Basic Math - Practice Problems
Conversions Answer Key

The Division of Water Quality makes no claim as the accuracy of any answers provided herein.

PRACTICE PROBLEMS 8.1: The "Box Method" of Conversions

☐ Complete the following problems using the box method of conversion. Use the conversion equations given below.

1. 32 in. = 81.2 cm

$\frac{32 \text{ in}}{2.54 \frac{\text{in}}{\text{cm}}}$

2. 120 cu ft = 3.4 m^3

$\frac{120 \text{ ft}^3}{35.31 \frac{\text{ft}^3}{\text{m}^3}}$

3. 37 m = 40.5 yds

$\frac{37 \text{ m}}{0.9144 \frac{\text{m}}{\text{yd}}}$

4. 75 kg = 165.3 lbs

$\frac{75 \text{ kg}}{0.4536 \frac{\text{kg}}{\text{lb}}}$

5. 250 ml = 8.5 oz (fl.)

$\frac{250 \text{ mL}}{29.57 \frac{\text{mL}}{\text{oz}}}$

6. 105 yds = 96 m

$105 \text{ yd} \times 0.9144 \frac{\text{m}}{\text{yd}}$

7. 18 kw = 24.1 hp

$\frac{18 \text{ kW}}{0.746 \frac{\text{kW}}{\text{hp}}}$

8. 515 lbs = 233.6 kg

$515 \text{ lbs} \times 0.4536 \frac{\text{kg}}{\text{lb}}$

9. 100 cm = 39.37 in.

$\cancel{100 \text{ cm} \times 2.54 \frac{\text{in}}{\text{cm}}}$

10. 30 hp = 22.4 kW

$30 \text{ hp} \times 0.746 \frac{\text{kW}}{\text{hp}}$

1 in = 2.54 cm
1 hp = 0.746 kW
1 m^3 = 35.31 cu ft
1 lb = 0.4536 kg
1 yd = 0.9144 m
1 oz (fluid) = 29.57 ml

PRACTICE PROBLEMS 8.2: Cubic Feet to Pounds Conversions

❑ Complete the conversion indicated below.

1. 4 cu ft = 29.9 gal

   $4\ ft^3 \times 7.48\ \frac{gal}{ft^3}$

2. 1000 gal = 13.4 cu ft

   $\frac{1000\ gal}{7.48\ \frac{gal}{ft^3}}$

3. 35 cu ft = 2183.4 lbs

   $35\ ft^3 \times 7.48\ \frac{gal}{ft^3} \times 8.34\ \frac{lbs}{gal}$

4. 60,000 gal = 500.400 lbs

   $60000\ gal \times 8.34\ \frac{lbs}{gal}$

5. 1500 lbs = 179.8 gal

   $\frac{1500\ lbs}{8.34\ \frac{lbs}{gal}}$

❑ Solve the following conversion problems.

6. A tank contains 188,000 gallons. How many cu ft is this?

   $\frac{188,000\ gal}{7.48\ \frac{gal}{ft^3}}$

   ANS 25,133.7 ft^3

7. Convert 60,000 lbs of sludge to cu ft of sludge. (Assume the sludge weighs 8.34 lbs/gal)

   $\frac{60,000\ lbs}{8.34\ \frac{lbs}{gal}} = 7,194.2\ gal$

   $\frac{7,194.2\ gal}{7.48\ \frac{gal}{ft^3}}$

   ANS 961.8 ft^3

8. If a tank contains 107,000 lbs of water, how many gallons of water does it contain?

   $\frac{107,000\ lbs}{8.34\ \frac{lbs}{gal}}$

   ANS 12,829.7 gal

9. How much does 20 cu ft of water weigh (in lbs)?

   $20\ ft^3 \times 7.48\ \frac{gal}{ft^3} \times 8.34\ \frac{lbs}{gal}$

   ANS 1,247.7 lbs

10. A tank contains 500 gallons of water. How many lbs of water does it contain?

    $500\ gal \times 8.34\ \frac{lbs}{gal}$

    ANS 4,170 lbs

PRACTICE PROBLEMS 8.3: Flow Conversions

☐ Complete the following conversion calculations:

