OPERATOR MATH SHEET

EQUIVALENTS

1 cubic ft. = 7.48 gallons
1 gallon of water weighs 8.34 pounds
1 mg/L = 1ppm
1% = 10,000 ppm (or 10,000 mg/L)
1 cu. ft./sec. (cfs) = 449 gpm
1 MGD (million gals/day)= 694 gpm = 1.547 cfs
1 p.s.i. = 2.31 feet of water

1 day = 1440 minutes
π (Pi) = 3.1416
Radius of circle = diameter ÷ 2
Circumference of circle = π x diameter
Centigrade = (°Fahrenheit - 32°) x 0.55
Fahrenheit = (°Centigrade x 1.8) + 32°F
1 horsepower = 0.746 kilowatts (or 550 ft-lbs/sec)

AREA AND VOLUME FORMULAS

Rectangles

Area, sq. ft. = length, ft. x width, ft.

Volume, cu. ft. = length, ft. x width, ft. x height, ft.
Volume, gal = Volume, cu. ft x 7.48 gal/cu. ft.

Circles/Cylinders

Area, sq. ft. = π x radius, ft. x radius, ft. *[also known as* πr^2*]*
Or = diameter, ft. x diameter, ft. x 0.785
Or = $\frac{\text{d'' x d'' x 0.785}}{\text{144 sq. in./1 sq. ft.}}$ *[allows you to start with inches]*

Volume, cu. ft. = π x radius, ft. x radius, ft. x height, ft.
Or (easier for a pipe) = $\frac{\text{d'' x d'' x 0.785}}{144}$ x length, ft.

GENERAL FORMULAS

Velocity, ft./sec. = $\frac{\text{flow, cu. ft./sec}}{\text{area, sq. ft.}}$. Or, $\frac{\text{distance, ft}}{\text{time, sec.}}$

# of Days supply = $\frac{\text{total chemical in inventory, lbs. (or gal.)}}{\text{average use, lbs/day (or gal/day)}}$

Flow, cu. ft./sec. = area, sq. ft. x velocity, ft./sec
OR = $\frac{\text{d'' x d'' x 0.785}}{144}$ x velocity, ft./sec.

Flow, gpm = Flow, cu. ft. x 7.48 gal/cu. ft.

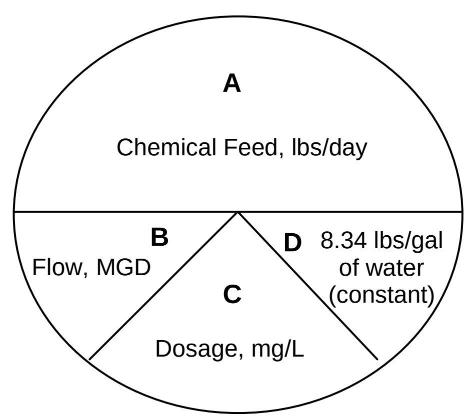
% Stroke Setting = $\frac{\text{required feed, gpd}}{\text{max. feed, gpd}}$ x 100 *[Note: this formula assumes the stroke setting is proportional]*

CHLORINE FORMULAS (the "Pounds Formula")

To solve for amount of Chemical Feed, lbs./day = Flow, in MGD x Dosage or desired residual, mg/L x 8.34 lbs./gal.

or **A = B x C x D**

to get the answer in gallons, divide by 8.34 lbs/gal



To solve for Flow of treated water, in MGD (millions of gallons/day, or gallons pumped per day divided by 1 million):

$$B = \frac{A}{C \times D}$$

To convert to MGD, divide gpd by 1 million, or move decimal 6 places to left:

- 100,000 gpd = 0.10 MGD
- 50,000 gpd = 0.05 MGD
- 10,000 gpd = 0.01 MGD

To solve for the Chlorine Dose, mg/L = $\frac{\text{chemical feed, lbs./day}}{\text{flow, MGD x 8.34}}$

or $$C = \frac{A}{B \times D}$$

By the way, this formula does not account for the *chlorine demand* of the water. At this scale, that could be minimal.
"Chlorine demand" = how much chlorine gets used up by disinfecting the contents of the water.
The bound up chlorine is only detected if you measure "total chlorine" rather than "free chlorine".

Free Chlorine Residual, mg/L = chlorine dose, mg/L – chlorine demand, mg/L