



## Homework Problems

Correct Answers Are Indicated by a Dark Numeral Such as ①, ②, ③, or ④

- 1. What is the surface area of a rectangular pool with a length of 10 meters and a width of 25 feet?**

① 250 square feet      ② 820 square feet      ③ 750 square feet      ④ 1000 square feet

Area for a rectangular pool (page 23 in textbook) is: Area = Length times Width

Remember meters times 3.28 = feet

$$\text{Area} = \begin{array}{c} \text{Length} \\ \boxed{\phantom{000}} \\ \text{in feet} \end{array} \text{ times } \begin{array}{c} \text{Width} \\ \boxed{\phantom{000}} \\ \text{in feet} \end{array} = \boxed{\phantom{000}}$$

- 2. What is the volume of a rectangular pool with a length of 60 feet, a width of 30 feet, and a depth ranging from 3 feet in the shallow end to 7 feet in the deep end?**

① 67,500 gallons      ② 76,500 gallons      ③ 62,800 gallons      ④ 65,500 gallons

Volume (in gallons) for a rectangular pool (page 23 in textbook) is:

Gallons = Area times Average Depth times 7.5

$$\text{Average Depth} = \begin{array}{c} \text{Shallow Depth} \\ \boxed{\phantom{000}} \\ \text{in feet} \end{array} \text{ plus } \begin{array}{c} \text{Deep Depth} \\ \boxed{\phantom{000}} \\ \text{in feet} \end{array} \text{ then divided by } 2$$

$$\text{Gallons} = \begin{array}{c} \text{Length} \\ \boxed{\phantom{000}} \\ \text{in feet} \end{array} \text{ times } \begin{array}{c} \text{Width} \\ \boxed{\phantom{000}} \\ \text{in feet} \end{array} \text{ times } \begin{array}{c} \text{Avg. Depth} \\ \boxed{\phantom{000}} \\ \text{in feet} \end{array} \text{ times } 7.5$$

$$\text{Gallons} = \boxed{\phantom{000}}$$

- 3. What is the flow rate of a 50,000 gallon pool based on an 5.2 hour turnover rate?**

① 208 GPM      ② 160 GPM      ③ 120 GPM      ④ 114 GPM

Flow Rate (page 87 in textbook) is:

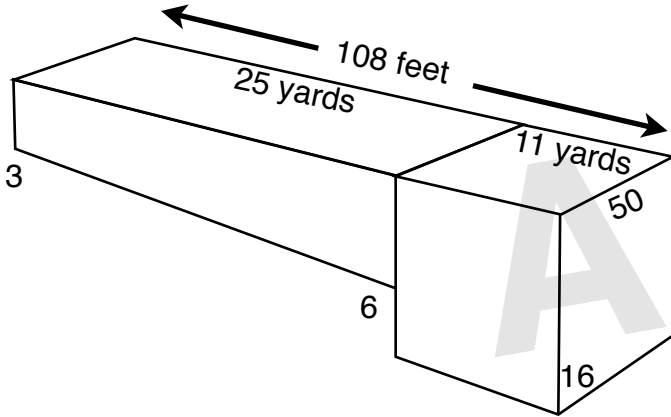
Flow Rate = Pool Volume divided by Turnover Rate divided by 60 minutes per hour

$$\text{Flow Rate} = \begin{array}{c} \text{Volume} \\ \boxed{\phantom{00000}} \\ \text{in gallons} \end{array} \text{ divided by } \begin{array}{c} \text{Turnover Rate} \\ \boxed{\phantom{000}} \\ \text{in hours} \end{array} \text{ divided by } 60 = \boxed{\phantom{000}}$$

## Homework Continued

4. Your pool is 108 feet long and 50 feet wide. The pool is divided into two areas: a swimming area and a dive well. The swimming area is 25 yards long with a depth from 3 feet to 6 feet. The diving well is 11 yards long and has a constant depth of 16 feet. What is the pool volume in gallons?

