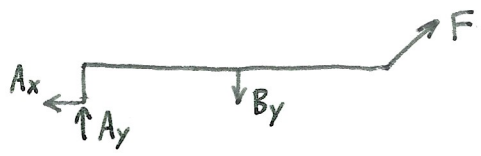
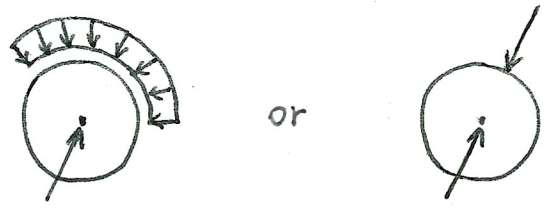
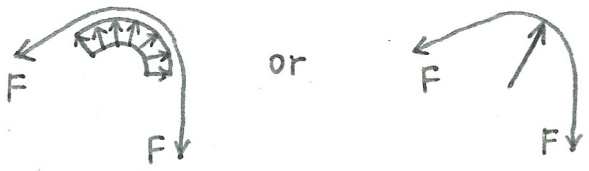
1. (a)







(b)

$$\sum_i F_{ix} = -A_x + \frac{\sqrt{3}}{2}F = 0$$

$$\sum_i F_{iy} = A_y - B_y + \frac{1}{2}F = 0$$

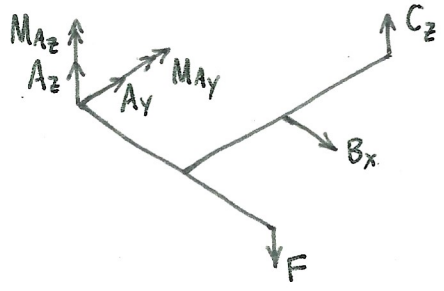
$$\sum_i M_{Ai} = -4m \cdot B_y - 1m \cdot \frac{\sqrt{3}}{2}F + 8m \cdot \frac{1}{2}F = 0$$

$$\Rightarrow A_x = \frac{\sqrt{3}}{2}F,\quad A_y = \left(\frac{1}{2} - \frac{\sqrt{3}}{8}\right)F,\quad B_y = \left(1 - \frac{\sqrt{3}}{8}\right)F$$

(c)

$$M_s \geq \frac{|A_x|}{|A_y|} = \frac{4\sqrt{3}}{4-\sqrt{3}}$$

2. (a)



(b)

$$\sum_i F_{ix} = B_x = 0$$

$$\sum_i F_{iy} = A_y = 0$$

$$\sum_i M_{Aix} = 4\,ft \cdot C_z = 0$$

$$\sum_i M_{Aiz} = M_{Az} - 2\,ft \cdot B_x = 0$$

$$\Rightarrow A_y = 0,\ B_x = 0,\ C_z = 0,\ M_{Az} = 0$$

(c)

$$\sum_i F_{iz} = A_z - F = 0$$

$$\sum_i M_{Aiy} = M_{Ay} + 2\,ft \cdot F = 0$$

$$\Rightarrow A_z = 20\,lb,\ M_{Ay} = -40\,lb \cdot ft$$

3. (a)

$r = 3,\ n = 9,\ j = 6$

$r + n = 2j$

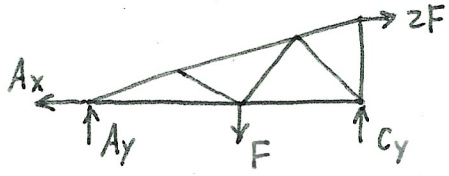
(b)

$\sum_i F_{ix} = -A_x + 2F = 0$

$\sum_i F_{iy} = A_y + C_y - F = 0$

$\sum_i M_{Ai} = 16a \cdot C_y - 8a \cdot F - 4a \cdot 2F = 0$

$\Rightarrow A_x = 2F,\ A_y = 0,\ C_y = F$

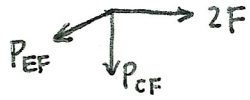


(c)

$\sum_i F_{cix} = -\frac{4}{\sqrt{17}} P_{EF} + 2F = 0$

$\sum_i F_{ciy} = -\frac{1}{\sqrt{17}} P_{EF} - P_{CF} = 0$

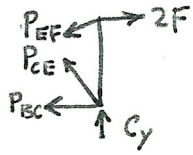
$\Rightarrow P_{CF} = -\frac{1}{2}F$ (compression), $P_{EF} = \frac{\sqrt{17}}{2}F$ (tension)



(d)

$\sum_i M_{Ei} = -3a \cdot P_{BC} + 4a \cdot C_y - a \cdot 2F = 0$

$\Rightarrow P_{BC} = \frac{2}{3}F$ (tension)



or

$\sum M_{Ei} = 3a \cdot P_{BC} - 3a \cdot A_x + 4a \cdot F = 0$

$\Rightarrow P_{BC} = \frac{2}{3}F$ (tension)