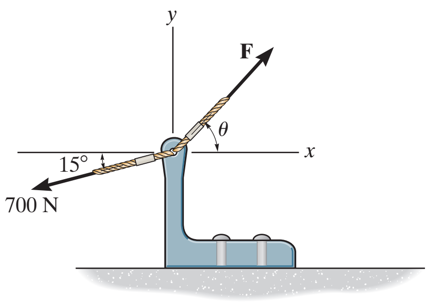
PROBLEMS

2–1. If $\theta = 60°$ and $F = 450$ N, determine the magnitude of the resultant force and its direction, measured counterclockwise from the positive x axis.

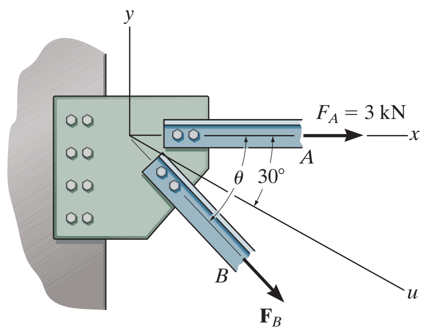
2–2. If the magnitude of the resultant force is to be 500 N, directed along the positive y axis, determine the magnitude of force **F** and its direction θ.



Probs. 2–1/2

2–6. If $F_B = 2$ kN and the resultant force acts along the positive u axis, determine the magnitude of the resultant force and the angle θ.

2–7. If the resultant force is required to act along the positive u axis and have a magnitude of 5 kN, determine the required magnitude of $\mathbf{F}_B$ and its direction θ.

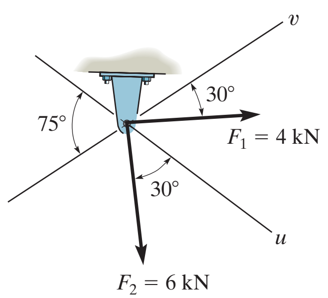


Probs. 2–6/7

2–3. Determine the magnitude of the resultant force $\mathbf{F}_R = \mathbf{F}_1 + \mathbf{F}_2$ and its direction, measured clockwise from the positive u axis.

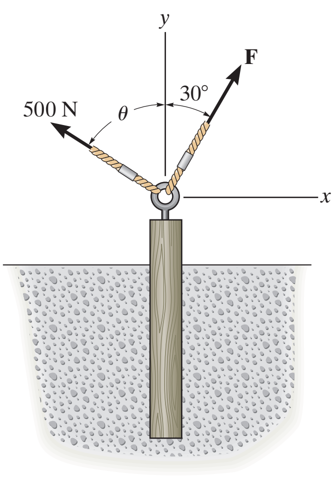
***2–4.** Resolve the force $\mathbf{F}_1$ into components along the u and v axes and determine the magnitudes of the components.

2–5. Resolve the force $\mathbf{F}_2$ into components along the u and v axes and determine the magnitudes of the components.



Probs. 2–3/4/5

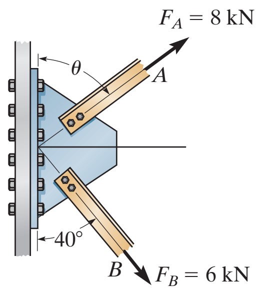
***2–8.** Two forces are applied at the end of a screw eye in order to remove the post. Determine the angle $\theta (0° \leq \theta \leq 90°)$ and the magnitude of force **F** so that the resultant force acting on the post is directed vertically upward and has a magnitude of 750 N.



Prob. 2–8

2–9. If $\theta = 60°$, determine the magnitude of the resultant force and its direction measured clockwise from the horizontal.

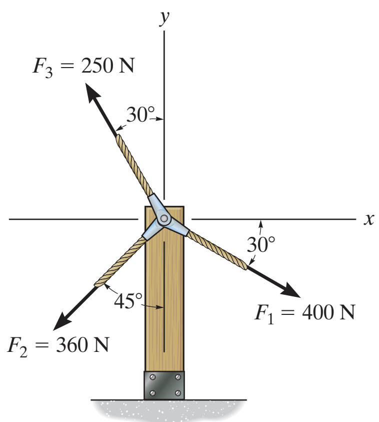
2–10. Determine the angle θ for connecting member A to the plate so that the resultant force of $\mathbf{F}_A$ and $\mathbf{F}_B$ is directed horizontally to the right. Also, what is the magnitude of the resultant force?



Probs. 2–9/10

2–11. Determine the magnitude of the resultant force $\mathbf{F}_R = \mathbf{F}_1 + \mathbf{F}_2$ and its orientation θ, measured clockwise from the positive x axis.

