KEY

Add, Subtract, Multiply, and Divide Rational Numbers to Solve Real-World Problems

Objective

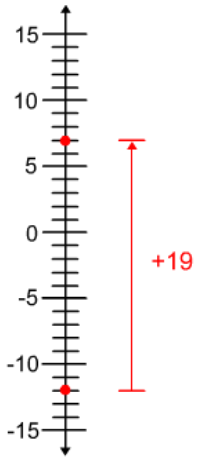
In this lesson, you will

use the four operations to solve real-world and mathematical problems that contain rational numbers.

Problem-Solving Strategies

Strategies to solve problems: look for a pattern, make a list, guess and check, make a table, working backward, using logic, draw a picture, and trying to solve a simpler problem.

Example: The weather report for Fox Point says the temperature will change from -12°F at 5 a.m. to 7°F at 3 p.m. What number represents the net change in temperature from 5 a.m. to 3 p.m.?



Strategy: drawing a picture

The net temperature change from -12°F to 7°F is **+19** °F.

Because this change involved moving in the positive direction on the number line, the change in temperature is a **positive** value.

Example: Holly is sightseeing in New York City. She left her hotel in the morning with a certain amount of money. She bought a $27 ticket to visit the observation deck at the Empire State Building. Then she took a cab to Madame Tussauds. The cab fare was $9. At the museum, she paid an entry fee of $39, and later, she spent $10 on lunch. If Holly had $200 with her after lunch, how much money did she have when she left her hotel?

Strategy: working backwards, making a table

balance after lunch	$200
cost of lunch	$10
balance before lunch	$200 + $10 = $**210**
cost of museum	$39
balance before museum	$210 + $39 = $**249**
cost of cab	$9
balance before cab	$249 + $9 = $**258**
cost of observation deck	$**27**
balance before observation deck (initial amount)	$258 + $27 = $**285**

Solving Real-World Problems

When solving a problem, you can figure out which operation to use by looking for keywords in the problem.

Addition	Subtraction	Multiplication	Division
more	*less*	*combined*	*divided*
additional	*fewer*	*together*	*broken up*
extra	*left over*	**total**	**separated**
rise	**drop**	**product**	**quotient**
combined	**withdraw**		
total	**difference**		
together			
deposit			
sum			

Some words, such as *combined*, *together*, and *total*, indicate addition as well as multiplication. Addition and multiplication have common keywords because **multiplication** is the same as repeated **addition**.

Some keywords also apply to the signs of values. The terms *rise*, *more*, and *deposit* denote **positive** values. The terms *fall*, *less*, and *withdrawal* suggest **negative** values.

Question Gretchen withdrew $31.45 from the bank to buy groceries. Then she deposited a check for $27.89 in the bank. Which expression represents the net change in her account balance as a result of these two transactions? What is the net change in her account balance?

Gretchen withdrew $**31.45** from her account.

The word *withdrew* signifies **subtraction** or a **negative** sign.

So, the net change in her account after this transaction is -$**31.45**.

Then she deposited $**27.89**.

The word *deposited* signifies **addition** or a **positive** sign.

So, the expression representing the net change in her account balance after these two transactions is:

- ○ -$31.45 - $27.89
- ◉ -$31.45 + $27.89
- ○ $31.45 + $27.89

The net change in her account balance because of these two transactions is:

- ◉ −$3.56
- ○ −$59.34
- ○ $59.34

Lesson Activity

Callie was billed $416.48 for car repairs. She will pay the service center in 4 equal monthly installments from her bank account. What is the net change in her bank account balance after each monthly payment? Complete the steps below to solve this problem and others like it.

Part A In terms of the entire bill, which rational number represents the net change to Callie's bank account? What does the sign on the number mean?	The net change to Callie's bank account is: ◉ -$416.48 ○ $416.48 ○ $4 The **negative** sign indicates money leaving Callie's account.	
Part B Which rational number represents the number of months that Callie has to pay off the bill? What does the sign on the number mean?	Callie has **4** months to pay off the bill. The rational number is **+4**. The sign is **positive** because it represents a quantity of something, in this case, months.	
Part C Write an expression to represent the net change to Callie's account balance each month.	◉ $\frac{-416.48}{4}$	○ 4×-416.48
Part D Simplify the expression in part C to find the net change to Callie's account balance each month.	**-$104.12**	
Part E After paying the car service center in full, Callie realizes that she should start saving money each month for her future. She decides to invest the same monthly amount that she was paying the service center in a retirement fund. If she invests in the retirement fund for one year, what will the net change in her account balance be during that time?	The monthly withdrawal from Callie's account continues to be **-$104.12**. After 1 year (12 months), the net change to her account balance will be **-$104.12** × 12 = **-$1,249.44**.	
Part F What is the sign of the net change in part E? Why does the sign make sense in this situation?	**The sign is negative because it represents money leaving, or being deducted from, Callie's bank account.**	

Summary

When solving real-world problems involving rational numbers, what can help you determine which operation and strategy to use?

Answers will vary.