation is - is this the same amount or different? Why or why not?

**When asking for their estimation, ask students to reason their estimations – What strategies did they use? Why?

Task 3

Ask the students to start counting the counters – look at which groups/students are counting efficiently and inefficiently – leave students to count for a little bit then stop and pause groups that are counting efficiently ask them to explain – use peer to peer learning

How would you count this collection? Why did you count it like that?

CONNECT FOUR TABLE DICE

Purpose

Recall basic multiplication facts, identify multiples, using the inverse relationship between multiplication and division.

Materials/resources required

- 1 ten sided dice between 2 players
- Table Dice Game board
- 4 counters each – a different colour for each player

Aim

To be the first player to cover four numbers in a row.

Rules

1. The first player rolls the dice and notes the number. This number indicates the multiplication fact to be used.

2. The player chooses to cover a multiplication fact using this number.

3. For example: if a 4 is rolled, you could place a counter on 28.

4. *You must tell your partner why you have chosen 28. " 28 = seven fours".*

5. The second player rolls the dice and covers a different fact.

6. The first player to cover four numbers in a row, either horizontally, vertically or diagonally wins.

7. Keep a record of who wins the most games in a certain time period.

DOUBLE, HALVE OR STAY

Purpose

To use appropriate mental strategies to double and halve two-digit numbers.

Materials

Two different coloured six-sided dice.

Aim

To be the first player to accumulate 10 points.

Rules

1. Play this game in pairs or a group of 3.

2. Nominate one coloured dice to represent the tens and the other to represent the ones.

3. Choose a target number between 5 and 122. Write it in your book.

4. Take it in turns to roll the dice to create a 2-digit number.

5. Make a decision:
    a. Double your number
    b. Halve your number
    c. Keep your number as it is.

6. After each player has had a turn, the player closest to the target number is declared the winner for that round and scores 1 point.

The winner is the first player to score 10 points.

Source: Paul Swan Dice Dazzlers