

Adding Integers

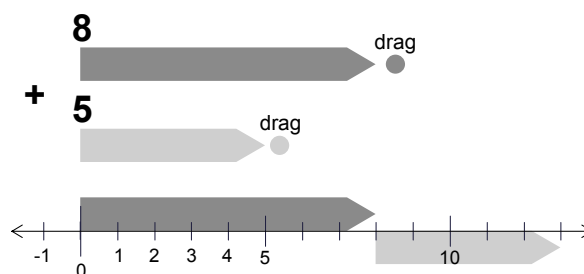
Definition:
Integers are positive and negative whole numbers, including zero. On a number line, tick marks usually represent the integers.

They say that a picture is worth a thousand words. In the next two activities, you'll explore integer addition and subtraction using a visual Sketchpad model. Keeping this model in mind can help you visualize what these operations do and how they work.

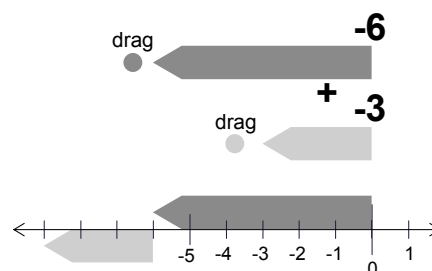
Sketch and Investigate

All sketches referred to in this booklet can be found in Sketchpad | Samples | Teaching Mathematics (Sketchpad is the folder that contains the application itself.)

1. Open the sketch **Add Integers.gsp** from the folder **1_Fundamentals**.
2. Study the problem that's modeled: $8 + 5 = 13$. Then drag the two "drag" circles to model other addition problems. Notice how the two upper arrows relate to the two lower arrows.



- Q1** Model the problem $-6 + -3$. According to your sketch, what is the sum of -6 and -3 ?



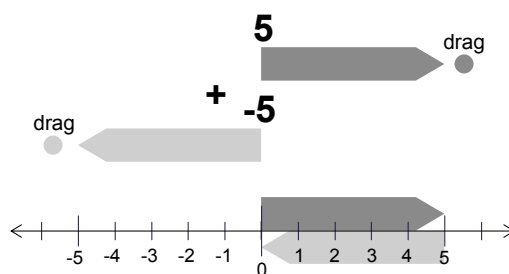
3. Model three more problems in which you add two negative numbers. Write your equations (" $-2 + -2 = -4$," for example) below.

- Q2** How is adding two negative numbers similar to adding two positive numbers? How is it different?

- Q3** Is it possible to add two negative numbers and get a positive sum? Explain.

Adding Integers (continued)

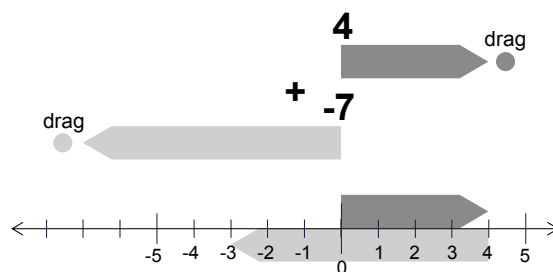
- Q4** Model the problem $5 + -5$.
According to your sketch,
what is the sum of 5 and -5 ?



4. Model four more problems in which the sum is zero. Have the first number be positive in two problems and negative in two problems. Write your equations below.

- Q5** What must be true about two numbers if their sum is zero?

- Q6** Model the problem $4 + -7$.
According to your sketch,
what is the sum of 4 and -7 ?



5. Model six more problems in which you add one positive and one negative number. Have the first number be positive in three problems and negative in three. Also, make sure that some problems have positive answers and others have negative answers. Write your equations below.

- Q7** When adding a positive number and a negative number, how can you tell if the answer will be positive or negative?

Adding Integers (continued)

Q8 A classmate says, “Adding a positive and a negative number seems more like subtracting.” Explain what he means.

Q9 Fill in the blanks:

- The sum of a positive number and a positive number is always a _____ number.
- The sum of a negative number and a negative number is always a _____ number.
- The sum of any number and _____ is always zero.
- The sum of a negative number and a positive number is _____ if the positive number is larger and _____ if the negative number is larger. (“Larger” here means farther from zero.)

Explore More

To *commute* means to travel back and forth. The *Commutative Property of Addition* basically says that addends can *commute* across an addition sign without affecting the sum.

- The *Commutative Property of Addition* says that for any two numbers a and b , $a + b = b + a$. In other words, order doesn't matter in addition! Model two addition problems on your sketch's number line that demonstrate this property.
 - Given the way addition is represented in this activity, why does the Commutative Property of Addition make sense?
 - Does the Commutative Property of Addition work if one or both addends are negative? Give examples to support your answer.