NUMBER OPERATIONS

GRADE 3

Western and Northern Canadian Protocol (WNCP) Edition

hands-on mathematics

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Introduction

The goal of the number operations module is to enhance students' computational fluency with addition, subtraction, multiplication, and division. In keeping with this goal, the activities in this module promote the use of various methods of computing.

The activities involving addition and subtraction focus on recalling basic number facts for these operations and on computing with three-digit numbers. They also highlight student-created algorithms, the development of estimation and mental-math skills, and the appropriate use of calculators. Of particular significance is the emphasis on student-created algorithms. Unlike traditional algorithms, student-generated algorithms give students additional insight into place-value concepts and the relationships between numbers.

It is important to note that number-operation questions are primarily presented in a horizontal format, which encourages the use of mental math and student-created algorithms. A vertical format implies the use of the standard algorithm, which inhibits students' number-sense abilities and flexible-thinking strategies.

The activities involving multiplication and division focus on basic number facts for these operations. They also include the development of operational properties such as the relationship between multiplication and division. These properties extend students' understanding of the operations and provide them with important strategies for learning the basic facts.

Many of the activities in this module involve a problem-solving approach to the teaching of mathematics, which encourages students to explore new ideas and to make sense of mathematical concepts in ways that are meaningful to them. It also encourages students to share their findings and justify their conclusions. It is a powerful technique that helps students develop their abilities to solve problems, to communicate, and to reason mathematically.

Some lessons in this module include a section called "Next Steps," which guides teachers through a subsequent sequence of activities to carry out with students, following developmentally from the main activities. For example, in the problem solving section of lesson 7, students are asked to use the strategy of their choice to solve addition story problems involving addition with three-digit numbers. Once students have mastered this, the next step is for them to create their own addition story problems for their classmates to solve.

Mathematics Vocabulary

Continue to use your classroom mathematics word wall to display new vocabulary as it is introduced. Throughout this module, teachers should use, and encourage students to use, vocabulary such as: *bridge to ten, compatible number, difference, sum, product, factor, times, multiply, divide,* and *digit*. Use, and encourage students to use, this vocabulary, both orally and in writing, and continue to review all vocabulary previously introduced.

Depending on your students' writing skills, also consider having them begin mathematics logbooks for recording:

- new math vocabulary
- mental-math strategies
- problem-solving strategies
- graphic organizers

3 One- and Two-Digit Addition and Subtraction

Materials

- blank ten frames (templates included. Photocopy at least five blank ten frames onto overhead transparencies.) (5.3.1)
- pennies
- overhead projector
- overhead transparencies
- overhead markers
- scrap paper
- pencils
- addition and subtraction cards (included. Photocopy one set of cards for each pair of students. Mount cards onto sturdy tagboard, and cut out.) (5.3.3)

Activity: Part One

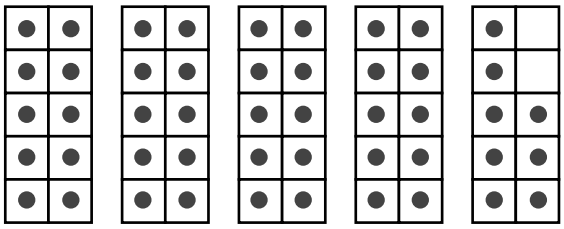
Present the following problem to students.

Mark has 48¢ in his pocket. His sister gives him 5¢ more. How much money does Mark have now?

Tell students that you will now use ten frames to solve this problem. Ask:

- How can we use pennies with the ten frames to show 48¢?

Place five blank ten frames onto the overhead, and use pennies to show the 48¢ that Mark originally had in his pocket, as in the following diagram.



Now, have students determine how to use the ten frames to add the additional 5¢ Mark's sister gave to him. Place five more pennies onto the overhead, beside the ten frames. Then, point to the ten frame with only eight pennies, and ask students:

- How many more pennies do we need to add to the eight pennies to equal ten pennies and fill the frame?

Move two pennies from the group of five pennies beside the ten frames onto the ten frame with eight pennies, to fill the frame. Ask:

- What is 48 plus 2?
- How many pennies are left over from the group of five pennies that was beside the ten frames? (3)
- What is 50 plus 3?