- ① 324,563 gallons      ② 275,875 gallons      ③ 175,560 gallons      ④ 159,175 gallons



From page 23 of the textbook:  
Separate complex pools into their simple shapes, calculate each one separately, and add them back together

Average Depth<sub>1</sub> =  Shallow Depth       Deep Depth  
    in feet      plus      in feet      then divided by 2

Gallons<sub>1</sub> =  Length       Width       Avg. Depth      times 7.5  
                                  in feet      times      in feet      times      in feet

Gallons<sub>1</sub> =

Gallons<sub>2</sub> =  Length       Width       Avg. Depth      times 7.5  
                                  in feet      times      in feet      times      in feet

Gallons<sub>2</sub> =

Total Gallons =  Pool 1      plus       Pool 2      =       Total

## Homework Continued

5. Calculate the Saturation index for water that has a total alkalinity of 50 ppm, a pH of 7.0, a calcium hardness of 120 ppm, a temperature of 82°F, and a total dissolved solids of 400 ppm. Is it balanced, corrosive or scaling?

- ① + 1.0                      ② - 0.6                      ③ - 1.0                      ④ + 0.6

$$\begin{array}{ccccccc}
 \text{SI} & = & \text{pH} & + & \text{Tf} & + & \text{Cf} & + & \text{Af} & - & \text{TDSf} \\
 \text{Saturation} & & \text{pH} & & \text{Temperature} & & \text{Calcium} & & \text{Alkalinity} & & \text{TDS} \\
 \text{Index} & & \text{as} & & \text{factor} & & \text{factor} & & \text{factor} & & \text{factor} \\
 & & \text{tested} & & & & & & & & \\
 & & & & & & & & & & 
 \end{array}$$

*Use Illustration 6-7 on page 59*

|                        | Test Kit Value | Index Factor |
|------------------------|----------------|--------------|
| pH                     |                |              |
| Temperature            |                |              |
| Calcium Hardness       |                |              |
| Total Alkalinity       |                |              |
| Sub-Total              |                |              |
| Total Dissolved Solids |                | -            |
| Saturation Index       |                |              |

*To Evaluate the Saturation Index Results  
Use Illustration 6-8 on page 59*

6. What is the maximum flow rate of a pool with a cartridge filter of 851 square feet?

- ① 422 GPM                      ② 357 GPM                      ③ 319 GPM                      ④ 297 GPM

Flow Rate ( page 106 in textbook) is:

Flow Rate = Filter Area times Filter Media Rate (page 105 in textbook)

Flow Rate =  Filter Area in Sq.Ft. times  Filter Media Rate Page 105 =

## Homework Continued

**7. How many BTU's does it take to raise the temperature of a 1000 gallon spa from 94° F to 102° F?**

- ① 13,280                      ② 6,640                      ③ 66,640                      ④ 7,921

From page 21 of the textbook: BTU's = Gallons times **8.33** times °F temperature rise

$$\text{BTU's} = \begin{array}{c} \text{Volume} \\ \hline \boxed{\phantom{00000}} \\ \text{in gallons} \end{array} \text{ times } \mathbf{8.33} \text{ times } \begin{array}{c} \text{Number } ^\circ\text{F} \\ \hline \boxed{\phantom{00000}} \\ \text{Temp. Rise} \end{array} = \boxed{\phantom{00000}}$$

**8. Adjust the CALCIUM HARDNESS from 120 ppm to 200 ppm in a 60,000 gallon pool. Use Calcium Chloride 77%.**

- ① 43.2 ounces                      ② 43.2 pounds                      ③ 36.2 pounds                      ④ 57.6 pounds

*Use Appendix B-2 on page 224*

**How Much Chemical = A times B times C**

A is the **Amount** of Chemical on the **Label** (page 224)

B<sub>1</sub> is **your** Pool Gallons

B<sub>2</sub> is the Gallons on the **Label** (page 224)

C<sub>1</sub> is the ppm **Change** You Make

C<sub>2</sub> is the ppm Change on the **Label** (page 224)

B<sub>1</sub> = 60,000 Gallons: C<sub>1</sub> = 200 ppm minus 120 ppm = 80 ppm

Remember:

**Ounces divided by 16 = pounds and Fluid Ounces divided by 128 = gallons**

| A – Amount of Chemical<br>using appendix B-2 | B – Pool Volume<br>using gallons on label  | C – Change<br>using ppm on label   |
|--|--|--|
|  | B is B <sub>1</sub> divided by B <sub>2</sub><br>B <sub>1</sub> = _____ Gallons<br>B <sub>2</sub> = _____ Gallons<br>B = _____ | C is C <sub>1</sub> divided by C <sub>2</sub><br>C <sub>1</sub> = _____ ppm<br>C <sub>2</sub> = _____ ppm<br>C = _____ |

$$\text{HMC} = \begin{array}{c} \text{Amount} \\ \hline \boxed{\phantom{00000}} \end{array} \text{ times } \begin{array}{c} \text{Big Factor} \\ \hline \boxed{\phantom{00000}} \end{array} \text{ times } \begin{array}{c} \text{Change Factor} \\ \hline \boxed{\phantom{00000}} \end{array}$$

$$\text{HMC} = \boxed{\phantom{00000}}$$

## Homework Continued

**9. How much SODIUM HYPOCHLORITE is needed to breakpoint chlorinate a 75,000 gallon pool if the free chlorine is 0.8 ppm and the total chlorine is 1.5?**

