Chapter 5 HW

4. $m = 2\,kg$

$\bar{F} = m\bar{a}$ ← vector relation

$F_x = ma_x$ } component relations.

$F_y = ma_y$ }

$$F_{1x} + F_{2x} + F_{3x} = ma_x$$
$$30 + -12 + F_{3x} = 2(-8)$$
$$F_{3x} = -34N$$

$$F_{1y} + F_{2y} + F_{3y} = ma_y$$
$$16 + 8 + F_{3y} = 2 \times 6$$
$$F_{3y} = -12N$$

$$\bar{F}_3 = -34\hat{i} - 12\hat{j}.$$

7. $\bar{F}_1 = 32\cos 30\hat{i} + 32\sin 30\hat{j}$

$= 27.7\hat{i} + 16\hat{j}$ N

$F_2 = 55\hat{i}$

$F_3 = 41\cos 60^\circ \hat{i} + 41\sin 60^\circ \hat{j}$

$= 20.5\hat{i} - 35.5\hat{j}.$

$F_x = ma_x$

$27.7 + 55 + 20.5 = 120\,a_x \Rightarrow a_x = 0.86\ m/s^2$

$F_y = ma_y$

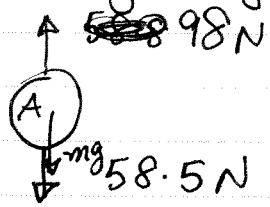
$16 - 35.5 = 120\,a_y \Rightarrow a_y = -0.16\ m/s^2$

$\bar{a} = 0.86\hat{i} - 0.16\hat{j}$

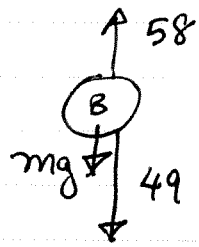
$|a| = \sqrt{0.86^2 + 0.16^2} = 0.88\ m/s^2$

$\tan\theta = \frac{-0.16}{0.86} \Rightarrow \theta = -10.5^\circ$ ie 10.5° below x axis

15. (a) Free body diagram of A



$$\Sigma F = 0$$
$$98 - 58.5 - mg = 0$$
$$mg = 39.5\ N$$
$$m_A = 4\ kg.$$



$$\Rightarrow m_B = 0.97 kg$$

$$m_C = 4 kg.$$

$$m_D = 1 kg.$$

24. First calculate |a|. This is a kinematics problem!

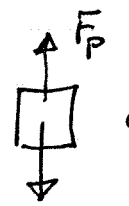
$V_0 = 2.8 m/s \quad V_f = 0 \quad a = ? \quad t = ? \quad x_i = 0 \quad x_f = 0.11$

$$V_f^2 - V_0^2 = 2a x_f - x_f \Rightarrow a = \frac{V_f^2 - V_0^2}{2(x_f - x_i)}$$
$$= 35.6\ m/s^2$$

Now consider Newton's law

$$\Sigma F = ma$$
$$F = \left(\frac{85}{g}\right) 35.6\ m/s^2 = \underline{309\ N}.$$

27.



$$\Sigma F = ma$$
$$712 - F_{fp} = m\,3$$
$$F_{fp} = 712 - \frac{712}{g}3$$
$$= 494 N.$$

Force on the foreman is 494 N up.
Force on the pole is 494 N down.