

NUMBER OPERATIONS
GRADE 4

**Western and Northern Canadian
Protocol (WNCP) Edition**

hands-on
mathematics
Grade 4

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PORTAGE & MAIN PRESS

Winnipeg • Manitoba • Canada

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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 strategies for computation.

As students develop a set of strategies and explore how they work in other settings, they need opportunities to explain their thinking to their peers. This gives students several windows of thinking to explore, validation of their own strategies, and new strategies to use later on in their learning. Throughout the module, suggestions are made for partner and class sharing. This is an important component of each lesson as the dialogue will allow students opportunities to articulate their understanding and gain new understanding from others.

Think time is very important for students. Be sure to provide it throughout the subsequent lessons, allowing students who think at different paces a chance to formulate their responses. As students respond, record their thinking on chart paper or on the chalkboard/whiteboard for other students to see. This validates their thinking and gives other students access to a variety of strategies to add to their existing collection.

To encourage student reflection, self-assessment, and communication skills, have students keep math journals. Suggestions for use of the math journals are provided within the module.

Mathematics Vocabulary

A mathematics word wall for displaying new vocabulary is a valuable reference for students. Dedicate a classroom bulletin board to your math word wall, and display the letters of the alphabet along the top. Use index cards to record math vocabulary introduced in each

lesson, attaching these to the board under the appropriate letter. Encourage students to refer to the math word wall during classroom activities and assignments.

TERMS TO KNOW

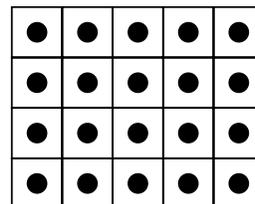
Digit Value: A number is made up of digits from 0 to 9. The *digit value* of any digit within a number is dependent on the place it holds (its place value) within the number. For example, 3792 is made up of four digits; the digit 7 has a value of 700.

Expanded Notation: The representation of a number in a mathematical sentence that shows the value of each digit (the sum of the value of each digit). For example:

$$5683 \text{ is written as } 5000 + 600 + 80 + 3$$

$$\text{or as } (5 \times 1000) + (6 \times 100) + (8 \times 10) + (3 \times 1)$$

Array: An arrangement of objects (tiles, bingo chips, and so on) in a rectangle or square.

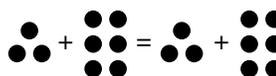


MATHEMATICAL PROPERTIES

Commutative Property: With addition, this refers to the fact that changing the order of the addends does not change the sum. With multiplication, this refers to the fact that changing the order of the factors does not change the product. For example:

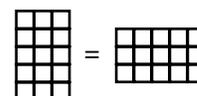
Addition

$$3 + 6 = 6 + 3$$



Multiplication

$$5 \times 3 = 3 \times 5$$



2 Compatible Numbers

Background Information for Teachers

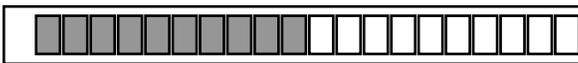
Compatible numbers are numbers that are easy to add, subtract, multiply, or divide mentally. For example, the numbers 53 and 17, for which the ones add up to 10, would be compatible.

Materials

- sticky notes in two colours
- chart paper
- markers
- adding machine tape

Activity: Part One

Note: Before beginning this activity, create a number line from 30 to 50 using adding machine tape and two colours of sticky notes: one colour for numbers 31–40 and a second colour for numbers 41–50 (the two different colours will help students visualize and use the benchmark to the next 10 strategy). Reserve a sticky note to be labelled with the number 30 in the same colour as the sticky notes you use for the numbers 41–50. However, do not stick the 30 note on yet. At this point, do not identify any numbers; the empty number line should simply include the 21 blank sticky notes, as in the diagram below. Hang the number line where all students can see it:



To begin the lesson, gather students around the empty number line. Explain that for this empty number line, the starting point can be any number; the start number determines the end point/number. Ask:

- If the start number is 1, what would the end number be? (20)
- If the start number is 5, what would the end number be? (24)
- If the start number is 20, what would the end number be? (39)
- If the start number is 15, what would the end number be? (34)

- If the end number is 50, what would the start number be? (31)

Explain that today the start number will be 30. Record 30 on a sticky note that is the same colour as the blank note at the end, and attach the 30 to the beginning of the number line. Record 50 on the last (end) sticky note, as in the following diagram:



Remind students that friendly numbers are ones that are usually easier to use, such as numbers said when skip counting by 5 or 10. Ask:

- What are some friendly numbers that we can identify on this empty number line?
- Where are the friendly numbers located?

