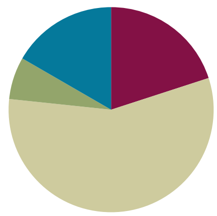
# Lesson 6

## Objective: Decompose arrays into rows and columns, and relate to repeated addition.

### Suggested Lesson Structure

| | |
|---|---|
| Fluency Practice | (12 minutes) |
| Application Problem | (4 minutes) |
| Concept Development | (34 minutes) |
| Student Debrief | (10 minutes) |
| **Total Time** | **(60 minutes)** |



## Fluency Practice (12 minutes)

- Making the Next Hundred Drill **2.NBT.5**, **2.NBT.7** (4 minutes)
- Grade 2 Core Fluency Practice Sets **2.OA.2** (5 minutes)
- Happy Counting by Tens: Crossing 100 **2.NBT.2** (3 minutes)

### Making the Next Hundred Drill (4 minutes)

Note: This fluency activity reviews foundations that lead into today's lesson.

T: (Write 170 on the board.) Let's find the missing part to make the next hundred. What is the next hundred?
S: 200.
T: If I say 170, you say the missing number needed to make 200. Ready? 170.
S: 30.
T: Tell me the addition sentence.
S: 170 + 30 = 200.

Continue with the following possible sequence: 190, 160, 260, 270, 370, 380, 580, 620, 720, 740, 840, 844, 846, 916, 914, and 924.

### Grade 2 Core Fluency Practice Sets (5 minutes)

Materials: (S) Core Fluency Practice Sets (G2–M6–Lesson 1 Core Fluency Practice Sets)

Note: During Topic B and for the remainder of the year, each day's Fluency Practice includes an opportunity for review and mastery of the sums and differences with totals through 20 by means of the Core Fluency Practice Sets or Sprints. Practice Sets, along with details about the process, are provided in Lesson 1.

### Happy Counting by Tens: Crossing 100 (3 minutes)

Note: Students skip-count by tens as a foundation for counting rows and columns in today's lesson.

T: Let's count by tens, starting at 90. Ready?

S: 90, 100, 110, 120, 130, 140 (switch) 130, 120, 110, 100, 90 (switch) 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220 (switch) 210, 200, 190, 180.

T: Excellent! Try it for 30 seconds with your partner, starting at 180. Partner B, you are the teacher today.

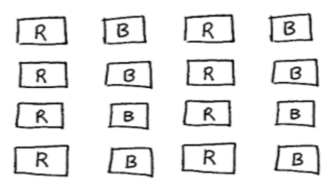
## Application Problem (4 minutes)

Sam is organizing her greeting cards. She has 8 red cards and 8 blue cards. She puts the red cards in 2 columns and the blue ones in 2 columns to make an array.

a. Draw a picture of Sam's greeting cards in the array.

b. Write a statement about Sam's array.

Note: This Application Problem includes drawing a simple array in preparation for the Concept Development.




$8 + 8 = 16$

Sam has 16 cards.

## Concept Development (34 minutes)

Materials: (T) 24 lima beans (or other counters), 21 1-inch tiles, ruler (S) Per pair: 21 1-inch tiles, 24 lima beans (or other counters), personal white board, 1 ruler

Distribute materials to students, and instruct them to create the arrays directly on their personal white boards. This way, they can count each row of beans and write the total at the end of the row. Then, they can write the repeated addition equation directly underneath the array.

T: (Show an array of 4 rows of 5 beans with a small space between each bean.)

T: How many rows do you see?

S: 4 rows.

T: Are my rows equal?

S: Yes!

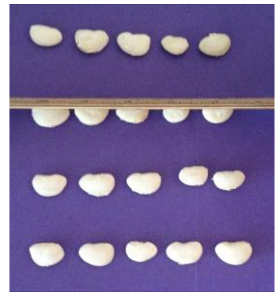
T: For right now, let's call a row a group. How many equal groups are there?

