CONVERSIONS & FORMULAS

1. Area Formulas

a. **1 square ft.** = 144 square inches
b. **1 square yd.** = 9 square ft.
c. **1 cubic yd.** = 27 cubic ft.

Square or Rectangle Area =
d. Length x Width = ft^2 (square feet)
e. Length x width x height = ft^3 (cubic feet)

f. **Cubic Area =** .785 x $Diameter^2$ or
   3.14 X $Radius^2$ (pi x R^2) (pi = 3.14)

2. Horsepower (hp) Formulas

a. **horsepower** = 550 foot-pounds/second
          = 33,000 foot-pounds/minute
          = 1,980,000 foot-pounds/hour

b. **Brake Horsepower** = $\dfrac{\text{Water Horsepower}}{\text{Pump Efficiency}}$

c. **Efficiency:**
   % Efficiency = $\dfrac{\text{out power}}{\text{input power}}$

d. **Kilowatts** (kW) = 0.746 x Motor Horsepower

e. **Motor Horsepower** = $\dfrac{\text{Brake Horsepower}}{\text{Motor Efficiency}}$

f. **Water Horsepower** = $\dfrac{\text{Q (flow gal/min.) x H (Head in ft.)}}{3960}$

g. **Wire to Water Efficiency:**
   Overall Efficiency = $\dfrac{\text{Water Horsepower x 100}}{\text{Electrical Horsepower}}$

3. Treatment Formulas

a. **Filtration Rate (gpm/ft^2) =** $\dfrac{\text{Flow (gal/min)}}{\text{Surface Area (}ft^2\text{)}}$

b. **Percent Strength by Weight** = $\dfrac{\text{Weight of Solute x 100}}{\text{Weight of Solution}}$

c. **Specific Capacity** = $\dfrac{\text{Flow (gallons per minute)}}{\text{Well Drawdown (feet)}}$

d. **Surface Loading, GPD/sq. ft. =** $\dfrac{\text{Flow (gal/day)}}{\text{Surface Area (sq ft)}}$

e. **Surface Overflow Rate** = $\dfrac{\text{gal/day}}{ft^2}$

4. Other Formulas

Chemical Dosage:
   These formulas require to be divided by % of strength.
   Flow—Chemical by weight:
a. **lbs/day** = MGD x mg/L x 8.34
b. **lbs/day** = gal/min x mg/L x .012

Circumference:
c. 3.14 X Diameter (Pi x Diameter)

Concentration:
d. **1 part per million (ppm)** = 1 milligram per liter
   =0.0584 grains per gallon
   =8.34 Pounds per MG
   1 pound of weight per million pounds

   1 part per billion = 1 ug/L (microgram/Liter)

   1 part per million = 1 mg/L (milligram/Liter)

e. **CT =** Chlorine Concentration (mg/L) x Time (min)

f. **Detention time =** $\dfrac{\text{Tank Volume (gallons)}}{\text{Flow (gpm or gpd or gph)}}$

Flows:
g. **1 gallons per minute** = 1,440 gallons/day
h. **1 cubic foot per second (cfs)** = 646,272 gallons/day
   = 448.8 gallons per minute
i. **1 million gallons per day** = 1.55 cubic ft/sec.=
   694.4 gallons per minute
j. **Flow Rate =**
   Q (flow ft^3/sec.) = V (velocity ft/sec.) x A (area ft^2)

k. **Force =** Pressure (psi) x Area ($inches^2$)

l. **Hydraulics:**
   2.31 Head Feet = 1 PSI
   0.433 PSI = 1.0 Feet of Head

m. **Per Capita Water Use =**
   Water used (gal/day)**/**total number of people

n. **Percent =** $\dfrac{\text{Part x 100}}{\text{Whole}}$

o. **Specific Gravity =**
   $\dfrac{\text{Solution weight (lbs/gal)}}{\text{Weight of Water (8.34 lbs/gal)}}$

Volume and Capacity:
  a. **1 cubic ft.** = 7.48 gallons
  b. **1 cubic yd.** = 27 cubic ft.
  c. **1 quart** = 2 pints = 32 fluid ounces
  d. **1 liter** = 1000 milliliters = 1.06 quarts = 1000 cubic centimeters
  e. **1 gallon (gal)** = 8 pints = 231 cubic inches =
  f. **3.785 liters** = 3,785 milliliters
  g. **1 acre foot (ac. ft.)** = 43,560 cubic feet = 325,851 gallons

Time:
  h. **1 minute** = 60 seconds
  i. **1 hour** = 60 minutes = 3600 seconds
  j. **1 day** = 24 hours = 1,440 minutes = 86,400 seconds
  k. **1 week** = 7 days
  l. **1 yr.** = 12 months = 52 weeks = 365 days

Lengths:
  m. **1 foot** = 12 inches
  n. **1 yd.** = 3 ft. = 36 inches
  o. **1 mile** = 5,280 ft.

