We will hone our skills at solving equations.

Elementary algebra
Class notes
Further Solving Linear Equations (section 9.3)

We will continue practicing our skills here. You might want to follow these steps.

Multiply by the LCD to eliminate fractions if present,
simplify each side separately,
isolate x-terms on one side,
isolate x to find solution,
check your answer,
celebrate!
Repeat.

Consider using the distribution property to unbury x's from parentheses.

expl 1: Solve and check.

$$\frac{2}{3}x-\frac{1}{9}=3$$

Start by multiplying by the LCD to eliminate the fractions.

expl 2: Solve and check.

$$\frac{2(x+3)}{3}=x-4$$

expl 3: Solve and check.

$.4x - .5 = 1.1$

If decimals bother you, multiply all terms by 10.

Identities and Equations with No Solutions:

Some equations are true for *any* value of the variable. These are called **Identities**. Other equations are never true, no matter what value we plug in. These are called **Bad, Bad to the Bone**.

expl 4: Solve and check.

$15x + 5 = 5(3x + 1)$

Did your variables cancel out leaving 0 = 0 or something similar?

Since 0 = 0 is **true**, we conclude the original equation is true for **all** x **values**.

Solution: all real numbers

Now, look at the original equation $15x + 5 = 5(3x + 1)$. Can you see why any x value would make it true? Choose any old number for x to see if it works. Compare your work with your neighbors.

expl 5: Solve and check.

$3(x - 6) = 3x + 10$

Did your variables cancel out leaving -18 = 10 or something similar?

Since -18 = 10 is **not true**, we conclude **no value of x** could make the original equation true.

Solution: no solution or Ø

Now, take the original equation $3(x - 6) = 3x + 10$ and distribute the 3 on the left to get $3x - 18 = 3x + 10$. This says "a number times 3 *minus 18*" is equal to "the number times 3 *plus 10*". Can you explain why you could never find such a number?

expl 6: Solve and check.

$$\frac{5(x-1)}{4}=\frac{3(x+1)}{2}$$

Multiply both sides by the LCD to eliminate the fractions.

Cross-multiplying:

You may remember from a past class that you could “cross-multiply” to start this problem. When you have an equation with just one fraction on each side, you can “cross-multiply” to get a simpler equation with no fractions. But beware! It only works if the equation is in the form “one fraction = another fraction”. Many times it saves a little brain power. Sometimes it complicates things. Below I start the cross-multiplying process. Finish it to see you get the same answer as above.

$$\frac{5(x-1)}{4}=\frac{3(x+1)}{2}$$

$$2\cdot 5(x-1)=4\cdot 3(x+1)$$

$$\vdots$$

Top of one side times the bottom of other side *equals* bottom of first side times top of other.

Which method do you prefer? Multiplying by the LCD or cross-multiplying?

expl 7: The length of my mother’s driveway was measured in two pieces. The first piece was found to be $2x$ feet long. The second piece is said to be $3x - 5$ feet long. Express the total length in terms of x. You may find a picture helps.

expl 8: Write the phrases as algebraic expressions using x as the unknown number.

a.) A number subtracted from -15

b.) The quotient of 14 and twice a number

expl 9: Solve and check.

$$6(x+2) - 4(x-4) = 5(2x+3)$$

Simplify each side separately before you even think of moving stuff from one side to the other!