LESSON 7

Objective

Divide integers.

Common Core State Standards

- **7.NS.2b** Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.
- **7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers.

The Number System

Divide Integers I

Students can use what they already know about multiplying integers to divide integers. Multiplication and division are inverse operations. So, for example, to find the quotient 30 ÷ 6, students can think of the related product: 6 × ? = 30. The rules for division of positive and negative numbers are the same as those for multiplication.

Try It! *Perform the Try It! activity on the next page.*

Talk About It

Discuss the Try It! activity.

- **Say:** *The addition problem for finding the sum of the scores is –4 + 1 + (–3).* **Ask:** *Does it matter which two numbers you add first?*
- **Say:** *The division problem for finding the average score is –6 ÷ 3 = –2. Write a related multiplication problem.* Students can write either *3 × (–2) = –6,* or *(–2) × 3 = –6.*
- **Ask:** *Looking at the three scores, is it reasonable that the answer is negative rather than positive?* Have students explain their answers.

Solve It

Reread the problem with students. The average score is the sum of the scores divided by the number of scores: [–4 + 1 + (–3)] ÷ 3. The sum of the scores is –6 and –6 ÷ 3 is –2. Ken's average score is –2.

More Ideas

For other ways to teach about dividing integers—

- Have students use Centimeter Cubes to model pairs of number sentences, such as –10 ÷ 5 = –2 and 5 × (–2) = –10. Suggest that students use red cubes for negative numbers and yellow cubes for positive numbers. Also, discuss why –8 ÷ 4 is easier to model than 8 ÷ (–4).
- Summarize the rules for dividing integers, and note that they are the same as the rules for multiplying integers.

  (1) The quotient of two positive integers is positive.
  (2) The quotient of two negative integers is positive.
  (3) The quotient of a positive integer and a negative integer is negative.
- Using Two-Color Counters, have students model an equation for rules 1 and 3.

Formative Assessment

Have students try the following problem.

Find the average of –6, –4, 8, and –2.

A. –4 **B.** –1 **C.** 1 **D.** 4

Try It! 15 minutes | Pairs

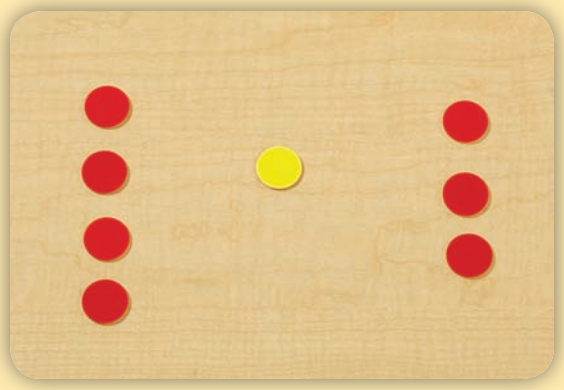
Here is a problem about dividing integers.

In three rounds of golf, Ken shot scores of –4, +1, and –3. What was his average score?

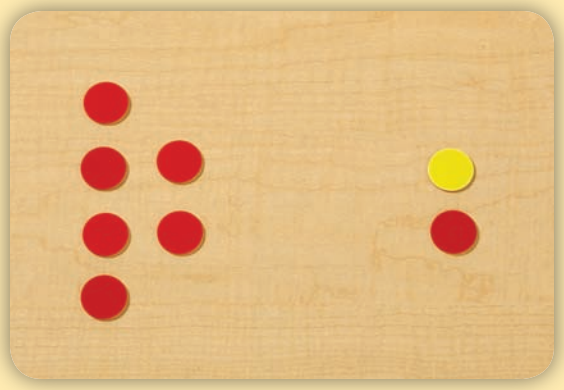
Introduce the problem. Then have students do the activity to solve the problem. Distribute the materials. Remind students that the average is the sum of the scores divided by the number of scores.

Materials

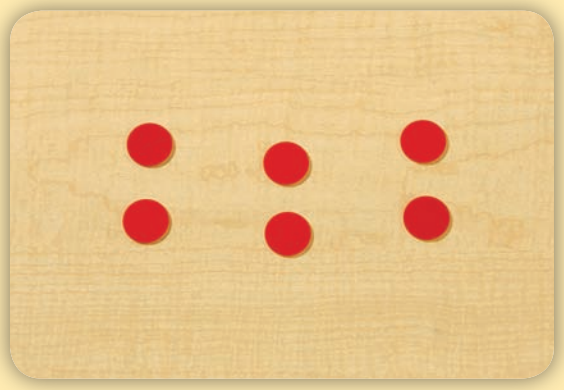
- Two-Color Counters (at least 20 per pair)



1. Say: *Each red counter represents negative one, and each yellow counter represents positive one. Use counters to show Ken's three scores.* Students place 4 red counters together, 1 yellow counter by itself, and 3 red counters together.