As students identify some of the friendly numbers, record them on the sticky notes, as below:



Ask:

- Where is the halfway number?
- What is the middle number?

Have students locate various numbers on the number line. Ask:

- If I want to place an arrow above the number 34, where should it go?
- If the arrow is above the number is 34, how do we jump to 47?
- What is the value of the jump from 34 to 47? (13)
- What would the addition sentence be? ($34 + 13 = 47$)

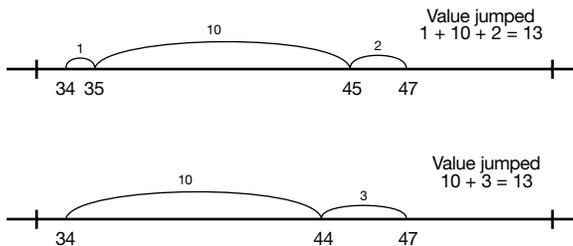
Now, discuss various strategies for showing this addition sentence on the number line.

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Ask:

- Instead of jumping 13 tiny steps, how else could we make the 13 jumps?

Record the following two strategies on chart paper:



Repeat the process for several different numbers, such as:

- jump from 37 to 49
- jump from 33 to 50
- jump from 31 to 46
- jump from 35 to 50
- jump from 41 to 46

Be sure to ask students for the *value* of the total jump between the two numbers and for the addition sentence. Have students share their various strategies for jumping from one number to another.

Note: placing the number line on the floor and having students physically jump to the specified number is another way of conducting the activity. While students are explaining their thinking or acting it out on the number line, record their strategy on an empty number line on chart paper.

Repeat this activity using different start and end numbers, such as: 50 to 70, 120 to 140, 165 to 185, 233 to 253, 1250 to 1270, and so on.

Assessment for Learning

Observe students to determine the number ranges with which they are comfortable. Be sure to use number ranges that are within a student's

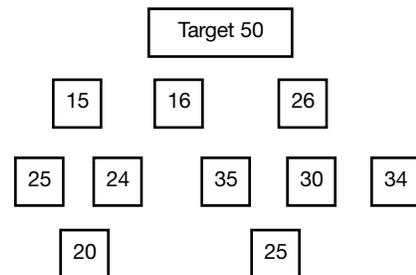
comfort zone, and build skills from that range.

Also, repeat this activity with two jumps from the first number as in the second of the preceding two figures.

Note: This activity can be done as a quick warm-up exercise: each day, have a few students present their strategies by drawing an empty number line that shows the jumps between two numbers. This is an effective way of revealing the different strategies students use.

Activity: Part Two

Before beginning the lesson, record, on sticky notes, several compatible numerals for a specific target number. For example, if the target number is 50, compatible numbers could be 25 and 25, 20 and 30, or 27 and 23. Randomly stick the numerals onto a bare wall, a piece of chart paper, or the chalkboard as in the diagram below:



Gather students in front of the numerals on sticky notes, and explain that on the wall in front of them are several pairs of compatible numbers. Together, each pair of numbers adds up to 50. You would like them to help you find each pair of compatible numbers.

Take this opportunity to discuss strategies students could use to find compatible numbers to 50. For example, if one of the numbers is 23, which has a 3 in the ones place, look for a number that has a 7 in the ones place.

2

Invite one student to select one of the numbers. Then, have a different student find the number that is compatible to the first one. Encourage students to carry out the task without talking. Continue until all compatible numbers have been found.

Note: This can be a good activity for students who are apprehensive and do not feel comfortable taking risks. For those students, choose a low target number and simpler compatible numbers such as 2 and 18 for a target of 20. This can also be a great warm-up activity at the beginning of a lesson.

Next Steps

- Record triads of compatible numerals on sticky notes. For example, for a target number of 50, three compatible numbers would be 20, 15, and 15, or 12, 28, and 10. Have students explain their thinking as they identify compatible triads.
- Make target numbers more challenging by increasing their value, working up to 3- to 4-digit numbers.

Distribute Activity Sheet A (5.2.1), and have students draw lines between sets of compatible numbers to 20. Then, have students complete Activity Sheet B (5.2.2) (compatible numbers to 50) and Activity Sheet C (5.2.3) (compatible numbers to 100).

Activity Sheet A

Directions to students:

Draw lines between sets of compatible numbers to 20 (5.2.1).

