

3.4 Multiplication and Division of Integers

Illustration 1




<p>A. I have three 5-dollar bills in my pocket. I can represent this amount as</p> $5 + 5 + 5$  $= 3 \cdot 5 = 15$ <p>I have \$15.</p>	<p>B. I owe \$5 to each of three friends. I can represent this amount as</p> $-5 + (-5) + (-5)$  $= 3(-5) = -15$ <p>I owe 15 dollars, thus my net worth is -\$15.</p>	<p>C. My three friends from “B”, have each forgiven my debt to them. I can represent this as</p> $-5 + (-5) + (-5) - [-5 + (-5) + (-5)]$  $= 3(-5) - 3(-5)$ $= 3(-5) + (-3)(-5)$ $= -15 + 15 = 0$ <p>I owe 0 dollars.</p>
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Illustration 2

Complete the following tables to see patterns that suggest rules for multiplication of integers.

Constant		Decrease by 1	=	Decrease by 3
3	×	3	=	9
3	×	2	=	
3	×	1	=	
3	×	0	=	
3	×		=	
3	×		=	

Decrease by 1		Constant	=	Increase by 3
3	×	-3	=	
2	×	-3	=	
1	×	-3	=	
0	×	-3	=	
	×	-3	=	
	×	-3	=	

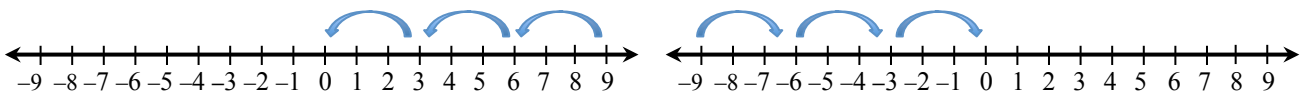
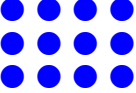

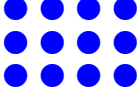


Illustration 3

3 rows of 4	3 rows of -4	the opposite of 3 rows of -4
$3 \cdot 4$  $= 12$	$3(-4)$  $= -12$	$-1(3)(-4)$ $-3 \cdot (-4)$  $= 12$

Rules for Multiplying Integers:

Positive \times Positive = Positive
 Positive \times Negative = Negative
 Negative \times Positive = Negative
 Negative \times Negative = Positive

<i>Demonstration Problems</i>	<i>Practice Problems</i>
1. (a) $5(-3) =$ 2. (a) $-1(-5) =$ 3. (a) $-3(5) =$	1. (b) $12(-5) =$ 2. (b) $-1(-8) =$ 3. (b) $-12(5) =$
Answers: 1. (b) -60 ; 2. (b) 8 ; 3. (b) -60	

<i>Demonstration Problems</i>	<i>Practice Problems</i>
4. (a) $18(-10) =$	4. (b) $15(-10) =$
5. (a) $(-2)^2 =$	5. (b) $(-3)^2 =$
6. (a) $(-2)^2 - (-5)^2 =$	6. (b) $(-3)^2 - (-4)^2 =$
7. (a) $(5 - 6)(8 - 2) =$	7. (b) $(5 - 8)(6 - 2) =$
8. (a) $-2^2 - 5^2 =$	8. (b) $-3^2 - 4^2 =$
Answers: 4. (b) -150; 5. (b) 9; 6. (b) -7; 7. (b) -12; 8. (b) -25	

Since $a \cdot b = c \Rightarrow c \div a = b$, and $c \div b = a$, then we can derive the following:

Rules for Dividing Integers:

Positive \div Positive = Positive
 Positive \div Negative = Negative
 Negative \div Positive = Negative
 Negative \div Negative = Positive

<i>Demonstration Problems</i>	<i>Practice Problems</i>
Simplify. 9. (a) $-8 \div (-2) =$	Simplify 9. (b) $-10 \div (-2) =$
10. (a) $8 \div (-2) =$	10. (b) $10 \div (-2) =$
Answers: 9. (b) 5; 10. (b) -5	

<i>Demonstration Problems</i>	<i>Practice Problems</i>
Let $x = -3$ and $y = 6$ and evaluate the following: 11. (a) $xy =$ 12. (a) $5xy =$ 13. (a) $\frac{y}{x}$	Let $x = -2$ and $y = 8$ and evaluate the following: 11. (b) $xy =$ 12. (b) $6xy =$ 13. (b) $\frac{y}{x}$
Answers: 11. (b) -16 ; 12. (b) -96 ; 13. (b) -4	