MULTIPLYING AND DIVIDING 2

Name: Key Date: Period:

SECTION 2.1 SKIP COUNTING WITH INTEGERS

VOCABULARY

DEFINITION	EXAMPLE
Product: result of multiplication	15 in $3 \cdot 5 = 15$
Factor: a number multiplied to get a product	3 or 4 in $3 \cdot 4 = 12$

Big Idea: How do we model multiplication on a number line?

EXPLORATION 1: FROG JUMP MULTIPLICATION

Complete the Table 2.1a in which each jump is 4 units long.

Table 2.1a

Length of Jump (factor)	Number of Jumps (factor)	Frog's Location (product)
4	0	0
4	1	4
4	2	8
4	3	12
4	4	16
4	5	20
4	6	24
4	10	40
4	20	80
4	n	$4n$

Does this table look familiar? You might recognize these numbers from a multiplication table of 4's where the pattern is $4 \cdot 1 = 4$; $4 \cdot 2 = 8$; $4 \cdot 3 = 12$; $4 \cdot 4 = 16$. You can think of (4)(3) as (4 units per jump)(3 jumps) = 12 units.

Complete the Table 2.1b as you did in Table 2.1a, but this time use jumps of directed length 7.

Table 2.1b

Length of Jump	Number of Jumps	Frog's Location
7	0	0
7	1	7
7	2	14
7	3	21
7	4	28
7	5	35
7	6	42
7	10	70
7	20	140
7	*n*	$7n$

Using the pattern demonstrated in this table, compute the product. Multiplication of 7 and 12, often written as 7×12, can also be written as 7 · 12, 7 *12, or (7)(12).

$7 \cdot 12 = 84$

$7n = 7(12) = 84$ or

7	10	70
7	11	77
7	12	84

EXPLORATION 2:

In McAllen, TX, the temperature rises an average of 3° F per hour over a 12 hour period from 1 am to 1 pm. The temperature at 7 am is 72° F. Let x be the number of hours after 7am.

a. Complete the table below to show the relationship between time and temperature over the 12 hours.

Time	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm
# of hrs. x	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5
Temp.	54°F	57°F	60°F	63°F	66°F	69°F	72° F	75°F	78°F	81°F	84°F	87°F

b. What was the temperature at 3 am? 60°F

c. What x-value corresponds to 11 pm? 16 (11 am corresponds to 4 & 11pm corresponds to -8 if going back in time)

d. When is the temperature 63° F? 4 am

e. Is it possible to use multiplication to help determine the temperature in parts b and c? If so, explain how.

Yes. (answers may vary slightly) Temperature is $(72+3x)$ °F.

PROBLEMS:

1. Write the expression five multiplied by fifteen using the different multiplication symbols.

   $5 \times 15 = 75$ $\quad 5 * 15 = 75$

   $5 \cdot 15 = 75$ $\quad (5)(15) = 75$

2. Write the equation $5x = 30$ using words.

   5 times x is thirty

   OR 5 times x equals thirty

3. Compute the following products.

   a. (18) (9)

   162

   $\overset{1}{18}$
   $\times 9$
   162

   b. (20) (14)

   280

   20
   $\times 14$
   80
   $+200$
   280

   c. (14) (y)

   $14y$

   d. (115) (30)

   3450

   $\overset{1}{115}$
   $\times 30$
   0
   $+3450$
   3450

Multiplication Model: In the product $(m)(n)$, we think of the first factor m as the length and direction of each jump and we think of n as the number of jumps.

EXPLORATION 3:

Use jumps of directed length -4 to fill the skip counting in Table 2.1d. You may use the number line below to confirm the Frog's location.

Table 2.1d

Directed Length of Jump	Number of Jumps	Frog's Location
-4	0	0
-4	1	-4
-4	2	-8
-4	3	-12
-4	4	-16
-4	5	-20
-4	6	-24
-4	10	-40
-4	20	-80
-4	n	$-4(n)=-4n$

How can we make sense of the product (3) (-4)? This is the first example where the second factor is negative.

The first number, 3 or +3, gives the length of each jump, and the direction the frog is facing. Because the number is positive, the frog faces right.

The second factor gives the number of jumps. What do we mean by the number -4 as the number of jumps? If we think of the jumps taking place at equal time intervals, we can imagine the frog jumping along a line. You may use the number line below to confirm the Frog's location.

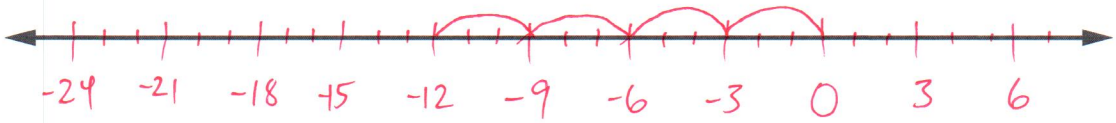

Table 2.1e

Directed Length of Jump	Number of Jumps	Frog's Location
3	-6	-18
3	-5	-15
3	-4	-12
3	-3	-9
3	-2	-6
3	-1	-3
3	0	0
3	1	3
3	2	6
3	3	9

Finally, use the model to fill in table 2.1f. You may use the number line below to confirm the Frog's location.

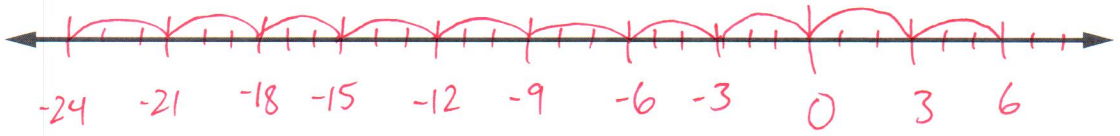

Table 2.1f

Directed Length of Jump	Number of Jumps	Frog's Location
-3	-6	+18
-3	-5	+15
-3	-4	+12
-3	-3	+9
-3	-2	+6
-3	-1	+3
-3	0	0
-3	1	-3
-3	2	-6
-3	3	-9

PROBLEM

Compute the following products. As you multiply, visualize the process to verify the accuracy and reasonableness of your answers.

1. $9 \cdot (-7)$ 2. $-4\,(-8)$ 3 $(-10 \cdot 13) - 10 \cdot 13$ 4. $11 * -5$

1. $(9) \cdot (-7) = -63$

2. $(-4)(-8) = 32$

3. $(-10 \cdot 13) - 10 \cdot 13 = (-130) - 130 = -260$

4. $11 * -5 = -55$

SUMMARY (What I learned in this section)