

NUMBER OPERATIONS

GRADE 2

ONTARIO EDITION

hands-on **mathematics**

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Introduction

The activities in this module are designed to develop students' understanding of number operations. Story problems are used throughout the module to provide a purpose for the mathematical tasks. The contexts provided will help students understand the meaning of the operations.

Note: The “Expressions and Equality” expectations from the Patterning and Algebra strand of *The Ontario Curriculum (2005)* are addressed in this module as they are related to skills and concepts of number operations.

Several lessons in this module include a section called “Next Step(s),” which guides teachers through a subsequent activity or sequence of activities to carry out with students, following developmentally from the preceding activity or activities.

As new math strategies are introduced in this module, create wall charts such as the following:

Mental Math Strategies We Know
Doubles
Near doubles (+1, -1)
Count-on
Count back
Think addition

Problem Solving Strategies We Know
Draw a diagram
Guess and check
Make a chart
Look for a pattern
Work backward
Solve with smaller numbers

Throughout this module, you may also consider including daily target-number activities, in which students are challenged with tasks such as the following:

- generate the number by adding two other numbers
- generate the number by subtracting one number from another number
- double the number
- find the sum of the number plus 20
- find the difference between the number and 5
- determine if the number is even or odd
- determine if the number is said when counting by 2s, 5s, 10s, and 25s

Students may have more suggestions for challenging tasks to complete with the daily target number.

Editorial Note to Teachers

Recent international research suggests that exposing students to *vertical* algorithms too early inhibits their ability to acquire flexible thinking strategies and number sense. Hence, in the *Hands-On Mathematics* books, the horizontal format is used to present addition and subtraction algorithms. You are encouraged to do likewise.

Mathematics Vocabulary

Throughout this module, teachers should use, and encourage students to use, vocabulary such as: *double, addition, near doubles, subtraction, addend, domino, facts, digit, one digit, two digit, equal, pattern, multiply, multiplication, divide, division, and array.*

Continue to use your classroom Math Word Wall as a means of focusing on new vocabulary. As new terms are introduced in the module, print them on index cards, and display them alphabetically on the Math Word Wall.

3 Missing Addends

Background Information for Teachers

The concept of missing addends is not new to students, as they were informally introduced to it in grade one. This lesson builds on their previous experience by having students apply the concept in game-like situations. Exposure to these situations over an extended period of time can promote students' use of the think-addition strategy when solving subtraction problems.

Questions involving missing sums, such as the example below, are easier for students to solve than questions involving missing addends:

$$a + b = \underline{\quad}$$

missing sum

Questions involving missing addends can be of two types:

$$\text{Type 1: } a + \underline{\quad} = c \quad \text{Type 2: } \underline{\quad} + b = c$$

missing addend missing addend

Note: The missing addend questions represented in type 2 are generally the most difficult for students to solve.

It is important to pre-assess students' abilities to solve questions involving missing sums before proceeding to questions involving missing addends. Students will experience more success solving problems with missing addends if they already have the ability to "count-on" from one number to another.

Materials

- counters
- ten frames (included in unit 5, lesson 4) (5.4.4)
- chart paper

- markers
- ten frames – dot mats (0-10) (included in the module, *Mental Math Strategies: Grades 1-3*. Cut out each ten frame, 0 to 10, and mount onto sturdy tagboard.)

Activity: Part One

Distribute counters and ten frames to students. Write the number 4 on a piece of chart paper. Ask students:

- What number, when added to 4, do you think will make 10?

On chart paper, record an addition fact by writing "4 +" and the number students predict ($4 + \underline{\quad} = 10$).

Now, have students use their counters and ten frames to determine whether or not their prediction is correct. Repeat the activity by asking students:

- What number, when added to 6, will make 10?
- What number, when added to 3, will make 5?
- What number, when added to 4, will make 9?
- What number, when added to 2, will make 8?

Have students use their counters and ten frames to check each prediction. Use different numbers to continue the activity.

