

1.) a) 175 lb/ft^3 $1 \text{ lb} = 0.0044482216 \text{ kN}$
 $1 \text{ ft}^3 = 0.0283168467116883 \text{ m}^3$

$175 \text{ lb/ft}^3 \times 0.1571 = 27.5 \text{ kN/m}^3$

27.5 kN/m³

b) 6 ft/hr

$1 \text{ ft/hr} = 0.0846666667 \text{ mm/sec}$

$6 \text{ ft/hr} \times 0.0846666667 \text{ mm/sec}$
 $= 0.51 \text{ mm/sec}$

0.5 mm/sec

c) 835 lb-ft

$1 \text{ lb-ft} = 1.35581794833 \text{ N}\cdot\text{m}$

$835 \text{ lb-ft} = 1132 \text{ N}\cdot\text{m}$

1132 N}\cdot\text{m}

2.) Brass = 520 lb/ft^3

$1 \text{ lb/ft}^3 = 16.0184634 \text{ kg/m}^3$

$520 \text{ lb/ft}^3 = 8329.6 \text{ kg/m}^3$

8330 kg/m³

3.) a) 20 mN

$\text{N} = \frac{\text{kg}\cdot\text{m}}{\text{s}^2}$

$\frac{20}{1000}$

$1 \text{ kg} = 9.80665002864 \text{ N}$

$1 \text{ N} = 0.101971621 \text{ kg}$

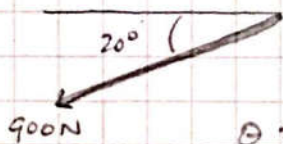
$20 \text{ mN} = 20 \times 10^{-3} \text{ N} = 0.02 \text{ N} = \underline{0.002 \text{ kg}}$

b) $150 \text{ kN} = 150,000 \text{ N} = 15295.7 \text{ kg} \approx \underline{15300 \text{ kg}}$

c) $60 \text{ MN} = 60 \times 10^6 \text{ N} = \underline{6,100,000 \text{ kg}}$

4.) a) Determine the horizontal & vertical force components

a.)



$$R_x = R \cos \theta$$

$$R_y = R \sin \theta$$

$$\theta = 20^\circ \quad R = 900 \text{ N}$$

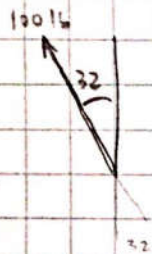
$$R_x = 900 \text{ N} \cos 20^\circ = 846 \text{ N}$$

$$R_y = 900 \text{ N} \sin 20^\circ = 308 \text{ N}$$

$$R_x = 846 \text{ N}$$

$$R_y = 308 \text{ N}$$

b.)



$$R_x = 100 \text{ lb} \sin 32^\circ$$

$$R_y = 100 \text{ lb} \cos 32^\circ$$

$$R_x = 53 \text{ lb}$$

$$R_y = 85 \text{ lb}$$

5.) Determine force req'd to ensure equilibrium in 4a and b above

a.) $R_c = 900 \text{ N} \swarrow 20^\circ$

b.) $R_c = 100 \text{ lb} \searrow 32^\circ$

6.) a.) see drawing on sheet

$$\begin{aligned} \sum F_x &= 250 \text{ lb} + 475 \text{ lb} \cos 40^\circ - 200 \text{ lb} \cos 35^\circ - 1500 \cos 30^\circ \\ &= -848.997 \text{ lbs} \end{aligned}$$

$$\begin{aligned} \sum F_y &= 475 \text{ lb} \sin 40^\circ - 1200 \text{ lb} + 200 \text{ lb} \sin 35^\circ - 1500 \sin 30^\circ \\ &= -1529.96 \text{ lbs} \end{aligned}$$

$$R = \sqrt{848.997^2 + 1529.96^2} = 1750 \text{ lbs}$$

$$\theta = \tan^{-1} \frac{-1529.96}{-848.997 \text{ lb}} = 61^\circ \nearrow$$

$$R = 1750 \text{ lbs } 61^\circ \nearrow$$

(241°)

6. b) See drawing

$$\Sigma F_x = 4k + 5k \cos 45 - 2k \cos 45 - 3k = 3.12k$$

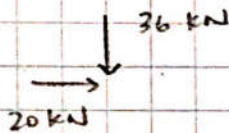
$$\Sigma F_y = 5k \sin 45 + 2k \sin 45 = 4.9497k$$

$$R = \sqrt{3.12^2 + 4.9^2} = 5.9k$$

$$\theta = \tan^{-1} \frac{4.9497}{3.12} = 57.77^\circ$$

$$\underline{\underline{R = 6k \ 45.8^\circ}}$$

6. c)



$$R = \sqrt{36^2 + 20^2} = 41 \text{ kN}$$

$$\theta = \tan^{-1} \frac{36}{20} = 61^\circ$$

$$R = 41 \text{ kN } 61^\circ \nearrow$$

(300°)