6.2 Adding Integers Using the Zero Principle

YOU WILL NEED
- red and blue counters
- a number line

GOAL

Use the zero principle to add integers.

LEARN ABOUT the Math

Nolan's favourite hockey player is Jordin Kudluk Tootoo, an Inuit who was born in Churchill, Manitoba.

Nolan recorded Jordin's +/− score over several games. If Jordin's team scored a goal while Jordin was on the ice, Nolan recorded +1 point. If the other team scored a goal while Jordin was on the ice, Nolan recorded −1 point. Here is Nolan's table for 11 goals.

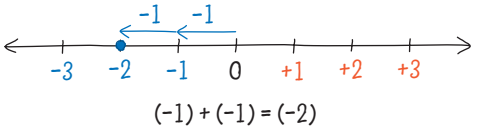
Goal	1	2	3	4	5	6	7	8	9	10	11
Result (+1) or (−1)	−1	−1	+1	+1	+1	−1	+1	−1	+1	−1	+1

How can you calculate Jordin's +/− score?

Example 1 | Using a number line

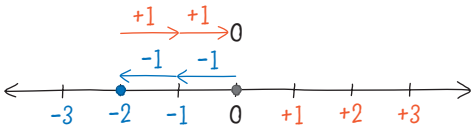
Calculate Jordin's +/− score using a number line.

Nolan's Solution



I added the first two integers in my table.
To represent −1, I drew an arrow pointing to the left.

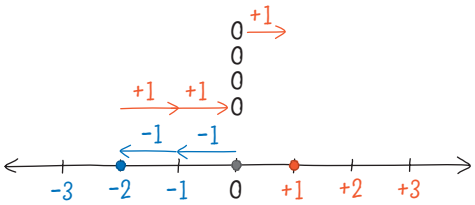
I recorded the result using symbols.



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

$(-2) + (+1) + (+1) = 0$

I added the next two integers. To represent +1, I drew an arrow pointing to the right. This brought me back to 0.



$0 + 0 + 0 + 0 + (+1) = (+1)$

The next two scores were +1 and −1. I knew they would bring me back to 0, so I just recorded the 0. There were two more pairs of 0s, which I recorded. Then I added the last integer.

Jordin's +/− score is +1.

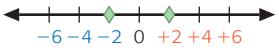
Example 2 | Modelling a sum with counters

Calculate Jordin's +/− score using counters.

Nayana's Solution

opposite integers

two integers that are the same distance from 0 on a number line; for example, +2 and −2 are opposite integers



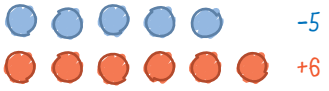
zero principle

the sum of two opposite integers is 0; for example,

(🔵🔵) + (🔴🔴) = 0

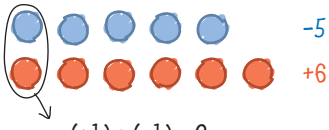
(−2) + (+2) = 0

I modelled the results. I used blue counters to represent −1s and red counters to represent +1s.



$(-5) + (+6)$

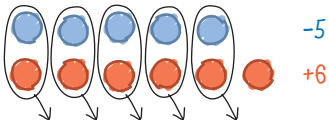
I put the blue counters in one row and the red counters in another row. The total is the sum of the counters.



$(+1) + (-1) = 0$

I paired a +1 with a −1 because they are **opposite integers.**

By the **zero principle,** the sum of +1 and −1 is 0.



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

I was able to pair all the counters, except one. One red counter, or +1, was left over.

Jordin's +/− score is +1.

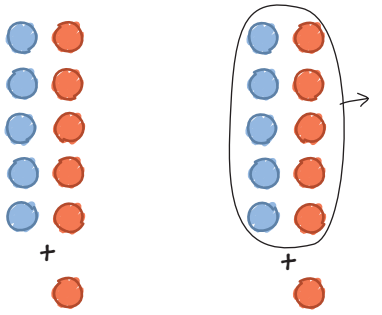
Communication Tip

When you write the sign of an integer (+, −), use brackets so you do not confuse it with the operation signs (+ for addition or − for subtraction). For example, write the addition of +2 and −5 as (+2) + (−5). This is read as "positive two plus negative five."

Example 3 | Renaming an integer

Calculate Jordin's +/− score by renaming.

