

Name: _____ Date: _____

Student Exploration: Adding and Subtracting Integers with Chips

Vocabulary: difference, integer, sum, zero pair

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

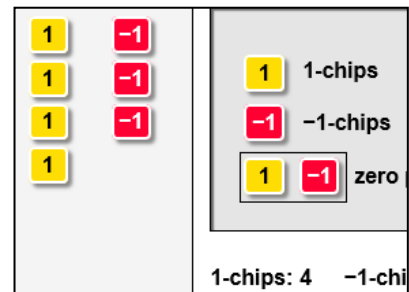
A gambler has lost all his money and owes the bank \$100. He tries to win it back playing poker.

1. At the start of the game, what is the gambler's total worth? _____
2. In the first hand, the gambler wins \$120. What is his total worth now? _____
3. In the next hand, the gambler loses \$35. What is his total worth now? _____

Gizmo Warm-up

Physical models such as apples and oranges are useful for modeling addition and subtraction with positive numbers, but different models must be used when the numbers are negative.

The *Adding and Subtracting Integers with Chips* Gizmo™ allows you to use chips to find **sums** and **differences** of positive and negative **integers**, which are numbers with no fractional part.



1. To begin, select **Explore**. Drag four of the yellow **1-chips** and three of the **-1-chips** into the yellow **Modeling Area**. What is the sum that you have modeled? _____
2. Drag a **zero pair** (a 1-chip and a -1-chip) into the area. Does this change the total value of chips in the area? _____ Explain. _____

3. Remove all the zero pairs you can by dragging 1-chips over -1-chips. (You can also remove zero pairs by selecting a whole region of zero pairs and then clicking inside the region.)

Does removing zero pairs change the sum? _____

Activity A: Adding integers	<u>Get the Gizmo ready:</u> • Select Addition from the choices at top right.	Evaluate: 5 + (-2)
--	--	-------------------------------------

- Check that under **Evaluate** the problem is $5 + (-2)$. (If not, refresh your browser to restart the Gizmo.) Follow the **Instructions** to model 5 and -2 in the modeling area.
 - How many 1-chips did you use? _____
 - How many -1 -chips did you use? _____
- Click **Continue**. Recall that adding and removing zero pairs does not change the sum. Remove all the zero pairs you can by dragging 1-chips over -1 -chips.
 - How many zero pairs did you remove? _____
 - What remains after all the zero pairs have been removed? _____
 - Click **Continue**. Type the sum in the space above the modeling area and click **Enter**.
What is $5 + (-2)$? _____
- Click **New**. The problem should now be $(-7) + 3$. Model this sum using chips.
 - How many 1-chips did you use? _____ How many -1 -chips? _____
 - Click **Continue** and remove the zero pairs. How many did you remove? _____
 - Click **Continue** and enter the sum. What is the sum of -7 and 3 ? _____
- Practice additional problems using the Gizmo. Then, in the space at right, use drawings of chips to model the sum $4 + (-3)$. Cross out the zero pairs and write the sum. Check your answer in the Gizmo. (Use the **Explore** mode.)

$4 + (-3) =$ _____
- Use what you have learned to solve the problems below. Check your answers with the Gizmo when possible. (You will need to use the **Explore** mode of the Gizmo.)
 - $-6 + (-5)$
 - $7 + (-12)$
 - $-22 + 23$



Activity B: Subtracting integers	<u>Get the Gizmo ready:</u>	Evaluate:
	<ul style="list-style-type: none"> Select Subtraction. 	$(-4) - (-3)$

1. Check that under **Evaluate:** the problem is $(-4) - (-3)$. Follow the **Instructions** to model -4 in the modeling area.

A. How many -1 -chips did you use to model -4 ? _____

B. Click **Continue**. To model subtraction, drag three of the -1 -chips into the **Subtraction Bin** to the right. (You can also remove the chips by clicking on them.)

How many -1 -chips remain in the yellow modeling area? _____

C. Click **Continue** and enter the answer. What is $(-4) - (-3)$ equal to? _____

2. Click **New**. The problem should now be $6 - (-2)$. Model 6 using chips and click **Continue**.

A. Is it possible to remove two -1 -chips from the modeling area now? _____

B. Add two **zero pairs** to the modeling area. Does this change the total value of the chips in the modeling area? _____

C. Is it possible to remove two -1 -chips from the modeling area now? _____

D. Remove the -1 -chips and click **Continue**. Enter the answer. What is $6 - (-2)$? _____

E. What addition expression is equivalent to $6 - (-2)$? _____

F. In general, what is equivalent to subtracting a negative? _____

3. Practice additional problems using the Gizmo. Then, in the space at right, use drawings of chips to model the difference $-4 - (-6)$. Be sure to add zero pairs if necessary, then cross out the chips that are removed.

$$-4 - (-6) = \underline{\hspace{2cm}}$$

4. Use what you have learned to solve the problems below. If possible, check your answers using the **Explore** mode of the Gizmo.

A. $-3 - (-5)$

B. $8 - (-12)$

C. $-22 - 1$

