Saddleback College Supplemental Instruction Lecture Notes
Candice Jhu Lawrence Perez Copyright©2007

Solving equations Part II

example 1: $3x + 6 = 18$

Since this equation is a bit more difficult to solve by inspection, we'll solve it **algebraically**.

$$\begin{array}{rcl} 3x + 6 &=& 18 \\ -6 && -6 \\ \hline 3x &=& 12 \end{array} \quad \leftarrow \text{Subtract 6 from both sides}$$

$$\frac{3x}{3} = \frac{12}{3} \quad \leftarrow \text{Divide both sides by 3}$$

$$x = 4$$

NOTE: The addition property of equality must be performed **BEFORE** the multiplication property of equality.

example 2: $7 - 2x = 19$

$$\begin{array}{rcl} 7 - 2x &=& 19 \\ -7 && -7 \\ \hline -2x &=& 12 \end{array} \quad \leftarrow \text{Subtract 7 from both sides}$$

$$\frac{-2x}{-2} = \frac{12}{-2} \quad \leftarrow \text{Divide both sides by } -2$$

WD $x =$ ______

Copyright©2007

Equations involving fractions:

Recall: $\frac{4}{3} \cdot \frac{3}{4} = \_\_\_$

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

example 3: $\frac{3}{4}x = \frac{1}{5}$

The **reciprocal approach**:

To isolate the variable we need to **divide** both sides by $\frac{3}{4}$. Since dividing by a fraction is the same as multiplying by its **reciprocal**, we can **multiply** both sides by $\frac{4}{3}$.

$$\left(\frac{4}{3}\right)\frac{3}{4}x = \left(\frac{4}{3}\right)\frac{1}{5}$$

$$x = \frac{4}{15}$$

This method is called the **reciprocal approach** but only works for **simple** equations.

 Copyright©2007

example 4:

$$\frac{3}{4}x = \frac{1}{2} + \frac{1}{3}$$

If we were to use the reciprocal approach, we would multiply both sides by $\frac{4}{3}$ in order to isolate the variable. We would then be forced to distribute $\frac{4}{3}$ on the right hand side. To avoid this extra work, we can use a method called **clearing the fractions**.

To **clear the fractions** we must first identify the lowest common denominator, or the **LCD** for short.

The **LCD** for the equation in example 4 is **12** since 12 is the **smallest** number that **ALL** the denominators divide evenly into.

Now that we've identified the **LCD**, we multiply **both sides** of the equation by the **LCD**.

 Copyright©2007

$$12\left[\frac{3}{4}x\right] = 12\left[\frac{1}{2}+\frac{1}{3}\right]$$

$$9x = 12\left(\frac{1}{2}\right) + 12\left(\frac{1}{3}\right)$$

$$9x = 6 + 4$$

notice that we've eliminated **ALL** the fractions!

$$\frac{9x}{9} = \frac{10}{9}$$

$$x = \frac{10}{9}$$

example 5:

$$-0.5x - 0.13 = 3.07$$

Recall: A decimal is simply a fraction whose denominator is a power of 10.
The number 0.13 is said "thirteen hundredths" and as a fraction, is written $\frac{13}{100}$.

Rewriting the equation as fractions instead of decimals, we get

$$-\frac{5}{10}x - \frac{13}{100} = \frac{307}{100}$$

Now we can clear the fractions.

LCD = 100

$$100\left[-\frac{5}{10}x - \frac{13}{100}\right] = 100\left[\frac{307}{100}\right]$$

$$100\left(-\frac{5}{10}x\right) - 100\left(\frac{13}{100}\right) = 307$$

$$-50x - 13 = 307$$

Now we have NO fractions in the equation!

$$-50x - 13 = 307$$

$$+13 \quad +13$$

$$\frac{-50x}{-50} = \frac{320}{-50}$$

$$x = -\frac{320}{50}$$

Now we must reduce!

$$x = -\frac{320}{50} = -\frac{32}{5}$$

 Copyright©2007

Solving Equations Part II Practice Problems

Solve each equation:

1. $5x + 13 = 58$

2. $8 - 3x = -2$

3. $\frac{5}{8}x = \frac{1}{3}$

4. $\frac{9}{2}x = \frac{5}{3} + \frac{1}{6}$

5. $-0.2 + 0.05x = 9.8$