**Grade 3 : Parts and Wholes**
**"Exploring Division"**
*(From: Mathology)*

*Students play a herding game to explore equal grouping, then do an equal sharing activity related to loot bags. In pairs, students plan birthday parties for dogs and cats, dividing dogs into equal teams and dividing treats equally among loot bags. To consolidate, students are introduced to the division sign, then write the related division sentences for a given array. Students discuss how repeated subtraction and division are related.*

| Big Idea | Curriculum expectations |
|---|---|
| **Lesson Focus:** Exploring division using models<br><br>**Additional Focus:** Subtracting numbers to 25 fluently | **B1. Number Sense:** demonstrate an understanding of numbers and make connections to the way numbers are used in everyday life<br>• **Fractions: B1.6** use drawings to represent, solve, and compare the results of fair-share problems that involve sharing up to 20 items among 2, 3, 4, 5, 6, 8, and 10 sharers, including problems that result in whole numbers, mixed numbers, and fractional amounts<br><br>**B2. Operations:** use knowledge of numbers and operations to solve mathematical problems encountered in everyday life<br>• **Math Facts: 2.2** recall and demonstrate multiplication facts of 2, 5, and 10, and related division facts<br>• **Multiplication and Division: B2.6** represent multiplication of numbers up to 10 × 10 and division up to 100 ÷ 10, using a variety of tools and drawings, |

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|---|---|
| | including arrays<br><br>**C4. Mathematical Modelling:** apply the process of mathematical modelling to:<br>• represent, analyse, make predictions, and provide insight into real-life situations |
| Learning Goals | Success Criteria |
| We want students to:<br><br>● Explore division using models (repeated subtraction, number lines, arrays)<br>● Explore equal sharing/grouping | I can:<br><br>● think of division as equal sharing and equal grouping.<br>● use repeated subtraction, number lines, and arrays to help us divide. |
| Materials | Math Language / Vocabulary |
| ● Counters<br>● Math Mats: *(All Math Mats can be accessed by logging into your Mathology account)*<br>○ Math Mat 5: Number Lines<br>○ Math Mat 6: Number Lines<br>○ Master 14: Pawty Planning<br>○ Math Mat 1: Thinking Space<br>● Exit Ticket (*Exit ticket can be accessed by logging into your Mathology account)* | ● Equal grouping<br>● Equal sharing<br>● Skip-count<br>● Repeated subtraction<br>● Division<br>● Division sentence<br>● Array |

## Prior Knowledge

Students may benefit from prior experience with:

- skip-counting backward
- multiplying using models
- decomposing numbers and objects into equal groups, with and without leftovers using a number line
- subtracting numbers to 25
- representing multiplication as equal grouping and division as equal sharing

**Key Concepts:**

- One way to model multiplication and division is to use repeated groups of equal size.
- Multiplication and division are related. A division problem can be thought of as a multiplication problem with a missing factor (unless 0 is involved). So 24 ÷ 6 can be rewritten as 6 × ? = 24.
- The array can be a very useful model for multiplication and division because it structures repeated groups of equal size into rows and columns.
    - In a multiplication situation the number of rows and the number of columns for the array are both known.
    - In a division situation the total number of objects is known, as well as either the number of rows or the number of columns. In order to create an array to represent a division situation, the objects are arranged into the rows or columns that are known until all the objects have been distributed evenly.
- The array helps make visual connections to skip counting, the distributive property, and the inverse relationship between multiplication and division.
- Fair-sharing or equal-sharing means that quantities are shared equally. For a whole to be shared equally, it must be partitioned so that each sharer receives the same amount.
    - Sometimes the share is a whole number (e.g., if 4 pieces of ribbon are shared equally among 2 people, each person gets 2 pieces of ribbon).

    - Sometimes the share is a fractional amount (e.g., if 4 pieces of ribbon are shared equally among 8 people, each person gets one half of a ribbon).
    - Sometimes the share results in a whole plus a fractional amount (mixed number) (e.g., if 4 pieces of ribbon are shared equally among 3 people, each person gets 4 one thirds or 1 and one third pieces of the ribbon).

