

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 = ft² (square feet)
- e. Length x width x height = ft³ (cubic feet)

- f. **Circular Area** = .785 x Diameter² or
3.14 X Radius² (pi x R²) (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** = $\frac{\text{Water Horsepower}}{\text{Pump Efficiency}}$

c. Efficiency:

$$\% \text{ Efficiency} = \frac{\text{out power}}{\text{input power}}$$

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

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

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

g. Wire to Water Efficiency:

$$\text{Overall Efficiency} = \frac{\text{Water Horsepower} \times 100}{\text{Electrical Horsepower}}$$

3. Treatment Formulas

- a. **Filtration Rate (gpm/ft²)** = $\frac{\text{Flow (gal/min)}}{\text{Surface Area (ft}^2\text{)}}$

- b. **Percent Strength by Weight** = $\frac{\text{Weight of Solute} \times 100}{\text{Weight of Solution}}$

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

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

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

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** = $\frac{\text{Tank Volume (gallons)}}{\text{Flow (gpm or gpd or gph)}}$

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** =
 $Q (\text{flow ft}^3/\text{sec.}) = V (\text{velocity ft/sec.}) \times A (\text{area ft}^2)$

- k. **Force** = Pressure (psi) x Area (inches²)

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** = $\frac{\text{Part} \times 100}{\text{Whole}}$

o. Specific Gravity =

$\frac{\text{Solution weight (lbs/gal)}}{\text{Weight of Water (8.34 lbs/gal)}}$

5. Common Conversions

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

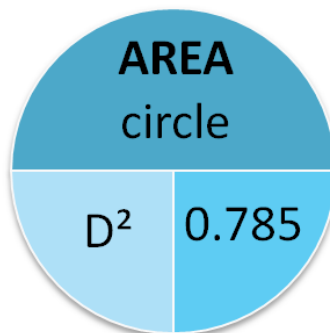
Weight:

- 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

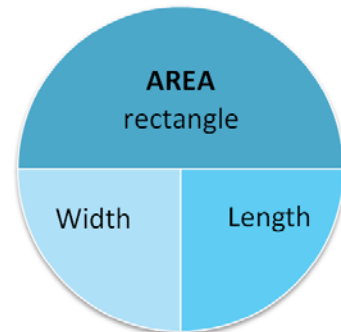
PIE WHEELS

- 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.

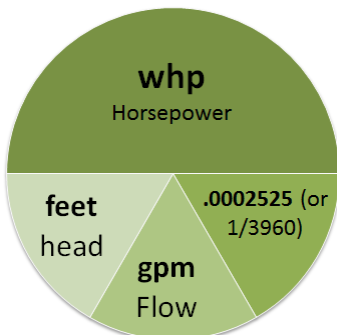
Area of a Circle



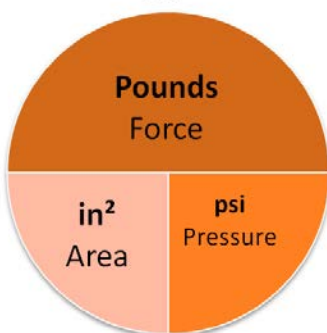
Area of a Rectangle



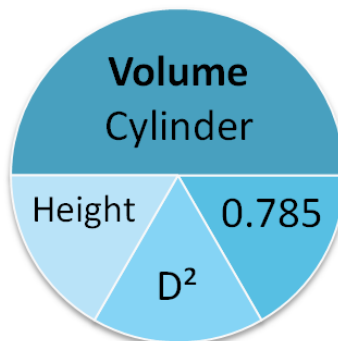
Horsepower, Water (whp)



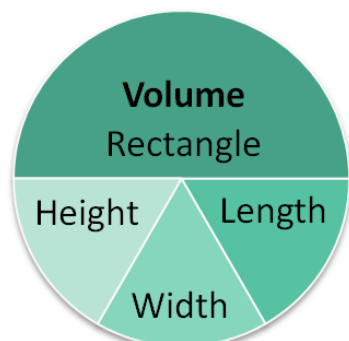
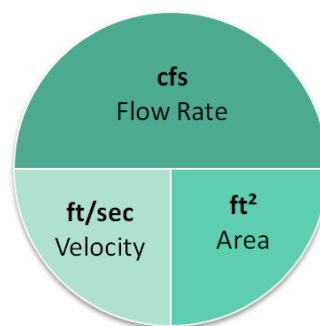
Force, pounds



Volume of Cylinder Volume of Rectangular Tank



Flow Rate, cfs



Feed Rate, lbs/day

