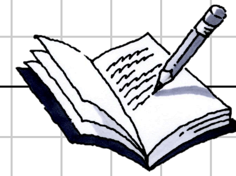
CHAPTER 1: PROBLEM SOLVING

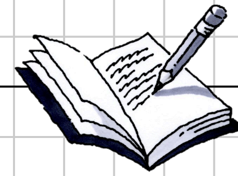
Date:
Lesson:

Learning Log Title:



Date:
Lesson:

Learning Log Title:

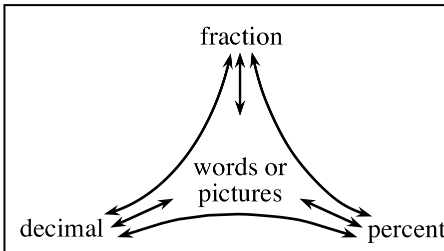


Notes:

MATH NOTES

FRACTION ⇔ DECIMAL ⇔ PERCENT

The **Representations of a Portion web** diagram below illustrates that fractions, decimals, and percents are different ways to represent a portion of a number. Portions can also be represented in words, such as "four fifths" or "twelve fifteenths" or with diagrams.



Representations of a Portion

The examples below show how to convert from one form to another.

Decimal to percent:
Multiply the decimal by 100.
$(0.34)(100) = 34\%$

Percent to decimal:
Divide the percent by 100.
$78.6\% = 78.6 \div 100 = 0.786$

Fraction to percent:
Set up an equivalent fraction using 100 as the denominator. The numerator is the percent.

$$\frac{4}{5} \cdot \boxed{\frac{20}{20}} = \frac{80}{100} = 80\%$$

Percent to fraction:
Use 100 as the denominator. Use the number in the percent as the numerator. Simplify as needed.

$$22\% = \frac{22}{100} \cdot \boxed{\frac{1/2}{1/2}} = \frac{11}{50}$$

Decimal to fraction:
Use the digits as the numerator. Use the decimal place value as the denominator. Simplify as needed.

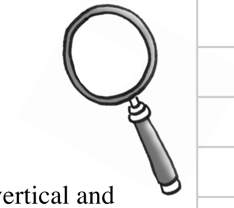
$$0.2 = \frac{2}{10} = \frac{1}{5}$$

Fraction to decimal:
Divide the numerator by the denominator.

$$\frac{3}{8} = 3 \div 8 = 0.375$$

$$\frac{70}{99} = 70 \div 99 = 0.70707 \ldots = 0.\overline{70}$$

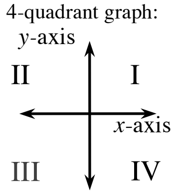
AXES, QUADRANTS, AND GRAPHING ON AN *XY*-COORDINATE GRAPH



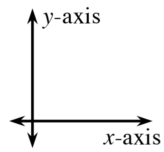
Coordinate axes on a flat surface are formed by drawing vertical and horizontal number lines that meet at 0 on each number line and form a right angle (90º). The *x*- and *y*-axes help define points on a graph (called a "Cartesian Plane"). The ***x*-axis** is horizontal, while the ***y*-axis** is vertical. The *x*- and *y*-axes divide the graphing area into four sections called **quadrants**.

Numerical data can be graphed on a plane using **points**. Points on the graph are identified by two numbers in an **ordered pair** written as (x, y). The first number is the ***x*-coordinate** of the point, and the second number is the ***y*-coordinate**. The point (0, 0) is called the **origin**.

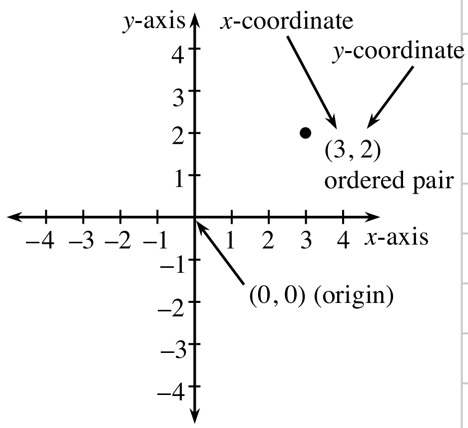
4-quadrant graph:



1st-quadrant graph:



To locate the point (3, 2) on an *xy*-coordinate graph, go three units from the origin to the right to 3 on the horizontal axis and then, from that point, go 2 units up (using the *y*-axis scale). To locate the point (–2, –4), go 2 units from the origin to the left to –2 on the horizontal axis and then 4 units down (using the *y*-axis scale).