***2–12.** Determine the magnitude of the resultant force $\mathbf{F}_R = \mathbf{F}_1 + \mathbf{F}_3$ and its orientation θ, measured counterclockwise from the positive x axis.

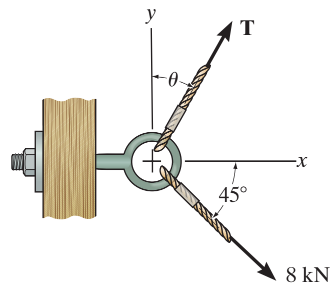


Probs. 2–11/12

2–13. If $\theta = 30°$ and $T = 6$ kN, determine the magnitude of the resultant force acting on the eyebolt and its direction measured clockwise from the positive x axis.

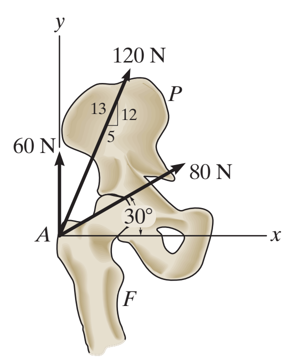
2–14. If $\theta = 60°$ and $T = 5$ kN, determine the magnitude of the resultant force acting on the eyebolt and its direction measured clockwise from the positive x axis.

2–15. If the magnitude of the resultant force is to be 9 kN directed along the positive x axis, determine the magnitude of force $\mathbf{T}$ acting on the eyebolt and its angle θ.



Probs. 2–13/14/15

***2–16.** The pelvis P is connected to the femur F at A using three different muscles, which exert the forces shown on the femur. Determine the resultant force and specify its orientation θ, measured counterclockwise from the positive x axis.

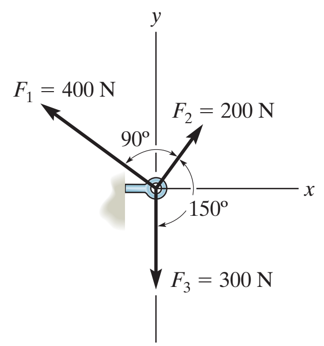


Prob. 2–16

2

2–17. Determine the magnitude and direction of the resultant force, $\mathbf{F}_R$ measured counterclockwise from the positive x axis. Solve the problem by first finding the resultant $\mathbf{F}' = \mathbf{F}_1 + \mathbf{F}_2$ and then forming $\mathbf{F}_R = \mathbf{F}' + \mathbf{F}_3$.

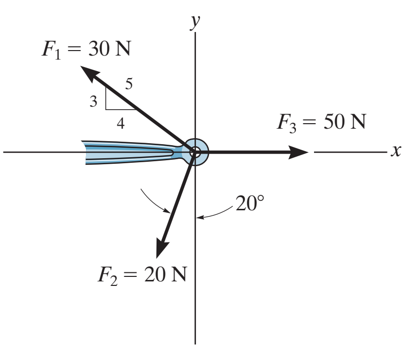
2–18. Determine the magnitude and direction of the resultant force, $\mathbf{F}_R$ measured counterclockwise from the positive x axis. Solve the problem by first finding the resultant $\mathbf{F}' = \mathbf{F}_2 + \mathbf{F}_3$ and then forming $\mathbf{F}_R = \mathbf{F}' + \mathbf{F}_1$.



Prob. 2–17/18

2–19. Determine the magnitude and direction of the resultant $\mathbf{F}_R = \mathbf{F}_1 + \mathbf{F}_2 + \mathbf{F}_3$ of the three forces by first finding the resultant $\mathbf{F}' = \mathbf{F}_1 + \mathbf{F}_2$ and then finding $\mathbf{F}_R = \mathbf{F}' + \mathbf{F}_3$.

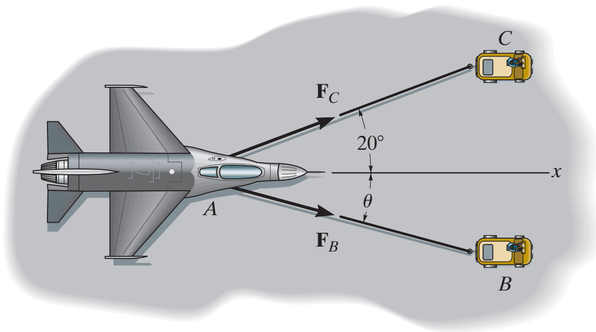
***2–20.** Determine the magnitude and direction of the resultant $\mathbf{F}_R = \mathbf{F}_1 + \mathbf{F}_2 + \mathbf{F}_3$ of the three forces by first finding the resultant $\mathbf{F}' = \mathbf{F}_2 + \mathbf{F}_3$ and then finding $\mathbf{F}_R = \mathbf{F}' + \mathbf{F}_1$.