2. Say: *To find the average score, you first need to add the three scores. Use the counters to find the sum.* Students pair one yellow counter with a red counter to equal zero, and move the pair aside. There are 6 red counters left. The sum is –6.



3. Say: *Now divide the sum by 3, since there are 3 scores. Divide the counters that represent the sum into 3 equal groups.* **Ask:** *How many counters are in each group?* Students arrange the 6 red counters into 3 groups, with 2 red counters in each group.

⚠ Look Out!

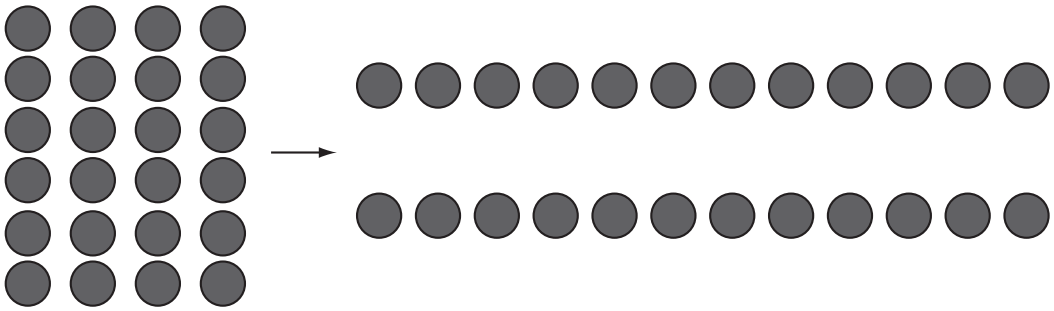
Make sure students understand that the average does not have to be one of the scores. To calculate the average score, they must add all the scores and divide by the number of scores, even though the scores include both positive and negative numbers. Note that the given scores, written in order from least to greatest, are –4, –3, and +1. It makes sense that the average, which is –2, lies between the least score, –4, and the greatest score, +1.

Answer Key

Use Two-Color Counters to model each division problem. Write a number sentence for the quotient.

(Check students' work.)

1.



–24 ÷ 2 = –12

Using Two-Color Counters, model each division problem. Sketch the model. Find the quotient.

2. –35 ÷ 7

–5

3. –81 ÷ 9

–9

Find each quotient.

4. 49 ÷ (–7) = –7

5. –45 ÷ (–5) = 9

6. –42 ÷ 7 = –6

7. 9 ÷ (–3) = –3

8. –30 ÷ (–6) = 5

9. 28 ÷ (–7) = –4

Answer Key

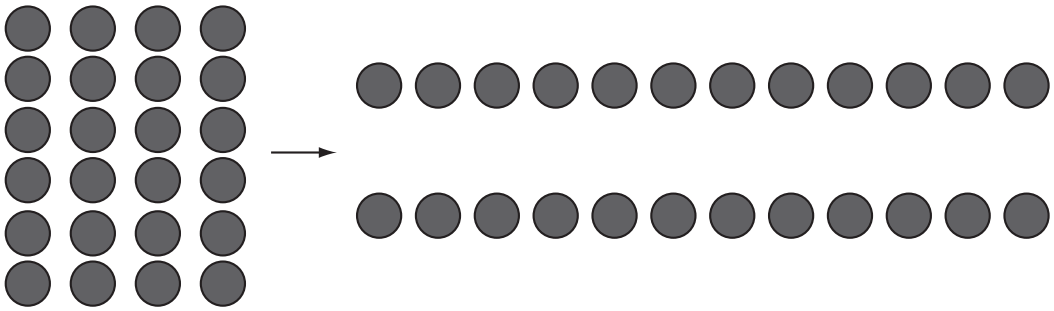
Challenge! How do the rules for dividing integers differ from the rules for multiplying integers? Draw pictures to help.

Challenge: (Sample) The rules for multiplying and dividing integers are the same.

Name _____

Use Two-Color Counters to model each division problem. Write a number sentence for the quotient.

1.



_____

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Name _____

Challenge! How do the rules for dividing integers differ from the rules for multiplying integers? Draw pictures to help.