Distribute copies of Activity Sheet A (6.3.1), and have students complete each number story and draw pictures to show how they determined what each missing addend is.

Activity Sheet A

Directions to students:

Complete each number story. Draw a picture to show how you figured out what each missing addend is (6.3.1).



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Activity: Part Two

Hold up one of the ten frames with dots (0 to 10). Ask students:

- How many more dots do we need to fill the ten frame?

Repeat using various ten frames with dots.

Next Step

Introduce addition with missing addends to 18.

Problem Solving

- Alexis has 7 nickels. She finds more nickels under a chair. Now, she has 9 nickels. How many nickels did Alexis find?
- Thomas has a baseball card collection. He buys 5 more cards for his collection. Now, he has 18 cards in his collection. How many cards did Thomas have to begin with?
- Jack is hungry. He eats 8 almonds. He is still hungry, so he eats some walnuts. Altogether, he eats 16 nuts. How many walnuts did Jack eat?

Note: A reproducible master for these problems can be found on page 242.

Activity Centres

Note: For the following activity centre you will need four sets of 0-8 numeral cards (provided in the module, *Patterning and Algebra*, lesson 12: 1.12.1) for each working group of students. Photocopy, and cut out the cards ahead of time, and create a deck of thirty-six cards for each group.

- Divide the class into working groups of students, and have them play “Make 8.” Provide each group with a deck of thirty-six 0-8 numeral cards, and have one player from each group divide all the cards among the players in the group. Tell players to put their cards facedown in a pile in front of them.

Have Player *A* in each group turn over the top card in his/her pile and place it, face up, in the centre of the playing space. Have Player *B* turn over his/her top card. If this card and the card in the centre add up to 8, Player *B* takes both cards and places them in his/her “win” pile. If the two cards make more than 8, they are placed in the discard pile. If the two cards make less than 8, Player *C* tries to make 8 with the next card.

Play continues until all players have used up all of their cards. The player with the greatest number of cards at the end wins.

Note: Vary the game by having students make other sums.

- Divide the class into groups of three students, and have them play “What Am I?” Give each group a set of numeral cards from 1 to 9. Have the groups shuffle their cards and place them, facedown, in the centre of the playing space.

Tell Player *A* and Player *B* to each take a card from the pile and, without looking at it, place it against their foreheads, facing outward. Then, have Player *C* add the two cards together and announce the sum. Have Players *A* and *B*, who can see each other’s cards, use this information to determine the unknown value of their own cards. Then, have players switch roles and play again.

Extensions

- Add the word *addend* to your classroom Math Word Wall.
- Distribute to each student a set of numeral cards from 1 to 9. Hold up a numeral card, and state a sum. Have each student

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hold up a card from his/her set that, together with your card, makes the required sum. For example, if you hold up a 7 and state the sum 10, each student should hold up a 3.

- Divide the class into groups of three students, and have them play “5s Go Fish.” Distribute to each group four sets of 0-5 numeral cards (each group should have a total of twenty-four cards).

Have a dealer for each group distribute five cards to each player and place the remaining cards, facedown, in a pile in the centre of the playing area. Tell players to take turns asking any other player for a number (numeral card) they need to make 5. If the player asked does not have the card, the asking player takes a card from the pile (“go fish”).

When players have two cards that make 5, have them place the pair face up beside them. The game continues until one player has used all his/her cards. The player with the most pairs of cards that make 5 is the winner.

Note: Vary the game by having students “fish” for other numbers. For example, students can use the ace through 9 cards from a standard deck of playing cards to play “10s Go Fish.”

What Is Missing?

$5 + \underline{\quad} = 7$

$8 + \underline{\quad} = 9$

$\underline{\quad} + 3 = 6$

$4 + \underline{\quad} = 10$

$\underline{\quad} + 2 = 5$

$\underline{\quad} + 7 = 9$

$\underline{\quad} + 8 = 8$

$3 + \underline{\quad} = 7$