1. 3.6 cfs = 1615.7 gpm

$3.6 \frac{ft^3}{s} \times 7.48 \frac{gal}{ft^3}$

$26.9 \text{ gps} \times 60 \frac{s}{m}$

2. 1820 gpm = 2620.800 gpd

$1820 \text{ gpm} \times 60 \frac{m}{hr} \times 24 \frac{hr}{day}$

3. 45 gps = 6.4 cfs

$\frac{45 \frac{gal}{s}}{7.48 \frac{gal}{ft^3}}$

4. 8.6 MGD = 5972.2 gpm

$\frac{8,600,000 \frac{gal}{day}}{60 \frac{min}{hr} \times 24 \frac{hr}{day}}$

5. 2.92 MGD = 2027.8 gpm

$\frac{2,920,000 \frac{gal}{day}}{60 \frac{min}{hr} \times 24 \frac{hr}{day}}$

6. 385 cfm = 4,146,912 gpd

$385 \frac{ft^3}{min} \times 60 \frac{m}{hr} \times 24 \frac{hr}{day}$

$554,400 \frac{ft^3}{day} \times 7.48 \frac{gal}{ft^3}$

7. 1,662,000 gpd = 1154.2 gpm

$\frac{1,662,000 \frac{gal}{Day}}{24 \frac{hr}{Day} \times 60 \frac{min}{hr}}$

8. 3.77 cfs = 2.4 MGD

$\frac{3.77 \frac{ft^3}{s} \times 60 \frac{min}{s} \times 60 \frac{min}{hr} \times 24 \frac{hr}{Day} \times 7.48}{1,000,000 \frac{gal}{MG}}$

9. The flow through a pipeline is 2.8 cfs. What is this flow in gpd?

$2.8 \frac{ft^3}{s} \times 7.48 \frac{gal}{ft^3} \times 60 \frac{s}{min} \times 60 \frac{min}{hr} \times 24 \frac{hr}{day}$

ANS 1,809,561.6 gpd

10. A treatment plant receives a flow of 3.61 MGD. What is this flow in gpm?

$\frac{3.61 \frac{MG}{Day} \times 1,000,000 \frac{gal}{MG}}{60 \frac{min}{hr} \times 24 \frac{hr}{Day}}$

ANS 2506.9 gpm

PRACTICE PROBLEMS 8.4: Linear Measurement Conversions

☐ Complete the following linear measurement conversion calculations:

1. 17 ft = 5.67 yds

$\frac{17 \text{ ft}}{3 \frac{\text{ft}}{\text{yd}}}$

2. 122 in. = 10.17 ft

$\frac{122 \text{ in}}{12 \frac{\text{in}}{\text{ft}}}$

3. 1.7 mi = 8976 ft

$1.7 \text{ mi} \times 5280 \frac{\text{ft}}{\text{mi}}$

4. 30 yds = 1080 in.

$30 \text{ yd} \times 36 \frac{\text{in}}{\text{yd}}$

5. 492 in. = 13.67 yds

$\frac{492 \text{ in}}{36 \frac{\text{in}}{\text{yd}}}$

6. 0.6 ft = 7.2 in.

$0.6 \text{ ft} \times 12 \frac{\text{in}}{\text{ft}}$

7. 70 yds = 210 ft

$70 \text{ yd} \times 3 \frac{\text{ft}}{\text{yd}}$

8. 9000 ft = 1.70 mi

$\frac{9000 \text{ ft}}{5280 \frac{\text{ft}}{\text{mi}}}$

9. The total weir length for a sedimentation tank is 142 ft 7 in. Express this length in terms of feet only.

$142 \text{ ft} \quad \frac{7}{12} \text{ ft}$

ANS 142.58 ft

10. A one-eighth mile segment of pipeline is to be repaired. How many feet of pipeline is this?

$\frac{1}{8} \text{ mi} \times 5280 \frac{\text{ft}}{\text{mi}}$

ANS 660 ft

PRACTICE PROBLEMS 8.5: Area Measurement Conversions

❑ Complete the square term conversion problems given below.

1. 1017 sq in. = 7.1 sq ft

$\frac{1017 \text{ in}^2}{12 \frac{\text{in}}{\text{ft}} \times 12 \frac{\text{in}}{\text{ft}}}$

2. 500 sq yds = 4500 sq ft

$500 \text{ yd}^2 \times 3 \frac{\text{ft}}{\text{yd}} \times 3 \frac{\text{ft}}{\text{yd}}$

3. 4 ac = 174,240 sq ft

$4 \text{ ac} \times 43{,}560 \frac{\text{ft}^2}{\text{ac}}$

4. 78.5 sq in. = 0.55 sq ft

$\frac{78.5 \text{ in}^2}{12 \frac{\text{in}}{\text{ft}} \times 12 \frac{\text{in}}{\text{ft}}}$

5. 25,000 sq ft = 0.57 ac

$\frac{25{,}000 \text{ ft}^2}{43{,}560 \frac{\text{ft}^2}{\text{ac}}}$

6. 1 sq yd = 12960 sq in.

