Subtract Integers

I Can... use different methods, including algebra tiles, number lines, or the additive inverse, to subtract integers.

Explore Use Algebra Tiles to Subtract Integers

Online Activity You will use algebra tiles to model subtraction of integers, and draw conclusions about the sign of the difference of the two integers.

Use algebra tiles t	o model 9 – (–2) on the workspace. Record the problem and your solution.	
Calk About	el de la companya de	
What did you de	to be able to subtract two -1-tiles from nine 1-tiles?	
	1 =1	

Learn Subtract Integers

To subtract integers, you can use a horizontal or vertical number line.

The horizontal number line models the equation 4 - 9 = -5. Start at zero. Move right four units to model the integer 4. Then move left nine units to model subtracting 9. The difference is -5.



The vertical number line models the equation 4 - 9 = -5. Start at zero. Move up four units to model the integer 4. Then move down nine units to model subtracting 9. The difference is -5.





🔁 Talk About It!

The Commutative Property is true for addition. For example, 7 + 2 = 2 + 7. Is the Commutative Property true for subtraction? Does 7 - 2 = 2 - 7? Explain your reasoning using a number line.



Your Notes

The number lines illustrate the rules for subtracting two integers.

Words	Symbols	Example
To subtract an integer, add the additive inverse of the integer.	p-q=p+(-q)	4 - 9 = 4 + (-9) = -5

Example 1 Subtract Integers

Find 5 - (-7).

Method 1 Use a number line.

Go Online You can use the Web Sketchpad number line.



Start at zero. Move right 5 units to model the integer 5. Then move right 7 units to model subtracting -7, which is the same as adding the additive inverse, 7. The sum is 12.

So, 5 - (-7) = 12.

Method 2 Use the additive inverse.

5 - (-7) = 5 + 7To subtract -7, add the additive inverse of -7. Add 5 + 7. So, 5 - (-7) = 12.

Check

Find 11 – (–15).

Show your work here

Go Online You can complete an Extra Example online.

Will you use a number

line or will you add the additive inverse to

solve this problem?

Talk About It!

Compare and contrast

Method 1 and Method 2.

Example 2 Subtract Integers

Find -24 - (-17). -24 - (-17) = -24 + 17 To subtract -17, add its additive inverse. = -7 So, -24 - (-17) = -7.

Check

Find -39 - (-24).

Example 3 Subtract Expressions

Evaluate x - y if x = -23 and y = 19.

x - y = -23 - 19	Replace <i>x</i> with —23 and <i>y</i> with 19.
= -23 + (-19)	To subtract 19, add its additive inverse
= -42	Add -23 + (-19).

Add.

So, when x = -23, and y = 19, x - y = -42.

Check

Evaluate p - q if p = -21 and q = 37.

Go Online You can complete an Extra Example online.

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Exits along h is 14 miles ar	highways are named by way from the weatern	y their numerical mile state line.	market, for example if	the road runs from a	rest to east, Exit H
Suppose Stu Record your	art is traveling exstbo answer	und passing Exit 165.	and exiting at Exit 191.	What is the distance	the will travel?
,,					
165	,				191 N
6					

Explore Find Distance on a Number Line

number line to find the difference of the two integers.

Online Activity You will calculate distance traveled by using a

Hink About It!

Predict the sign of the difference between the two integers.

Calk About It!

Describe a situation where the difference between two numbers is greater than either number. Then explain why that happens.

Learn Find the Distance Between Integers

Find the distance between -4 and 5.

Go Online Watch the animation to learn how to find the distance between two integers.

Method 1 Use a number line.

Step 1 Plot the integers on a number line. The animation shows two points at -4 and 5.



Step 2 Count the number of units between the two integers.



There are 9 units between -4 and 5.

Method 2 Use an expression.

The distance between two integers is equal to the absolute value of their difference.

distance = |difference of integers|

Step 1 Write an expression for the distance.

|-4 - 5|

Step 2 Simplify the expression.



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The distance between -4 and 5 is 9 units.

You can also use the expression |5-(-4)| to represent the distance. Because you find the absolute value of the difference, the order of the integers does not matter. The expressions |-4-5| and |5-(-4)|are both equal to 9.



Example 4 Find the Distance Between Integers

Find the distance between -9 and 8.

Method 1 Use a number line.

Go Online You can use the Web Sketchpad number line.

Start at -9. Move right until you reach 8.



There are _____ units between -9 and 8.

Method 2 Use the absolute value.

To find the distance between integers, you can find the absolute value of their difference.



Simplify.

Add the additive inverse of 8.

So, the distance between -9 and 8 is 17 units.

Check

Find the distance between -5 and 9 on the number line.



Go Online You can complete an Extra Example online.

