Name _____ Date_____

Develop Rules for Multiplying Signed Numbers

1. Create a real-life example that can be modeled by the expression -2×4, and then state the product.

2. Two integers are multiplied and their product is a positive number. What must be true about the two integers?

1. Complete the problems below. Then, answer the question that follows.

$3 \times 3 =$	$3 \times 2 =$	$3 \times 1 =$	$3 \times 0 =$	$3 \times (-1) =$	$3 \times (-2) =$
$2 \times 3 =$	$2 \times 2 =$	$2 \times 1 =$	$2 \times 0 =$	$2 \times (-1) =$	$2 \times (-2) =$
$1 \times 3 =$	$1 \times 2 =$	$1 \times 1 =$	$1 \times 0 =$	$1 \times (-1) =$	$1 \times (-2) =$
$0 \times 3 =$	$0 \times 2 =$	$0 \times 1 =$	$0 \times 0 =$	$0 \times (-1) =$	$0 \times (-2) =$
$-1 \times 3 =$	$-1 \times 2 =$	$-1 \times 1 =$	$-1 \times 0 =$	$-1 \times (-1) =$	$-1 \times (-2) =$
$-2 \times 3 =$	$-2 \times 2 =$	$-2 \times 1 =$	$-2 \times 0 =$	$-2 \times (-1) =$	$-2 \times (-2) =$
$-3 \times 3 =$	$-3 \times 2 =$	$-3 \times 1 =$	$-3 \times 0 =$	$-3 \times (-1) =$	$-3 \times (-2) =$

   Which row shows the same pattern as the outlined column? Are the problems similar or different? Explain.

2. Explain why $(-4) \times (-5) = 20$. Use patterns, an example from the Integer Game, or the properties of operations to support your reasoning.

3. Each time that Samantha rides the commuter train, she spends $\$4$ for her fare. Write an integer that represents the change in Samantha's money from riding the commuter train to and from work for 13 days. Explain your reasoning.

4. Write a real-world problem that can be modeled by $4 \times (-7)$.

Challenge:

5. Use properties to explain why for each integer a, $-a = -1 \times a$. (Hint: What does $\big(1 + (-1)\big) \times a$ equal? What is the additive inverse of a?)

1. **Create a real-life example that can be modeled by the expression -2×4, and then state the product.**

   Answers will vary. Tobi wants to lose 2 lb. each week for four weeks. Write an integer to represent Tobi's weight change after four weeks. Tobi's weight changes by -8 lb. after four weeks.

2. **Two integers are multiplied and their product is a positive number. What must be true about the two integers?**

   Both integers must be positive numbers, or both integers must be negative numbers.

1. **Complete the problems below. Then, answer the question that follows.**

$3 \times 3 = 9$	$3 \times 2 = 6$	$3 \times 1 = 3$	$3 \times 0 = 0$	$3 \times (-1) = -3$	$3 \times (-2) = -6$
$2 \times 3 = 6$	$2 \times 2 = 4$	$2 \times 1 = 2$	$2 \times 0 = 0$	$2 \times (-1) = -2$	$2 \times (-2) = -4$
$1 \times 3 = 3$	$1 \times 2 = 2$	$1 \times 1 = 1$	$1 \times 0 = 0$	$1 \times (-1) = -1$	$1 \times (-2) = -2$
$0 \times 3 = 0$	$0 \times 2 = 0$	$0 \times 1 = 0$	$0 \times 0 = 0$	$0 \times (-1) = 0$	$0 \times (-2) = 0$
$-1 \times 3 = -3$	$-1 \times 2 = -2$	$-1 \times 1 = -1$	$-1 \times 0 = 0$	$-1 \times (-1) = 1$	$-1 \times (-2) = 2$
$-2 \times 3 = -6$	$-2 \times 2 = -4$	$-2 \times 1 = -2$	$-2 \times 0 = 0$	$-2 \times (-1) = 2$	$-2 \times (-2) = 4$
$-3 \times 3 = -9$	$-3 \times 2 = -6$	$-3 \times 1 = -3$	$-3 \times 0 = 0$	$-3 \times (-1) = 3$	$-3 \times (-2) = 6$

   Which row shows the same pattern as the outlined column? Are the problems similar or different? Explain.

   The row outlined shows the same pattern as the outlined column. The problems have the same answers, but the signs of the integer factors are switched. For example, $3 \times (-1) = -3 \times 1$. This shows that the product of two integers with opposite signs is equal to the product of their opposites.

2. **Explain why $(-4) \times (-5) = 20$. Use patterns, an example from the Integer Game, or the properties of operations to support your reasoning.**

   Answers may vary. Losing four -5 cards will increase a score in the Integer Game by 20 because a negative value decreases a score, but the score increases when it is removed.

3. **Each time that Samantha rides the commuter train, she spends $\$4$ for her fare. Write an integer that represents the change in Samantha's money from riding the commuter train to and from work for 13 days. Explain your reasoning.**

   If Samantha rides to and from work for 13 days, then she rides the train a total of 26 times. The cost of each ride can be represented by -4. So, the change to Samantha's money is represented by $-4 \times 26 = -104$. The change to Samantha's money after 13 days of riding the train to and from work is $-\$104$.

4. **Write a real-world problem that can be modeled by $4 \times (-7)$.**

   Answers will vary. Every day, Alec loses 7 pounds of air pressure in a tire on his car. At that rate, what is the change in air pressure in his tire after 4 days?

Challenge:

5. **Use properties to explain why for each integer a, $-a = -1 \times a$. (Hint: What does $(1 + (-1)) \times a$ equal? What is the additive inverse of a?)**

$0 \times a = 0$	*Zero product property*
$(1 + (-1)) \times a = 0$	*Substitution*
$a + (-1 \times a) = 0$	*Distributive property*

Since a and $(-1 \times a)$ have a sum of zero, they must be additive inverses. By definition, the additive inverse of a is $-a$, so $(-1 \times a) = -a$.