Chapter 2 Addition and Subtraction — Part 1

	Lesson	Page	Objectives
	Chapter Opener	28	
1	Strategies for Addition	29	Review mental math strategies for adding one-digit numbers when the sum is greater than 10.
2	Strategies for Subtraction	30	Review mental math strategies for subtracting a one-digit number from 11-18 when the difference is less than 10.
3	Parts and Whole	31	Review solving word problems by determining whether the problem involves finding a missing whole or missing part. Understand the part-whole bar models as a pictorial representation of the information given in a word problem.
4	Comparison	33	Review solving word problems involving comparison. Understand the comparison bar models as a pictorial representation of the information given in a word problem.
5	Practice	35	

Materials

Materials

- Counters
- Linking cubes

Optional

- Laminated hundred chart
- Playing cards

Printouts

(singaporemath.com/higprintouts)

- Addition and Subtraction within 10
- Addition and Subtraction within 20
- Blank Double Ten-frames
- Number Cards 0–100

Mental Math

(singaporemath.com/higprintouts)

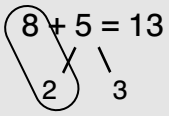
Mental Math		After Lesson
4	Add within 20	1
5	Subtract within 20	2
6	Add and subtract within 20	2
7	Add and subtract within 20	2
8	Add and subtract within 20	2
9	Add and subtract within 20	2

Notes

This chapter reviews the mental math strategies for adding and subtracting within 20 when regrouping occurs that students learned in Dimensions Math® 1A. It also introduces the use of bar models to help students determine what operation to use when solving word problems. These topics are foundational for the rest of the series. Take as little or as much time as needed, depending on whether or not your student completed Dimensions Math® 1.

Although students should be proficient at recalling addition and subtraction "facts" within 20, some students, even those who have exceptional understanding of math concepts, find memorizing math facts difficult, since it is like memorizing dates or a random string of numbers. If they do know the math facts within 10, they can use those facts to quickly calculate facts they have not yet memorized, using these strategies. Students can also fall back on these strategies if they forget a fact.

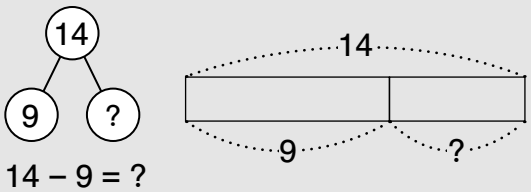
Mental math strategies often involve breaking a number down into parts and then adding or subtracting those parts separately. In this curriculum, these strategies are often illustrated by showing a number bond. Students saw illustrations of number bonds in the previous chapter showing a number within 100 split into tens and ones. In this chapter, they will see numbers within 20 split in other ways. For example, one strategy for adding one-digit numbers when the sum is greater than ten is to "make a ten." To show this, one of the two addends is split into two parts, one of which makes a ten with the other addend:



Students are not required to draw these number bonds, unless they need to initially; they are used simply to illustrate the thinking behind a strategy.

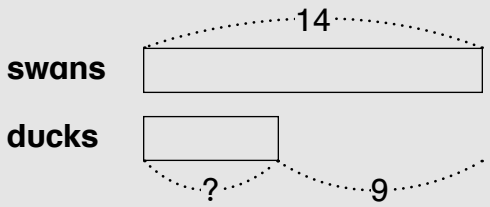
8 + 5 = 13 is called an equation. Students learned this term in Dimensions Math® 1A. 8 + 5 is called an expression. Students do not learn this term, though it will be used in this guide.

Students will see "part-whole" bar models for the first time in this chapter, which is another way to show parts and a whole and to illustrate what operation to use to find the "missing whole" or "missing part." For example, "There are 14 children at a park. Some children go home. There are now 9 children still at the park. How many children went home?" The problem gives a whole and is asking for a part, and so is solved using subtraction, which can be easy to see if the information is illustrated (or "modeled") with a number bond or a "part-whole" bar model.



This is a relatively easy problem to interpret. Students solved problems like these without bar models in Dimensions Math® 1B for addition and subtraction within 100. They needed to determine whether the problem was asking for a whole or for a part, as in the example above. You can draw part-whole models for your student if the greater numbers in the problems in the next chapter make your student unsure of what operation to use.

