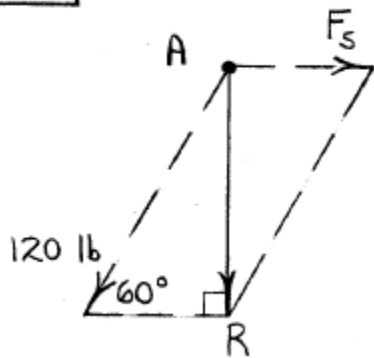


E36 Spring 2005
Homework 2 Solutions
2/10,22,36,54,86

2/10



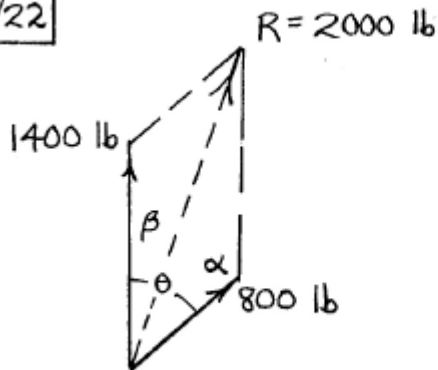
$$\cos 60^\circ = \frac{F_s}{120}$$

$$F_s = 60 \text{ lb}$$

$$\sin 60^\circ = \frac{R}{120}$$

$$R = 103.9 \text{ lb}$$

2/22



$$\text{Law of Cosines: } 2000^2 = 1400^2 + 800^2 - 2(1400)(800)\cos\alpha$$

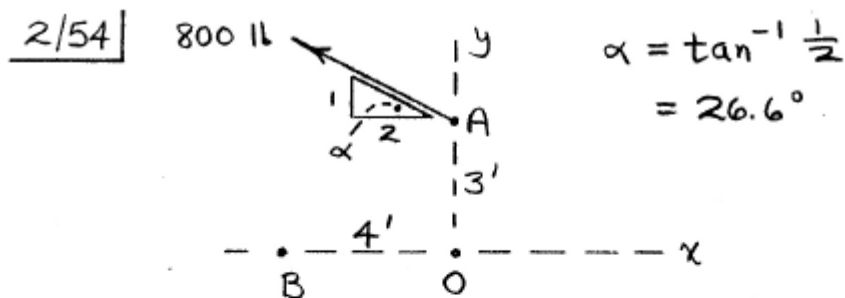
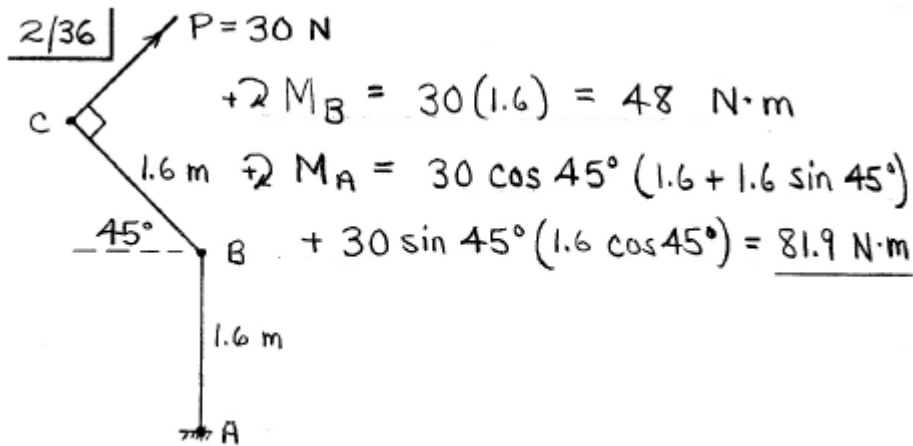
$$\text{With } \alpha = 180^\circ - \theta \text{ and } \cos(180^\circ - \theta) = -\cos\theta:$$

$$2000^2 = 1400^2 + 800^2 + 2(1400)(800)\cos\theta$$

$$\theta = 51.3^\circ$$

$$\text{Law of Sines: } \frac{800}{\sin\beta} = \frac{2000}{\sin(180^\circ - 51.3^\circ)}$$

$$\beta = 18.19^\circ$$



At O: $F = 800 \text{ lb}$ 26.6°

$\curvearrowright M_O = 800 \frac{2}{\sqrt{5}} (3) = \underline{2150 \text{ lb}\cdot\text{ft CCW}}$

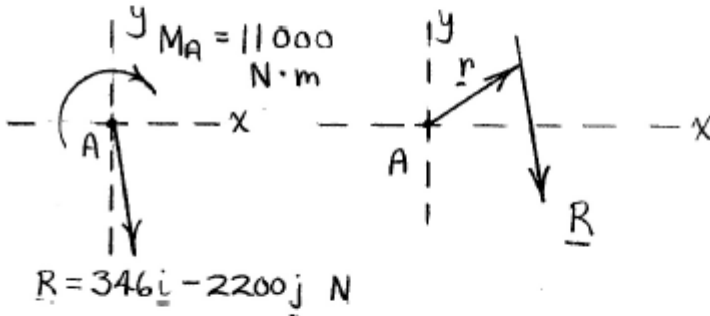
At B: $F = 800 \text{ lb}$ 26.6°

$\curvearrowright M_B = 800 \frac{2}{\sqrt{5}} (3) + 800 \frac{1}{\sqrt{5}} (4) = \underline{3580 \text{ lb}\cdot\text{ft CCW}}$

2/86 | Equivalent force-couple system at A:

$$\underline{R} = \sum \underline{F} = [-2(250) - 3(500)]\underline{j} + 400[\cos 30^\circ \underline{i} - \sin 30^\circ \underline{j}]$$
$$= \underline{346 \underline{i} - 2200 \underline{j} \text{ N}}$$

$$\curvearrowright M_A = 500[2.5 + 5 + 7.5] + 250[10] + 400(2.5)$$
$$= \underline{11,000 \text{ N}\cdot\text{m} \text{ CW}}$$



Condition: $\underline{M}_A = \underline{r} \times \underline{R}$

$$-11000 \underline{k} = (x \underline{i} + y \underline{j}) \times (346 \underline{i} - 2200 \underline{j})$$
$$= (-2200x - 346y) \underline{k}$$

Set $y = 0$ & obtain $\underline{x = 5 \text{ m}}$ (!)