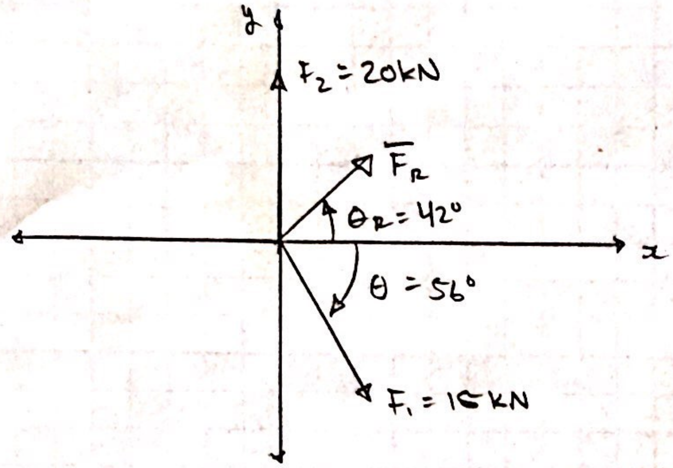
ME 122 "In-class" Quiz #1 | 4/20/20 | Sean Lai

1.



A: $\overline{F}_R = F_1 \cos\theta \,\hat{i} + (F_2 - F_1 \sin\theta)\hat{j}$
$= 8.39\hat{i} + 7.56\hat{j}$ kN

$|F_R| = \sqrt{8.39^2 + 7.56^2}$

$\boxed{|F_R| = 11.29 \text{ kN}}$

B: $\theta_R = \tan^{-1}\left(\frac{7.56}{8.39}\right)$

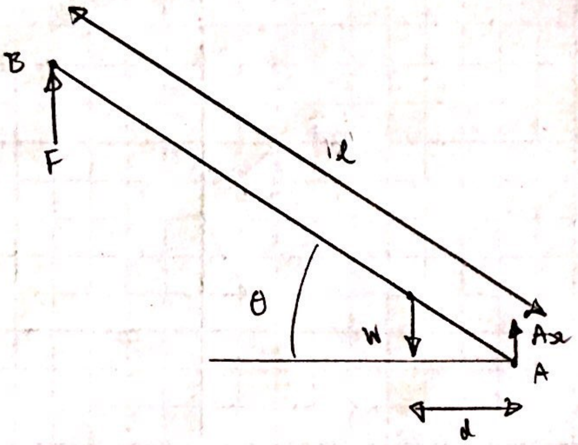
$\boxed{\theta_R = 42.0°}$

C: see figure

D: The reaction force would be equal in magnitude and opposite in direction.

2.

Given:



$l = 12'$
$\theta = 37^\circ$
$d = 2'$
$W = 110\ lb$

Find: Force F at B

Solution:

$\Sigma F_y = 0 \longrightarrow F - W + A_x = 0$

$\Sigma M_A = 0 \longrightarrow -Fl\cos\theta + Wd = 0$

$Fl\cos\theta = Wd$

$F = \dfrac{Wd}{l\cos\theta}$

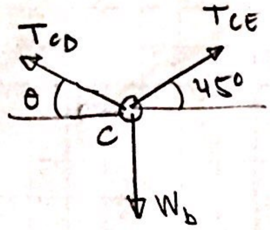
A. See given for FBD

B. $\boxed{F = 21.39\ lb}$

Scanned with CamScanner

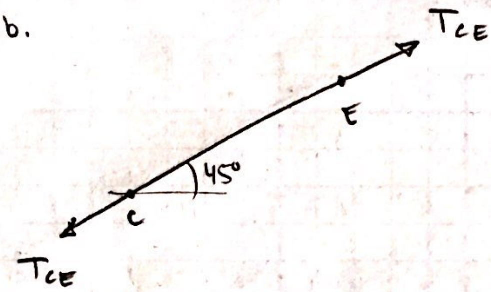
3.

a.

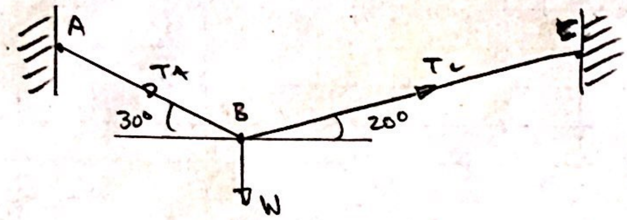


$\theta = \tan^{-1}\left(\frac{3}{4}\right)$
$= 36.87°$

b.



4.



W = 10 kg · 9.81 m/s²
N ≐ 98.1 N

line AB should be under greater tension it will be supporting a larger proportion of the weight due to the larger sin term, i.e. sin 30 > sin 20.

<u>BONUS</u>:

$$\Sigma F_x = 0 \rightarrow -T_A \cos 30 + T_C \cos 20 = 0$$

$$T_C = T_A \frac{\cos 30}{\cos 20}$$

$$\Sigma F_y = 0 \rightarrow -W + T_A \sin 30 + T_C \sin 20 = 0$$

$$T_A \sin 30 + T_A \frac{\cos 30}{\cos 20} \sin 20 = W$$

$$T_A = \frac{W}{\sin 30 + \cos 30 \tan 20}$$

$$\boxed{T_A = 120.3\,N}$$

$$T_C = T_A \cdot \frac{\cos 30}{\cos 20}$$

$$\rightarrow \boxed{T_C = 110.9\,N}$$