S: 4 equal groups.

T: How many beans are in each group?

S: 5 beans.

T: I am going to pull this array apart so we can clearly see our 4 rows. (Using the ruler, separate the rows so there is space between each row as pictured.)

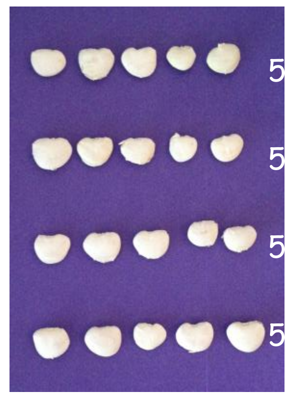


T: There are 5 beans in the first row. With your marker, write 5 to the right of the row. (Write 5 to the right of the row.)

T: There are 5 in the second row. (Write 5 to the right of the row as students do the same.) 5 + 5 is…?

S: 10.

T: Add 5 more for the third row. (Write another 5 as students do the same.) 10 + 5 is…?




S: 15.

MP.4

T: Add 5 more for the last row. (Write another 5 as students do the same.) 15 + 5 is…?

S: 20.

T: Look at all these fives! (Point to the 4 fives along the right of the bean array.) What repeated addition equation can we write underneath to show the total number of beans?

S: 5 + 5 + 5 + 5 = 20.

T: Yes! And how many addends do you see?

S: 4 addends!

T: So, there are 4 fives, and 5 + 5 + 5 + 5 equals 20.

T: (Push the beans back together so there is no space between each row.)

T: Using your lima beans, work with your partner to make an array with 5 columns of 4 beans on your personal white board.

T: Watch now as I use my ruler to add space between each column. (Using the ruler, separate the columns so there are about 2 inches between each one, as students do the same.)

T: How many columns do you see?

S: 5 columns.

T: Are the columns equal?

S: Yes!

T: Now, let's say a column is a group. How many equal groups are there?

S: 5 equal groups!

T: Let's count the number in each group.

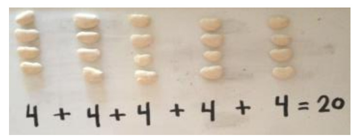
S: (Count beans.)

**NOTES ON MULTIPLE MEANS OF ENGAGEMENT:**

Set up games for students that involve arrays of different numbers of objects. For example, set up a memory game with 5 rows of 5 cards each. Then, have students try to keep track of where a card appeared by noting its position mentally (e.g., third row, second column).

S: 4 beans. (Write 4 at the bottom of each column, just as they did with the rows.)
T: If there are 4 beans in the first column, how many beans are in each column?
S: 4 beans!
T: Turn and talk: Can we make this into a repeated addition equation to find the total number of beans?
S: Yes, put a plus sign between each number. → Add the number in each group to find the total.
T: Let's count to find the total.
T: 4 + 4 is…?


S: 8.
T: Add 4 more.
S: 12.
T: Add 4 more.




S: 16.
T: And the last 4.
S: 20.
T: Do we have the same total number of beans as before?
S: Yes!
T: (Add a column of 4 beans to the right of the array as students do the same.)
T: How many columns do we have now?
S: 6 columns!
T: Turn and talk: How many beans do we have now? How do you know?
S: There are 24 beans. I know because 4 + 4 + 4 + 4 + 4 + 4 = 24. → I know there are 24 beans now because there were 20, and I added on 4 more. → We added another group of 4, so there are 24.
T: Let's try another. With your partner, create an array with 3 rows of 6 tiles.
S: (Create array with partners.)
T: How many equal groups of 6 do you see?
S: 3 equal groups!
T: Turn and talk: What repeated addition equation would you use to find the total?
S: 6 + 6 + 6 = 18.
T: How many groups, or addends, are there?
S: 3 groups!
T: So, there are 3 sixes! And if you add them, 6 + 6 + 6, you have 18.
T: (Push the tiles back together.) Turn and talk: How many columns do you see, and how many tiles are in each column?
S: There are 6 columns of 3 tiles.

**NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:**

Some students will actively make the connection with multiplication at this point. Encourage them to also notice the connections between repeated addition of groups of objects and the multiplication facts.

T: Let’s check that using our ruler. (Use the ruler to separate the tiles into 6 columns of 3 tiles.)

T: How many columns?

S: 6 columns!

T: How many tiles in each column?

S: 3 tiles!

T: Turn and talk: What repeated addition equation would you use to find the total?

S: 3 + 3 + 3 + 3 + 3 + 3 = 18.

T: We made an array with 3 rows of 6 and 6 columns of 3, and the total was the same!

T: (Add another column of 3 tiles.)

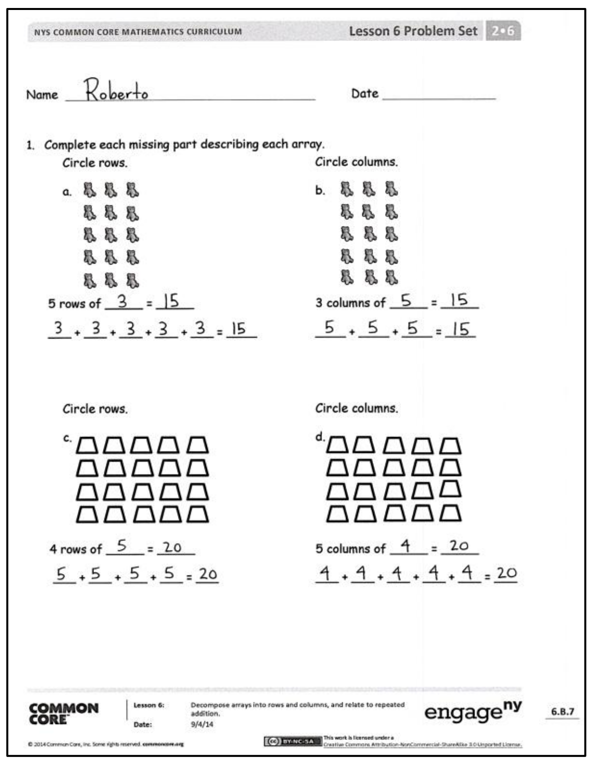
T: Turn and talk: How many tiles are there now, and how do you know?

S: There are 21 tiles, because 3 + 3 + 3 + 3 + 3 + 3 = 18. 18 plus 3 more is 21. → I know there were 18, so I added 3 more, and that makes 21.

Repeat the above process with an array of 2 by 7, and draw the students’ attention to the fact that when you remove a column or row, you remove a unit. Repeat as needed with arrays of 3 by 4 and 4 by 4. Afterward, allow students to move on to the Problem Set.

### Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.


NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 6 Problem Set 2•6

Name Roberto Date

1. Complete each missing part describing each array.

Circle rows.

a. 5 rows of 3 = 15

3 + 3 + 3 + 3 + 3 = 15

Circle columns.

b. 3 columns of 5 = 15

5 + 5 + 5 = 15

Circle rows.

c. 4 rows of 5 = 20

5 + 5 + 5 + 5 = 20

Circle columns.