Activity Sheet B

Directions to students:

Draw lines between sets of compatible numbers to 50 (5.2.2).

Activity Sheet C

Directions to students:

Draw lines between sets of compatible numbers to 100 (5.2.3).

Activity Centres

■ And How Many More?:

At an activity centre, place a 10-sided number cube, and a collection of coins to \$1. Also, include copies of the “And How Many More Cents?” game boards (there is one version for 20¢, one for 50¢, and one for \$1) and copies of the recording sheet. Have students work in pairs or individually to play “And How Many More Cents?” a game in which students find compatible numbers to 20¢, 50¢, and \$1.

Have students begin with the “And How Many More Cents? to 20 Cents” game board. If they are playing in pairs, ask them to take turns rolling the 10-sided number cube and using coins to build that number on the left side of the game board. Then, on the right side of the game board, have the same student use coins to build a compatible number for the first number, to 20¢. Ask each student to record which coins he/she used for each turn on his/her own recording sheet (5.2.4, 5.2.5, 5.2.6, 5.2.7).

Next Step

Once students are comfortable using coins to build numbers to 20¢, have them repeat the activity with a 20-sided number cube and building compatible numbers to 50¢, and then with a combination of number cubes with numerals to 100 (five 10-sided number cubes plus two 20-sided number cubes plus one 10-sided number cube; a 100-sided number cube, and so on) to \$1.



2

- At an activity centre, place a 10-sided number cube, a collection of bingo chips, copies of the “And How Many More? to 20” game board, and copies of the accompanying recording sheet.

Again, have students work in pairs or individually to play a game similar to the preceding one but using bingo chips on ten frames to build the numbers. Ask students to take turns rolling the 10-sided number cube and using bingo chips on ten frames to build that number on the left side of the game board. For example, if a student rolls 9, he/she uses bingo chips to cover nine squares on one of the ten frames. Then, on the right side of the game board, have students use bingo chips on ten frames to build a compatible number for the first number to 20. Returning to the previous example, the student would then cover one full ten frame and one more with bingo chips on the right-hand side. Have students record the two compatible numbers on the accompanying recording sheet provided (for example, 9 and 11 is 20) (5.2.8, 5.2.9).

- At an activity centre, place a 20-sided number cube, copies of the “And How Many More? to 50” game board, copies of the accompanying recording sheet, and sets of the smaller ten frames.

Note: The smaller accompanying ten frames (5.2.12.) need to be cut out. Either cut them out ahead of time, or also include scissors at the centre, and instruct students to cut them out.

Again, have students work in pairs or individually to play a game similar to the preceding one except they roll a 20-sided number cube and build compatible numbers to 50. If they are playing in pairs, ask students to take turns rolling the 20-sided number cube and using the smaller ten frames to build that number on the left side

of the game board. Then, tell students to use the ten frames to build the compatible number to the number rolled on the right side of the game board. Have students record their compatible numbers on the recording sheet provided (5.2.10, 5.2.11, 5.2.12).

Next Step

As students progress with this activity, give them another 10-sided number cube so they can roll numbers to a maximum of 30 (still working with compatible numbers to 50). Continue to increase the maximum number that can be rolled by adding 10-sided number cubes until the maximum number that can be rolled is 50.

- At an activity centre, place a combination of number cubes with numerals to 100 (six 10-sided number cubes, plus two 20-sided number cubes; a 100-sided number cube, and so on). Also, include copies of the “And How Many More? to 100” game board, copies of the accompanying recording sheet, and sets of the smaller ten frames.

Note: The smaller accompanying ten frames need to be cut out. Either cut them out ahead of time, or also include scissors at the centre, and instruct students to cut them out.

Again, have students work in pairs or individually to play a game similar to the preceding one except they use a combination of number cubes with numerals to 100 and they build compatible numbers to 100. If they are playing in pairs, ask them to take turns rolling the number cube(s) and building that number by placing smaller ten frames onto the larger one. For example, if a student rolls 47, he/she would place four full ten-frames and the frame with 7 dots onto the larger ten frame. Then, have students build the compatible number to the number rolled (five full ten-frames and the frame with three

2

dots) on a second copy of the game board. Finally, have students record the compatible numbers on the recording sheet provided (47 and 53 is 100) (5.2.13, 5.2.14, 5.2.12).

Assessment of Learning

While students are working on the lesson's activities, observe them to determine the following:

- Which students still count on their fingers by 1s? By 2s?
- Which students use “friendly” benchmark numbers to help?
- Which students need support to use the empty number line?