$1 \text{ yd}^2 \times 36 \frac{\text{in}}{\text{yd}} \times 36 \frac{\text{in}}{\text{yd}}$

7. 9.5 sq ft = 1368 sq in.

$9.5 \text{ ft}^2 \times 12 \frac{\text{in}}{\text{ft}} \times 12 \frac{\text{in}}{\text{ft}}$

8. 0.9 ac = 39,204 sq ft

$0.9 \text{ ac} \times 43{,}560 \frac{\text{ft}^2}{\text{ac}}$

9. For solids treatment, a total of 60,000 sq ft will be required. How many acres is this?

$\frac{60{,}000 \text{ ft}^2}{43{,}560 \frac{\text{ft}^2}{\text{ac}}}$

ANS 1.38 ac

10. A pipe has a cross-sectional area of 452 sq in. How many sq ft is this?

$\frac{452 \text{ in}^2}{12 \frac{\text{in}}{\text{ft}} \times 12 \frac{\text{in}}{\text{ft}}}$

ANS 3.14 ft^2

PRACTICE PROBLEMS 8.6: Volume Measurement Conversions

❑ Complete the following conversions.

1. 25 cu yds = 675 cu ft

$25\ yd^3 \times 3\ \frac{ft}{yd} \times 3\ \frac{ft}{yd} \times 3\ \frac{ft}{yd}$

2. 1500 cu in. = 0.87 cu ft

$\frac{1500\ in^3}{12\ \frac{in}{ft} \times 12\ \frac{in}{ft} \times 12\ \frac{in}{ft}}$

3. 2.2 ac-ft = 95,832 cu ft

$2.2\ ac\ ft \times 43,560\ \frac{ft^2}{ac}$

4. 21 cu ft = 0.78 cu yds

$\frac{21\ ft^3}{3\ \frac{ft}{yd} \times 3\ \frac{ft}{yd} \times 3\ \frac{ft}{yd}}$

5. 92,600 cu ft = 2.13 ac-ft

$\frac{92,600\ ft^3}{43,560\ \frac{ft^2}{ac}}$

6. 17,260 cu ft = 639.3 cu yds

$\frac{17,260\ ft^3}{3\ \frac{ft}{yd} \times 3\ \frac{ft}{yd} \times 3\ \frac{ft}{yd}}$

7. 0.6 cu yds = 16.2 cu ft

$0.6\ yd^3 \times 3\ \frac{ft}{yd} \times 3\ \frac{ft}{yd} \times 3\ \frac{ft}{yd}$

8. 3 cu ft = 5184 cu in.

$3\ ft^3 \times 12\ \frac{in}{ft} \times 12\ \frac{in}{ft} \times 12\ \frac{in}{ft}$

9. A screenings pit must have a capacity of 400 cu ft. How many cu yds is this?

$\frac{400\ ft^3}{3\ \frac{ft}{yd} \times 3\ \frac{ft}{yd} \times 3\ \frac{ft}{yd}}$

ANS 14.8 yd^3

10. A reservoir contains 50 ac-ft of water. How many cu ft of water does it contain?

$50\ ac \cdot ft \times 43,560\ \frac{ft^2}{ac}$

ANS 2,178,000 ft^3

PRACTICE PROBLEMS 8.7: mg/*L* and Percent Conversions

❑ Complete the conversion problems given below.

1. 120 mg/*L* = 0.012 %

$$\frac{120 \ \frac{mg}{L}}{10{,}000 \ \frac{mg/L}{1\%}}$$

2. 1.5% = 15,000 mg/*L*

$$1.5\% \times 10{,}000 \ \frac{mg/L}{1\%}$$

3. 0.025% = 250 mg/*L*

$$0.025\% \times 10{,}000 \ \frac{mg/L}{1\%}$$

4. 5000 mg/*L* = 0.5 %

$$\frac{5000 \ mg/L}{10{,}000 \ \frac{mg/L}{1\%}}$$

❑ Complete the following word problems.

5. The suspended solids concentration of the return activated sludge is 6800 mg/*L*. What is this concentration expressed as a percent?

$$\frac{6800 \ \frac{mg}{L}}{10{,}000 \ \frac{mg/L}{1\%}}$$

ANS 0.68 %

6. A concentration of 195 mg/*L* is equivalent to a concentration of what percent?

$$\frac{195 \ \frac{mg}{L}}{10{,}000 \ \frac{mg/L}{1\%}}$$

ANS 0.0195 %