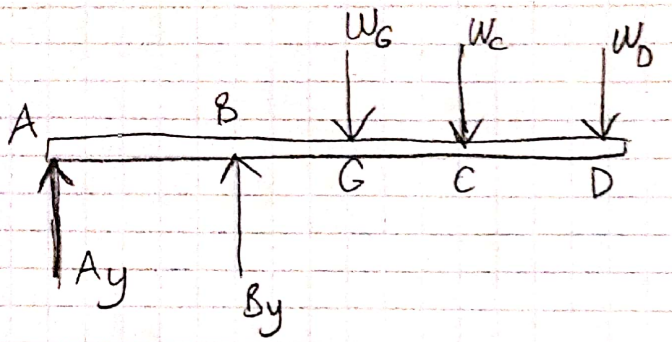
Q1



Free body-diagram

$W_G = m_G g = (65\,kg)(9.81\,m/s^2) = 637.65\,N$

$W_C = m_C g = (28\,kg)(9.81\,m/s^2) = 274.68\,N$

$W_D = m_D g = (40\,kg)(9.81\,m/s^2) = 392.4\,N$

a) From F.b.d of diving board.

$+\circlearrowleft \Sigma M_B = 0;\quad -A_y(1.2\,m) - (637.65\,N)(0.48\,m) -$

$(274.68\,N)(1.08\,m) - (392.4\,N)(2.08\,m) = 0$

$A_y = -\frac{1418.92}{1.2} = \boxed{-1182.43\,N} = \boxed{1.182\,kN}$

b) From f.b.d of diving board;

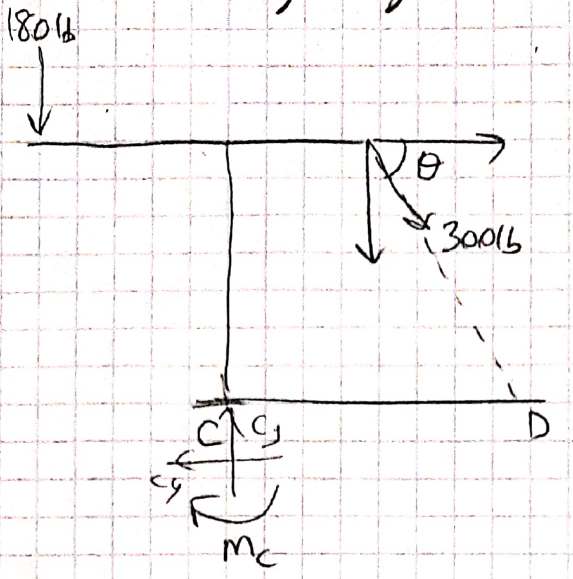
$+\circlearrowleft \Sigma M_A = 0;\quad B_y(1.2m) - 637.65N(1.68m) - 274.68N(2.28m)$

