3.2 Methods of Addition

Objectives
- Relate addition stories to number bonds.
- Write two addition facts for a given number bond.
- Solve picture problems using addition.
- Learn addition facts through 5, and the ones for + 0, and + 1.
- Count on to add 1, 2, or 3 to a number.
- Learn and memorize addition facts through 10.
- Solve missing addend equations.
- Determine if an equation is true.

Notes

In this chapter, two main strategies for addition are introduced – number bonds and counting on.

The number bonds learned in Unit 2 will help students master both the addition and subtraction facts within 10. These facts are associated with the part-whole concept of number bonds. Given a number bond, we can write two related addition facts and two related subtraction facts. For this unit, we will only focus on the addition facts.

$$5 + 3 = 8 \qquad 3 + 5 = 8$$
$$8 - 5 = 3 \qquad 8 - 3 = 5$$
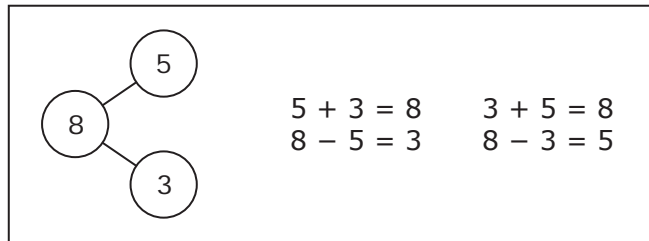
Help students commit the addition facts to memory. Some students can memorize these number facts easily with only a little drill; others may need additional help through games and structured activities. Some students, even those who excel at math comprehension, will always have trouble memorizing math facts, although they will probably be able to memorize the facts through 10. Strategies for computing the facts through 20 from the facts through 10 will be given in a later unit.

At this stage, most students already know addition facts within 5 and some easier addition facts such as + 1. These are listed below.

Addition facts within 5:

0 + 0	0 + 1	0 + 2	0 + 3	0 + 4	0 + 5	0 + 6	0 + 7	0 + 8	0 + 9	0 + 10
1 + 0	1 + 1	1 + 2	1 + 3	1 + 4	1 + 5	1 + 6	1 + 7	1 + 8	1 + 9	
2 + 0	2 + 1	2 + 2	2 + 3							
3 + 0	3 + 1	3 + 2								
4 + 0	4 + 1									
5 + 0	5 + 1									
6 + 0	6 + 1									
7 + 0	7 + 1									
8 + 0	8 + 1									
9 + 0	9 + 1									
10 + 0										

This chapter also introduces students to a "count on" strategy for addition. This strategy will help them work out some addition facts before they can memorize them. They can use this strategy for + 2 and + 3 addition facts. It will become particularly useful later in Grade 3 when examining what happens when the tens digit changes, or adding and subtracting numbers close to a multiple of ten, for example, 25 + 28 = 25 + 30 − 2.

Students will probably be able to count on 1, 2, or 3 quickly without using fingers. Fingers can be used if needed to begin with. Note that counting on as a strategy is used only for adding 1, 2, or 3 in this curriculum. The goal is quick computation, and with adding on greater numbers, it becomes harder to keep track of how many are added on and to know where to stop without fingers or number lines. Also, adding numbers where the sum is greater than 10 will be taught in the context of the base-10 concept.

Make sure students do not include the number they are counting on from. For example, for 6 + 3, they might say "6, 7, 8" and stop there since they have counted on 3 numbers. They need to count on from 6 and not include it, saying "7, 8, 9."

Additional time is spent in this chapter on pairs of numbers that "make 10." If students have learned the number bonds to 10, they will already know the addition facts for 10 and you will not need to spend as much time on this lesson.

The only addition facts within 10 not included in sums to 5, + 1, + 2, and + 3, and the "make 10" facts are 4 + 4, 4 + 5, and 5 + 4. 4 + 4 is usually easy to memorize and the other two are just one more than 4 + 4.

