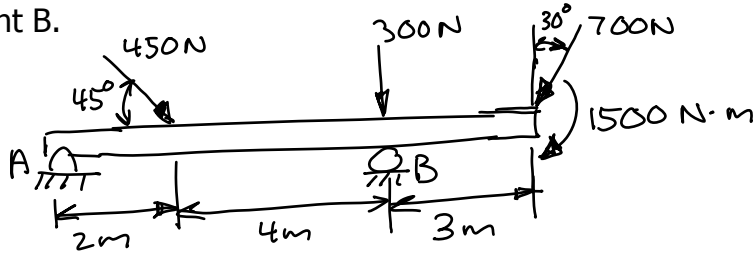


Equivalent Systems

Problem Statement: Replace the force system with an equivalent resultant force and couple moment about point B.



1.) Draw the FBD.

Given

2.) Resolve each force into components.

$$F_{450x} = (450\text{N})(\cos 45^\circ) = \underline{318.2\text{N}}$$

$$F_{300x} = 0$$

$$F_{700x} = -(700\text{N})(\sin 30^\circ) = \underline{350\text{N}}$$

$$F_{450y} = -(450\text{N})\sin 45^\circ = \underline{-318.2\text{N}}$$

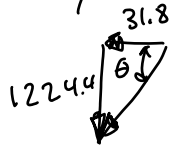
$$F_{300y} = -300\text{N}$$

$$F_{700y} = -700\text{N}(\cos 30^\circ) = \underline{-606.2\text{N}}$$

3.) Determine the resultant force and its direction.

$$\rightarrow F_{Rx} = \sum F_x = 318.2\text{N} - 350\text{N} = -31.8\text{N}$$

$$\uparrow F_{Ry} = \sum F_y = -318.2\text{N} - 300\text{N} - 606.2\text{N} = -1224.4\text{N}$$



$$\boxed{F_R = 1224.8\text{N}}$$

$$\tan \theta = \frac{1224.4}{31.8} \Rightarrow \boxed{\theta = 88.5^\circ}$$

4.) Determine the moment arms for each component.

$$d_{450x} = 0$$

$$d_{450y} = 4\text{m}$$

$$d_{300y} = 0$$

$$d_{700x} = 0$$

$$d_{700y} = 3\text{m}$$

5.) Determine the resultant moment.

$$\uparrow M_{RB} = \sum M_B = (318.2\text{N})(4\text{m}) - (606.2\text{N})(3\text{m}) - 1500\text{N}\cdot\text{m}$$

$$\boxed{M_{RB} = -2045.8\text{N}\cdot\text{m}}$$

6.) For a single equivalent force system, determine d.

Not a single equivalent force system

7.) Draw the equivalent system.

