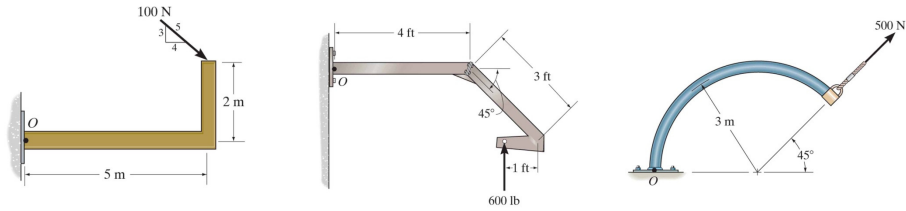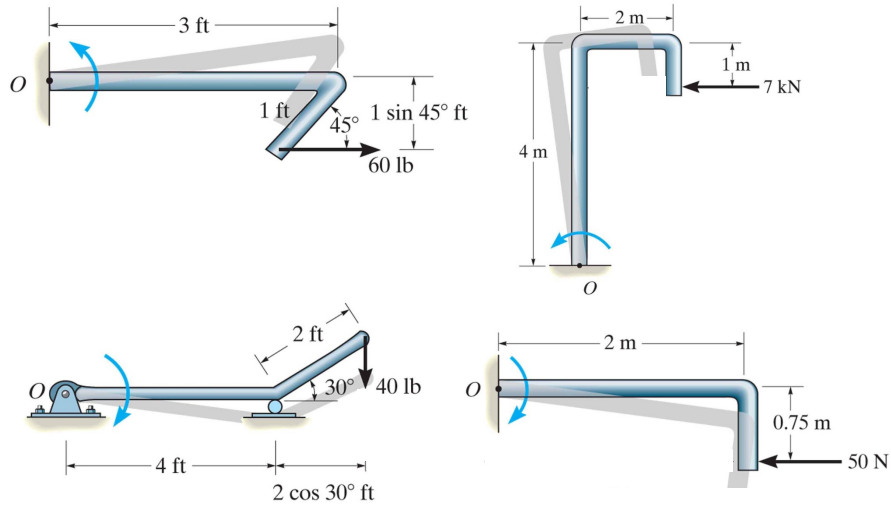# Sense of M_O

Example 1:

Determine the sense of M_O for each example below:
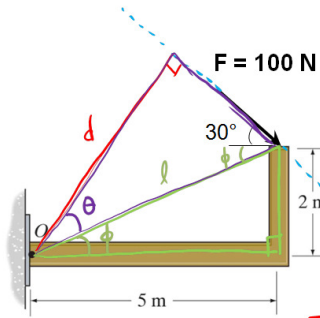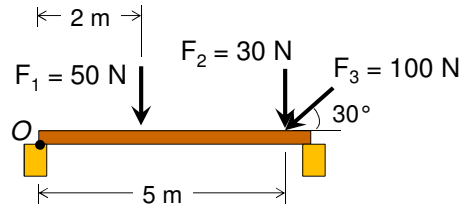

Example 2: Determine M_O for each example

Moments of Multiple Forces—
Principle of Moments

For coplanar forces, resultant moment about a point equals sum of individual moments caused by each of the forces about that point.

$$M_{R_O} = \sum M_{i_O} = \sum F_i d_i$$

Example 3:

Determine the moment about point O caused by the force shown.