Tell students that 48 + 5 = 53, since 48 + 2 = 50 and 3 more is 53. Explain that students found the sum of 48 + 5 by *bridging to ten*.

Repeat the procedure for new problems such as

- 28 + 6 = ____
- 7 + 8 = ____
- 49 + 7 = ____

Distribute Activity Sheet A (5.3.2), and have students make each problem easier to solve by bridging to ten. Then, have students find the sum for each problem.

Activity Sheet A

Directions to students:

Make each problem easier to solve by bridging to ten. Then, find the sum (5.3.2).

Activity: Part Two

Record the following two problems on the overhead:

27 + 8 = ____ 30 + 5 = ____

Distribute scrap paper and pencils, and have students find the answer to each problem.

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Ask:

- What strategy did you use to solve each problem?
- Did you find a way to simplify each problem?

Have students share the strategies they used to solve the problems. Stress that any strategy is valid if it enables you to answer a problem.

Using the two previous problems as examples, demonstrate, or have a student demonstrate, how to make a problem easier to solve by using the bridge-to-ten strategy. For example:

The problem 30 + 5 = _____ was fairly easy to solve because I simply added the ones (5) to the tens (30).

To solve the problem 27 + 8 = _____ , I split up the 8 into 3 and 5 and bridged to 30. The problem then became 30 + 5 = 35.

Now, record the following sets of problems on the overhead:

56 + 7 = _____ 60 + 3 = _____

38 + 5 = _____ 40 + 3 = _____

76 + 6 = _____ 80 + 2 = _____

Have students find the answer(s) to each set of problems. Ask:

- What strategy did you use to solve each problem?
- Did you find a way to simplify any of the problems? Which problem(s), and how did you simplify it (them)?

Have students share the strategies they used to solve the problems.

Activity: Part Three

Divide the class into pairs of students, and give each pair a set of addition and subtraction cards (included, 5.3.3). Have students in each pair sort their cards into two sets: easier to solve and harder to solve.

When students finish sorting the cards, have them share their results and explain their reasoning.

Problem Solving

Note: Orally present the following story problems, and have students solve them mentally, encouraging them to use the bridge-to-ten strategy.

- Jake found 7 seashells on the beach. He took them home and added them to the 28 seashells he collected last week. How many seashells does Jake have now?
- There are 36 horses in the corral. Dario opened the gate and let in 8 more horses. How many horses are in the corral now?
- Sophie had 86¢. Her brother Ryan found 6¢, and he gave it to Sophie. How much money does Sophie have now?
- Forty-seven third-grade students go to summer camp. Nine fourth-grade students also go to camp. Altogether, how many third- and fourth-grade students go to summer camp?
- Mel is 18 years old. Her brother is 6 years older than she is. How old is Mel's brother?
- Bill is using centimetre blocks to build a tower. On Monday, the tower was 38-centimetres high. On Tuesday, he added another 5 centimetres to the height of his tower. What is the total height of Bill's tower now?

Note: Reproducible masters for these problems can be found on pages 137 and 138.

