

<b>MA 2B</b>	<b>Mathematics Embedded Credit</b>	
<b>Cape Career &amp; Technology Center</b>	<b>Last Update: November 2004</b>	
<b>Topic: Fractions, Decimals, Percents</b>	<b>Focus: Basic Operations - Fractions</b>	




Show-Me Standards: MA1, MA5	MO Grade Level Expectations: N2B6, N2B7, N2B8, N2C9	NCTM Standards: 2A, 3A
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**OBJECTIVE: Students will be able to solve problems using basic operations with fractions.**

**Introduction:**

Fractions are historically one of the hardest forms of problems for students to solve. In the world of work, most problems involve a form of fraction in some way. You cannot make most measurements in the shop, the graphic arts classroom, or in the medical clinic without fractions being involve as a major part of what you are calculating. All vocational students need to have an accurate working knowledge of fraction problem solving. Future lessons will use a calculator to solve fraction problems; however, in the world of work a calculator may not always be readily available to the problem solver. A solid understanding of fractions will help the savvy employee keep on top of the calculations necessary for estimates and operations.

The following are important concepts to remember when working with fractions:

-  Most fractions contain three parts: the Whole Number, the Numerator (the number located on the top of the fraction), and the Denominator (the number located on the bottom of the fraction).
  - **EXAMPLE:**  $3\frac{1}{4}$  - the 3 is the Whole Number, the 1 is the Numerator, the 4 is the Denominator.
  
-  It is usually best to write fractions as proper fractions before performing any calculations. Proper fractions are whole numbers and fractions where the numerator is smaller than the denominator.
  - **EXAMPLE:**  $4\frac{10}{3}$  is an 'improper fraction'. The numerator (10) is larger than the denominator (3). Divide the numerator (10) by the denominator (3) and the non-remainder result should be added to the whole number (4). The remainder becomes the 'new' numerator and the denominator remains as it was originally. In this case the 'proper fraction' is  $7\frac{1}{3}$  since  $10/3$  is 3 with a remainder of 1.
  
-  Always reduce the fraction to the lowest form in calculating the answer. This is achieved by dividing the numerator and denominator by the same number.
  - **EXAMPLE:**  $\frac{6}{8}$  can be reduced to  $\frac{3}{4}$  since the 6 and the 8 are divisible by 2.

📖 There are several ways to handle the addition and subtraction of fractions, but the key is that the denominators are the same before performing the operations. Thus, you need to find the common denominator before you add or subtract. Once the common denominator is found you add or subtract the numerators and keep the common denominator. The next step is to reduce the fraction to its lowest form. If the numerator is larger than the denominator, the whole number is increased by the total whole numbers taken from the numerator.

- **EXAMPLE:**  $3\frac{1}{5} + 2\frac{2}{3}$  - the common denominator for 5 and 3 is 15, so the fractions are re-written as:  $3\frac{3}{15} + 2\frac{10}{15}$  - then add the whole numbers and numerators (placing the 'new' numerator over the common denominator [in this case 15]) and re-write as:  $5\frac{13}{15}$  - since 13 and 15 do not reduce, the problem is currently written in its lowest form.

📖 When multiplying fractions, the best way to proceed is to make the fractions into improper fractions and then multiply the numerators and then the denominators. After completing this step reduce until the fraction is in the lowest form.

- **EXAMPLE:**  $2\frac{1}{2} * 3\frac{2}{5}$  - change the fractions to 'improper fractions':  $\frac{5}{2} * \frac{17}{5}$  then multiply the numerators and the denominators to get:  $\frac{85}{10}$  - which will reduce since 5 divides into both 85 and 10. The result is  $\frac{17}{2}$  which can be reduced when 2 is divided into 17, the lowest proper fraction is  $8\frac{1}{2}$ .

📖 When dividing fractions, the best way to proceed is to make the fractions improper fractions and invert the second fraction (put the denominator on top and the numerator on the bottom) and then multiply the numerators and denominators. After completing this step reduce until the fraction is in the lowest form.

- If you are to divide by a whole number: convert the whole number to a fraction by placing the whole number in the numerator position and placing 1 in the denominator position. Then follow the directions listed above.
- **EXAMPLE:**  $3\frac{2}{3} \div \frac{3}{4}$  - would be solved by converting the fractions to 'improper fractions':  $\frac{11}{3} \div \frac{3}{4}$  - and then inverting the second fraction and multiplying the fractions together:  $\frac{11}{3} * \frac{4}{3}$  - which equals:  $\frac{44}{9}$ . Reducing this fraction to its lowest form results in  $4\frac{8}{9}$  as the answer.

**PROBLEMS:**

1. $2\frac{3}{5} + 4\frac{2}{3}$	2. $2\frac{3}{8} + 5\frac{1}{4}$	3. $8\frac{9}{16} - 3\frac{1}{4}$	4. $2\frac{1}{2} - \frac{3}{16}$
5. $\frac{1}{2} * \frac{3}{5}$	6. $2\frac{1}{3} * 3\frac{3}{5}$	7. $2\frac{3}{8} * 4\frac{3}{4}$	8. $5\frac{7}{16} * \frac{1}{2}$
9. $2\frac{1}{2} \div \frac{4}{5}$	10. $\frac{3}{8} \div \frac{1}{2}$	11. $\frac{5}{16} \div \frac{1}{4}$	12. $5\frac{1}{2} \div 2$

**WORD PROBLEMS:**

1. In a stack of lumber there are 147 boards of dimensional lumber.  $\frac{3}{7}$  of the boards are 2x4's.  
What fraction of the boards are other sizes?
2. A length of copper pipe  $14\frac{3}{4}$  ft. long is cut into 5 equal pieces. How long is each piece, assuming no length is lost with each cut?
3. A case of paper costs \$24. The project you are working on needs  $3\frac{3}{4}$  cases of paper. The manager of the print shop asks you for an estimate on the cost of paper for the project. What do you present to the manager as the estimate for the cost of paper for this project?

4. In machining operations that use a rotating work piece, such as lathe turning, the reduction in diameter of the work piece is twice the depth of the cut. If a round aluminum shaft is reduced in diameter by  $\frac{7}{16}$  ", what is the total depth of the cut?

5. A patient needs to have  $\frac{2}{3}$  oz. of juice with each 15 milligrams of a specific medicine. How many ounces of juice are needed for 75 milligrams of the medicine?