0 + 0	0 + 1	0 + 2	0 + 3	0 + 4	0 + 5	0 + 6	0 + 7	0 + 8	0 + 9	0 + 10
1 + 0	1 + 1	1 + 2	1 + 3	1 + 4	1 + 5	1 + 6	1 + 7	1 + 8	1 + 9	
2 + 0	2 + 1	2 + 2	2 + 3	**2 + 4**	**2 + 5**	**2 + 6**	**2 + 7**	**2 + 8**		
3 + 0	3 + 1	3 + 2	**3 + 3**	**3 + 4**	**3 + 5**	**3 + 6**	**3 + 7**			
4 + 0	4 + 1	**4 + 2**	**4 + 3**	**4 + 4**	**4 + 5**	**4 + 6**				
5 + 0	5 + 1	**5 + 2**	**5 + 3**	**5 + 4**	**5 + 5**					
6 + 0	6 + 1	**6 + 2**	**6 + 3**	**6 + 4**						
7 + 0	7 + 1	**7 + 2**	**7 + 3**							
8 + 0	8 + 1	**8 + 2**								
9 + 0	9 + 1									
10 + 0										

Dot cards can also help students initially with visualizing the addition facts for adding on to 5, the facts that make 10, doubles (e.g., 4 + 4), and doubles + 1 (e.g., 4 + 5 is the same as double 4 + one more). Students should by now be able to recognize numbers from dot patterns without having to count.

During this chapter, help students commit the addition facts to memory, and then add new facts as you go through succeeding lessons and units. Use flash cards, drills, the games suggested in this guide, computer games where you can set the facts that are to be practiced, math sprints, and other activities, even after completing this unit. Students should be comfortable with all the addition facts through 10 by Chapter 6.2.

In a math sprint, students answer as many problems as they can within a specified time and then repeat trying to beat their previous score by answering a greater number of similar problems. They are only competing against themselves and trying to better their individual scores. Do not keep a record of scores or compare them to other students.

There are also mental math worksheets in the appendix you can copy and use. They can be used any time after the facts are introduced and can be copied multiple times. The lesson will list the worksheets that cover the facts for that lesson, but you do not have to do them the same day, particularly if there is more than one. One could be used at the start of the next lesson as a warm-up activity.

Since some first graders are still working on fine-motor skills, using worksheets, particularly timed ones, may not be a good idea for them. For such students, it may be better to use activities that emphasize speed without stress and without writing quickly.

3.2a Number bonds and addition

Objectives
- Relate addition stories to number bonds.
- Write two addition facts for a given number bond.
- Solve picture problems using addition.
- Learn addition facts through 5, and the ones for + 0, and + 1.

Materials
- Linking cubes
- Objects
- Addition fact cards with answers on separate cards for the addition facts through 5 (students can make them)

**Common Core Standards**
1.OA.1
1.OA.3
1.OA.6
1.OA.8

Mathematical Practices
MP.2
MP.3
MP.6
MP.7

PRIMARY digital

Reinforcement 3.2

Number bonds

- Show students two sets of different but related objects.
- Ask them to find the number in each set, then the total, and write an addition equation.
- Draw a number bond. Have students discuss with their partners what each circle of the number bond represents. Guide them to understand the following ideas:
  When we have two parts and we want to find the whole, we can draw a number bond for this situation. One part plus the other part equals the whole.
- Lead students to understand that we do not need to recount to find the total if we remember the number bond. (You can illustrate this by rewriting the number bond using a "+" between the two parts and an "=" before the whole.)
- Rewrite the addition equation, changing the order of the addends. Ask students if it matters in what order we write them. Have students discuss in their pairs before getting a pair or two to share their conclusions.
- Lead students to see that it does not matter in what order we write the two parts. The parts are on one side of the equal sign, and the whole is on the other side.
- Rewrite the addition equation again, with addition expressions on both sides of the equal sign, that is, 4 + 6 = 6 + 4. Ask, "Is this also an addition equation?" (Yes) Help students recall that the equal sign means "the same as." Ask them to find the total on each side and ask if 4 + 6 (which gives 10) is the same as 6 + 4 (which also gives 10).
- Repeat with other objects. Ask students to write a number bond first and then an addition equation. Encourage them to find the whole by remembering the number bond rather than recounting.
- Include one story that has 0 as one of the parts. For example, "There are 2 baskets. There are 5 balls in one basket. There are no balls in the other basket. How many balls are there altogether?"
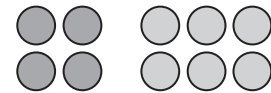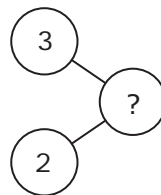
$$4 + 6 = 10$$
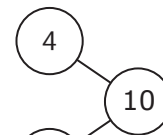
$$6 + 4 = 10$$
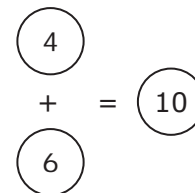
- Write a number bond with a missing whole. Ask students to share an addition number story that requires finding the whole to go with the given number bond with their classmates. For example, "There are 3 dogs and 2 cats. How many animals are there in all?"
- Have students then write an addition equation for the number bond.
- Repeat with other examples.