Bar models are more useful at this level for illustrating and interpreting situations that involve comparison. For example, "There are 14 swans in a pond. There are 9 more swans than ducks. How many ducks are there?" This problem does not give an easily identifiable whole and parts. It can be illustrated with a "comparison model."



14 – 9 = ?

The bar model could help a student see that they can find the answer using subtraction, if they are confused by the word "more".

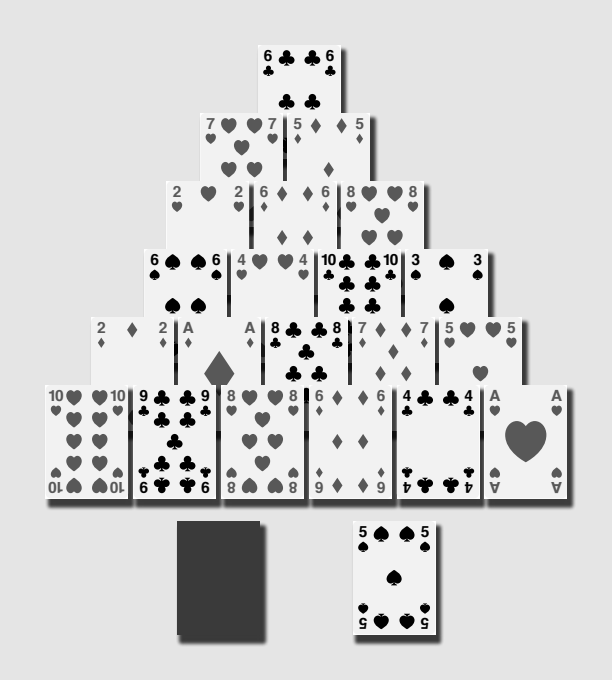
Students are not expected to draw bar models at this level, where they are just becoming familiar with them. They do not always have the number sense to draw somewhat proportional bar models, nor the fine motor skills, and drawing models should not be a tedious chore. If your student mastered Dimensions Math® 1B, they should not have much difficulty interpreting the word problems; the main difference at this level will be that the numbers will be greater (up to 3 digits). Constructing or drawing a model for a simple one-step problem requires a basic level of interpretation, enough to already know whether to add or subtract, in most cases.

If you draw a model for your student in cases where they are confused about how to solve a problem, and there isn't one already drawn in the textbook or workbook, talk about it as you draw it, helping your student see the connection between the model and the problem. You could draw just the bars and have your student label them. Study the textbook problems and pictures of bar models and read the lesson material in this guide (while looking at the textbook) ahead of time so you are familiar with bar models.

Bar models are a problem solving tool that students will draw themselves and will need to use in Dimensions Math® 3A and later to determine how to solve more complex multi-step word problems.

Activity

- After Lesson 1
  Materials: Four sets of number cards 1–10, or playing cards ace–10
  Purpose: Add within 20.
  Procedure: Shuffle the cards and then place them face up in a pyramid of 6 rows with overlapping cards.



Place the rest of the cards face down in a pile. Decide on a target number between 11 and 18. Turn over the top card from the face-down pile. Any combination of the cards that are either fully exposed on the pyramid of have been turned over from the face-down pile that add to make the target number are then discarded.

In this example, if the target number is 14, 8 and 6 can be removed from the pyramid, and so can 10 and 4. The 5 that was turned over and the 9 on the bottom row of the pyramid can also be removed. This exposes most of the next row of the pyramid.

When no more cards can be combined to make the target number, turn over another card from the face-down pile. If, for example, the next card turned over is 10, it can be combined with the ace still in the bottom row and the 2 and ace now exposed in the second row to make 14, which removes three more cards from the pyramid.

Play continues until all the cards in the face-down pile have been turned over. The goal is to get rid of as much of the pyramid as possible.