Find: M_O

$M_O = Fd$

$M_O = (100N)(4.23m)$

$\boxed{M_O = 423\ Nm}$

Given: F, geometry

$l = \sqrt{5^2 + 2^2} = \sqrt{29}$

$\phi = \tan^{-1}\left(\frac{2}{5}\right) = 21.8°$

$\theta = 90° - (30° + \phi) = 38.2°$

$d = l\cos\theta = 4.23\ m$
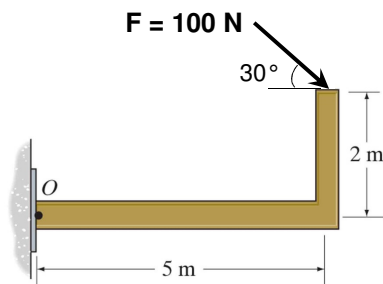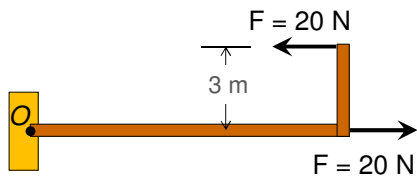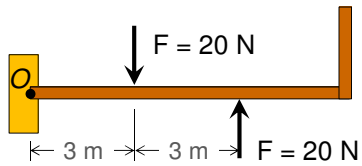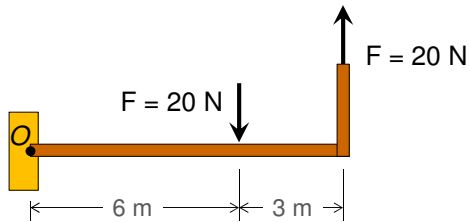
Moment of a Couple

Couple:

- Two parallel forces with equal magnitudes, opposite directions, separated by a distance.
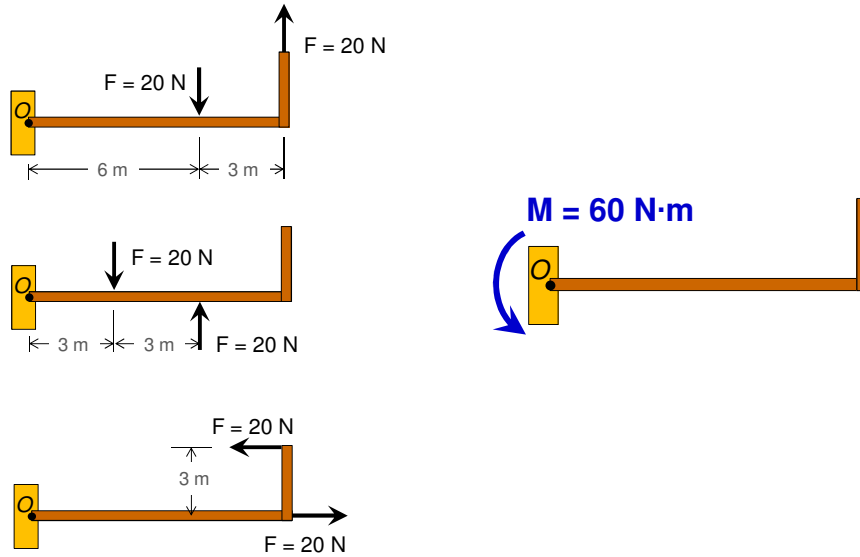- They generate a pure rotation (no translation).
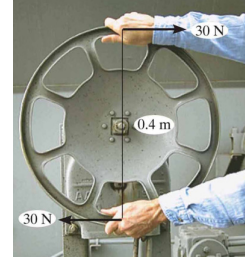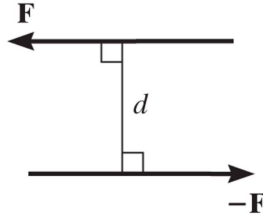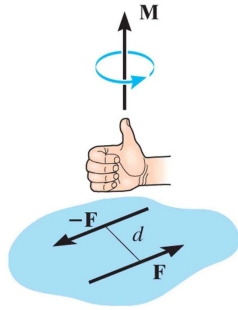
Moment of Couple $$M = F\,d$$

Equivalent Couples

F = 20 N

F = 20 N

6 m   3 m

F = 20 N

3 m   3 m   F = 20 N

F = 20 N

3 m

F = 20 N

A Couple Moment is a **Free Vector**

F = 20 N

F = 20 N

6 m   3 m

F = 20 N

3 m   3 m   F = 20 N

M = 60 N·m

O

F = 20 N

3 m

O

F = 20 N

Example 4: Determine the couple moment created by the forces shown.

$F = 600 \text{ N}$

$30°$

O

0.2 m

$30°$

$F = 600 \text{ N}$

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