- ① 4.4 gallons      ② 35.2 gallons      ③ 28 gallons      ④ 7.6 gallons

Breakpoint Chlorine (page 42 in textbook) = 10 times Combined Chlorine  
 Combined Chlorine = Total Chlorine minus Free Chlorine

Combined Chlorine = Total Chlorine  
 minus Free Chlorine  
 =

Breakpoint Chlorine = Combined Chlorine  
 **times 10** =   
**C<sub>1</sub>**

A is the **Amount** of Chemical on the **Label** (page 224)

B<sub>1</sub> is **your** Pool Gallons  
 ppm **Change** You Make

B<sub>2</sub> is the Gallons on the **Label** (page 224) is the  
 C<sub>2</sub> is the ppm Change on the **Label** (page 224)

B<sub>1</sub> = 75,000 Gallons: C<sub>1</sub> = Breakpoint Chlorine (the change you wish to make)

Remember:

**Ounces divided by 16** = pounds and **Fluid Ounces divided by 128** = gallons

| A – Amount of Chemical<br>using appendix B-2 | B – Pool Volume<br>using gallons on label  | C – Change<br>using ppm on label   |
|--|--|--|
|  | B is B <sub>1</sub> divided by B <sub>2</sub><br>B <sub>1</sub> = _____ Gallons<br>B <sub>2</sub> = _____ Gallons<br>B = _____ | C is C <sub>1</sub> divided by C <sub>2</sub><br>C <sub>1</sub> = _____ ppm<br>C <sub>2</sub> = _____ ppm<br>C = _____ |

Amount
Big Factor
Change Factor

HMC =  **times**  **times**

HMC =

## Homework Continued

**10. What is the filter surface area needed for a D.E. filter if the flow rate is 650 gpm?**

- ① 626 square feet      ② 325 square feet      ③ 525 square feet      ④ 740 square feet

Filter Area ( page 106 in textbook) is: Filter Area = Flow Rate divided by Filter Media Rate

$$\text{Filter Area} = \frac{\text{Flow Rate}}{\text{in GPM}} \text{ divided by } \frac{\text{Filter Media Rate}}{\text{page 105}} = \boxed{\phantom{000}}$$

**11. What is the flow rate of a 115,000 gallon pool based on a 6 hour turnover rate?**

- ① 422 GPM      ② 357 GPM      ③ 319 GPM      ④ 297 GPM

Flow Rate ( page 87 in textbook) is:

Flow Rate = Pool Volume divided by Turnover Rate divided by 60 minutes per hour

$$\text{Flow Rate} = \frac{\text{Volume}}{\text{in gallons}} \text{ divided by } \frac{\text{Turnover Rate}}{\text{in hours}} \text{ divided by } 60 = \boxed{\phantom{000}}$$

**12. What is the total filter area of a diatomaceous earth (DE) filter with 20 grids measuring 2 feet by 2.5 feet and filtering from both sides?**

- ① 100 square feet      ② 200 square feet      ③ 400 square feet      ④ 180 square feet

$$\text{Filter Area} = \frac{\text{Length}}{\text{in feet}} \text{ times } \frac{\text{Width}}{\text{in feet}} \text{ times } 2 \text{ sides times } \frac{\text{Number}}{\text{of grids}}$$

$$\text{Filter Area} = \boxed{\phantom{000}}$$

**13. A spa contains 1,100 gallons of water and averages 15 people per day. How many days between replacing the water?**

- ① 24 days      ② 72 days      ③ 7 days      ④ Once per month

Replacement Interval (in days) ( page 172 in textbook) is:

$$\text{Days} = \frac{\text{Gallons}}{\text{Users per day}} \text{ divided by } 3 \text{ then divided by } \frac{\text{Days}}{\text{Users per day}} = \boxed{\phantom{000}}$$