NEWEA Formula/Conversion Table for Collection Systems Exams

Amps $= \frac{\text{Volts}}{\text{Ohms}}$

Area of Circle $= (0.785)\,(\text{Diameter}^2)$ or $(\pi)(\text{Radius}^2)$

Area of Cylinder (total exterior surface area) = [End #1 SA] + [End #2 SA] + [(3.14)(Diameter)(Height or Depth)] where SA = surface area

Area of Rectangle = (Length)(Width)

Average (arithmetic mean) $= \frac{\text{Sum of All Terms}}{\text{Number of Terms}}$

Chemical Feed Pump Setting, mL/min $= \frac{(\text{Flow,MGD})(\text{Dose,mg/L})(3.785\text{L/gal})(1{,}000{,}000\text{gal/MG})}{(\text{Liquid,mg/mL})(24\text{hr/day})(60\text{min/hr})}$

Circumference of Circle $= (\pi)(\text{Diameter})$

Cycle Time, min. $= \frac{\text{Storage Volume, gal}}{\text{Pump Capacity, gpm} - \text{Wet Well Inflow, gpm}}$

Detention Time $= \frac{\text{Volume}}{\text{Flow}}$ Note: Units must be compatible.

Electromotive Force (E. M. F), volts $= (\text{Current, amps})(\text{Resistance, ohms})$ or $E = IR$

Feed Rate, lbs/day $= \frac{(\text{Dosage, mg/L})(\text{Capacity, MGD})(8.34\text{lbs/gal})}{(\text{Purity, decimal percentage})}$

Flow Rate, cfs $= (\text{Area, sq ft})\left(\text{Velocity}, \frac{\text{ft}}{\text{sec}}\right)$ or

$Q = AV$ where: Q = flow rate, A = area, V = velocity

Force, pounds $= (\text{Pressure, psi})(\text{Area, sq in})$

Horsepower, Brake (bhp) $= \frac{(\text{Flow, gpm})(\text{Head, ft})}{(3{,}960)(\text{Decimal Pump Efficiency})}$

Horsepower, Motor (mhp) $= \frac{(\text{Flow, gpm})(\text{Head, ft})}{(3{,}960)(\text{Decimal Pump Efficiency})(\text{Decimal Motor Efficiency})}$

Horsepower, Water (whp) $= \dfrac{(\text{Flow, gpm})(\text{Head, ft})}{3{,}960}$

Mass, lb Pounds $= (\text{Volume, MG})(\text{Concentration, mg/L})(8.34\text{lbs/gal})$

Motor Efficiency, % = $\dfrac{\text{Brake hp}}{\text{Motor hp}}$ x 100%

Pounds/day $= (\text{Flow, MGD})(\text{Concentration, mg/L})(8.34\text{lbs/gal})$

Population Equivalent, Organic $= \dfrac{(\text{Flow, MGD})(\text{BOD, mg/L})(8.34\text{lbs/gal})}{\text{lbsBOD/day/person}}$

Slope, % $= \dfrac{\text{Drop or Rise}}{\text{Distance}}$ x 100

Specific Gravity $= \dfrac{\text{Specific Weight of Substance, lbs/gal}}{\text{Specific Weight of Water, lbs/gal}}$

Velocity, ft/second $= \dfrac{\text{Flow Rate,cu ft/sec}}{\text{area,sq ft}}$

$= \dfrac{\text{Distance,ft}}{\text{Time,second}}$

Volume of Cone = (1/3) (0.785) (Diameter^2)(Height)

Volume of Cylinder $= (0.785)(\text{Diameter}^2)(\text{Height})$

Volume of Rectangular Tank $= (\text{Length})(\text{Width})(\text{Heigth})$

Weir Overflow Rate, gpd/ft $= \dfrac{\text{Flow, gpd}}{\text{Weir Length, ft}}$

Wire-to-Water Efficiency, % $= \dfrac{\text{Water Horsepower, HP}}{\text{Power Input, HP or Motor HP}}$ x100

Wire-to-Water Efficiency, % $= \dfrac{(\text{flow, gpm})(\text{Total Dynamic Head, ft})(0.746\text{kw/hp})(100)}{(3{,}960)(\text{Electrical Demand, kilowatts})}$

(8/17/2020)

Conversion Factors:

1 acre = 43,560 square feet
1 acre foot = 326,000 gallons
1 cubic foot = 7.48 gallons
1 cubic foot = 62.4 pounds
1 cubic foot per second = 0.646 MGD
1 foot = 0.305 meters
1 foot of water = 0.433 psi
1 gallon = 3.79 liters
1 gallon = 8.34 pounds
1 grain per gallon = 17.1 mg/L
Population Equivalent, hydraulic = 100 gallons/person/day
Population Equivalent = 0.17 lbs BOD/person/day
1 horsepower = 0.746 kW or 746 watts or 33,000 ft. lbs/min.
1 million gallons per day = 694 gallons per minute
1 million gallons per day = 1.55 cubic feet per second
1 mile = 5,280 feet
1 pound = 0.454 kilograms
1 pound per square inch = 2.31 feet of water
1 ton = 2,000 pounds
1% = 10,000 mg/L
π or pi = 3.14
24 hours = 1,440 minutes