Lesson 1 Strategies for Addition (pp. 37–38)

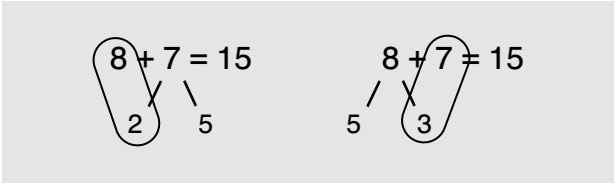
This lesson reviews the mental math strategy of "making a ten" when adding one-digit numbers when the sum is greater than 9.

Think (p. 37)

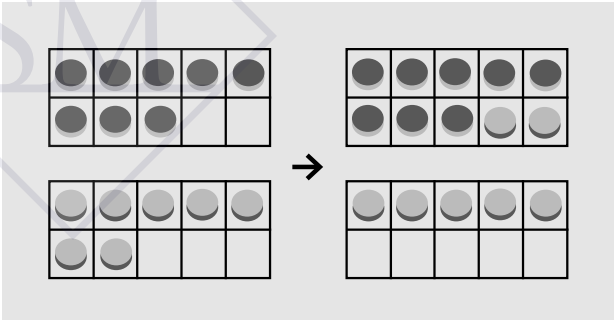
Before having your student find the answer, ask if they know whether the answer will be greater than ten or not. They can find the answer any way they want.

Learn (p. 37)

In the first method, Dion's thought is to split 7 into 2 and 5, so that 2 can be added to 8 first to make 10. Sofia's thought is to split 8 into 5 and 3, so that 3 can be added to 7 first to make 10.



Splitting one of the numbers and adding in two steps this way takes advantage of the base-ten system of numeration, and uses math facts to 10. If your student is unfamiliar with this idea of "making a ten," it might help to show it with counters and ten-frames:



Answers

15
15

❶ (a) 13
(b) 14

❷ (a) 12 (b) 12 (c) 13
(d) 14 (e) 11 (f) 16

Do (p. 38)

❶ The thought boxes show the strategy Emma and Mei each used.

❷ Students just need to find the answer. They do not have to follow a specific strategy, nor explain their strategy (unless they get an incorrect answer). If they make a ten, they can choose to make a ten with either addend. Generally it is easier to make a ten with the greater addend, as shown in the previous problem, but if one of the addends is 5, the other one might be split into 5 and a part. Students may even use another strategy, such as adding 9 by adding 10 and subtracting 1. They may simply already know the answer, having memorized the "fact."

❸ This problem is a reminder to practice the rest of the addition facts. You can use the **Addition and Subtraction within 20** printout to look for patterns. You can have your student practice the facts any way that works for your student. You could use the **Mental Math Sheets**, or find some online games.

Lesson 4 Comparison (pp. 45–48)

Bar models are particularly useful at this level in helping students interpret word problems that involve comparison. This lesson may take an extra day.

Think (p. 45)

Have your student solve this any way they want (including using counters or linking cubes) without first looking at Learn The first problem, (a), cannot be easily interpreted in terms of finding a whole or a part.

Learn (p. 45)

This shows a "comparison bar model" made from linking cubes. It is labeled with what each quantity represents (ants or crickets) and the quantity (12 or 7).

Reread (a) from Think and ask your student which question mark indicates what we need to find. It is the one that shows the difference between the two bars, which represents how many more ants than crickets there are. The model can help your student understand that we need to subtract to find the answer (and not simply see the word "more" and add.)

Reread (b) from Think and ask your student which question mark indicates what we need to find. The question mark at the side indicates that we need to find the total for both numbers. We need to add. This problem is similar to those in the previous lesson, which showed part-whole models.

Answers

(a) 5
5
(b) 19
19

❶ (a) 11 + 5 = 16
16
(b) 11 – 5 = 6
6

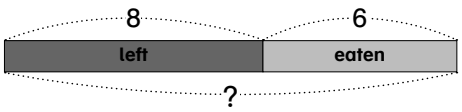
❷ 11 5
6 16

❸ 7 + 4 = 11 11 years old

❹ 18 – 5 = 13 13 stickers

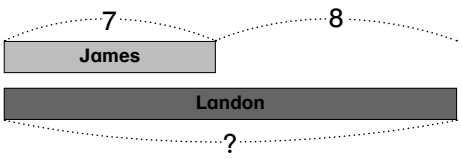
❺ (a) 10 + 4 = 14 14 cards
(b) 10 + 14 = 24 24 cards

