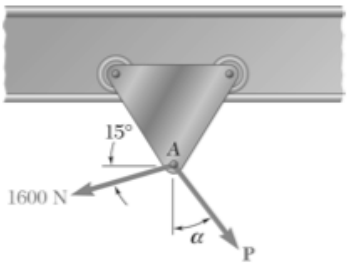
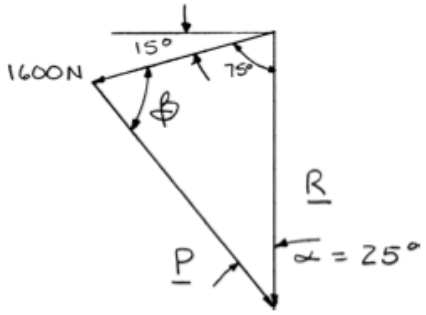


PROBLEM 2.6

A trolley that moves along a horizontal beam is acted upon by two forces as shown. (*a*) Knowing that $\alpha = 25°$, determine by trigonometry the magnitude of the force **P** so that the resultant force exerted on the trolley is vertical. (*b*) What is the corresponding magnitude of the resultant?

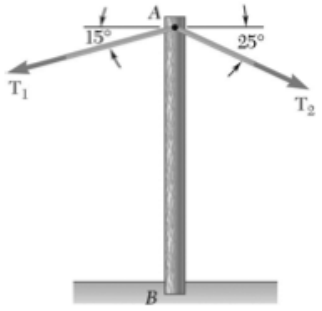
SOLUTION



Using the triangle rule and the law of sines:

(*a*)
$$\frac{1600\ \text{N}}{\sin 25°} = \frac{P}{\sin 75°}$$
$$P = 3660\ \text{N} \blacktriangleleft$$

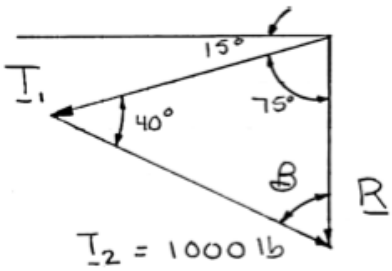
(*b*)
$$25° + \beta + 75° = 180°$$
$$\beta = 180° - 25° - 75°$$
$$= 80°$$
$$\frac{1600\ \text{N}}{\sin 25°} = \frac{R}{\sin 80°}$$
$$R = 3730\ \text{N} \blacktriangleleft$$



PROBLEM 2.9

A telephone cable is clamped at A to the pole AB. Knowing that the tension in the right-hand portion of the cable is $T_2 = 1000$ lb, determine by trigonometry (a) the required tension T_1 in the left-hand portion if the resultant **R** of the forces exerted by the cable at A is to be vertical, (b) the corresponding magnitude of **R**.

SOLUTION

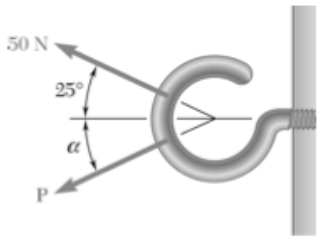


Using the triangle rule and the law of sines:

(a)
$$75° + 40° + \beta = 180°$$
$$\beta = 180° - 75° - 40°$$
$$= 65°$$

$$\frac{1000 \text{ lb}}{\sin 75°} = \frac{T_1}{\sin 65°}$$
$$T_1 = 938 \text{ lb} \blacktriangleleft$$

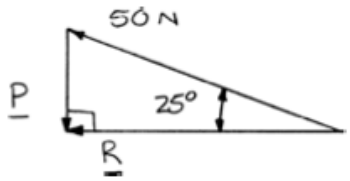
(b)
$$\frac{1000 \text{ lb}}{\sin 75°} = \frac{R}{\sin 40°}$$
$$R = 665 \text{ lb} \blacktriangleleft$$



PROBLEM 2.14

For the hook support of Prob. 2.10, determine by trigonometry (*a*) the magnitude and direction of the smallest force **P** for which the resultant **R** of the two forces applied to the support is horizontal, (*b*) the corresponding magnitude of **R**.