Liam's Solution



I used counters.
I renamed +6 as (+5) + (+1).

(−5) + (+5) = 0
(−5) + (+6) = (+1)

One red counter is left, so Jordin's +/− score is +1.

Since −5 and +5 are opposite integers, their sum is 0.

Reflecting

A. How are Nayana's solution and Liam's solution alike? How are they different?

B. Nolan added each integer in order. How might he have paired more of the numbers to make the addition easier?

C. How do you think Liam knew that he could rename +6 as (+5) + (+1)?

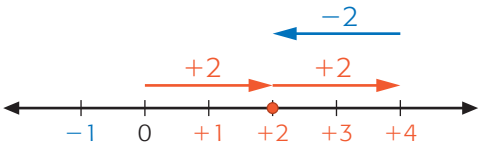
WORK WITH the Math

Example 4 | Adding integers

Calculate (+4) + (−2).

Solution A

Rename +4 as (+2) + (+2).



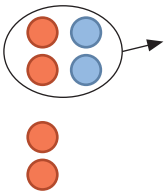
By the zero principle, (+2) + (−2) = 0.

So, (+4) + (−2) = (+2) + (+2) + (−2)
= (+2)

Solution B

Use counters to represent the integers.

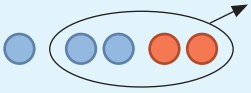
Group the counters to make opposite integers.



(+4) + (−2) = (+2)

A Checking

1. Add the integers in each expression using counters. Then record the addition using symbols. The first one is done for you.

	Expression	Addition model	Recording
a)	(−3) + (+2)		(−3) + (+2) = (−1)
b)	(−4) + (+6)		
c)	(+5) + (−6)		
d)	(−5) + (+7)		
e)	(+2) + (−8)		
f)	(−1) + (−9)		