Notes:

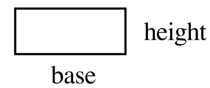
Notes:

WRITING EQUATIONS USING THE 5-D PROCESS

The 5-D Process is an organized method to help write equations and solve problems. The D's stand for Describe/Draw, Define, Do, Decide, and Declare. An example of this work is shown below.

Example Problem: The base of a rectangle is 13 centimeters longer than the height. If the perimeter is 58 centimeters, find the base and the height of the rectangle.

Describe/Draw: The shape is a rectangle, and we are looking at the perimeter.



	Define		**Do**	**Decide**
	Height (trial)	Base (height + 13)	Perimeter 2(base) + 2(height)	58
Trial 1:	10	10 + 13 = 23	2(23) + 2(10) = 66	66 is too high
Let x represent the height in cm	x	$x + 13$	$2(x) + 2(x + 13)$	$2(x) + 2(x + 13) = 58$

Use any trial value.

Use the relationships stated in the problem to determine the values of the other quantities (such as base and perimeter).

Now use the trial to create an equation by defining and adding a variable line.

Now use your algebra skills to solve the equation.

Declare: The base is 21 centimeters, and the height is 8 centimeters.

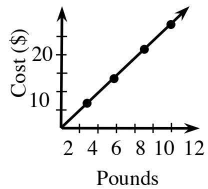
If you do not write an equation, you can solve the problem by making more trials until you find the answer.

PROPORTIONAL RELATIONSHIPS

A **proportional relationship** can be seen in a table: if one quantity is multiplied by an amount, the corresponding quantity is multiplied by the same amount. On a graph, a proportional relationship is linear and goes through the origin.

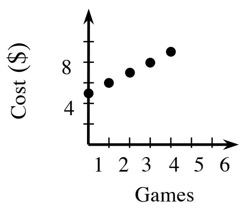
Proportional example: Three pounds of chicken costs $7.00. Below, other values are shown in the table and plotted on the graph.

Pounds	0	3	6	9	12
Cost ($)	0	7	14	21	28



The relationship between pounds and cost is proportional.

Games	0	1	2	3	4
Cost ($)	5	6	7	8	9



Non-proportional example: The video arcade costs $5.00 to enter and $1.00 per game.

The relationship between games and cost is *not* proportional. For example, someone who plays four games ($9) does not pay twice as much as someone who played two games ($7). There is no multiplier for the relationship. The graph does not go through the origin.

Notes:

Notes:

SOLVING PROPORTIONS

If a relationship is known to be proportional, ratios from the situation are equal. An equation stating that two ratios are equal is called a **proportion**. Some examples of proportions are:

$$\frac{6\text{ mi}}{2\text{ hr}} = \frac{9\text{ mi}}{3\text{ hr}} \qquad\qquad \frac{5}{7} = \frac{50}{70}$$

Setting up a proportion is one strategy for solving for an unknown part of one ratio. For example, if the ratios $\frac{9}{2}$ and $\frac{x}{16}$ are equal, setting up the proportion $\frac{x}{16} = \frac{9}{2}$ allows you to solve for x.

Giant One: One way to solve this proportion is by using a Giant One to find the equivalent ratio. In this case, since 16 is 2 times 8, you create the Giant One shown at right.

$$\frac{x}{16} = \frac{9}{2} \cdot \frac{8}{8}$$

$$\frac{x}{16} = \frac{9 \cdot 8}{2 \cdot 8}$$

$$\frac{x}{16} = \frac{72}{16}$$

which shows that $x = 72$

Undoing Division: Another way to solve the proportion is to think of the ratio $\frac{x}{16}$ as, "x divided by 16." To solve for x, use the inverse operation of division, which is multiplication. Multiplying both sides of the proportional equation by 16 "undoes" the division.

$$\frac{x}{16} = \frac{9}{2}$$

$$\left(\frac{16}{1}\right)\frac{x}{16} = \frac{9}{2}\left(\frac{16}{1}\right)$$

$$x = \frac{144}{2}$$

$$x = 72$$

Cross-Multiplication: This method of solving the proportion is a shortcut for using a Fraction Buster (multiplying each side of the equation by the denominators).

Fraction Buster	Cross-Multiplication
$\frac{x}{16} = \frac{9}{2}$	$\frac{x}{16} = \frac{9}{2}$
$2 \cdot 16 \cdot \frac{x}{16} = \frac{9}{2} \cdot 2 \cdot 16$	$\frac{x}{16} \quad \frac{9}{2}$
$2 \cdot x = 9 \cdot 16$	$2 \cdot x = 9 \cdot 16$
$2x = 144$	$2x = 144$
$x = 72$	$x = 72$

