



Basic Wastewater Math Review

New Mexico Rural Water Association
2007



Conversion Factors

Length

- 1 foot = 12 inches
- 1 mile = 5,280 feet
- 1 inch = 2.54 centimeters
- 1 yard = 3 feet
- 1 meter = 39.37 inches



Area

- 1 acre = 43,560 square feet
- 1 square foot = 144 inches



Volume

- 1 cubic foot = 7.481 gallons
- 1 acre foot = 43,560 cubic feet
- 1 acre foot = 325,828 gallons
- 1 gallon = 3.785 liters
- 1 cubic yard = 27 cubic feet
- 1 cubic meter = 35.315 cubic feet
- 1 liter = 1000 milliliters (ml)



Weight

- 1 kilogram (kg) = 2.2 lbs.
- 1 cubic foot = 62.4 lbs. (water)
- 1 gallon = 8.34 lbs. (water)



Flow

- 1 cubic foot/second = 0.646 MGD
- 1 cubic foot/second = 448.8 gpm
- 1 MGD = 3.07 acre feet/day
- 1 MGD = 694.4 gpm



Pressure/Head

- 1 psi = 2.31 feet of water
- 1 inch mercury = 1.133 feet of water
- 1 foot of water = 0.433 psi



Power

- 1 Horse Power = 550 ft-lbs/second
- 1 Horse Power = 746 Watts
- 1 Horse Power = 0.746 kilowatts (kW)
- 1 Horse Power = 33,000 ft-lbs/minute



Time

- 60 seconds per minute
- 60 minutes per hour
- 24 hours per day
- 1440 minutes per day



Dosage

- $1 \text{ mg/l} = 1 \text{ ppm}$
- $1 \text{ grain/gallon} = 17.1 \text{ mg/l}$
- $8.34 \text{ lbs of solids in } 1,000,000 \text{ gal of water} = 1 \text{ ppm}$
- $1 \% \text{ (solids)} = 10,000 \text{ mg/l}$