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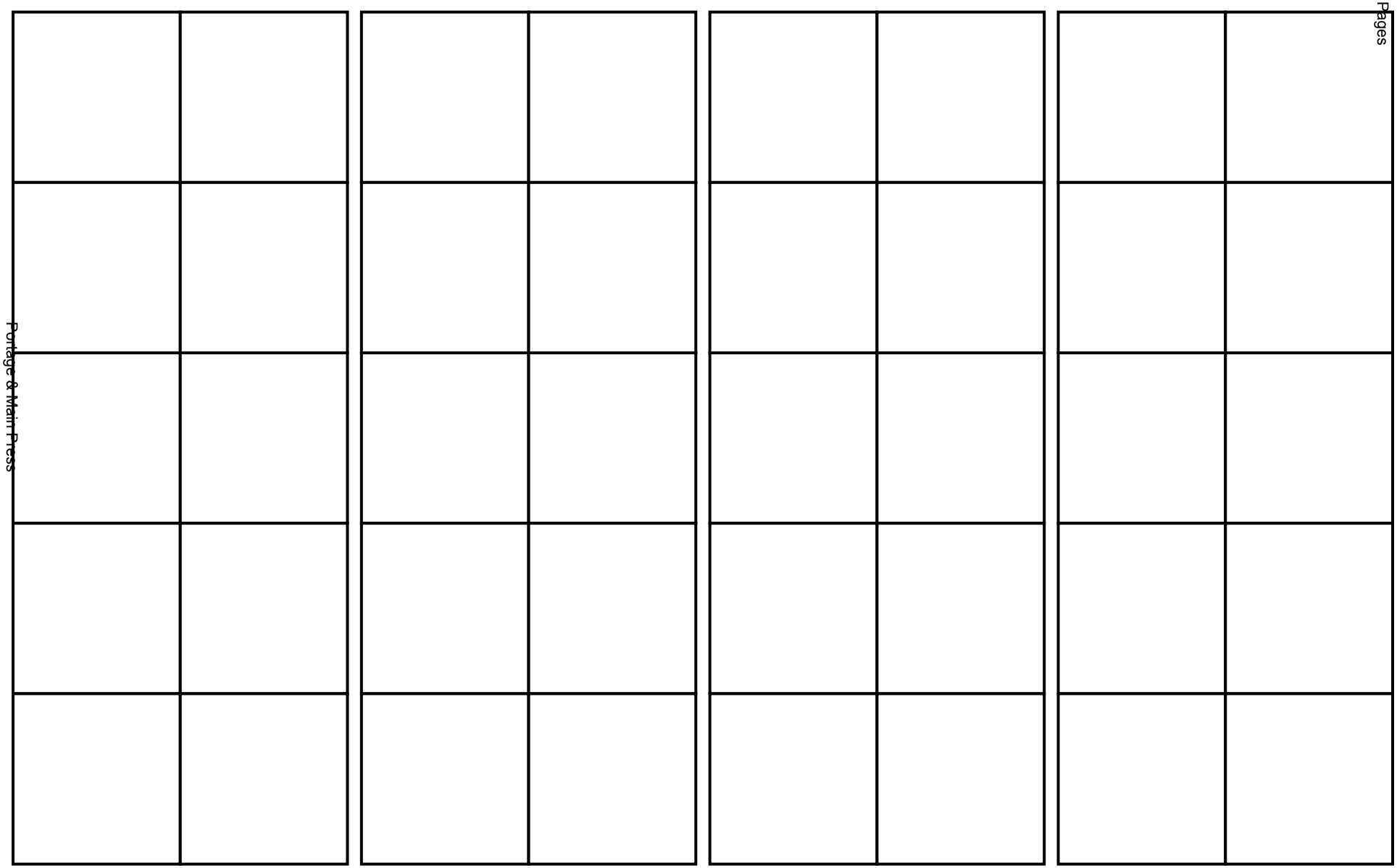
Extensions

- Add the term *bridge to ten* to your classroom math word wall.
- Introduce students to the bridge-to-ten strategy for subtraction. For example, to find the difference between 38 and 44 (44 – 38 =):
  - think 38 + 2 = 40, and 4 more equals 44
  - 2 + 4 is 6
  - 44 – 38 = 6

Blank Ten Frames



Date: _____ **Name:** _____

Bridge to Ten

Example: 26 + 8 =

26 + 4 = 30 and 4 more is 34.

Problem	Bridge-to-Ten Strategy
19 + 6 = _____	_____ + _____ = _____ and _____ more is ☐
49 + 9 = _____	_____ + _____ = _____ and _____ more is ☐
35 + 8 = _____	_____ + _____ = _____ and _____ more is ☐
86 + 5 = _____	_____ + _____ = _____ and _____ more is ☐
77 + 4 = _____	_____ + _____ = _____ and _____ more is ☐
54 + 8 = _____	_____ + _____ = _____ and _____ more is ☐
28 + 7 = _____	_____ + _____ = _____ and _____ more is ☐
15 + 8 = _____	_____ + _____ = _____ and _____ more is ☐
47 + 6 = _____	_____ + _____ = _____ and _____ more is ☐
36 + 9 = _____	_____ + _____ = _____ and _____ more is ☐

Addition and Subtraction Cards

29+5=	88+8=	50+8=	46+8=
38+6=	30+3=	40+2=	69+4=
70+5=	40+9=	75+8=	80+6=
87+7=	20+7=	10+9=	57+5=
60+4=	86+9=	90+1=	36+9=