NUMBER OPERATIONS
GRADE 2
MANITOBA 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.

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.

1 | Addition – Doubles

Background Information for Teachers

The activities in this lesson focus first on addition to 10. As students gain addition skills, next steps include addition to 18.

At the grade-two level, students are expected to recall addition facts to 10 with speed and accuracy. They are also expected to learn various strategies for determining sums beyond 10, to 100. Many of the activities in this lesson and subsequent lessons introduce strategies for addition first to 10 and then beyond.

Materials

- *Double Those Wheels*, a book by Nancy Raines Day
- bingo chips (two colours)
- overhead projector

Activity: Part One

Read the book *Double Those Wheels* with students. Ask:

- In the story, where is the monkey going?
- Why is he going there?
- Why does the monkey keep changing vehicles?
- What happens to the number of wheels each time the monkey changes vehicles?

Read the story again with students. This time, discuss the pictures that show the different vehicles the monkey uses. Help students recognize that adding the number of wheels on both sides of a vehicle or adding the number of wheels on the front half and the back half of a vehicle doubles the number of wheels.

Select one student to name a number that is less than 6. Now, help students double the number by telling them first to hold up fingers on one hand to represent the number named. Then, have students hold up that many fingers on

their other hand. For example, if the number is 3, students should hold up three fingers on one hand and then double that by holding up three fingers on the other hand. Ask students:

- How many fingers are you holding up?

Repeat the activity with different numbers that are less than 6.

Activity: Part Two

Before turning on the overhead projector, use two different colours of bingo chips to make a doubles pattern on the screen, as in the following diagram:
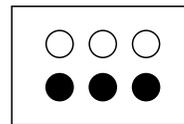
Have students focus on the dark screen. Then, turn on the projector long enough for students to see the pattern without being able to count the chips. Ask:

- How many chips are there?
- How do you know?

Repeat the activity for other doubles patterns to 10.

Note: **The technique of displaying visual representations of numbers for short periods of time is a strategy called *flash math*. Using flash math techniques helps students develop their abilities to instantly recognize random dot patterns, referred to as *subitizing*.**

Next Steps

- Introduce addition doubles to 18.
- Introduce students to the related subtraction facts (subtraction number sentences) that involve doubles to 10. For example:
  - $10 - 5 = 5$
  - $8 - 4 = 4$

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■ 6 − 3 = 3

Discuss with students the patterns that they see in the subtraction facts.

Problem Solving

Note: **The following problem refers to the book** *Double Those Wheels*.

■ In the story, the last vehicle the monkey used had 64 wheels. If the monkey changed vehicles one *more* time, how many wheels would the new vehicle have?

■ At snack time, each student gets 1 piece of cheese and 2 crackers. Make a chart to find out how many pieces of cheese and how many crackers are needed for 10 students. What about for 20 students? To help you, use the following sample chart for 4 students:

Students	Cheese	Crackers
1	1	2
2	2	4
3	3	6
4	4	8

Note: **A reproducible master for the previous problem can be found on page 178.**

Activity Centre

Place number cubes and copies of the doubles game scoring sheets (included) at an activity centre, and have students play the "Doubles Game" in pairs or small groups. Each player starts with ten points. Players take turns rolling two number cubes. If players roll doubles, they add to their scores the sum of the two numbers showing on the number cubes. If players do not roll doubles, they lose one point. The first player to get twenty or more points wins. Have each student keep track of his/her own score on a copy of the "Doubles Game" scoring sheet (5.1.1).

Extensions

■ Add the term *double(s)* to your classroom Math Word Wall.

■ Distribute to students sets of dominos, and ask them to sort the dominos into two groups: doubles and not doubles.

■ Provide students with some examples of real-life doubles patterns. For example, each of our fingers (on one hand) has a double (on the other hand); each leg on an insect has a double; each egg cup in an egg carton has a double; each leg on a table has a double. Have students identify other examples of doubles. Keep a running list of students' ideas on chart paper. Then, make a class doubles book, including one example on each page.

■ Ask students to solve the following doubles riddles:

I am thinking of a number.
The number is between 5 and 10.
If you double my number, you get 12.
What is my number?

I am thinking of a number
The number is less than 5.
If you double my number, you get 2.
What is my number?

I am thinking of a number.
It is an odd number.
If you double my number, you get 6.
What is my number?

I am thinking of a number.
The number is even and is less than 10.
If you double my number you get 16.
What is my number?

▶

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I am thinking of a number.
My number's tens digit is the double
of the ones digit.
What number am I?

Note**: The last riddle has many answers. Take the opportunity to discuss with students that in mathematics, there is often more than one possible solution to a problem.**

Assessment Suggestion

Ask students:

■   What does it mean to double a number?

Have students write the answer to this question in their math journals. In students' answers, look for:

■   understanding that a number is doubled when it is added to itself
■   appropriate examples

Record your comments on copies of the Anecdotal Record sheet, found on page 14.

Date: _____   **Name:** _____

Doubles Game Scoring Sheet

Roll		Score
Doubles (add sum)	**Not Doubles (–1)**	
___	___	**10**