PREPARATORY MATH SKILLS LAB

Lab PMS 15

MATH ACTIVITY

Multiplying and Dividing Fractions

MATH SKILLS LAB OBJECTIVE

When you complete the math lab activities, you should be able to multiply or divide one fraction by another.

Technicians must know how to work with fractions. This means they must know how to add, subtract, multiply and divide fractions. Here are some technical problems involving fractions:

ADDING FRACTIONS

"A worn magnetic gasket around a refrigerator door must be replaced. The door is 30 1/4 inches wide and 40 1/8 inches high. What's the length of gasket needed?" (Answer is 140 3/4 inches.)

SUBTRACTING FRACTIONS

"The outside diameter of a hose is 2 1/4 inches. The wall is 13/32 inch thick. How large, in inches, is the ***inside*** diameter?" (Answer is 1 7/16 inches.)

MULTIPLYING FRACTIONS

"Each hour an oil burner runs, the nozzle sprays 3/4 gallon of fuel. If the burner runs for 2 1/2 hours, how much fuel is sprayed into the burner?" (Answer is 1 7/8 gallons.)

DIVIDING FRACTIONS

"How many 7/8-inch-long pieces can be cut from a piece of safety wire 7 inches long?" (Answer is 8 pieces.)

If you were able to solve each of these problems, you know how to add, subtract, multiply and divide fractions. If you weren't, you need practice.

First, let's review some of the things you already know about fractions. Then let's concentrate on ***multiplying*** and ***dividing*** simple fractions. Then we'll multiply and divide ***units*** in the form of fractions.

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LET'S REVIEW

a. A *simple fraction* is a ratio of two numbers, such as ½ or $^{13}/_{16}$. The top number in the fraction is called the "numerator." The bottom number is called the "denominator."

Example: $\frac{1}{2}$ ← numerator ← denominator

b. A *mixed fraction* is made up of a whole number and a simple fraction, such as 2 ¼ or 1 ⅞. In the mixed fraction 2 ¼, the whole number is 2 and the simple fraction is ¼.

c. A *complex fraction* is

1) a whole number divided by a fraction $\left[\text{such as } \frac{4}{2/3}\right]$, or

2) a fraction divided by a whole number $\left[\text{such as } \frac{1/2}{3}\right]$, or

3) a fraction divided by a fraction $\left[\text{such as } \frac{3/8}{1/4}\right]$.

d. You *add* simple fractions that have the ***same denominator*** by adding the numerators and placing the sum over the common denominator.

$$\frac{1}{16} + \frac{3}{16} = \frac{1+3}{16} = \frac{4}{16} \qquad \left[\frac{1}{4} \text{ in reduced form}\right]$$

e. You *add* units written as fractions as follows—***provided units are identical.***

$3\ \text{lb/in}^2 + 2\ \text{lb/in}^2 = 5\ \text{lb/in}^2$

f. You *subtract* simple fractions that have the ***same denominator*** by subtracting the numerators and placing the difference over the common denominator.

$$\frac{9}{8} - \frac{7}{8} = \frac{9-7}{8} = \frac{2}{8} \qquad \left[\frac{1}{4} \text{ in reduced form}\right]$$

g. You *subtract* units written as fractions as follows, ***provided units are identical.***

12 cal/sec − 8 cal/sec = 4 cal/sec

EXAMPLES: MULTIPLYING AND DIVIDING SIMPLE FRACTIONS

a. You multiply simple fractions together by multiplying numerator by numerator and denominator by denominator. The result is written as a fraction. The following examples show how this is done:

$$\frac{3}{2} \times \frac{1}{2} = \frac{3\times 1}{2\times 2} = \frac{3}{4}$$

$$\frac{1}{3} \times \frac{7}{9} = \frac{1\times 7}{3\times 9} = \frac{7}{27}$$

$$\frac{5}{6} \times \frac{14}{3} = \frac{5\times 14}{6\times 3} = \frac{70}{18} \qquad \left[\frac{35}{9} \text{ in reduced form}\right]$$

b. You divide simple fractions by one another by following this rule: "Invert the fraction that's in the denominator. Then multiply it by the fraction in the numerator." The following example shows how this is done.

$$\frac{3}{2} \div \frac{1}{2} = \frac{3/2}{1/2} = ?$$

According to the rule, invert the fraction that's in the denominator and multiply. "Invert" means to turn "upside down." Therefore, to invert $\frac{1}{2}$, turn it upside down and write $\frac{2}{1}$.

$$\frac{\frac{3}{2}}{\frac{1}{2}} = \frac{3}{2} \times \frac{2}{1}$$

Therefore,

$$\frac{\frac{3}{2}}{\frac{1}{2}} = \frac{3}{2} \times \frac{2}{1} = \frac{3 \times \cancel{2}}{\cancel{2} \times 1} = \frac{3}{1}, \text{ or } 3$$ (Cancel the 2's.)

Let's try another one.

$$\frac{5}{6} \div \frac{17}{2} = ?$$

Following the rule:

$$\frac{\frac{5}{6}}{\frac{17}{2}} = \frac{5}{6} \times \frac{2}{17} = \frac{5 \times 2}{6 \times 17} = \frac{10}{102}$$

Therefore, summarizing what we've done,

$$\frac{\frac{5}{6}}{\frac{17}{2}} = \frac{10}{102}$$ $\left[\frac{5}{51} \text{ in reduced form}\right]$

PRACTICE EXERCISES

Problem 1: Multiply the simple fractions that follow. Use the rules just given.

$\frac{3}{8} \times \frac{7}{2} =$ _____

$\frac{2}{1} \times \frac{1}{9} =$ _____

$\frac{16}{3} \times \frac{3}{16} =$ _____

$\frac{5}{13} \times \frac{9}{2} =$ _____

Problem 2: Divide the simple fractions given below. Follow the previous rule.

$\frac{3}{8} \div \frac{7}{2} = \frac{\frac{3}{8}}{\frac{7}{2}} =$ _____

$\frac{2}{1} \div \frac{1}{9} = \frac{\frac{2}{1}}{\frac{1}{9}} =$ _____

$\frac{16}{3} \div \frac{3}{16} = \frac{\frac{16}{3}}{\frac{3}{16}} =$ _____

$\frac{5}{13} \div \frac{9}{2} = \frac{\frac{5}{13}}{\frac{9}{2}} =$ _____

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