- Comparing two different sharing situations involves reviewing the relationship (ratio) between the amount to be shared and the number of sharers.

    - If the amounts to be shared are the same, then the greater the number of sharers, the less each sharer gets.
    - If the number of sharers is the same, then the greater the amount to be shared, the greater each sharer gets.
    - If the amounts to be shared are the same as the number of sharers, then the amount each sharer gets is the same for each situation.

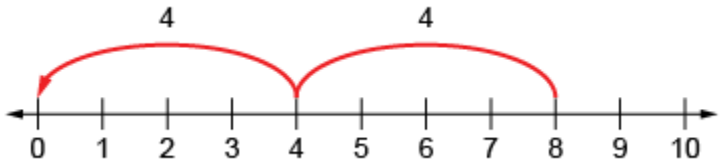
*Note*

- Words can have multiple meanings. It is important to be aware that in many situations, fair does not mean equal, and equal is not equitable. Educators should clarify how they are using the term "fair share" and ensure that students understand that in the math context fair means equal and the intent behind such math problems is to find equal amounts.
- Fair-share or equal-share problems provide a natural context for students to encounter fractions and division. Present these problems in the way that students will best connect to.
- Fractional amounts can be expressed as a count of unit fractions (e.g., 2 one thirds), as words (e.g., two thirds), as a combination of numbers and words (e.g., 2 thirds), and symbolically (e.g.,2/3). As students come to understand fraction terms (halves, fourths, and so on) and use them independently, it is appropriate to introduce the corresponding symbolic fractional notation (see B2.9). Continuing to use all four ways of expressing fractions helps to reinforce the meaning behind the symbols.

## Minds On

**Equal Grouping game:**
Play a herding game with 8 volunteers. For example: “Rabbits, herds of 4.“ Students pretend to be rabbits and hop to make groups of 4. Record the result: 8 divided into groups of 4 is 2 groups.

Model other strategies students could use to find the number of groups:
– arranging 8 counters into groups of 4
– skip-counting backward by 4s: 8, 4, 0
– using repeated subtraction: 8 – 4 – 4 = 0
– taking jumps of 4 backward on a number line:




Repeat for herds of 5, 3, and 2. Discuss any leftovers.
Repeat with different numbers of volunteers.

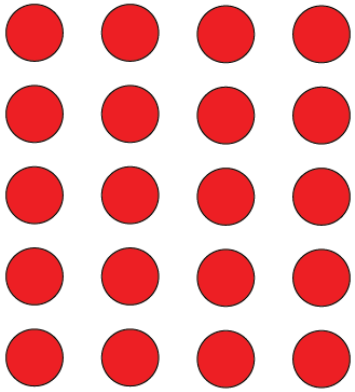
**Equal Sharing activity:**

> Mario is giving his dog a birthday party.
> He has 20 dog biscuits to divide equally among
> 5 loot bags.
> How many biscuits should he put in each bag?

Use 20 counters. Act out the equal sharing of the counters into 5 piles.

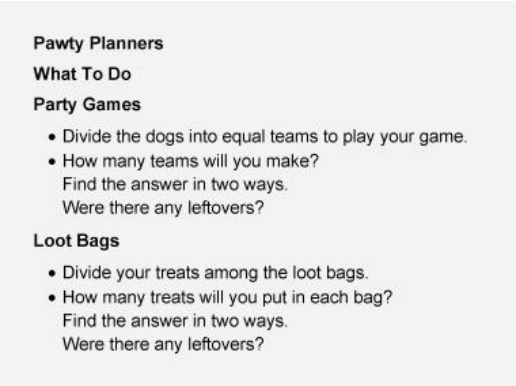
Count the number in each pile to see that each loot bag should have 4 biscuits.

Form an array with 5 rows of 4. Discuss how the array shows 5 loot bags with 4 biscuits in each.



## Action!

Give each pair a copy of the master. Have counters and number lines available. Students work together to plan parties for dogs and cats.



