Equations Review, Part 3

If an equation involves fractions, it is often easier to solve it if you first get rid of them. We do that by **multiplying** both sides of the equation **by the denominator of the fraction** (or by the LCM of the denominators). This is not absolutely necessary as a starting point, but it does make things much easier.

Example 1.

$$\frac{3}{4}a + 4 = 6 \quad | \cdot 4$$

$$4\left(\frac{3}{4}a + 4\right) = 4 \cdot 6$$

$$3a + 16 = 24 \quad | -16$$

$$3a = 8 \quad | \div 3$$

$$a = 8/3 = \mathbf{2\ 2/3}$$

Note: the *entire* left side needs to be multiplied by 4. That is why we enclose it in parentheses.

Check:

$$\frac{3}{4} \cdot \frac{8}{3} + 4 \stackrel{?}{=} 6$$

$$\frac{8}{4} + 4 \stackrel{?}{=} 6$$

$$6 = 6 \quad \checkmark$$

Example 2.

$$-\frac{2}{5}(x + 7) = -6 \quad | \cdot 5$$

$$5 \cdot \left(-\frac{2}{5}\right)(x + 7) = 5(-6)$$

Next we simplify $5 \cdot (-2/5)$.

$$-2(x + 7) = -30 \quad | \div (-2)$$

$$x + 7 = 15 \quad | -7$$

$$x = 8$$

Check:

$$-\frac{2}{5}(8 + 7) \stackrel{?}{=} -6$$

$$-\frac{2}{5}(15) \stackrel{?}{=} -6$$

$$-6 = -6 \quad \checkmark$$

1. Find the errors in these solutions, and correct them.

a.

$$\frac{3}{8}y - 7 = 2 \quad | \cdot 8$$

$$3y - 7 = 16 \quad | +7$$

$$3y = 23 \quad | \div 3$$

$$y = 23/3 = 7\ 2/3$$

b.

$$4(y + 2) = \frac{13}{5} \quad | \cdot 5$$

$$4y + 8 = 13 \quad | -8$$

$$4y = 5 \quad | \div 4$$

$$y = 5/4 = 1\ ¼$$

2. Solve the equations. Compare the three and how they are solved.

a. $\frac{1}{5}a + 7 = 3$	**b.** $\frac{1}{5}(a + 7) = 3$	**c.** $-\frac{2}{5}(a + 7) = 3$

3. Practice some more. Solve the equations.

a. $2 = -\frac{9}{10}(4 - x)$	**b.** $2(1 - x) = \frac{5}{12}$	**c.** $2y - 5 = -\frac{4}{7}$

4. Solve equations involving decimals, also. Use a calculator. Give your final answer rounded to two decimals.

a. $0.4(x + 5) = -3.7$	**b.** $4.72w - 8.9 = 20$	**c.** $98.5 = -3(y + 25.6)$

Example 3. Here, the fraction is in a different spot in the equation. Multiplying by the denominator still works.

However, you could also start the solution process by applying the distributive property on the left side.

$$2\left(x+\frac{4}{5}\right) = -7 \qquad \cdot 5$$
$$5 \cdot 2\left(x+\frac{4}{5}\right) = -35$$
$$10\left(x+\frac{4}{5}\right) = -35$$
$$10x + 8 = -35 \qquad -8$$
$$10x = -43 \qquad \div 3$$
$$x = -\frac{43}{10} = -4\frac{3}{10}$$

5. Solve the equation from example 4 again, this time starting the solution by applying the distributive property on the left side.

   Hint: don't convert improper fractions to mixed numbers during the solution process. It is easier to calculate with fractions than with mixed numbers.

$$2\left(x+\frac{4}{5}\right) = -7$$

6. Solve. Compare the three and how they are solved. Again, keep any improper fractions during the process.

a. $-3\left(x+\frac{1}{6}\right) = 1$	**b.** $-3x+\frac{1}{6} = 1$	**c.** $-3x+1 = -\frac{1}{6}$

7. Fill in the missing parts — either what is to be done in the next step, or the missing numbers.

$$2y - 7 = \frac{5}{9}$$
$$9 \cdot (2y - 7) = \square$$
$$18y - \square = \square$$
$$18y = 68$$
$$y = \square$$

8. **a.** Verify that $x = -4/3$ is *not* a root of this equation.

$$6\left(x - \frac{2}{3}\right) = -2$$

$$6x - \frac{12}{3} = -12$$

$$6x - 4 = -12$$

$$6x = -8$$

$$x = -8/6 = -4/3$$

b. Find the mistake in the solution, and correct it.

9. Here's a riddle to discover by solving the equations. Use blank paper if needed.

T $3\left(x + \frac{2}{9}\right) = -3$	**R** $2 = \frac{1}{8}(7 - x)$	**A** $-3x + 6 = \frac{3}{5}$
H $0.2(6 - s) = 50$	**E** $1.5 = 3(-T + 0.7)$	**W** $40 - 0.9x = 35.5$

Everyone always talks about it, but no one does anything about it. What is it?

The

5	0.2	1 4/5	−1 2/9	−244	0.2	−9