d. 5 columns of 4 = 20

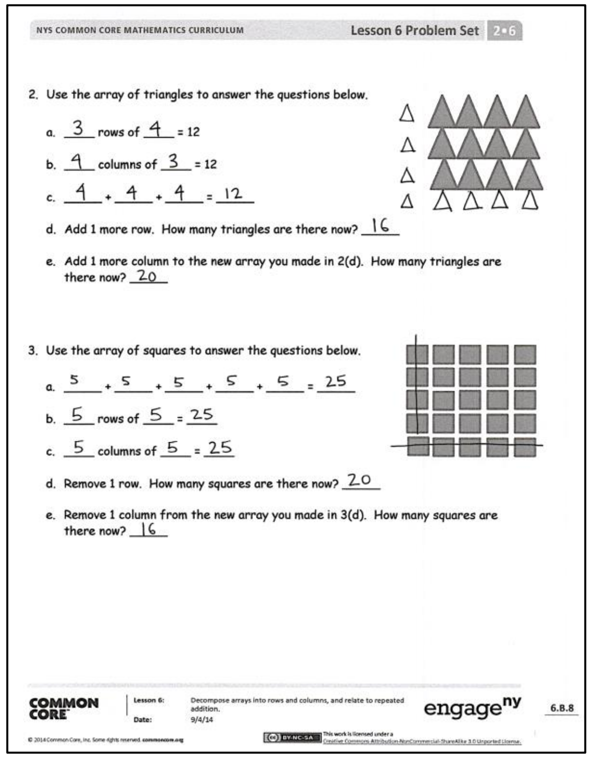
4 + 4 + 4 + 4 + 4 = 20

## Student Debrief (10 minutes)

**Lesson Objective:** Decompose arrays into rows and columns, and relate to repeated addition.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.



NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 6 Problem Set 2•6

2. Use the array of triangles to answer the questions below.

a. 3 rows of 4 = 12

b. 4 columns of 3 = 12

c. 4 + 4 + 4 = 12

d. Add 1 more row. How many triangles are there now? 16

e. Add 1 more column to the new array you made in 2(d). How many triangles are there now? 20

3. Use the array of squares to answer the questions below.

a. 5 + 5 + 5 + 5 + 5 = 25

b. 5 rows of 5 = 25

c. 5 columns of 5 = 25

d. Remove 1 row. How many squares are there now? 20

e. Remove 1 column from the new array you made in 3(d). How many squares are there now? 16

Any combination of the questions below may be used to lead the discussion.

- For Problems 1(a) and (b), describe the arrays. Discuss how each repeated addition equation, or number sentence, matches the array.
- For Problems 1(c) and (d), describe the arrays. How many shapes are in each row or column? How does this match the repeated addition equation?
- For Problem 2, describe two different ways to break apart, or decompose, the 3 by 4 array using rows or columns. How is decomposing arrays similar to decomposing numbers?
- For Problem 2(d), how would adding one more row change the repeated addition equation?
- For Problem 3(a), did you write the repeated addition equation in terms of rows or columns? Why didn't it matter?
- For Problem 3(d), how did removing one row change the repeated addition equation?

## Exit Ticket (3 minutes)

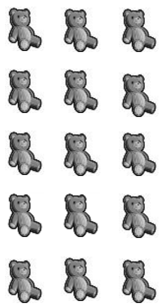
After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

Name ______________________________ Date ______________

1. Complete each missing part describing each array.

Circle rows.

a.



5 rows of _____ = _____

____ + ____ + ____ + ____ + ____ = _____

Circle columns.

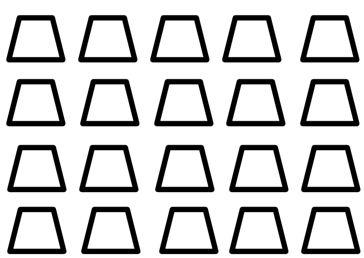
b.

3 columns of _____ = _____

_____ + _____ + _____ = _____

Circle rows.

c.

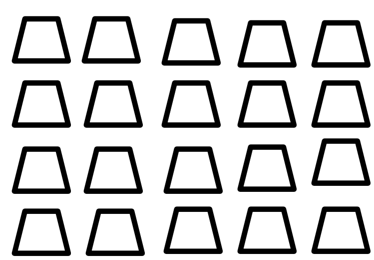


4 rows of _____ = _____

____ + ____ + ____ + ____ = ____

Circle columns.

