

ADDING INTEGERS

LESSON 2.2



Add two or more integers to find the sum.

EXPLORE!

INTEGER CHIPS

Integer chips are helpful for modeling integer operations. Each blue chip will represent the integer $+1$. Each red chip will represent the integer -1 . When a positive integer chip is combined with a negative integer chip, the result is zero. This pair of integer chips is called a **zero pair**.

$$\begin{array}{c} \bullet \quad \bullet \\ +1 \quad + \quad -1 = 0 \end{array}$$

Step 1: Model $4 + (-2)$ with integer chips.

Step 2: Group as many zero pairs as possible.

Step 3: Because zero pairs are worth zero, remove all zero pairs. What is the result?

Step 4: Write an expression for the following model. Create the same model using your own integer chips.



Step 5: Group as many zero pairs as possible and remove them. What is the result of your expression?

Step 6: Model $-5 + (-3)$ with integer chips.

Step 7: Are there any zero pairs? If so, remove them. What is the result of $-5 + (-3)$?

Step 8: Write an integer addition expression. Model it with integer chips to find the sum.

Step 9: Use integer chips to help you determine what type of answer (positive, negative or zero) you think you will get for each situation. Explain your reasoning.

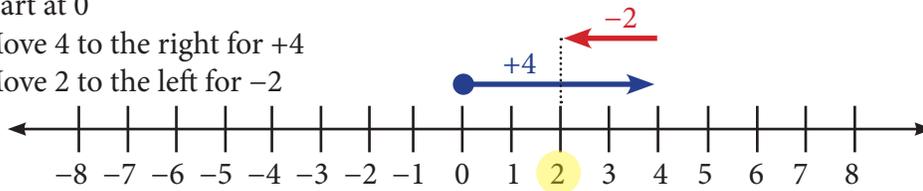
- the sum of two positive numbers
- the sum of two negative numbers
- the sum of a number and its opposite
- the sum of a negative and positive integer



Number lines are another way to model integer addition. Look at these integer sums on a number line:

You can find the value of $4 + (-2)$ using a number line.

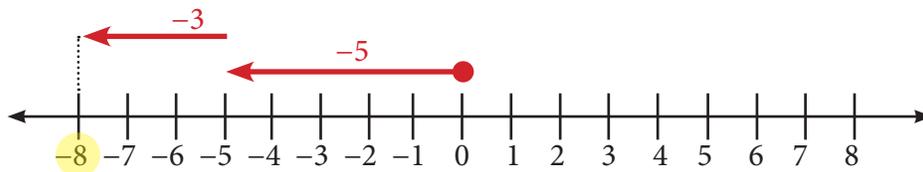
- ◆ Start at 0
- ◆ Move 4 to the right for +4
- ◆ Move 2 to the left for -2



The value of $4 + (-2) = 2$.

You can find the value of $-5 + (-3)$ using a number line.

- ◆ Start at 0
- ◆ Move 5 to the left for -5
- ◆ Move 3 to the left for -3



The value of $-5 + (-3) = -8$.

EXAMPLE 1

Find the sum using integer chips or a number line.

a. $-1 + (-4)$

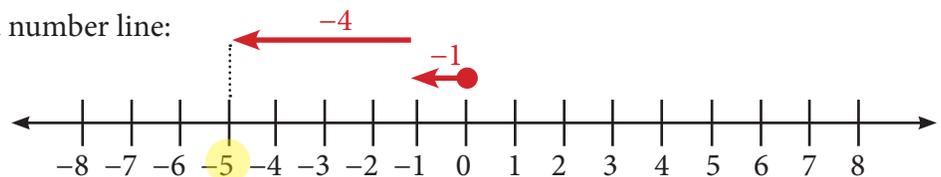
b. $6 + (-3)$

SOLUTIONS

a. $-1 + (-4)$

Using integer chips: $= -5$

Using a number line:

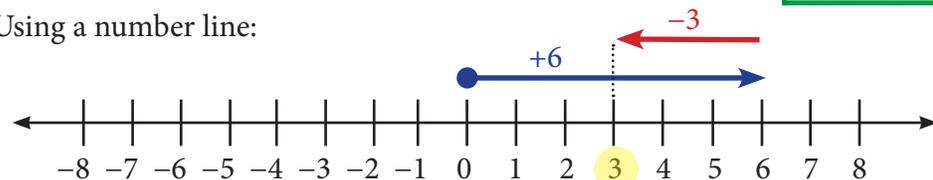


b. $6 + (-3)$

Using integer chips: $= 3$

Zero pairs are removed.

Using a number line:



The following rules may help you add two integers without using integer chips or a number line.

