


MA 4B/4C	Mathematics Embedded Credit
Cape Career & Technology Center	Last Update: November 2004
Topic: Ratio and Proportion	Focus: Basic Operations and Applications

Show-Me Standards: MA5, MA6, G3-4	MO Grade Level Expectations: N3E10, N3E8, N2D9	NCTM Standards: 2A, 3A, 20A, 20B
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OBJECTIVE: Students will be able to perform basic operations and complete applications for ratios and proportions.

Introduction:


There are three important words related to the subject of 'Ratios and Proportions'.

 **RATIO:** the expression of a relationship between two or more numbers using division.

- **Can Be WRITTEN:** A to B; A:B; or A/B – all of these forms are equal. Fractions are the most common way that ratios are written.
- **"Same Ratio, Different Expression":** The same ratio can be expressed many different ways: $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10} = \frac{15}{30}, etc.$

 **PROPORTION:** the comparison of two equal ratios that are expressed with different numbers.

- **Can Be WRITTEN:** $\frac{a}{b} = \frac{c}{d}$, or $a : b :: c : d$
- **Be CAREFUL:** Units of measure in one ratio should always be written exactly the same as the units in the other ratio.
- **EXAMPLES:** $\frac{\text{dollars}}{\text{hour}} = \frac{\text{dollars}}{\text{hour}}, \frac{\text{miles}}{\text{gallon}} = \frac{\text{miles}}{\text{gallon}}, \frac{\text{cents}}{\text{pound}} = \frac{\text{cents}}{\text{pound}}$
- **"Cross Multiplication":** The method used to transpose numbers in a proportion. Cross multiplication removes the division from an equation. To cross multiply, multiply each denominator by the opposite numerator; the equate the two products. $\frac{a}{b} = \frac{c}{d} = (a * d = b * c)$

 **VARIATION:** an equation that relates one variable to one or more other variables.

EXAMPLE:

A car uses 18 gallons to travel 270 miles. At this rate, how many miles can be driven using 24 gallons? Also, what is the average miles per gallon?

Step #1: Set Up a Proportion. (let the new distance = x mi.)

$$\frac{270mi.}{18gal.} = \frac{xmi.}{24gal.}$$

Step#2: Solve the Equation Using Cross Multiplication.

$$(270mi.)(24gal.) = (18gal.)(xmi.)$$

$$6480 = 18x$$

$$360 = x$$

Step #3: Check the solution. Does the answer create a proportion that is equal?

$$\frac{270mi.}{18gal.} = \frac{360mi.}{24gal.} = 15 \frac{mi.}{gal.}$$

On a certain machine, pulleys between the motor shaft and machine shaft have an RPM ratio of 3:5. If the motor turns at 300 RPM, how fast does the machine shaft turn?

Step #1: Set Up a Proportion.

$$\frac{3RPM}{5RPM} = \frac{300RPM}{xRPM}$$

Step #2: Solve the Equation Using Cross Multiplication.

$$\frac{3RPM}{5RPM} = \frac{300RPM}{xRPM}$$

$$3x = 5(300)$$

$$3x = 1500$$

$$x = 500$$

$$\text{machine shaft} = 500 \text{ RPM}$$

Step #3: Check the Solution. Does the answer create a proportion that is equal?

$$\frac{3RPM}{5RPM} = \frac{300RPM}{500RPM} = \frac{3}{5}$$

