

## FRACTION OPERATIONS

When adding and subtracting fractions, we need to be sure that each fraction has the same denominator, then add or subtract the numerators together. For example:

$$\frac{1}{8} + \frac{3}{4} = \frac{1}{8} + \frac{6}{8} = \frac{(1+6)}{8} = \frac{7}{8}$$

That was easy because it was easy to see what the new denominator should be, but what about if it was not so apparent? For example:

$$\frac{7}{12} + \frac{8}{15}$$

For this example, we must find the lowest common denominator (LCM) for the two denominators 12 and 15. The LCM of 12 and 15 is 60, so

$$\frac{7}{12} + \frac{8}{15} = \frac{35}{60} + \frac{32}{60} = \frac{(35+32)}{60} = \frac{67}{60} = 1 \frac{7}{60}$$

To multiply fractions, we multiply the numerators together and denominators together, and then simplify the product. To divide fractions, we find the reciprocal of the second fraction (flip the numerator and the denominator) and then multiply the two together. For example:

$$\left(\frac{2}{3}\right) \times \left(\frac{1}{4}\right) = \frac{2}{12} = \frac{1}{6} \quad \text{and} \quad \left(\frac{2}{3}\right) \div \left(\frac{3}{4}\right) = \left(\frac{2}{3}\right) \times \left(\frac{4}{3}\right) = \frac{8}{9}$$

When adding mixed numbers, we can add the whole numbers and the fractions separately, then simplify the answer. For example:

$$4\frac{1}{3} + 2\frac{3}{4} = 4\frac{8}{24} + 2\frac{18}{24} = 6\frac{26}{24} = 6 + 1\frac{2}{24} = 7\frac{2}{24} = 7\frac{1}{12}$$

When subtracting mixed numbers, we subtract the whole numbers and the fractions separately, then simplify the answer. For example:

$$5\frac{1}{4} - 3\frac{3}{8} = 5\frac{2}{8} - 3\frac{3}{8} = 4\frac{10}{8} - 3\frac{3}{8} = 1\frac{7}{8} \quad (\text{borrowing is needed in order to subtract})$$

You can also turn the mixed numbers into improper fractions and subtract:

$$5\frac{1}{4} - 3\frac{3}{8} = \frac{21}{4} - \frac{27}{8} = \frac{42}{8} - \frac{27}{8} = \frac{15}{8} = 1\frac{7}{8}$$

To multiply and divide mixed numbers, you must first convert them into improper fractions, then carry out the operations as done above.