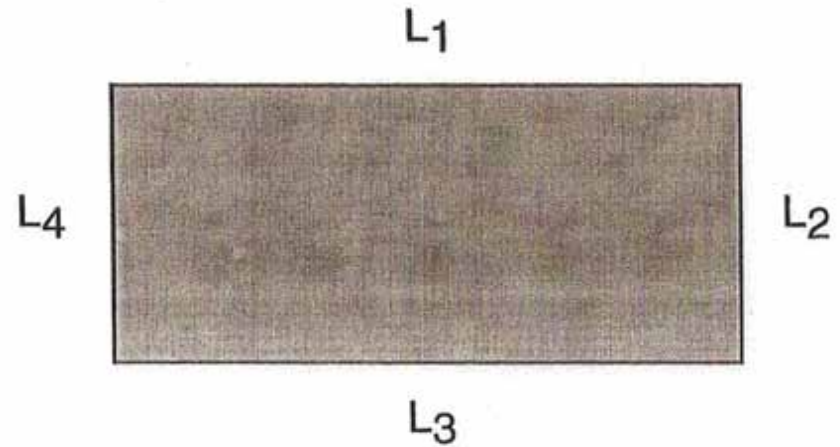
Temperature

- $C = (F - 32) / 1.8$

- $F = (C \times 1.8) + 32$

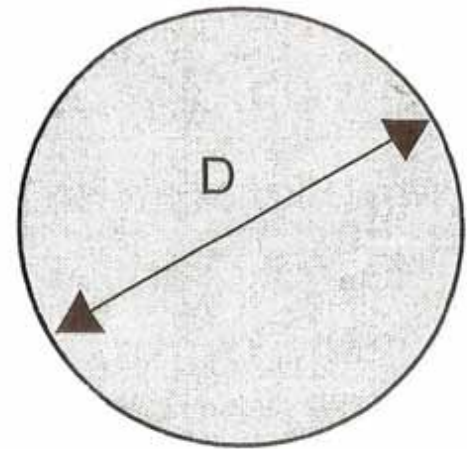
PERIMETER/CIRCUMFERENCE

Square or Rectangle $P = L_1 + L_2 + L_3 + L_4$



Circle

$$C = \pi D$$

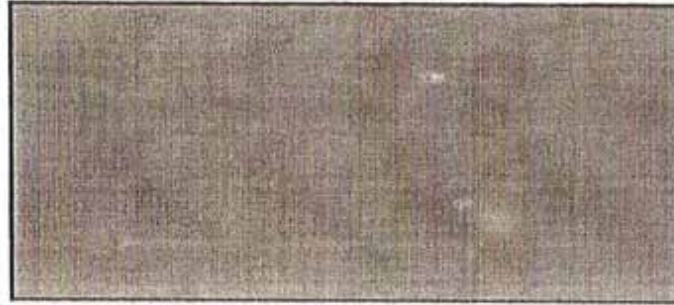


AREA

Rectangle or Square $A = L \times W$

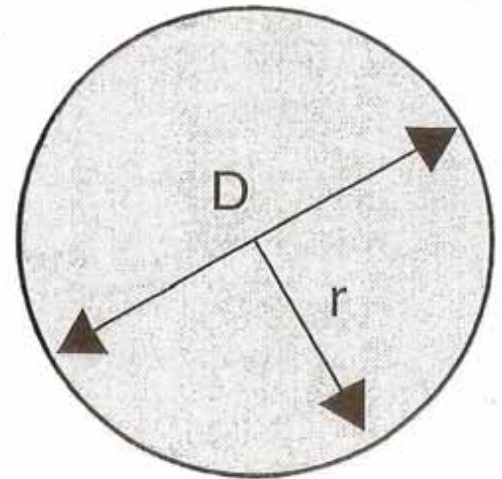
L

W



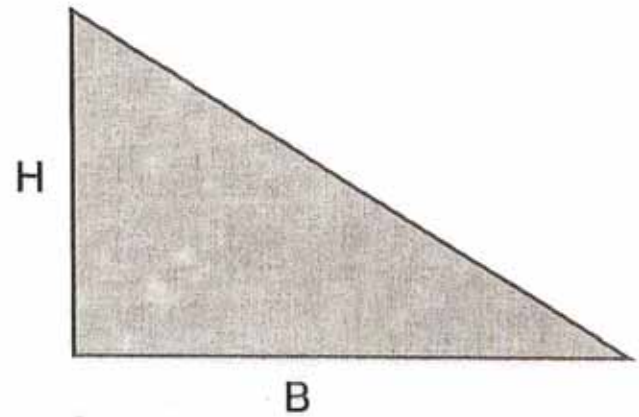
Circle

$$A = \pi r^2$$



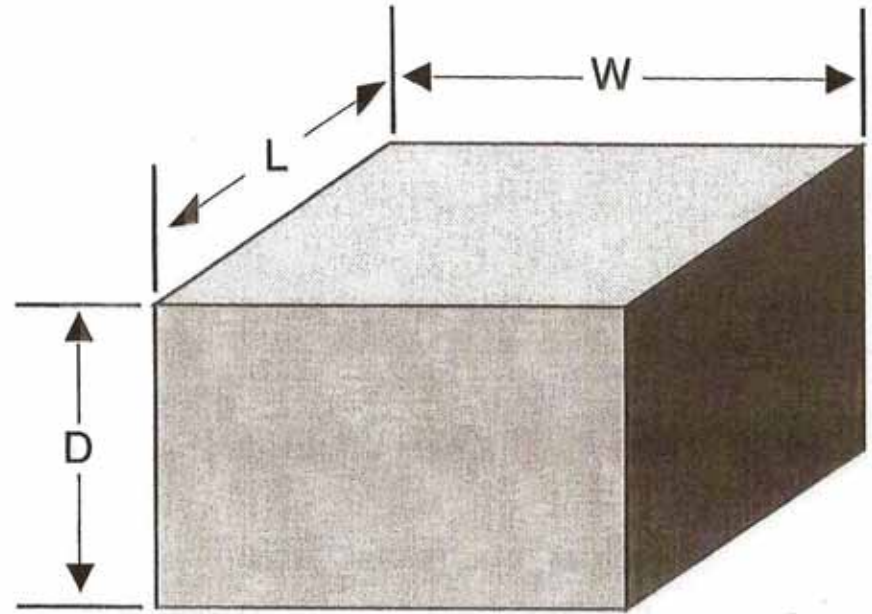
Triangle

$$A = \frac{B \times H}{2}$$



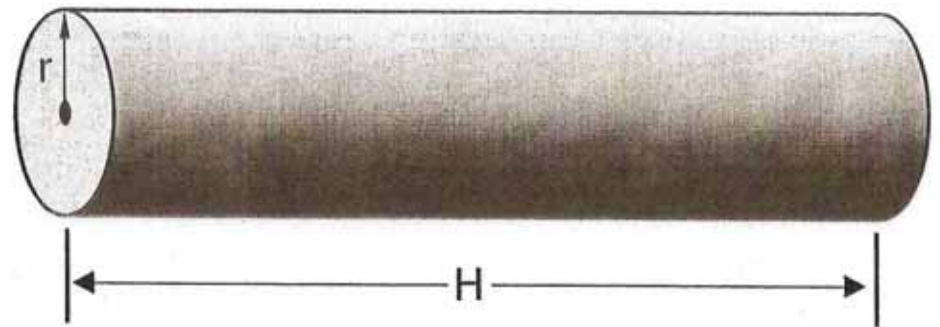
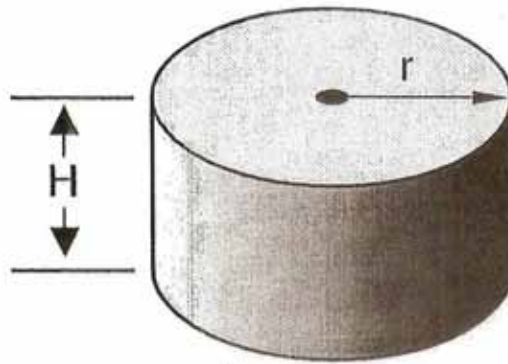
VOLUME Rectangle or Square

$$V = L \times W \times D$$



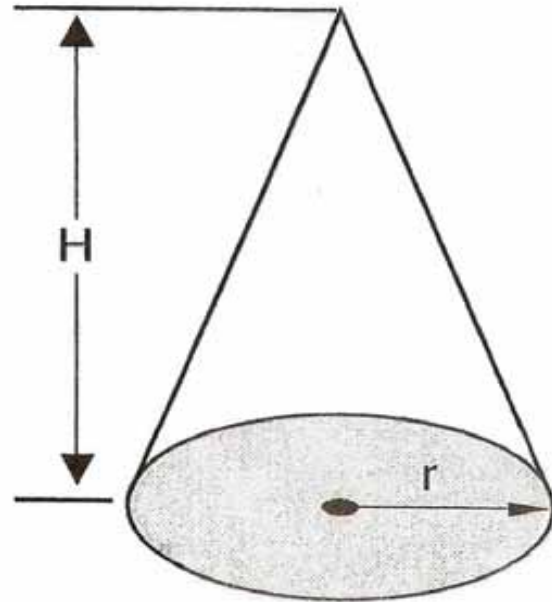
Cylinder

$$V = \pi r^2 \times H \text{ or } L$$



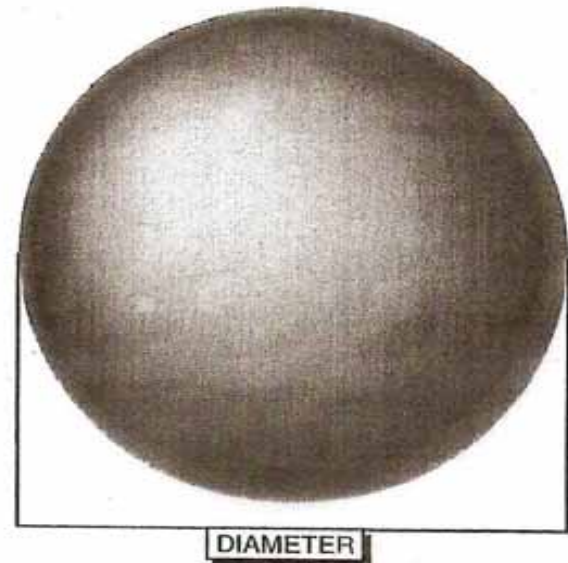
Cone

$$V = \frac{\pi r^2 H}{3}$$



Sphere

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



Other Equations

○ Pounds or Dosage Formula

- $\text{Lbs} = \text{Flow or Vol.} \times \text{MG} \times 8.34 \times \text{Conc. Mg/l}$

○ Removal Efficiency

- $$\frac{\text{In} - \text{Out}}{\text{IN}} \times 100 = \% \text{ Removal}$$

○ Pump Efficiency

- $$\frac{\text{Output Horsepower}}{\text{Input Horsepower}} \times 100 = \% \text{ Efficiency}$$

- **Weir Overflow Rate**

- $WO = \frac{\text{Flow, gpm}}{\text{Weir length, ft}}$

- **Detention Time**

- $DT = \frac{\text{Volume}}{\text{Flow}}$



Word Problems

Word

of

and

per

less than

Meaning

multiply

add

divide

subtract



Procedure

1. Make a drawing if possible
2. Place given data on the drawing
3. Ask “What is the question?”
4. What units must your answer be in
5. Write down equations you will need
6. Place the data in the equation
7. Rearrange the equation, if necessary
8. Make the calculation
9. Check your answer: Does it make sense?

Practice Problems

- Scrap paper
- Pen or pencil
- Calculator
- Thinking cap