Temperature:
  p. **Degree Fahrenheit** = Degree C x 9/5 +32
 q. **Degree Centigrade** = (Degree F –32) x 5/9

Weight:
  r. **1 pound** = 16 ounces = 7000 grains = 453.6 grams = .454 kilograms
  s. **1 kilogram** = 1,000 gm = 2.205 pounds
  t. **1 ton** = 2,000 pounds
  u. **1 gallon of water** = 8.34 pounds
  v. **1 cubic ft. of water** = 62.4 pounds
  w. **1 liter of water** = 1 kilogram = 1000 grams
  x. **1 milliliter of water** = 1 gram
  y. **Density of water** = 1gm/ml or 1gm/cc
  z. **Specific gravity of water** = 1.00
  aa. **Weight of Solution** = Weight of Solute + Weight of Solvent
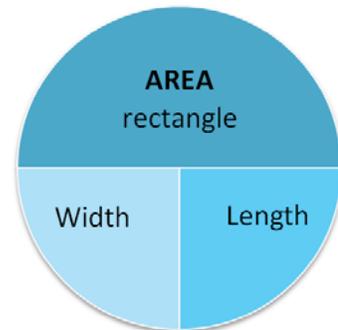
PIE WHEELS

• To find the quantity *above* the horizontal line: multiply the pie wedges below the line together.
• To solve for one of the pie wedges *below* the horizontal line: cover that pie wedge, then divide the remaining pie wedge(s) into the quantity above the horizontal line.
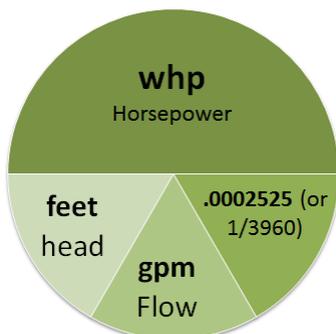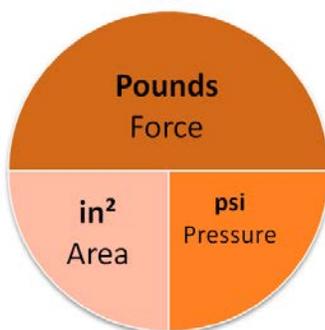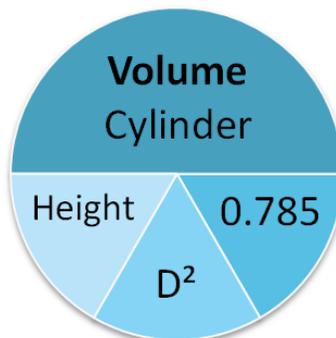
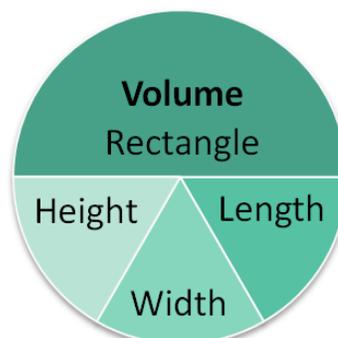### Area of a Circle
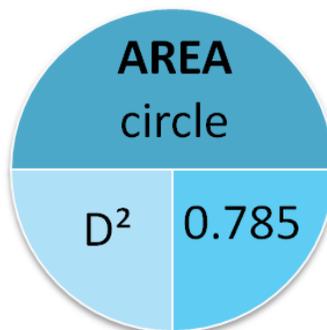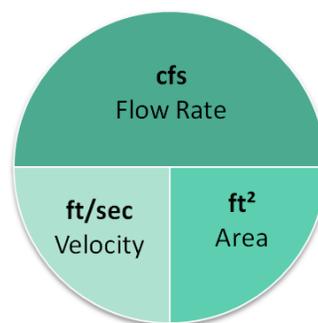

Area of a Rectangle

Horsepower, Water (whp)

Volume of Cylinder

Volume of Rectangular Tank

Force, pounds

Flow Rate, cfs

Feed Rate, lbs/day