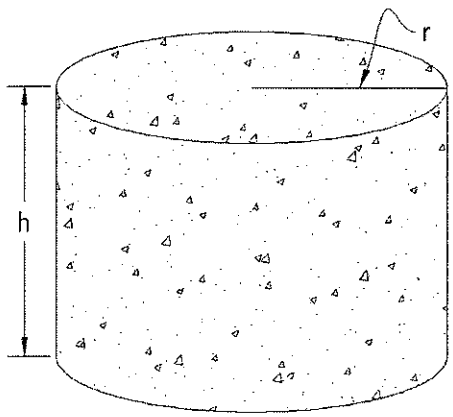
Math 63 Chapter 2 Review

- Calculators are allowed but show your steps and box your final answer.
- Include the correct unit with your answer.

1. The volume of cylindrical footing (V) is $V = \pi r^2 h$.

   H = height
   r = radius

   Find the height for a cylinder with volume = 314 in^3 and radius = 6 inches. Round to one decimal place.



$314 = \pi \cdot 6^2 \cdot h$

$314 = \pi \cdot 36 \cdot h$

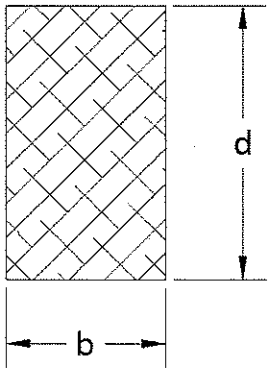
$314 = 113.097h$

$\frac{314}{113.097} = h$

$h = 2.8$ IN

2. The moment of inertia (I) of a beam is $I = \frac{bd^3}{12}$.

   I = moment of inertia of the beam measured in $inches^4$
   b = width of the beam measured in inches
   d = height of the beam measured in inches



   Find the width of the beam (b) if d = 22 in and I = 3846 in^4. Round to the nearest quarter of an inch.

$3846 = \frac{b \cdot 22^3}{12}$

$3846 = \frac{b \cdot 10648}{12}$

$12 \cdot 3846 = b \cdot 10648$

$46152 = b \cdot 10648$

$\frac{46152}{10648} = b$

$b = 4.3 = 4\frac{1}{4}$ IN

3. In electronics, Power (P) is $P = \frac{E^2}{R}$.

   P = power measured in watts
   R = resistance measured in ohms
   E = voltage measured in volts

   Find the voltage in a 1364 watt circuit with 12.4 ohms of resistance. Round your answer to one decimal place.

$1364 = \frac{E^2}{12.4}$

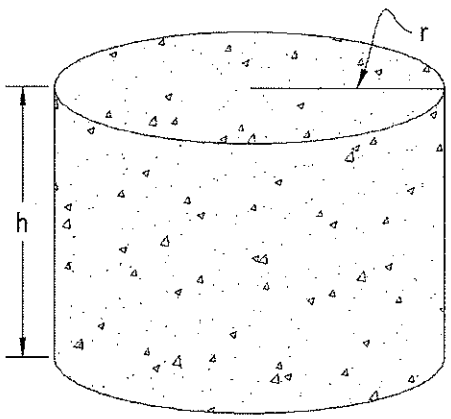
$12.4 \cdot 1364 = E^2$

$16913.6 = E^2$

$\sqrt{16913.6} = E$

$E = 130.1$ VOLTS

4. The volume of cylindrical footing (V) is $V = \pi r^2 h$.



H = height
r = radius

Find the radius for a cylinder with volume = 296 in^3 and height = 5 inches. Round to one decimal place.

$296 = \pi r^2 \cdot 5$

$\frac{296}{5\pi} = r^2$

$18.844 = r^2$

$r = 4.3$ IN

5. The formula for horsepower is $H = W\left(\frac{S}{234}\right)^3$.

H = horsepower
W = weight in pounds
S = speed in MPH

Calculate the speed for a car that weighs 2460 pounds with 440 horsepower. Round to the nearest MPH.

$440 = 2460\left(\frac{S}{234}\right)^3$

$\frac{440}{2460} = \left(\frac{S}{234}\right)^3$

$.1789 = \left(\frac{S}{234}\right)^3$

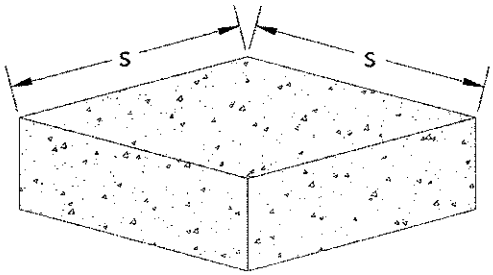
$\sqrt[3]{.1789} = \frac{S}{234}$

$.563 = \frac{S}{234}$

$234 \cdot .563 = S$

$S = 132$ MPH

6. The formula to calculate size (S) of a square footing is $S = 12\sqrt{\frac{W}{B}}$.



S = size of the footing measured in inches
W = weight on the footing measured in pounds
B = soil bearing capacity measured in pounds per square foot (PSF)

Find the bearing capacity for a footing supporting 4320 pounds if S = 27 inches. Round to the nearest PSF.

