

Mechanics Exam 1 Review

Tools you need in your toolbox:

1. Algebra, Geometry, Trig

Triangle Facts

Common triangles (3-4-5, 1-2- $\sqrt{3}$, 1-1- $\sqrt{2}$)

SOH-CAH-TOA

Pythagorean Theorem

Law of Sines

Law of Cosines

2. Vectors

Magnitude and direction

Components in a given direction

Rectangular Components (usually x and y components.)

Vector addition by

 Parallelogram Rule

 Triangle Rule

 Tip-to-tail Method

 Addition of rectangular components

Convert from Magnitude and Direction to components, and vice-versa

Express a vector in writing

3. Equilibrium of a Particle

Free Body Diagrams

Vector solution: Force Triangle

Set up and solve equilibrium equations $\Sigma F_x = 0$ and $\Sigma F_y = 0$

Multi-particle equilibrium

4. Moments

Definition of a Moment: Fd_{\perp} or $F_{\perp}d$

Definition of Perpendicular Distance d_{\perp} and Perpendicular Component F_{\perp}

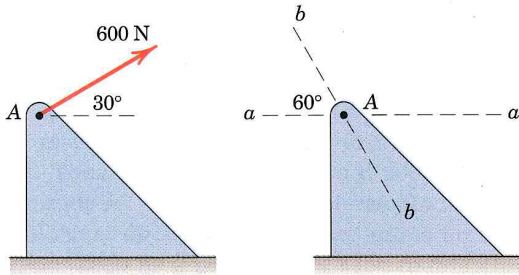
Sign Convention for Moments

Varignon's Theorem

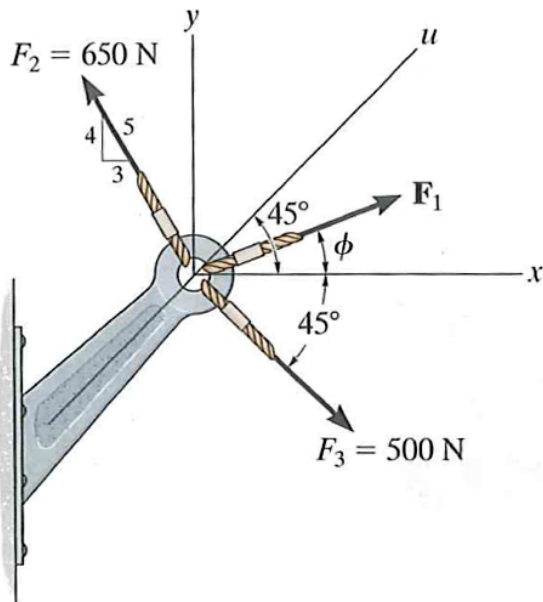
Add Moments to find resultant moment

Balance moments to achieve rotational equilibrium

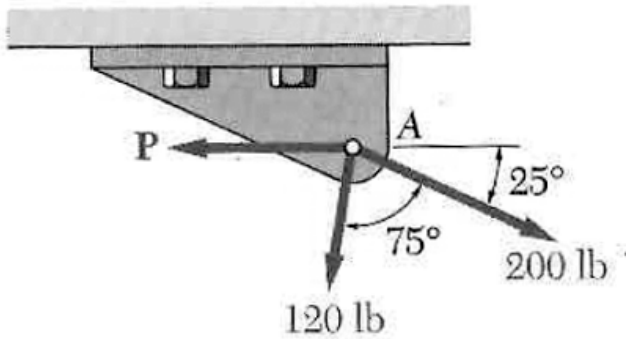
1. The 600 N force applied to the bracket at A is to be replaced by two forces, F_a in the $a-a$ direction, and F_b in the $b-b$ direction, which together produce the same effect on the bracket as the 600 N force. Determine F_a and F_b .



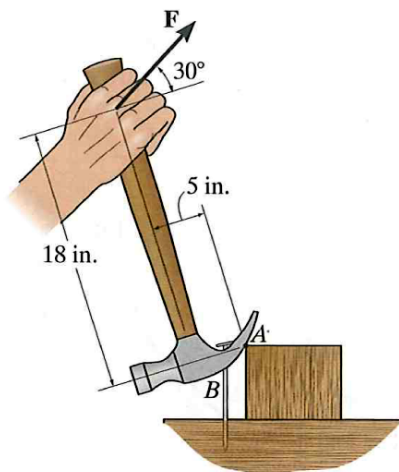
2. If the three forces acting on the bracket are held in equilibrium by a 600 N force directed along the negative u axis, determine the magnitude of F_1 and its direction ϕ .



3. Determine the range of values for P for which the resultant of the three forces applied at A does not exceed 225 lb.



4. The handle of the hammer is subjected to force $F = 20$ lb. Determine the moment of this force about point A using two different methods and show that they produce the same result.



5. Determine the magnitude and direction of equilibrium force F_{AB} exerted along link AB by the patient using the tractive apparatus shown. The suspended mass is 10 kg. Neglect the size of the pulleys.

