Equations with Fractions, Part 1

When an equation of the form $p(x + q) = r$ involves a fraction, we can use the same technique as before: first distribute the multiplication and go on from there. You will need to use fraction arithmetic.

However, it is also possible to start by **multiplying both sides by the denominator of the fraction**, as this will **eliminate the fraction**, and then the solution process will only involve whole numbers (until possibly the last step). This is therefore often the simpler way. Study the examples carefully.

Example 1a: First distribute.

$$3(x - 1) = \frac{4}{5} \qquad \text{Distribute the multiplication.}$$

$$3x - 3 = \frac{4}{5} \quad \Big| \; \mathbf{+ 3}$$

$$3x = 3\frac{4}{5} \qquad \text{Change 3 4/5 into a fraction.}$$

$$3x = \frac{19}{5} \quad \Big| \; \mathbf{\div 3}$$

$$x = \frac{19}{15}$$

Check: $3(19/15 - 1) \overset{?}{=} \frac{4}{5}$

$$3(4/15) \overset{?}{=} \frac{4}{5}$$

$$12/15 = \frac{4}{5} \quad \checkmark$$

Example 1b:
First multiply by the denominator of the fraction.

$$3(x - 1) = \frac{4}{5} \quad \Big| \; \mathbf{\cdot 5} \qquad \text{(Multiply both sides by the denominator of the fraction.)}$$

$$5 \cdot 3(x - 1) = 5 \cdot \frac{4}{5} \qquad \text{Next, simplify.}$$

$$15(x - 1) = 4 \qquad \text{Distribute the multiplication.}$$

$$15x - 15 = 4 \quad \Big| \; \mathbf{+ 15}$$

$$15x = 19 \quad \Big| \; \mathbf{\div 15}$$

$$x = \frac{19}{15}$$

1. Solve. You can choose which way to start. Also, check your work, using blank paper if necessary.

a. $4(x - 3) = \frac{1}{8}$	**b.** $2(b - 8) = \frac{2}{3}$	**c.** $2(a + 3) = \frac{11}{4}$

2. Use these for more practice (use blank paper).

a. $3(x + 1) = \frac{2}{5}$ **b.** $2(w - 4) = -\frac{3}{4}$ **c.** $4(y + 1) = \frac{36}{5}$ **d.** $\frac{11}{3} = 7(x - 3)$