Abbreviations:

BOD	biochemical oxygen demand
cfs	cubic feet per second
DO	dissolved oxygen
ft	feet
g	grams
gpd	gallons per day
gpm	gallons per minute
in	inches
kW	kilowatt
lbs	pounds
mg/L	milligrams per liter
MGD	million gallons per day
mL	milliliter
ppm	parts per million
psi	pounds per square inch
PE	population equivalent
Q	flow
SS	settleable solids
TSS	total suspended solids

(8/17/2020)


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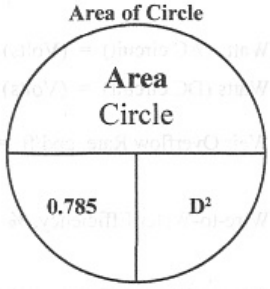
***Pie Wheels:**

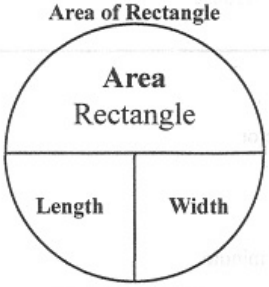
- To find the quantity above the horizontal line: multiply the pie wedges below the line together.
- To solve for one of the pie wedges below the horizontal line: cover that pie wedge, then divide the remaining pie wedge(s) into the quantity above the horizontal line.

Given units must match the units shown in the pie wheel.

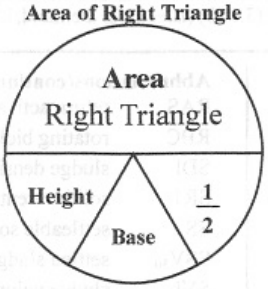
Area of Circle



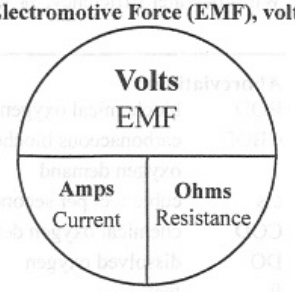
Area of Rectangle



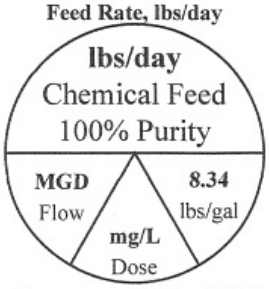
Area of Right Triangle



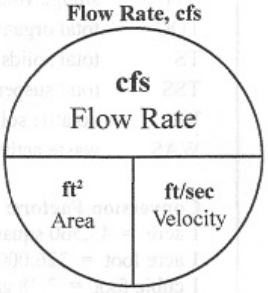
Electromotive Force (EMF), volts



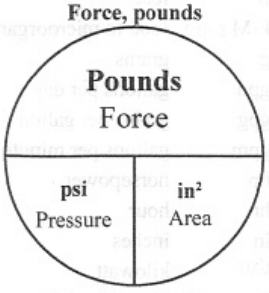
Feed Rate, lbs/day



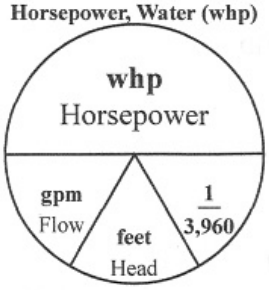
Flow Rate, cfs



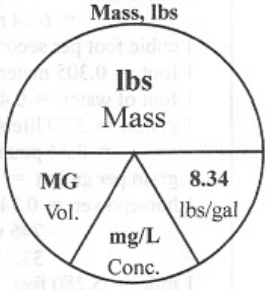
Force, pounds



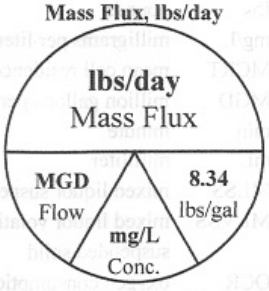
Horsepower, Water (whp)



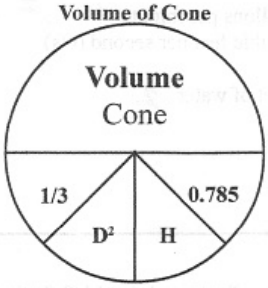
Mass, lbs



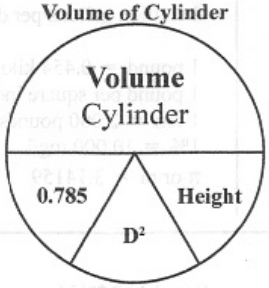
Mass Flux, lbs/day



Volume of Cone



Volume of Cylinder



Volume of Rectangular Tank