

LESSON 2.3 Applying Integer Operations

COMMON CORE 7.NS.3

Solve real-world and mathematical problems involving the four operations with rational numbers. *Also 7.NS.2a, 7.NS.2c, 7.EE.3*



ESSENTIAL QUESTION

How can you use integer operations to solve real-world problems?

Using the Order of Operations with Integers

The order of operations applies to integer operations as well as positive number operations. Perform multiplication and division first, and then addition and subtraction. Work from left to right in the expression.



Math On the Spot

my.hrw.com

EXAMPLE 1



COMMON CORE 7.NS.2c, 7.NS.2a

Hannah made four withdrawals of \$20 from her checking account. She also wrote a check for \$215. By how much did the amount in her checking account change?

Analyze Information

You need to find the total *change* in Hannah's account. Since withdrawals and writing a check represent a decrease in her account, use negative numbers to represent these amounts.

Formulate a Plan

Write a product to represent the four withdrawals.

$$-20 + (-20) + (-20) + (-20) = 4(-20)$$

Add -215 to represent the check that Hannah wrote.

$$4(-20) + (-215)$$

Solve

Evaluate the expression to find by how much the amount in the account changed.

$$\begin{aligned} 4(-20) - 215 &= -80 - 215 \\ &= -295 \end{aligned}$$

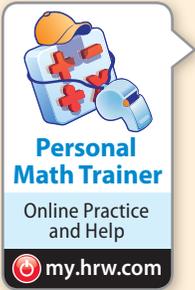
Multiply first.

Then subtract.

The amount in the account decreased by \$295.

Justify and Evaluate

The value -295 represents a decrease of 295 dollars. This makes sense, since withdrawals and writing checks remove money from the checking account.



YOUR TURN

1. Reggie lost 3 spaceships in level 3 of a video game. He lost 30 points for each spaceship. When he completed level 3, he earned a bonus of 200 points. By how much did his score change?

2. Simplify: $-6(13) - 21$ _____



Math On the Spot

my.hrw.com

Using Negative Integers to Represent Quantities

You can use positive and negative integers to solve problems involving amounts that increase or decrease. Sometimes you may need to use more than one operation.

EXAMPLE 2



COMMON CORE

7.NS.3, 7.EE.3

Three brothers each have their own savings. They borrow \$72 from their parents for concert tickets. Each brother must pay back an equal share of this amount. Also, the youngest brother owes his parents \$15. By how much will the youngest brother's savings change after he pays his parents?

- STEP 1** Determine the signs of the values and the operations you will use. Write an expression.

Since the money is being paid back, it will *decrease* the amount in each brother's savings. Use -72 and -15 .

Since an *equal share* of the \$72 will be paid back, use division to determine 3 equal parts of -72 . Then add -15 to one of these equal parts.

$$\text{Change to youngest brother's savings} = (-72) \div 3 + (-15)$$

- STEP 2** Evaluate the expression.

$$\begin{aligned} (-72) \div 3 + (-15) &= -24 + (-15) && \text{Divide.} \\ &= -39 && \text{Add.} \end{aligned}$$

- The youngest brother's savings will decrease by \$39.

Math Talk

Mathematical Practices

Suppose the youngest brother has \$60 in savings. How much will he have left after he pays his parents what he owes?

Reflect

3. **What If?** Suppose there were four brothers in Example 2. How much would the youngest brother need to pay?

YOUR TURN

Simplify each expression.

4. $(-12) \div 6 + 2$ _____

5. $-87 \div (-3) - 9$ _____

6. $40 \div (-5) + 30$ _____

7. $-39 \div 3 - 15$ _____



**Personal
Math Trainer**

Online Practice
and Help

my.hrw.com

Comparing Values of Expressions

Often, problem situations require making comparisons between two values. Use integer operations to calculate values. Then compare the values.

EXAMPLE 3



COMMON
CORE

7.NS.3, 7.EE.3

Jill and Tony play a board game in which they move counters along a board. Jill moves her counter back 3 spaces four times, and then moves her counter forward 6 spaces. Tony moves his counter back 2 spaces three times, and then moves his player forward 3 spaces one time. Find each player's overall change in position. Who moved farther?

STEP 1 Find each player's overall change in position.

Jill: $4(-3) + 6 = -12 + 6 = -6$ *Jill moves back 6 spaces.*

Tony: $3(-2) + 3 = -6 + 3 = -3$ *Tony moves back 3 spaces.*

STEP 2 Compare the numbers of spaces moved by the players.

$|-6| > |-3|$ *Compare absolute values.*

○ Jill moves farther back than Tony.

Math Talk

Mathematical Practices

Why do you compare absolute values in Step 2?

YOUR TURN

8. Amber and Will are in line together to buy tickets. Amber moves back by 3 places three times to talk to friends. She then is invited to move 5 places up in line. Will moved back by 4 places twice, and then moved up in line by 3 places. Overall, who moved farther back in line?

Evaluate each expression. Circle the expression with the greater value.

9. $(-10) \div 2 - 2 =$ _____

10. $42 \div (-3) + 9 =$ _____

$(-28) \div 4 + 1 =$ _____

$(-36) \div 9 - 2 =$ _____



**Personal
Math Trainer**

Online Practice
and Help

my.hrw.com

Guided Practice

Evaluate each expression. (Example 1)

1. $-6(-5) + 12$ _____

2. $3(-6) - 3$ _____

3. $-2(8) + 7$ _____

4. $4(-13) + 20$ _____

5. $(-4)(0) - 4$ _____

6. $-3(-5) - 16$ _____

Write an expression to represent the situation. Evaluate the expression and answer the question. (Example 2)

7. Bella pays 7 payments of \$5 each to a game store. She returns one game and receives \$20 back. What is the change to the amount of money she has?

8. Ron lost 10 points seven times playing a video game. He then lost an additional 100 points for going over the time limit. What was the total change in his score?

9. Ned took a test with 25 questions. He lost 4 points for each of the 6 questions he got wrong and earned an additional 10 points for answering a bonus question correctly. How many points did Ned receive or lose overall?

10. Mr. Harris has some money in his wallet. He pays the babysitter \$12 an hour for 4 hours of babysitting. His wife gives him \$10, and he puts the money in his wallet. By how much does the amount in his wallet change?

Compare the values of the two expressions using $<$, $=$, or $>$. (Example 3)

11. $-3(-2) + 3$ _____ $3(-4) + 9$

12. $-8(-2) - 20$ _____ $3(-2) + 2$

13. $-7(5) - 9$ _____ $-3(20) + 10$

14. $-16(0) - 3$ _____ $-8(-2) - 3$



ESSENTIAL QUESTION CHECK-IN

15. When you solve a problem involving money, what can a negative answer represent?
