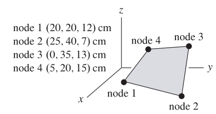
A flat quadrilateral plate finite element is shown.

(a) Describe and perform a test, using two cross products that will verify if all four nodes (corners) lie in the same plane.

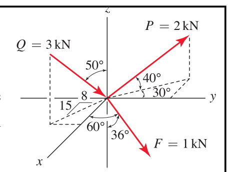
(b) Determine the unit outward normal direction to the surface (i.e., pointing away from the origin).

(c) Determine the surface area of the element.

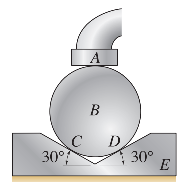


(a) Determine the resultant $\vec{R}$ of the three forces $\vec{F} + \vec{P} + \vec{Q}$.

(b) If an additional force $\vec{T}$ in the $\pm x$ direction is to be added, determine the magnitude it should have so that the magnitude of the resultant is as small as possible.



In a machining setup, workpiece B, which weighs 20 lb, is supported by a fixed V block E and a clamp at A. All contact surfaces are frictionless, and the clamp applies a vertical force of 35 lb to the workpiece. Determine the reactions at points C and D between the V block and the workpiece.

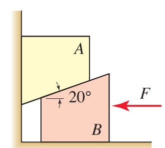


Blocks A and B each have 5 kg mass, and all contact surfaces are frictionless.

(a) Determine the force F needed to keep the blocks in static equilibrium and the forces on all contact surfaces.

(b) If the value of F determined in Part (a) is applied, will the blocks move? Explain.

(c) If F is smaller than the value determined in Part (a), describe what happens.

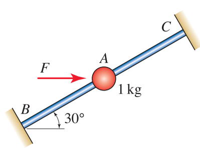


Bead A has 1 kg mass and slides without friction on bar BC.

(a) Determine the force F needed to keep the bead in static equilibrium and the reaction force between the bead and bar.

(b) If the value of F determined in Part (a) is applied, will the bead move? Explain.

(c) If F is larger than the value determined in Part (a), describe what happens.



Blocks A and B each weigh 100 lb and rest on frictionless surfaces. They are connected to one another by cable AB. Determine the force P required to hold the blocks in the equilibrium position shown and the reactions between the blocks and surfaces.