Use the Anecdotal Record sheet, found on page 13, to record your results.

Compatible Numbers to 20

0	4	9	12
16	11	15	14
8	1	6	20
7	19	3	17
18	5	13	2

1	11	10	20
6	17	4	12
3	10	0	13
18	19	4	7
16	5	14	2
15	9	8	

Compatible Numbers to 50

0 30 4 9 27 5
41 28 25 15 37
8 1 6 36 17 42
35 34 40
18 5 46 13
26 11 29 50
22 32 48
16 45 24 23 37
40 14
5 7 19 12 33
47 5 2
41 39 21 44

Compatible Numbers to 100

17	2	25	10
	24	69	
31	75	45	98
55	76	90	83

20	91	35	
	43	84	
100		57	0
	16		
65		9	80

And How Many More Cents? to 20¢

Build it with



And How Many More Cents? to 50¢

Build it with



And How Many More Cents? to \$1

Build it with



Coin designs © courtesy of the Royal Canadian Mint
Image des pièces © courtoisie de la Monnaie royale canadienne

And How Many More? to 20

Name: _____

Date: _____

And How Many More? to 20 Recording Sheet

	and		is 20		and		is 20
	and		is 20		and		is 20
	and		is 20		and		is 20
	and		is 20		and		is 20

And How Many More? to 50



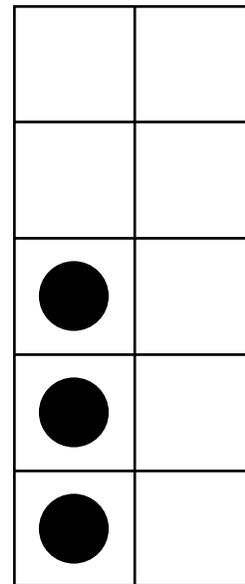
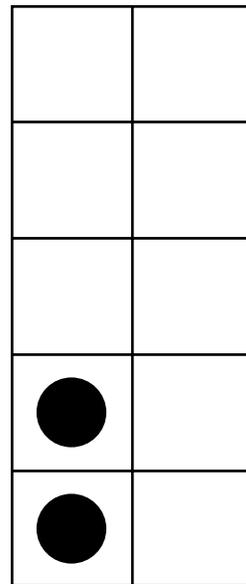
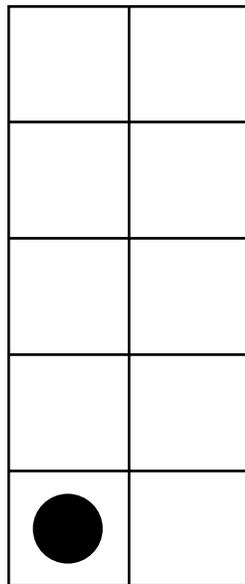
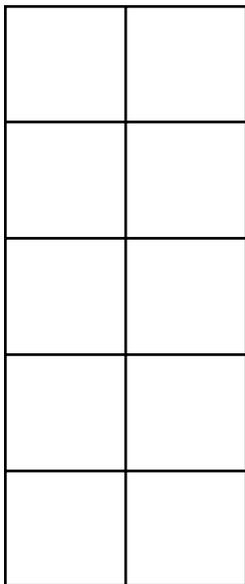
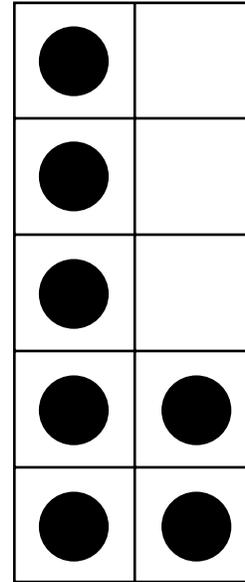
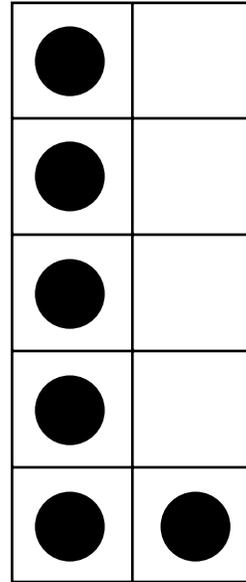
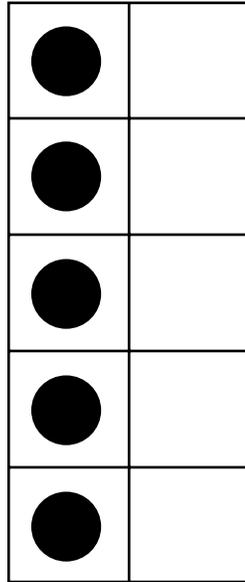
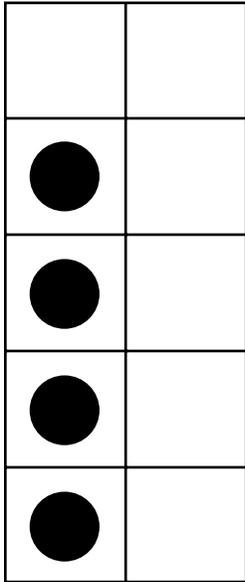
Name: _____

