Unit 1: Relationships Among Quantities

Key Ideas

- Unit Conversions
- Expressions, Equations, Inequalities
- Solving Linear Equations
- Solving Exponential Equations

Ex 1: Convert 5 miles to feet.

$$\frac{5\text{miles}}{} \bullet \frac{5280\text{feet}}{1\text{mile}}$$

$$= 26{,}400\text{feet}$$

Tips

There are situations when the units in an answer tell us if the answer is wrong.

For example, if the question called for weight and the answer is given in cubic feet, we know the answer cannot be correct.

Don't forget

"**King Henry Died Unfortunately Drinking Chocolate Milk**"

What measurement would I use if I wanted to measure the distance from Atlanta to Orlando?

****Miles****

2. Review Examples

- **The formula for density *d* is $d = m/v$ where *m* is mass and *v* is volume.**

If mass is measured in kilograms and volume is measured in cubic meters, what is the unit for density?

$$d = \frac{m}{v}$$

$$\frac{kg}{m^3}$$

Expressions, Equations & Inequalities

- ***Arithmetic expressions*** are comprised of numbers and operation signs.
- ***Algebraic expressions*** contain one or more variables.
- The parts of expressions that are separated by addition or subtraction signs are called ***terms***.
- The number in front of a variable is called the ***coefficient***.

Example 3: $4x^2 + 7xy - 3$

- It has three terms: $4x^2$, $7xy$, and 3.
- For $4x^2$, the coefficient is 4 and the variable factor is x.
- For $7xy$, the coefficient is 7 and the variable factors are x and y.
- The third term, 3, has no variables and is called a ***constant***.

Example 4:
The Jones family has twice as many tomato plants as pepper plants. If there are 21 plants in their garden, how many plants are pepper plants?

- How should we approach the solution to this equation?

tomato plant: $2x$

pepper plant: x

$$2x + x = 21$$

$$x = 7$$

Example 5:
Find 2 consecutive integers whose sum is 225.

first: x

second: x + 1

$$x + x + 1 = 225$$

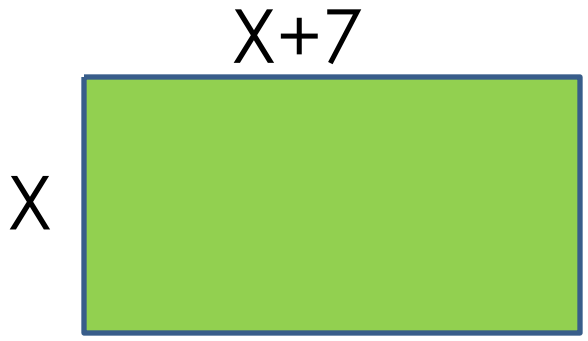
$$2x + 1 = 224$$

$$x = 112$$

112 & 113

Example 6:

A rectangle is 7 cm longer than it is wide. Its perimeter is at least 58 cm. What are the smallest possible dimensions for the rectangle?



$$x + x + (x + 7) + (x + 7) \geq 58$$

$$4x + 14 \geq 58$$

$$x \geq 11$$

11 by 18

Writing Linear & Exponential Equations

- If you are adding or subtracting by the same amount, the equation is a **linear** equation and should be written in the form **y = mx + b**.
- If you are multiplying or dividing by the same amount, the equation is an **exponential equation** and should be written in the form $\mathbf{y = a(b)^x}$.

Create the equation of the line for each of the following tables.

7)

x	y
0	2
1	6
2	18
3	54

Multiplying by 3

Starting at 2

$y = a(b)^x$

$y = 2(3)^x$

8)

x	y
0	-5
1	3
2	11
3	19

Adding 8

Starting at -5

$y = mx + b$

$y = 8x - 5$

9. Linear Word Problem

Enzo is celebrating his birthday and his mom gave him $50 to take his friends out to celebrate. He decided he was going to buy appetizers and desserts for everyone. It cost 5 dollars per dessert and 10 dollars per appetizer. Enzo is wondering what kind of combinations he can buy for his friends.

a) Write an equation using 2 variables to represent Enzo's purchasing decision. $5d + 10a = 50$

(Let a = number of appetizers and d = number of desserts.)

b) Use your equation to figure out how many desserts Enzo can get if he buys 4 appetizers.

$$5d + 10(4) = 50$$
$$d = 2$$

c) How many appetizers can Enzo buy if he buys 6 desserts?

$$5(6) + 10a = 50 \qquad a = 2$$

10. Exponential Word Problem:

Ryan bought a car for $20,000 that depreciates at 12% per year. His car is 6 years old. How much is it worth now?

$$y = P(1 \pm r)^t$$

$$y = 20{,}000(1 - .12)^6$$

$$y = \$9{,}288.08$$

Solving Exponential Equations

- If the **bases are the same**, you can just set the exponents equal to each other and solve for x.
- If the **bases are not the same**, you must make them the same by changing one or both of the bases.
  - Distribute the exponent to the given exponent.
  - Then, set the exponents equal to each other and solve.

Solve the exponential equation:

11) $2^{4x-8} = 2^{x+7}$

$4x - 8 = x + 7$

$3x = 15$

$x = 5$

12) $3^{2x} = 27^{x-2}$

$3^{2x} = 3^{3(x-2)}$

$2x = 3(x-2)$

$2x = 3x - 6$

$x = 6$

CW/HW

Unit 1 Practice Problems from the GA Study Guide

As you are taking the test:

1. Answer the ones you know
2. Answer the ones you have an idea about
3. Guess on the ones you don't know

*You have 15 minutes…
Watch your timing*

Answers to 1st Practice

Front	Back
1. A*	7. C
2. B	8. B*
3. Skip	9. A*
4. C	10. A
5. C*	11. C*
6. D*	

* You should have gotten these ones right

Answers to 2nd Practice

Front

1. B
2. A
3. A
4. C
5. C
6. C
7. A
8. C

Back

6. D
7. A
8. C
9. A
10. B
11. D
12. B