❻



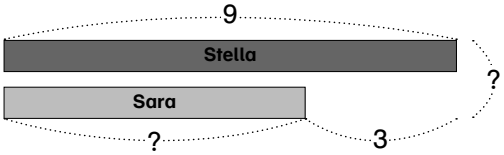
8 + 6 = 14 14 cherries

❼



7 + 8 = 15 15 stickers

❽



(a) 9 – 3 = 6 6 badges
(b) 9 + 6 = 15 15 badges

If a comparison model is already drawn for part of the problem, it is not necessary to draw a new part-whole model. Instead, we can indicate the total with a bracket on the side encompassing both bars.

Tell your student that the first question they need to ask themselves when interpreting a word problem is whether it involves comparing two quantities. If not, they can then ask themselves whether it is asking for a part or a whole.

Do (pp. 46–48)

1. In this problem, (a) is similar to problems in the previous lesson, but (b) involves comparison. The models do not show individual linking cubes.

2. We can also use a comparison model to show that we can add the lesser number and the difference to find the greater number (5 + 6 = 11). We can subtract the difference from the greater number to find the lesser number (11 – 6 = 5). You can come up with some word problems to illustrate these, and redraw the models with question marks. For example, "There are 5 swans in a pond. There are 6 more ducks than swans. How many ducks are there?" (5 + 6 = 11, 11 ducks). "There are 11 ducks in a pond. There are 6 more ducks than swans. How many swans are there?" (11 – 6 = 5, 5 swans).

3. These show a variety of situations illustrated
4. with comparison models. Make sure your
5. student understands the model in relation to the word problem. Ask questions like, "Why is Madison's bar longer than Kaylee's bar?" (Madison is older than Kaylee).

5. This problem is an introduction to two-step word problems. The answer to (a) is used to find the answer to (b). In Dimensions Math® 3, and a few problems in the practices of Dimensions Math® 2, students will only get the question in (b) and will have to determine what needs to be found first. Make sure your student understands which part of the bar model indicates the answer for (a) and for (b). They can write the numbers next to the question marks.

6. In these problems, students have to fill in
7. the values for the bars. They should fill in
8. the numbers given in the problem, and a question mark for what they need to find.

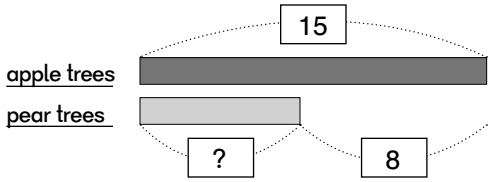
8. This problem also uses the answer to (a) to solve (b).

Chapter 2 Workbook Answers

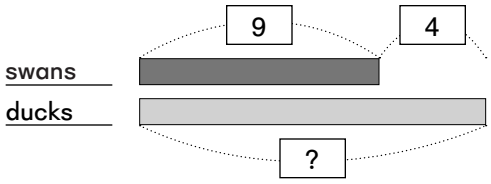
Exercise 4 pp. 37–40

1. Each of these problems show a different part of the comparison model as the unknown value. The numbers given in the bar model should be used in the expression on the left hand side.
   (a) **13** – 5 = **8**
   (b) **13** + 5 = **18**
   (c) 15 **– 7** = **8**
   (d) 11 **– 7** = **4**
   (e) 11 **+ 6** = **17**

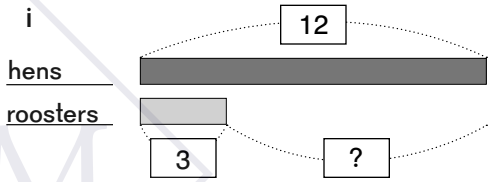
2. (a) 7 + 4 = 11
   11
   (b)



   15 – 8 = 7
   7
   (c)



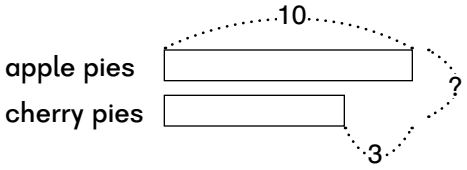
   9 + 4 = 13
   13
   (d) i



   12 – 3 = 9
   9
   ii 12 + 3 = 15
   15

3. (a) 11 – 4 = 7
   7
   (b) 12 – 9 = 3
   3

4. 17 pies
   This is a two-step problem without the first step being given. Students need to first find the number of cherry pies in order to then find the number of pies in all. If your student struggles, ask them what they need to know in order to find the total number of pies. If it helps, draw a bar model for your student as you discuss the problem.