Date: _____

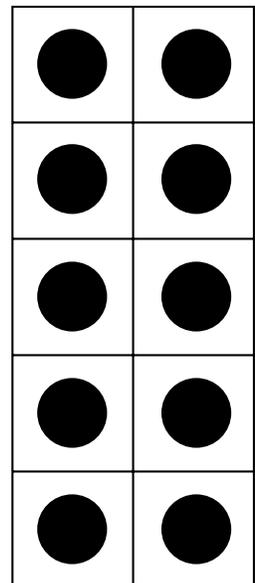
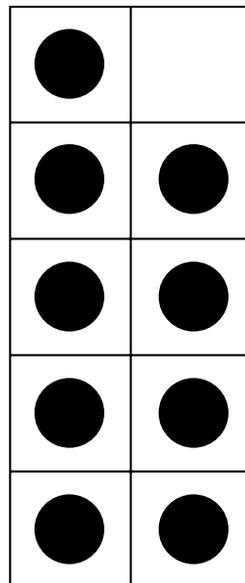
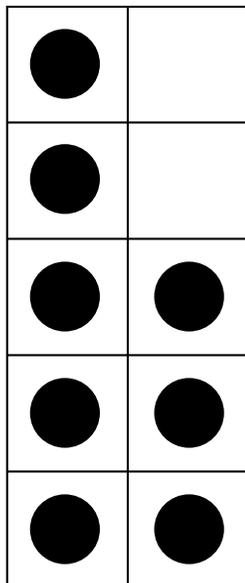
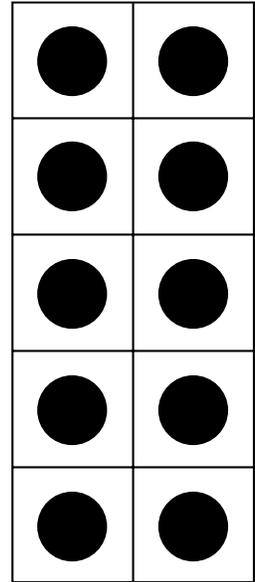
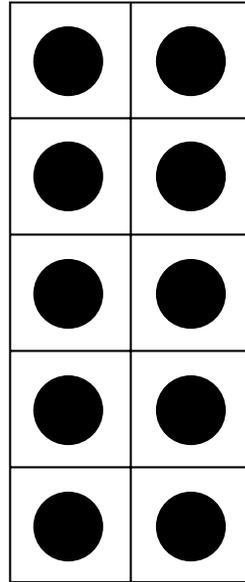
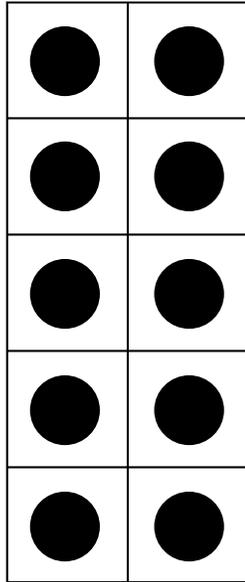
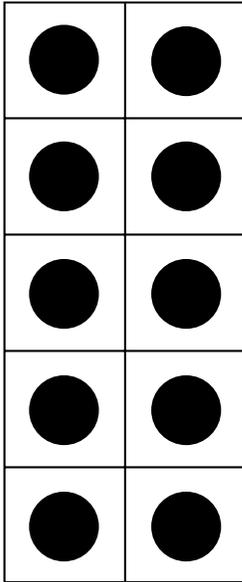
And How Many More? to 50 Recording Sheet

	and		is 50

Small “And How Many More?” Ten Frames



Small “And How Many More?” Ten Frames



And How Many More? to 100

Date: _____

Name: _____

And How Many More? to 100 Recording Sheet

Sample Pages

and

is 100

and

is 100