# ACTIVITY 1 INTEGERS WITH CHIPS

## Representations and Addition

**Representing Integers:** Yellow (or black) represents positive numbers; red represents negative numbers. One yellow with one red represents zero. Why? The sum of a number and its opposite is always zero.

Build a representation for the number 2 in five different ways. Record your results.

1. ⊕⊕
2. ⊕⊕⊕⊖
3. ⊕⊕⊕⊕⊖⊖
4. ⊕⊕⊕⊕⊕⊖⊖⊖
5. ⊕⊕⊕⊕⊕⊕⊖⊖⊖⊖

**Adding Integers:** Adding can be interpreted as a "putting together" operation.

Same Signs:

1. Build a representation that shows the sum of 2 and 5. What is the result? ⊕⊕ ⊕⊕⊕⊕⊕ **7**
2. Build a representation that shows the sum of –2 and –5. What is the result? ⊖⊖ ⊖⊖⊖⊖⊖ **–7**

Questions A:

In your own words, write a "rule" for adding two integers with the same sign.

> **Add the numbers (absolute value of each) and use the common sign for the answer.**

Compare your rule with the one in your textbook. Are they the same?

Opposite Signs:

1. Build a representation that shows –2 + 5. What is the result? ⊖⊖ ⊕⊕⊕⊕⊕ **3**
2. Build a representation that shows 2 + –5. What is the result? ⊕⊕ ⊖⊖⊖⊖⊖ **–3**
3. Build a representation that shows –3 + 2. What is the result? ⊖⊖⊖ ⊕⊕ **–1**
4. Build a representation that shows 4 + –1. What is the result? ⊕⊕⊕⊕ ⊖ **3**

Questions B:

In your own words, write a "rule" for adding two integers with opposite signs.

> **Subtract the numbers (absolute value of each) and use the sign of the larger number for the answer.**

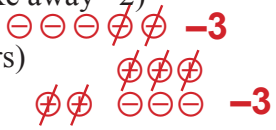
Compare your rule with the one in your textbook. Are they the same?

## Subtraction

**Subtracting Integers:** Finding the difference between two integers can be interpreted as finding the distance between them on a number line, and can be represented by a "take-away" model, using chips. In order to be able to "take away" the required number of positive or negative chips, it may be necessary to add some zeros (yellow plus red) to the representation of the problem.

For each of these problems, record the results in the first column of the table below.

1. Build a representation to find the difference of –5 and –2. (Build –5 and take away –2)
2. Build a representation to find 2 – 5 (Hint: Put in some red/yellow zero pairs)
3. Build a representation to find –2 – 5
4. Build a representation to find 5 – (–2)
5. Build a representation to find –5 – 2









| Subtraction Problem | Result | Related Addition Problem | Result | Compare Result Columns |
|---|---|---|---|---|
| 1. –5 – (–2) | –3 | –5 + 2 | –3 | |
| 2. 2 – 5 | –3 | 2 + –5 | –3 | |
| 3. –2 – 5 | –7 | –2 + –5 | –7 | |
| 4. 5 – (–2) | 7 | 5 + 2 | 7 | |
| 5. –5 – 2 | –7 | –5 + –2 | –7 | |

Questions C:

Did the result columns match? **Yes**

How do the subtraction and addition problem columns relate? **They are the same.**

In your own words, write a rule for subtracting integers.

**Add the opposite of a number to subtract that number.**

For online practice with two-color chips, go to the National Library of Virtual Manipulatives web site:

http://nlvm.usu.edu/en/nav/frames_asid_161_g_1_t_1.html?from=topic_t_1.html for addition practice

http://nlvm.usu.edu/en/nav/frames_asid_162_g_2_t_1.html?from=topic_t_1.html for subtraction practice

**Note:** Decks of cards, with red/black cards representing negative/positive numbers can also be used if chips are unavailable.

## A Model for Multiplication

**Vocabulary:** Product, Quotient, Commutative Property, Set

**Set model of multiplication:** $3 \times 2$ is represented as building 3 sets of 2 each. $2 \times 3$ is represented as building 2 sets of 3 each. The first number, if it is positive, tells how many sets you are building, and the second number tells what is in each set.

Examples with First Number Positive:

1. Build a representation to find the product $2 \times 5$. The result is 10
2. Build a representation to find the product $2 \times -5$. The result is –10
3. Build a representation of $4 \times -3$. The result is –12


for example

Examples with Second Number Positive:

4. Use the commutative property to rewrite $-3 \times 2$. Then build a representation. The result is _____.
5. Rewrite $-2 \times 5$. Then build a representation. The result is –10.

2 × –3

5 × –2

Examples with Both Numbers Negative:

When dealing with negative numbers, we interpret the first (negative) number as indicating how many sets we will take away. The second number tells us what's in each set. In order to take away, it is necessary to represent zero with some zero-pairs (red/yellow pairs).

6. Build a representation for $-3 \times -2$. (Take away 3 sets of –2 from a representation of zero.) The result is 6
7. Build a representation for $-2 \times -5$. The result is 10
8. Build a representation for $-4 \times -2$. The result is 8

Record the above results in the following table.

| Problem | Sign of First Number | Sign of Second Number | Sign of Product |
|---|---|---|---|
| 1 | + | + | + |
| 2 | + | – | – |
| 3 | + | – | – |
| 4 | – | + | – |

| Problem | Sign of First Number | Sign of Second Number | Sign of Product |
|---|---|---|---|
| 5 | – | + | – |
| 6 | – | – | + |
| 7 | – | – | + |
| 8 | – | – | + |

What patterns do you see? Write a "rule" for multiplying integers. Compare your rule with the one in your textbook.

**When you have an even number of negative signs and are multiplying (zero counting as even) your product will be positive.**