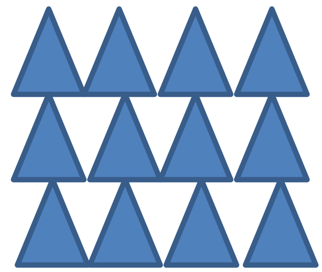
d.



5 columns of _____ = _____

____ + ____ + ____ + ____ + ____ = ____

2. Use the array of triangles to answer the questions below.



a. _____ rows of _____ = 12

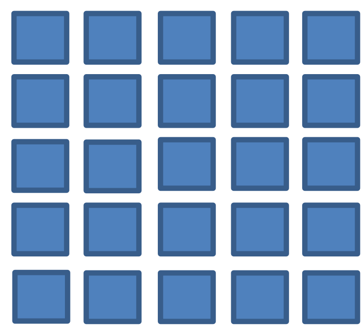
b. _____ columns of _____ = 12

c. ______ + ______ + ______ = ______

d. Add 1 more row. How many triangles are there now? ______

e. Add 1 more column to the new array you made in 2(d). How many triangles are there now? ______

3. Use the array of squares to answer the questions below.



a. ______ + ______ + ______ + ______ + ______ = ______

b. _____ rows of _____ = _____

c. _____ columns of _____ = _____

d. Remove 1 row. How many squares are there now? ______

e. Remove 1 column from the new array you made in 3(d). How many squares are there now? ______

Name ______________________________ Date ______________

Use the array to answer the questions below.

a. ____ rows of ____ = _____

b. ____ columns of ____ = _____

c. _____ + _____ + _____ + _____ = _____

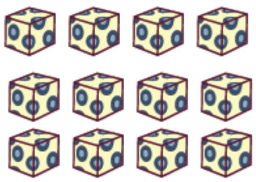
d. Add 1 more row. How many stars are there now? _____

e. Add 1 more column to the new array you made in (d). How many stars are there now? _____

Name ________________________________ Date _______________

1. Complete each missing part describing each array.

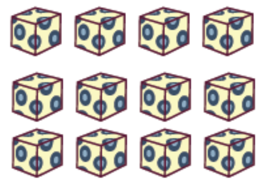
Circle rows.

a. 

3 rows of _____ = _____

____ + ____ + ____ = _____

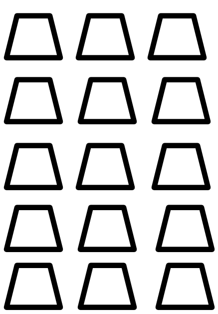
Circle columns.

b. 

4 columns of _____ = _____

____ + ____ + ____ + ____ = _____

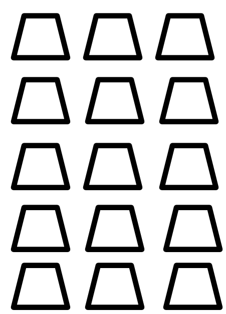
Circle rows.

c. 

5 rows of _____ = _____

____ + ____ + ____ + ____ + ____ = ____

Circle columns.

d. 

3 columns of _____ = _____

____ + ____ + ____ = ____

2. Use the array of smiley faces to answer the questions below.

a. ____ rows of ____ = _____

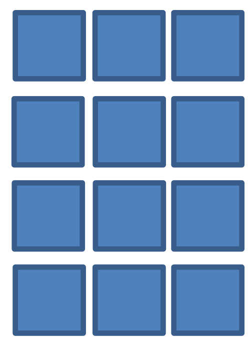
b. ____ columns of ____ = _____

c. _____ + _____ + _____ = _____

d. Add 1 more row. How many smiley faces are there now? _____

e. Add 1 more column to the new array you made in 2(d). How many smiley faces are there now? _____

3. Use the array of squares to answer the questions below.



a. _____ + _____ + _____ + _____ = _____

b. ____ rows of ____ = ____

c. ____ columns of ____ = ____

d. Remove 1 row. How many squares are there now? _____

e. Remove 1 column from the new array you made in 3(d). How many squares are there now? _____