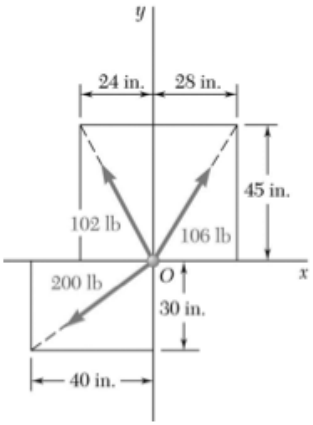
SOLUTION



The smallest force P will be perpendicular to R.

(*a*) $P = (50\text{ N})\sin 25°$ $\quad \mathbf{P} = 21.1\text{ N}\downarrow$ ◀

(*b*) $R = (50\text{ N})\cos 25°$ $\quad R = 45.3\text{ N}$ ◀

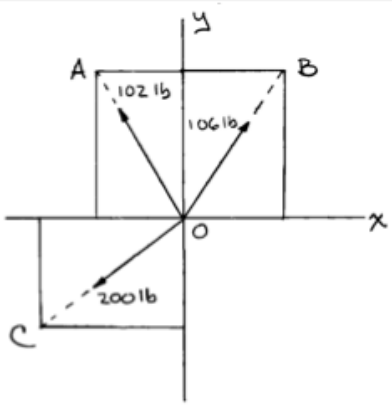


PROBLEM 2.24

Determine the x and y components of each of the forces shown.

SOLUTION

Compute the following distances:



$$OA = \sqrt{(24\text{ in.})^2 + (45\text{ in.})^2} = 51.0\text{ in.}$$

$$OB = \sqrt{(28\text{ in.})^2 + (45\text{ in.})^2} = 53.0\text{ in.}$$

$$OC = \sqrt{(40\text{ in.})^2 + (30\text{ in.})^2} = 50.0\text{ in.}$$

102-lb Force:

$$F_x = -102\text{ lb}\frac{24\text{ in.}}{51.0\text{ in.}} \qquad F_x = -48.0\text{ lb} \blacktriangleleft$$

$$F_y = +102\text{ lb}\frac{45\text{ in.}}{51.0\text{ in.}} \qquad F_y = +90.0\text{ lb} \blacktriangleleft$$

106-lb Force:

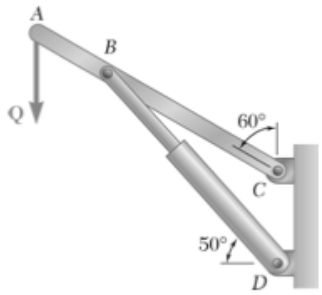
$$F_x = +106\text{ lb}\frac{28\text{ in.}}{53.0\text{ in.}} \qquad F_x = +56.0\text{ lb} \blacktriangleleft$$

$$F_y = +106\text{ lb}\frac{45\text{ in.}}{53.0\text{ in.}} \qquad F_y = +90.0\text{ lb} \blacktriangleleft$$

200-lb Force:

$$F_x = -200\text{ lb}\frac{40\text{ in.}}{50.0\text{ in.}} \qquad F_x = -160.0\text{ lb} \blacktriangleleft$$

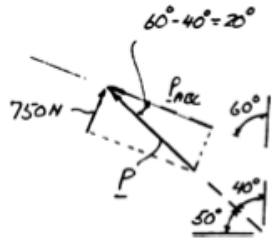
$$F_y = -200\text{ lb}\frac{30\text{ in.}}{50.0\text{ in.}} \qquad F_y = -120.0\text{ lb} \blacktriangleleft$$



PROBLEM 2.25

The hydraulic cylinder *BD* exerts on member *ABC* a force **P** directed along line *BD*. Knowing that **P** must have a 750-N component perpendicular to member *ABC*, determine (*a*) the magnitude of the force **P**, (*b*) its component parallel to *ABC*.

SOLUTION



(*a*) $750\text{ N} = P\sin 20°$

$$P = 2192.9\text{ N}$$

$$P = 2190\text{ N} \blacktriangleleft$$

(*b*) $P_{ABC} = P\cos 20°$

$$= (2192.9\text{ N})\cos 20°$$

$$P_{ABC} = 2060\text{ N} \blacktriangleleft$$