$27 = 12\sqrt{\frac{4320}{B}}$

$\frac{27}{12} = \sqrt{\frac{4320}{B}}$

$2.25 = \sqrt{\frac{4320}{B}}$

$2.25^2 = \frac{4320}{B}$

$5.0625 = \frac{4320}{B}$

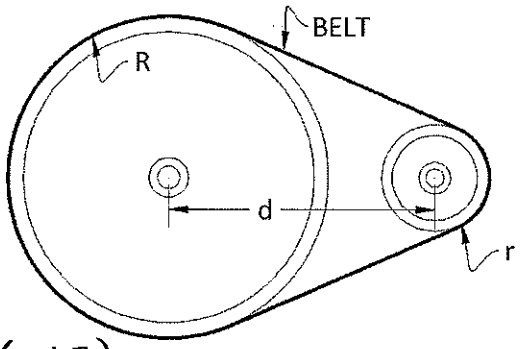
$5.0625\,B = 4320$

$B = \frac{4320}{5.0625}$

$B = 853$ PSF

7. An approximation of the belt length (L) in a motor is $L = \pi(R + r) + 2d$.

R = radius of the larger pulley
r = radius of the smaller pulley
d = distance between the pulleys



Find the radius of the larger pulley if the length of the belt is 132 inches, r = 7 inches, and d = 24 inches. Round to the nearest inch.

$132 = \pi(R+7) + 2(24)$

$132 = \pi(R+7) + 48$

$-48 \qquad -48$

$\frac{84}{\pi} = \frac{\pi(R+7)}{\pi}$

$26.738 = R + 7$

$-7 \qquad -7$

$R \approx 19.7$ IN

R = 20 IN

8. The reactance offered by a capacitor in electronics is $X = \frac{1}{2\pi fC}$.

X = reactance measured in ohms
f = frequency measured in cycles per second (hertz)
C = capacitor size measured in farads

Find the frequency in a circuit with a capacitor size of .00021 farads and a reactance or 13 ohms. Round to one decimal place.

$f \cdot 13 = \frac{1}{2\pi f \cdot .00021} \cdot f$

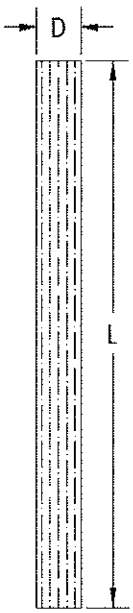
$\frac{13f}{13} = \frac{1}{2\pi \cdot .00021} \div 13$

$f = \frac{1}{2\pi \cdot .00021 \cdot 13}$

$f \approx 58.298$

f = 58.3 HERTZ

9. The allowable stress (S) on a post is $S = \frac{3ED^2}{10L^2}$.



S = allowable stress measured in pounds per square inch (PSI)
D = dimension of the post measured in inches
L = length of the post measured in inches
E = elasticity of the beam measured in pounds per square inch (PSI)

Find the length (L) for a 5.5 inch wide post with 2180 PSI of stress, if E = 2,000,000 psi. Round to the nearest inch.

$L^2 \cdot 2180 = \frac{3 \cdot 2000000 \cdot 5.5^2}{10L^2} \cdot L^2$

$\frac{2180L^2}{2180} = \frac{3 \cdot 2000000 \cdot 5.5^2}{10} \div 2180$

$L^2 = \frac{3 \cdot 2000000 \cdot 5.5^2}{10 \cdot 2180}$

$L^2 \approx 8325.69$

$L \approx \sqrt{8325.69} \approx 91.2$

L = 91 IN

10. In electronics, Power (P) is $P = RI^2$. Solve the electronics formula for I.

$$P = RI^2$$

$$\frac{P}{R} = I^2$$

$$\boxed{I = \sqrt{\frac{P}{R}}}$$

11. In electronics, Power (P) is $P = \frac{E^2}{R}$. Solve the electronics formula for R.

$$P = \frac{E^2}{R}$$

$$PR = E^2$$

$$\boxed{R = \frac{E^2}{P}}$$

12. The formula to calculate size (S) of a square footing is $S = 12\sqrt{\frac{W}{B}}$. Solve the construction formula for B.

$$S = 12\sqrt{\frac{W}{B}}$$

$$\frac{S}{12} = \sqrt{\frac{W}{B}}$$

$$\left(\frac{S}{12}\right)^2 = \frac{W}{B}$$

$$B\left(\frac{S}{12}\right)^2 = W$$

$$\boxed{B = \frac{W}{\left(\frac{S}{12}\right)^2}}$$ GOOD

$$\boxed{B = \frac{144W}{S^2}}$$ BETTER

13. The reactance offered by a capacitor in electronics is $X = \frac{1}{2\pi fC}$. Solve the electronics formula for f.

$$X = \frac{1}{2\pi fC}$$

$$fX = \frac{1}{2\pi C}$$

$$\boxed{f = \frac{1}{2\pi CX}}$$

14. The volume of cylindrical footing (V) is $V = \pi r^2 h$. Solve the construction formula for r.

$$V = \pi r^2 h$$

$$\frac{V}{\pi h} = r^2$$

$$\boxed{r = \sqrt{\frac{V}{\pi h}}}$$

15. The moment of inertia (I) of a beam is $I = \frac{bd^3}{12}$. Solve the construction formula for d.

$$I = \frac{bd^3}{12}$$

$$12I = bd^3$$

$$\frac{12I}{b} = d^3$$

$$\boxed{d = \sqrt[3]{\frac{12I}{b}}}$$ OR $$\boxed{d = \left(\frac{12I}{b}\right)^{1/3}}$$