

Math 2303  
Section 3.3 and 3.5  
Class Notes

$$2x + 3$$

$$8x - 7$$

Solving Equations

The basic technique for solving linear equations is to rearrange the equation into an equivalent one that is easy to solve.

For example: The equation  $3x + 4 = 2x + 7$  is not "hard", but the equivalent form that is easy to solve is  $x = 6$ .

How do we get the equivalent form?

The Balanced Equation Rules

1. You can add any real number to both sides of the equation
2. You can subtract any real number from both sides of the equation
3. You can multiply both sides of the equation by a NONZERO number
4. You can divide both sides of the equation by a NONZERO number

Order that usually works

1. Multiply all terms by the common denominator and simplify
2. Distribute
3. Simplify each side by adding like terms.
4. Add or subtract quantities from both sides of the equation.
5. Divide by the coefficient of the  $x$  term.

$$3x + 2(x + 5)$$

$$\frac{1}{3}(3x + 6)$$

$$= \frac{1}{3} \cdot 3x + \frac{1}{3}(6)$$

$$= x + 2$$

We did this pretty well in the "setting your expression equal to your neighbors" exercise last class, but let me work a few "messy" problems so we can see these rules in action.

$$\frac{1}{2}x + 5 = 12$$

Mult  $\times 2$

$$2 \left( \frac{1}{2}x \right) + 2 \times 5 = 2 \times 12$$

$$x + 10 = 24$$

$$\underline{-10 \quad -10}$$

$$x = 14$$

$$x = 14$$

$$\frac{1}{2}(x-2) + \frac{2}{3}(5x+6) = \frac{5}{6}$$

LCM = 6

$$\frac{6}{1} \cdot \frac{1}{2}(x-2) + \frac{6}{3} \cdot \frac{2}{3}(5x+6) = \frac{6}{1} \cdot \frac{5}{6}$$

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

$$3x - 6 + 20x + 24 = 5$$

$$23x + 18 = 5$$

$$\underline{-18 \quad -18}$$

$$23x = -13$$

$$\text{LCM} = 24$$

$$\frac{3}{8}(2x+7) = \frac{5}{3}(4x-5)$$

$$\frac{23x}{23} = \frac{-13}{23}$$

$$x = -13/23$$

$$\frac{24}{7} \cdot \frac{3}{8} (2x+7) = \frac{24}{7} \cdot \frac{5}{3} (4x-5)$$

$$9(2x+7) = 40(4x-5)$$

$$18x + 63 = 160x - 200$$
$$\begin{array}{r} -18x + 200 \\ \hline 263 = 142x \end{array}$$

$$1.38(x-1.4) - 2 = 6.71(x-2.65) + 8$$

$$x = \frac{263}{142}$$

$$1.38x - 1.38 \times 1.4 - 2$$

$$= 6.71x - 6.71 \times 2.65 + 8$$

$$1.38x - 1.932 - 2 = 6.71x - 17.7815 + 8$$

$$1.38x - 3.932 = 6.71x - 9.7815$$

$$-1.38x + 9.7815 - 1.38x + 9.7815$$

$$\frac{13.7135}{5.33} = \frac{5.33x}{5.33}$$

$$x = 2.57$$

Section 3.4 is a self-study section if you want some pointers on using your calculator. However, we need to practice a few of these problems with the CASA calculator.

$$2^2 - 5\sqrt{3} - \frac{7}{8}$$

$$5000[1 - (1 + .05)^{-60}]$$

$$\frac{270[1 - (1 + .025)^{-240}]}{.025}$$

$$2,300,000e^{(.065)(6)}$$

## Section 3.5 Formulas

Formulas are equations that express a relationship between two or more quantities.

Using a formula is a critical skill for any citizen.

When you look at a formula, you should ask what do the variables stand for? What quantities do I know the values of, and what quantity am I looking for?

Here are some basic geometric formulas –

### I. Perimeter, Area and Volume formulas

Square:  $P = 4s$   
 $A = s^2$

Rectangle:  $P = 2l + 2w$   
 $A = lw$

Parallelogram:  $A = bh$

Trapezoid:  $A = \frac{1}{2}(b_1 + b_2)h$

Triangle:  $A = \frac{1}{2}bh$

Circle:  $C = 2\pi r$   
 $A = \pi r^2$

Closed Box:  $A = 2lw + 2lh + 2wh$   
 $V = lwh$

Sphere:  $A = 4\pi r^2$   
 $V = \frac{4}{3}\pi r^3$

Cone:  $V = \frac{1}{3}\pi r^2h$

Cylinder:  $A = 2\pi r^2 + 2\pi rh$   
 $V = \pi r^2h$

Find the perimeter and area of a rectangle that is 5 feet long 3.25 feet wide.

$$P = 2w + 2l$$

width                      length

$$A = lw$$

$$P = 2(3.25) + 2(5)$$
$$= 6.50 + 10 = 16.5 \text{ ft}$$

$$A = 3.25 \times 5 = 16.25 \text{ ft}^2$$

A box is going to be made out of solid oak. The material costs \$3.25 per square foot.

There are two options being considered for the dimensions of the box.

Option 1: The box is 2 feet long, 1.5 foot wide and 3 feet high.

Option 2: The box is a cube with sides of length 2 ft.

Which box has the bigger volume?

Which box will cost the most to make (material is surface area)?

Option 1

$$V = 2 \times 1.5 \times 3 = 9 \text{ ft}^3$$

Option 2

$$V = s^3 = 2^3$$
$$V = 8 \text{ ft}^3$$