Lesson 1.3 Multiplying & Dividing Integers

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MCA Lesson 1.3

The Real Number System

1.3 Multiplying and Dividing Integers

What You Will Learn

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- Multiplying integers with like signs and with unlike signs.
- Divide Integers with like and with unlike signs.
- Find factors and prime factors of an integer.
- Represent the definitions and rules of arithmetic symbolically.

Multiplying Integers

Multiplication of two integers can be described as repeated addition or subtraction.

"of" (x)

The result of multiplying one number by another is called a **product.** (x)

3 x 0 = 0

1. The product of an integer and zero is zero.

+3 x +4 = +12 -2 x -3 = +6

2. The product of two integers with like signs is positive.

3. The product of two integers with unlike signs is negative.

$+3 \times -2 = -6$

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Example 1 – Multiplying Integers

a. $4(10) =$ 40

b. $-6 \cdot 9 =$ -54

c. $-5(-7) =$ 35

d. $3(-12) =$ -36

e. $-12 \cdot 0 =$ 0

f. $-2(8)(-3)(-1) =$

$-16(-3)(-1)$

$(48)(-1)$

$= 48$

(positive)•(positive) = +

(negative)•(positive) = −

(negative)•(negative) = +

(positive)•(negative) = −

(negative)•(zero) = 0

Odd number of negative factors Answer is −

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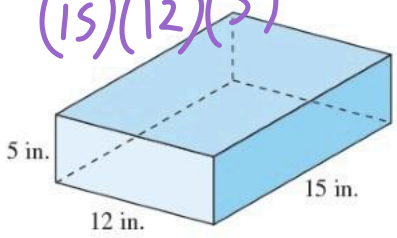
Example 2 – Geometry: Finding the Volume of a Box

Find the volume of the rectangular box.

$V = lwh$

$(15)(12)(5)$



$900\ in^3$

Solution

To find the volume, multiply the length, width, and height of the box.

Volume = (length)•(width)•(height)

= (15 inches)•(12 inches)•(5 inches)

= 900 cubic inches

So, the box has a volume of 900 cubic inches.

Dividing Integers

Dividing Integers 1

The result of dividing one integer by another is called the **quotient** of the integers. Division is denoted by the symbol ÷ or by /, or by a horizontal line.

$$30 \div 6, \qquad 30/6 \qquad \text{and} \qquad \frac{30}{6}$$

These all denote the quotient of 30 and 6, which is 5.

Using the form 30 ÷ 6, 30 is called the **dividend** and 6 is the **divisor**. In the forms 30/6 and $\frac{30}{6}$,

30 is the **numerator** and 6 is the **denominator**

Dividing Integers 2

0 ÷ 3

1. Zero divided by a nonzero integer is 0, whereas a nonzero integer divided by a zero is undefined.

$\frac{0}{3} = 0$ ✓

3 ÷ 0 error

2. The quotient of two nonzero integers with like signs is positive.

9 ÷ 3 = 3 −9 ÷ −3 = 3

$\frac{3}{0} \neq 0$

3. The quotient of two nonzero integers with unlike signs is negative.

−9 ÷ 3 = −3

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Example 3 – Dividing Integers

a. 36 ÷ (−9) = −4

b. -42/-6 = 7

c. 0 ÷ (−13) = 0

$\frac{0}{-13} = 0$

d. −105 ÷ 7 = −15

e. $-97 \div 0 =$ undefined $\frac{-97}{0}$ = error

Example 4 – Finding an Average Gain in Stock Prices

On Monday, you bought $500 worth of stock in a company. During the rest of the week, you recorded the gains and losses in your stock's value.

Tuesday	Wednesday	Thursday	Friday
Gained $15	Lost $18	Lost $23	Gained $10

a. What was the value of the stock at the close of Wed.?
b. What was the value of the stock at the end of the week?
c. What would the total loss have been if Thursday's loss had occurred on each of the four days?
d. What was the average daily gain (or loss) for the four days recorded?

$500+15=515$, $-18=497$, $-23=474$, $+10=484$

$4(-23)=-92$, $500-92=408$

$\frac{+15-18-23+10}{4}=\frac{-16}{4}=-4$

Example 4 – Finding an Average Gain in Stock Prices cont'd

Solution

a. The value at the close of Wednesday was

$$500 + 15 - 18 = \$497$$

b. The value of the stock at the end of the week was

$$500 + 15 - 18 - 23 + 10 = \$484$$

c. The loss on Thursday was \$23. If the total loss had occurred each day, the total loss would have been 4(23) = \$92

d. To find the average daily gain (or loss), add the gains and losses of the four days and divide by 4.

$$\text{Average} = \frac{15 + (-18) + (-23) + 10}{4} = \frac{-16}{4} = -4$$

This means that during the four days, the stock had an average loss of \$4 per day

Factors and Prime Numbers

Factors and Prime Numbers

If *a* and *b* are positive integers, then *a* is a **factor** (or divisor) of *b* if and only if *a* divides evenly into *b*. For instance, 1, 2, 3, and 6 are all factors of 6.