2. Calculate.

a) (+3) + (−3) = ▢ **b)** (−7) + (+7) = ▢

B Practising

3. Complete.

a) $(-3) + (-2) = \square$

b) $(+2) + (-2) = \square$

c) $(-4) + (+1) = \square$

d) $(+3) + (-5) = \square$

e) $(-2) + (-1) = \square$

f) $(-6) + (+7) = \square$

4. Hailey's +/− score was +2 in one game and −3 in another game. What was her total +/− score?

5. Explain why $(-25) + (+25) = 0$.

6. Each pattern is based on adding integers. Continue each pattern. Then write a rule for the pattern.

a) $0, -1, -2, -3, -4, \square, \square, \square$

b) $-3, -2, -1, 0, \square, \square, \square$

7. Replace each $\square$ with +1 or −1 to make each statement true.

a) $(+1) + \square + \square = (-1)$

b) $(-1) + \square + \square = (+1)$

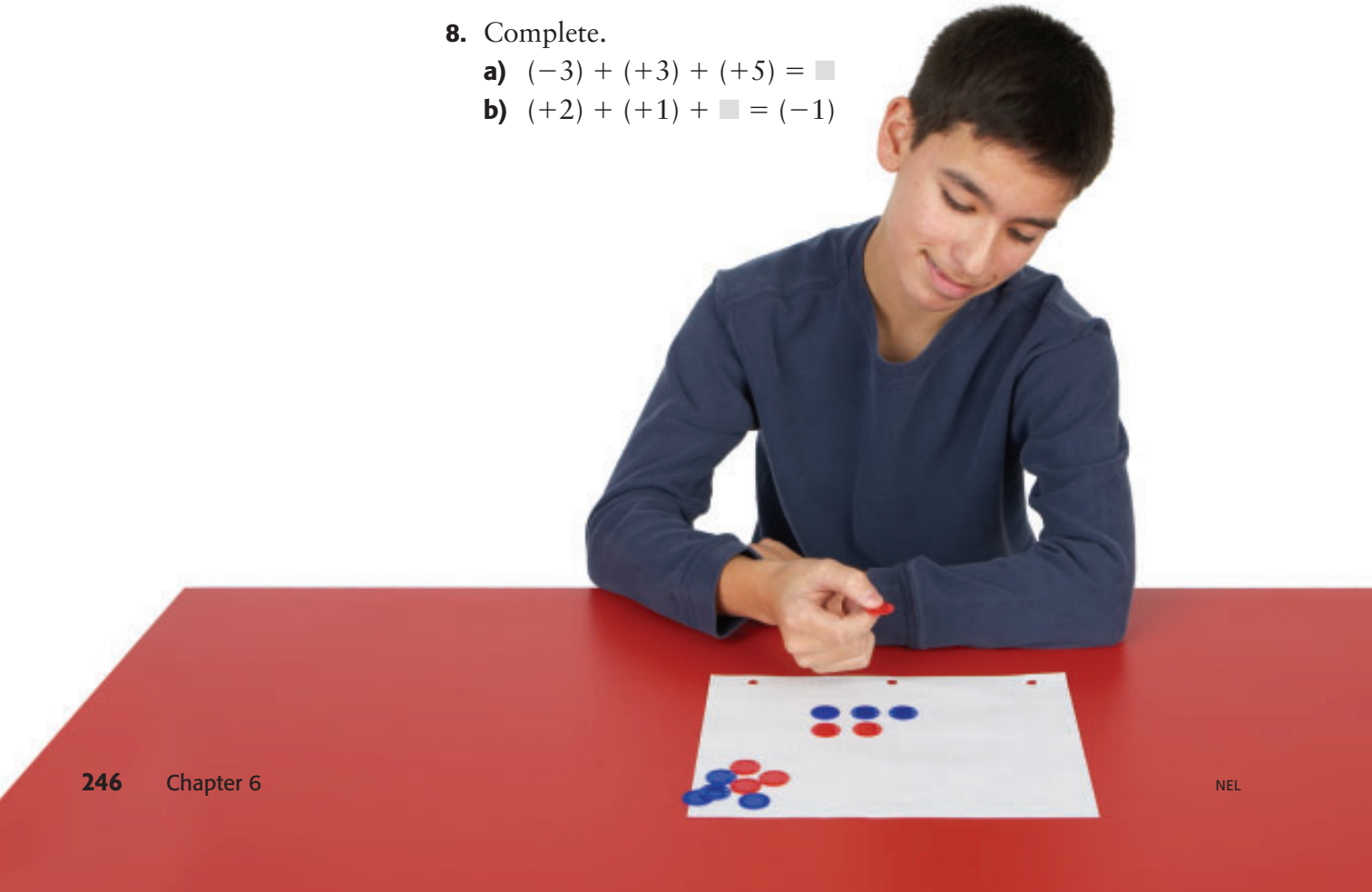
c) $(+1) + \square + \square + \square + \square = (-1)$

d) $(+1) + \square + \square + \square + (+1) = (-1)$

8. Complete.

a) $(-3) + (+3) + (+5) = \square$

b) $(+2) + (+1) + \square = (-1)$



9. Replace the ■ with =, <, or > to make each statement true.

a) $(-1) + (-2)$ ■ (-4)

b) $(+2) + (-5)$ ■ (-3)

c) $(-3) + (+6)$ ■ $(+2)$

d) $(+5) + (-7)$ ■ (-2)

e) $(-2) + (-4)$ ■ (-5)

f) $(-2) + (+1)$ ■ 0

10. Using $+1$ and -1 only, create an addition question that has each sum. Use at least four numbers for each question.

a) $+3$ **b)** -2 **c)** 0 **d)** -1

11. Replace each ■ with an integer to make the equation true. Show three different solutions.

■ + ■ + ■ = (-5)

12. Explain why you cannot complete this equation using only $+1$s or -1s.

$(+1)$ + ■ + ■ + ■ = $(+1)$

+1	−6	−1
−4	−2	0
−3	+2	−5

(−1) + 0 + (−5) = (−6)

13. **a)** In a Magic Square, all rows, columns, and diagonals have the same sum. No number appears more than once. The Magic Square at the left uses integers from -6 to $+2$. Show that the rows, columns, and diagonals all have the same sum. The sum of the third column is shown.

b) Create a Magic Square that uses the integers from -10 to -2.

14. **a)** Add all the integers from -10 to $+10$. What pattern can you use to calculate the sum?

b) Add all the integers from -50 to $+50$, using the pattern in part (a).

15. Is each statement true or false? Explain your reasoning.

a) The sum of two positive integers is always positive.

b) The sum of two negative integers is always negative.

c) The sum of a negative integer and a positive integer is always positive.