ADDING INTEGERS

1. Determine the sign of the answer:

◆ If both integers are positive, the sum is positive.

$$\boxed{+} + \boxed{+} = \boxed{+}$$

◆ If both integers are negative, the sum is negative.

$$\boxed{-} + \boxed{-} = \boxed{-}$$

◆ If one integer is negative and the other is positive, the sum is the sign of the number with the greater absolute value.

$$\boxed{+} + \boxed{-} = \boxed{?}$$

2. Find the sum:

◆ If the integers have the same sign, add the absolute value of the numbers and use the sign determined above.

◆ If the integers have different signs, subtract the lesser absolute value from the greater absolute value and use the sign determined above.

EXAMPLE 2

JaNell descended 16 feet and then rose 21 feet in elevation on a hike. Write an integer addition expression to represent this situation. Determine her overall change in elevation.

SOLUTION

JaNell descended 16 feet and then rose 21 feet.

Integer expression: $-16 + 21$

Determine the sign.

One integer is negative and the other is positive so use the sign of the number that has the larger absolute value. Since $|21| > |-16|$, the sign of the answer is positive.

Find the sum.

Subtract the lesser absolute value from the larger absolute value.

$$21 - 16 = 5$$

JaNell's overall change in elevation is 5 feet.



EXAMPLE 3

Find the value of $-5 + (-2) + 1$.

SOLUTION

Find the sum of the first two numbers.

$$-5 + -2 = -7$$

Add the third number to the sum.

$$-7 + 1 = -6$$

$$-5 + (-2) + 1 = -6$$

EXERCISES

Use a number line to find each sum.

1. $-5 + (-1)$

2. $6 + (-2)$

3. $-3 + 4$

4. $-9 + 7$

5. $-2 + (-3)$

6. $8 + (-2)$

Find each sum. Use integer chips, a number line or the integer addition rules.

7. $-2 + (-7)$

8. $-3 + 9$

9. $-4 + 3$

10. $14 + (-10)$

11. $-11 + (-1)$

12. $-5 + 5$

13. $7 + (-8)$

14. $-15 + (-6)$

15. $10 + 12$

16. $100 + (-30)$

17. $-5 + 18$

18. $-25 + (-15)$

19. Jason withdrew \$14 from his account on Monday. He deposited \$8 in his account on Tuesday. What integer represents the total change in his account over the last two days?

20. Maria is in a two-day golf tournament. She scored -3 on the first day. On the second day, her score is -5 . What is her overall score for the entire tournament? Use two different methods to show your answer is correct.



21. Ishmael's stock went up \$17 on Thursday and then down \$13 on Friday. What was the total change in the value of the stock?

Find each sum.

22. $-3 + (-4) + (-1)$

23. $12 + (-5) + 3$

24. $10 + (-7) + 6$

25. $20 + 15 + (-12)$

26. $-8 + (-4) + 5$

27. $-1 + (-2) + (-3) + (-4)$

28. Yesterday Kirk borrowed \$13 from his friend. Today he borrowed \$8 more. He plans to pay back his friend \$15 tomorrow. What will Kirk's balance be? Show all work necessary to justify your answer.

29. Find three different integer addition expressions that equal -4 . Use mathematics to justify your answers.

30. Santiago ran up 72 stairs. He realized he forgot something and went down 32 stairs. He finished by going up 65 more stairs.

a. Write an integer addition expression to show Santiago's movement up and down the stairs.

b. What was Santiago's ending location on the stairs?

- 31.** Esther opened a checking account by depositing \$60. Her next four transactions are shown in the table. Copy and complete the “Integer” column of the table by writing an integer to represent each transaction. Find her balance at the end of this transaction period.

Transaction	Integer
Deposited \$60	+60
Withdrew \$22	
Withdrew \$6	
Deposited \$35	
Withdrew \$20	
Balance	

- 32.** Determine the sign of each answer without adding the values. Explain your reasoning.
- $-3429 + 4502$
 - $10770 + 2980$
 - $-60.86 + -902.5$
 - $0.067 + (-0.1)$

REVIEW

Order the integers from least to greatest.

33. $-5, 4, -1, 2$

34. $-1, -6, -10, -2, 0$

35. $5, -3, -1, -2, -7$

Find each absolute value.

36. $|8|$

37. $|-12|$

38. $|-1\frac{2}{3}|$

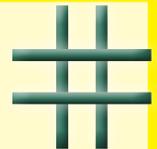
- 39.** Carlina bought 1.52 pounds of raisins and 1.08 pounds of prunes for \$6.50. The raisins and prunes cost the same price per pound. What is the price per pound for the dried fruit? Show all work necessary to justify your answer.

TIC-TAC-TOE ~ VIDEO GAME



Write a proposal for a kid-friendly video game. Players can earn integer point values based on specific situations in the game. Design a flyer giving the details of your game, including the following:

- ◆ the theme
- ◆ the characters
- ◆ all the different ways participants can earn positive integers
- ◆ all the different ways participants can earn negative integers



At the end of your flyer include an example level of your game. Explain what is happening to the character, how many points they are earning for each event and a score total after each event.