**Pawty Planners**

**What To Do**

**Party Games**

- Divide the dogs into equal teams to play your game.
- How many teams will you make?
  Find the answer in two ways.
  Were there any leftovers?

**Loot Bags**

- Divide your treats among the loot bags.
- How many treats will you put in each bag?
  Find the answer in two ways.
  Were there any leftovers?

Assign each pair a party game for dogs (equal grouping) and a treat for cats (equal sharing). Have students give each team a mascot and draw designs for the loot bags. Encourage students to record their work on the Thinking Space Mat.

**Probing Questions:**

- *How did you divide the dogs into equal teams?*
- *What would you do if there were any dogs not on a team?*
- *How did you share the treats among the bags?*
- *What would you do if there were treats left over?*

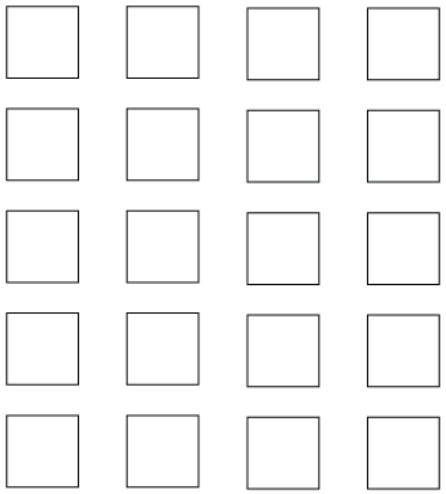
## Look-Fors

- How do students group the dogs to find the number of teams (e.g., modelling with counters, skip-counting backward, using repeated subtraction, taking jumps backward on a number line)?
- How do students share the treats (e.g., using counters, using an array)?
- How do students deal with any leftovers (e.g., ignore them; don't make teams of that size as dogs will be left out; don't share the leftover treats so all cats get the same amount)?
- Are students able to check their answers using a different strategy?

## Consolidation

Have students share the strategies they used to find the number of teams and number of treats in a bag. Make a poster of students' findings to finalize the plans for the parties.

Introduce the division sign. For example, 20 treats **shared among** 4 loot bags = 5 treats can be written as 20 ÷ 4 = 5. 10 dogs **arranged in groups of** 2 = 5 groups can be written as 10 ÷ 2 = 5.



Explain that the array shown here represents a strip of stickers. Ask, "If the stickers are shared among 5 people, how many will each person get?" (4) "Among 4 people?" (5) Relate the answers to the array. Record the related division sentences.

Discuss how repeated subtraction and division are related. Have students share times when they have had to share or group items equally.

To allow students to show what they have learned in this lesson, go to the **Exit Ticket** and/or **Practice** page

**Highlight for Students**

- We can think of division as equal sharing and equal grouping.

- We can use repeated subtraction, number lines, and arrays to help us divide.

## Supports for Student Learning

**Accommodation:** Focus on equal grouping and have students use counters to represent the dogs.

**Extension:** When a situation has leftovers, have students suggest what they could do so there aren't any.

## Independent Tasks / Assessment Opportunities

All assessments, in the moment feedback/prompts, and independent tasks can be accessed by logging into your Mathology account.

**SEL Self-Assessments (English) and Teacher Rubric**

## Extension Activities

Log in to your Mathology.ca / Mathologie.ca account to access Intervention and Extension activities, Professional Learning Videos and Assessment tools.

## Technology


If you require support logging into your Mathology/Mathologie account, please contact Kerry Stack or Erica Doucet.

https://etr.mathology.ca/


Use the Counters Tool to explore equal sharing. Drag 3 bear counters to the top of the workspace, then drag 20 counters to the bottom of the workspace. Have volunteers model sharing the counters among the bears. Discuss any leftovers. Or start with 20 counters and have volunteers make groups of 5, skip-counting backward from 20, or subtracting 5 with each group removed. Record a repeated subtraction sentence and connect repeated subtraction to equal sharing/grouping.