The concept of factors allows you to classify positive integers into three groups: Prime numbers, composite numbers, and the number 1.

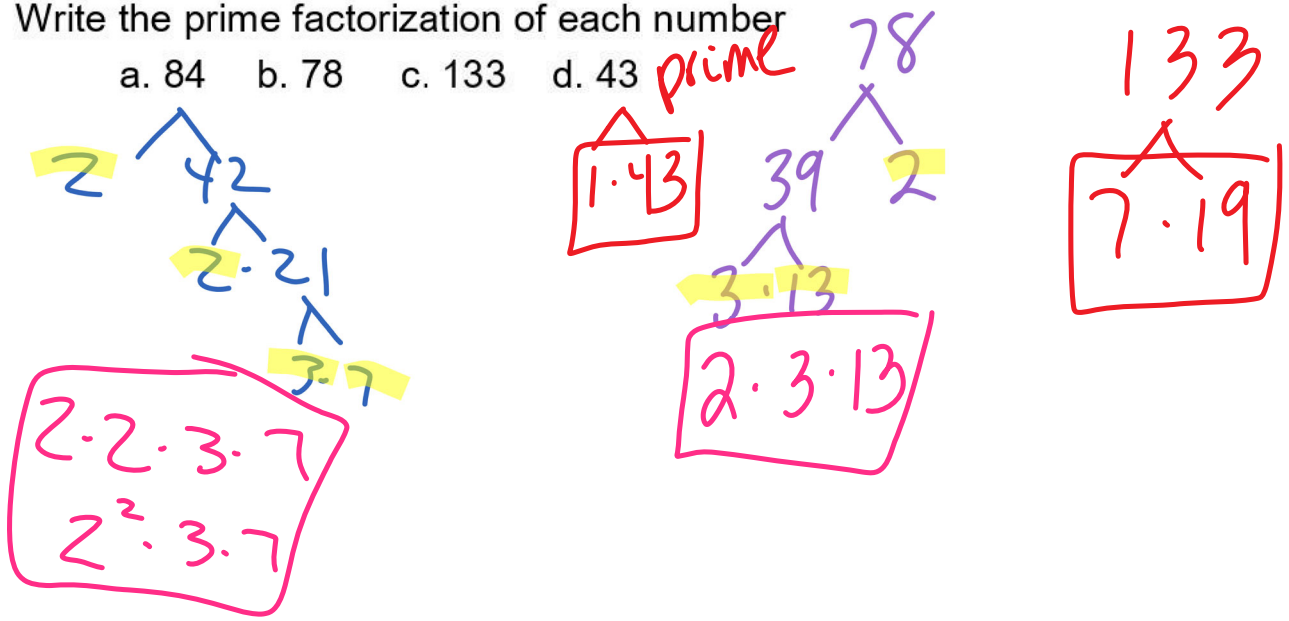
1. An integer greater than 1 with no factors other than itself and 1 is called a **prime number,** or simply a prime.
2. An integer greater than 1 with more than two factors is called a **composite number,** or simply a composite.

Every composite number can be expressed as a unique product of prime factors.

Example 5 – Prime Factorization

Write the prime factorization of each number

a. 84 b. 78 c. 133 d. 43



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Example 5 – Prime Factorization

Write the prime factorization of each number

a. 84 b. 78 c. 133 d. 43

Solution

a. 2 is a divisor of 84. So,

$$84 = 2 \cdot 42 = 2 \cdot 2 \cdot 21 = 2 \cdot 2 \cdot 3 \cdot 7$$

b. 2 is a divisor of 78. So

b. 2 is a divisor of 78. So,

$$78 = 2 \cdot 39 = 2 \cdot 3 \cdot 13$$

c. If you do not recognize a divisor of 133, you can start by dividing any of the prime numbers, 2, 3, 4, 7, 11, etc., into 133. You will find 7 to be the first prime to divide into 133. So,

$$133 = 7 \cdot 9$$

d. In this case, none of the primes less than 43 divides 43. So, 43 is a prime.