$3 + 2 = 5$
$2 + 3 = 5$

Discussion

- Ask students to write a number bond for each situation.
- By comparing each pair of equations, explain to students that we can write addition expressions on both sides of the equal sign, for example, $6 + 2 = 2 + 6$.
- Emphasize that the order in which we write the addends does not matter.
- Write $5 + 3 = 7 + 1 = 4 + 4 = 0 + 8 = 8$ on the board. Highlight that this is also an addition equation.
- Have students discuss in pairs what this addition equation means. Get one or two pairs to share and justify their conclusions.
- Lead students to understand that there can be more than one equal sign in any equation. This statement simply means "5 plus 3 is the same as 7 plus 1, which is the same as 4 plus 4, which is also the same as 0 plus 8, and they all are the same as 8 after adding."

Answers:
8; 8
8
8; 8; 1
8; 8; 8

- Have students list all the number bonds that make 8. (0 and 8, 1 and 7, 2 and 6, 3 and 5, and, 4 and 4)

Textbook, p. 34

Assessment

- Write a number on the board. Tell students that this is the total.
- Have students think of as many number bonds as they can for that whole.
- Ask them to write addition equations for each number bond. For example, if you write the number 6, they could write $0 + 6 = 6$ (or $6 = 0 + 6$), $1 + 5 = 6$ (or $6 = 1 + 5$), $2 + 4 = 6$ (or $6 = 2 + 4$), and $3 + 3 = 6$ (or $6 = 3 + 3$).
- Have students share their addition equations with the class.
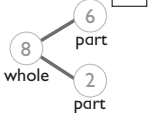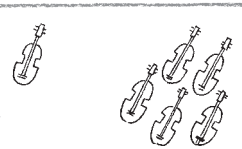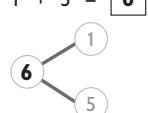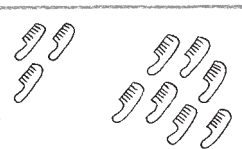
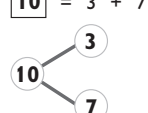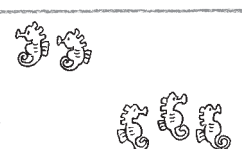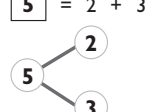| Practice	Workbook Exercise 4, pp. 35–37
• Have students complete Workbook Exercise 4 on pages 35–37. • Allow students who have not completely memorized number bonds to use linking cubes or draw pictures for Task 3 of Exercise 4.	

EXERCISE 4
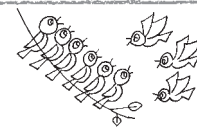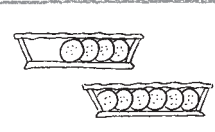
1. Fill in the missing numbers.

(a)

$6 + 2 = \boxed{8}$

whole 8, parts 6 and 2

(b)

$1 + 5 = \boxed{6}$

whole 6, parts 1 and 5

(c)

$\boxed{10} = 3 + 7$

whole 10, parts 3 and 7

(d)

$\boxed{5} = 2 + 3$

whole 5, parts 2 and 3

Unit 3: Addition

2. Add.

$4 + 5 = \underline{9}$
$5 + 4 = \underline{9}$
$4 + 5 = 5 + \underline{4}$

$4 + 3 = \underline{7}$
$3 + 4 = \underline{7}$
$4 + 3 = \underline{3} + 4$

$4 + 2 = \underline{6}$
$2 + 4 = \underline{6}$
$4 + 2 = \underline{2} + 4$

$5 + 3 = \underline{8}$
$3 + 5 = \underline{8}$
$5 + \underline{3} = 3 + 5$

$6 + 3 = \underline{9}$
$3 + 6 = \underline{9}$
$\underline{6} + 3 = 3 + 6$

$4 + 6 = \underline{10}$
$6 + 4 = \underline{10}$
$4 + \underline{6} = 6 + 4$

Unit 3: Addition