Pause and Reflect

When finding the distance between integers with different signs, which method would you choose to use? Explain.



🕞 Think About It!

What subtraction expression could be used to find the distance?

Talk About It!

Compare and contrast the two methods.

Grant Think About It!

Will the distance be greater or less than 14,494 feet?

Talk About It!

Is it reasonable to have a negative answer? Why or why not?

Section 2017 Find the Distance Between Integers

The highest point in California is Mount Whitney with an elevation of 14,494 feet. The lowest point is Death Valley with an elevation of -282 feet.



What is the distance between the height of Mount Whitney and the depth of Death Valley?

14,494 - (-282) = 14,494 + 282	To subtract —282, add its additive inverse.
= 14,776	Add.
=	Find the absolute value.

So, the distance between the two points is 14,776 feet.

Check

The top of an iceberg is 55 feet above sea level, while the bottom is 385 feet below sea level. What is the distance between the top and bottom of the iceberg?



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Apply The Solar System

The table shows the minimum and maximum temperatures on various celestial objects in the solar system.

Celestial Object	Minimum Temperature (°F)	Maximum Temperature (°F)
Moon	-387	253
Mars	-225	70
Mercury	-279	801
Venus	864	864

Scientists want to send a probe to study the celestial object with the greatest variation in temperature. To which celestial object should they send the probe?

1 What is the task?

Make sure you understand exactly what question to answer or problem to solve. You may want to read the problem three times. Discuss these questions with a partner.

First Time Describe the context of the problem, in your own words. **Second Time** What mathematics do you see in the problem? **Third Time** What are you wondering about?

2 How can you approach the task? What strategies can you use?



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3 What is your solution?

Use your strategy to solve the problem.



4 How can you show your solution is reasonable?

Write About It! Write an argument that can be used to defend your solution.

Go Online Watch the animation.



Calk About It!

On which celestial object from the table would it be most reasonable to live? Explain.

Check

The table shows the highest and lowest points of elevation, in relation to sea level, in four countries. Which country in this list has the greatest variation in elevation? the least?

Country	Highest Point (ft)	Lowest Point (ft)
Jordan	6,083	-1,404
United Kingdom	4,406	-13
Sweden	6,903	-8
Ireland	3,406	-10



Go Online You can complete an Extra Example online.

Foldables It's time to update your Foldable, located in the Module Review, based on what you learned in this lesson. If you haven't already assembled your Foldable, you can find the instructions on page FL1.



Name		Period	Date	
Practice		Go Online	You can complete yo	our homework online.
Subtract. (Examples 1 and 2)				
1. 9 – (–2)	2. -20 - 10		3. 13 – (–63)	
4. 28 – 14	5. -10 - 0		6. –33 – 33	
7. -18 - (-12)	8. –28 – (–13)		9. –18 – (–40)
10. Evaluate $a - b$ if $a = 10$ and (Example 3)	b = -7.	11. Evaluate x (Example 3)	-y if $x = -11$ ar	y = 26.
	, i			

- **12.** Find the distance between -6 and 7 on a number line. (Example 4)
- **13.** Find the distance between -14 and 5 on a number line. (Example 4)

14. The highest and lowest recorded temperatures for the state of Texas are 120° Fahrenheit and -23° Fahrenheit. Find the range of these extreme temperatures. (Example 5)

Test Practice

15. Open Response The table shows the starting and ending elevations of a hiking trail. How much greater is the elevation of the ending point than the starting point for the trail?

Point on Trail	Elevation
Starting Point	180 ft below sea level
Ending Point	260 ft above sea level

Apply

16. The table shows the maximum and minimum account balances for three college students for one month. Giovanni claimed that he had the least variation (from maximum to minimum) in his account balance that month. Is he correct? Write a mathematical argument to justify your solution.

Student	Maximum Balance (\$)	Minimum Balance (\$)
Jordan	145	-25
Giovanni	168	15
Elisa	152	-10

17. The table shows the record high and record low temperatures for certain U.S. states. Which state in the list had the greatest variation in temperature? the least?

State	Record High Temperature (°F)	Record Low Temperature (°F)
Alaska	100	-80
Idaho	118	-60
Nevada	125	-50
Utah	117	-69

- **18. W** Use a Counterexample Determine if each statement is *true* or *false*. If false, provide a counterexample.
 - a. Distance is always positive.
 - **b.** Change is always positive.

20. Create Write a subtraction expression with a positive and negative integer whose difference is negative. Then find the difference.

19. (i) Find the Error A student is finding 4 - (-2). Find the student's mistake and correct it.

$$4 - (-2) = 4 - 2$$

= 2

21. If you subtract two negative integers, will the difference *always, sometimes,* or *never* be negative? Explain using examples to justify your solution.