$-392.4N(3.28m) = 0$

$B_y = \frac{2984.6}{1.2} = 2487.2N = \boxed{2.49\,kN}$

Q.2

Free body diagram



$$\theta = \tan^{-1}\left(\frac{24}{10}\right) = 67.4^\circ$$

$$\Sigma F_x = 300\cos 67.4 - 100 - C_x = 0$$

$$\boxed{C_x = 15.3\,lb}$$

$$\Sigma F_y = C_y - 180 - 300\sin 67.4 = 0$$

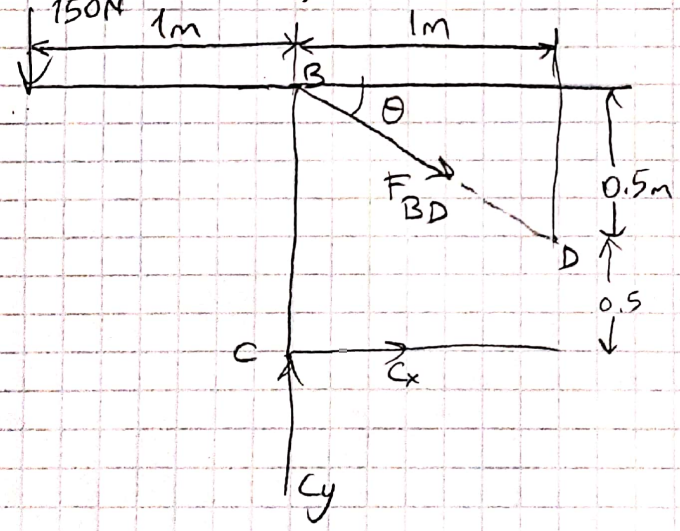
$$\boxed{C_y = 457\,lb}$$

$$\Sigma M_C = 300\cos 67.4(24) + 300\sin 67.4(16) - 100(16) - 180(20) + M_C = 0$$

$$\boxed{M_C = 770.8\,lb.in\,CW}$$

Q3

Free body diagram



$$\theta = \tan^{-1}\left(\frac{0.5}{1}\right) = \boxed{26.56^\circ}$$

$$\Sigma M_C = 0$$

$$-(F_{BD}\cos\theta)(1) + (150)(1) = 0$$

$$F_{BD} = \frac{150\,Nm}{\cos 26.56^\circ} = \boxed{167.7\,N}$$

$$\Sigma F_x = 0$$

$$C_x + F_{BD}\cos\theta = 0$$

$$C_x + (167.7N)\cos 26.56^\circ = 0$$

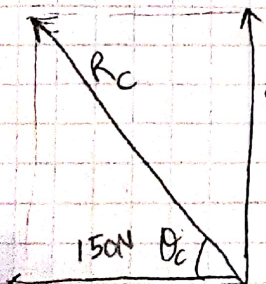
$$\boxed{C_x = -150\,N}$$

$$\Sigma F_y = 0$$

$$C_y - (150N) - (F_{BD}\sin\theta) = 0$$

$$C_y - (150N) - (167.7N)(\sin 26.56^\circ) = 0$$

$$C_y = 225\,N$$



$$|C| = \sqrt{C_x^2 + C_y^2}$$

$$|C| = \sqrt{(150N)^2 + (225N)^2} = \boxed{270.4\,N}$$

$$\theta_C = \tan^{-1}\left(\frac{225N}{150N}\right) = \boxed{56.3^\circ}$$

(R4)

weight of the crate = 200 lb a 1.5 ft

$\Sigma M_B = 0$

$-(T\cos 35°)\times(0.5\,ft) - (T\sin 35°)\times\left(\frac{1.5\,ft}{\tan 65°}\right) + (200\,lb)\times(1.5\,ft) = 0$

$-0.4096T - 1.2287T + 300lb = 0$

$T = \frac{300\,lb}{1.6383}$

$T = 183.12\,lb$

$\Sigma F_x = 0$

$-B_x + T\cos 35° = 0$

$B_x = (183.12lb)\cos 35°$

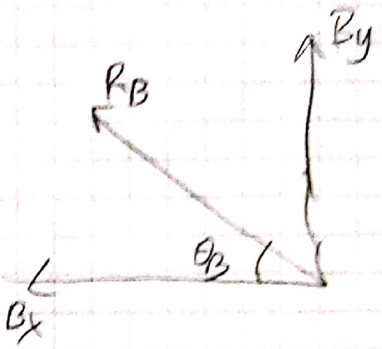
$B_x = 150lb$

$\Sigma F_y = 0$

$B_y + T\sin 35° - 200lb = 0$

$B_y = 200lb - (183.12lb)\sin 35°$

$B_y = 94.97lb$



$\tan\theta_B = \frac{B_y}{B_x}$

$\tan\theta_B = \frac{94.97\,lb}{150\,lb}$

$\theta_B = 32.34°$

The reaction at B

$R_B = \sqrt{(B_x)^2 + (B_y)^2}$

$R_B = \sqrt{(150lb)^2 + (94.97lb)^2}$

$R_B = 177.54\,lb$