   Number of cherry pies:
   10 – 3 = 7
   Total number of pies:
   10 + 7 = 17

Exercise 5 pp. 41–44

1.

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

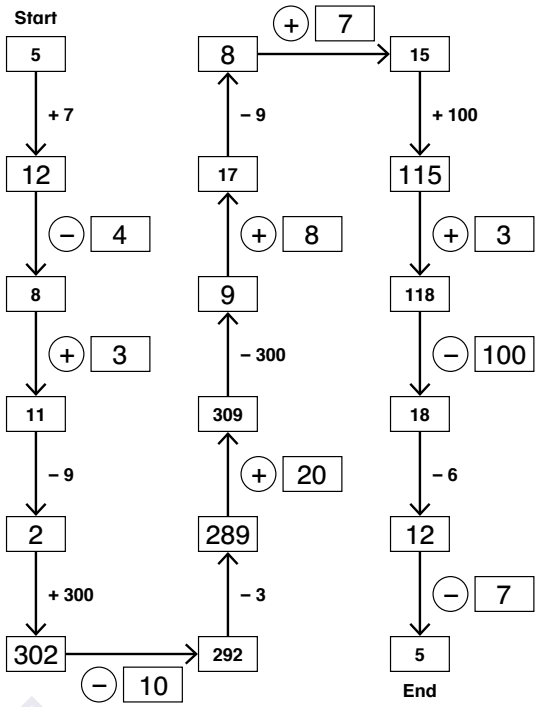
   Make sure your student understands that the value that goes in each box is the sum of the value in the top row and the left column.

Chapter 2 Workbook Answers

2 (a) 6 (b) 5
(c) 15 (d) 11
(e) 9 (f) 7
(g) 4 (h) 17

3 (a) >
8 > 2
(b) =
11 = 11
(c) =
3 = 3
(d) <
18 < 19
(e) >
9 > 7
(f) =
15 = 15

4



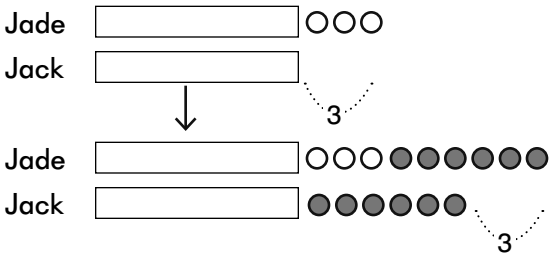
5 17 – 5 = 12
12

6 12 – 8 = 4
4

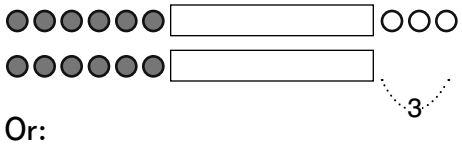
7 11 + 5 = 16
16

8 11 – 5 = 6
6

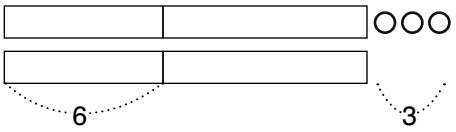
9 3 more action figures
If they both get the same amount, the difference stays the same. If necessary, use a paper strip for the amount Jade has. Your student can line up counters to show how many more counters Jack has, and then how many more each get. You can instead draw the situation as you discuss the problem.



The amount they receive could also be added at the left of the bars to emphasize that the difference does not change:



Or:



10 2 more points
Students can act this problem out with counters.
Dexter's score: 15 – 9 = 6
Cora's score: 6 + 11 = 17
Difference: 17 – 15 = 2
Or: 9 less and 11 more is 2 more.