Probs. 2–19/20

2–21. Determine the magnitude of the two towing forces $\mathbf{F}_B$ and $\mathbf{F}_C$ if the resultant force has a magnitude $F_R = 10$ kN and is directed along the positive x axis. Set $\theta = 15°$.

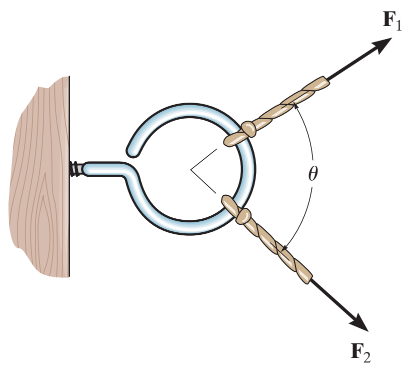
2–22. If the resultant $\mathbf{F}_R$ of the two forces acting on the jet aircraft is to be directed along the positive x axis and have a magnitude of 10 kN, determine the angle θ of the cable attached to the truck at B so that F_B is a minimum. What is the magnitude of force in each cable when this occurs?



Probs. 2–21/22

2–23. Two forces act on the screw eye. If $F_1 = 400$ N and $F_2 = 600$ N, determine the angle θ $(0° \leq \theta \leq 180°)$ between them, so that the resultant force has a magnitude of $F_R = 800$ N.

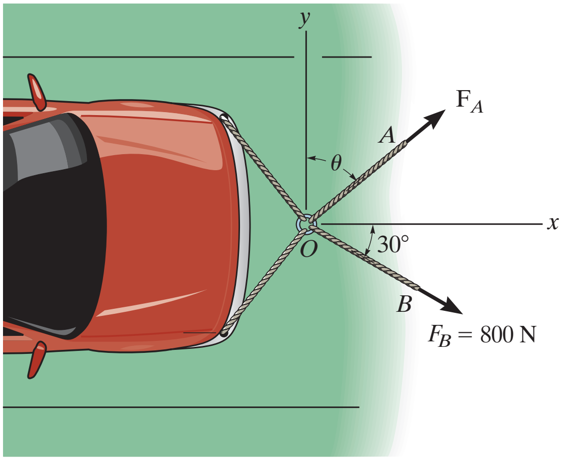
***2–24.** Two forces $\mathbf{F}_1$ and $\mathbf{F}_2$ act on the screw eye. If their lines of action are at an angle θ apart and the magnitude of each force is $F_1 = F_2 = F$, determine the magnitude of the resultant force $\mathbf{F}_R$ and the angle between $\mathbf{F}_R$ and $\mathbf{F}_1$.



Probs. 2–23/24

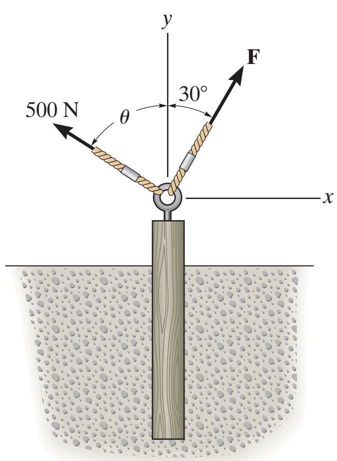
2–25. Determine the magnitude and direction θ of $\mathbf{F}_A$ so that the resultant force is directed along the positive x axis and has a magnitude of 1250 N.

2–26. Determine the magnitude of the resultant force acting on the ring at O, if $F_A = 750$ N and $\theta = 45°$. What is its direction, measured counterclockwise from the positive x axis?



Probs. 2–25/26

2–27. Two forces act on the screw eye. If $F = 600$ N, determine the magnitude of the resultant force and the angle θ if the resultant force is directed vertically upward.

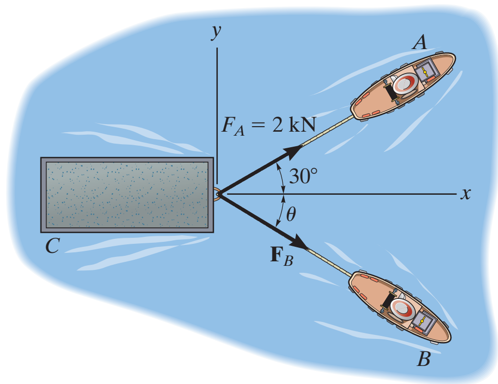


Probs. 2–27

***2–28.** If the resultant force of the two tugboats is 3 kN, directed along the positive x axis, determine the required magnitude of force $\mathbf{F}_B$ and its direction θ.

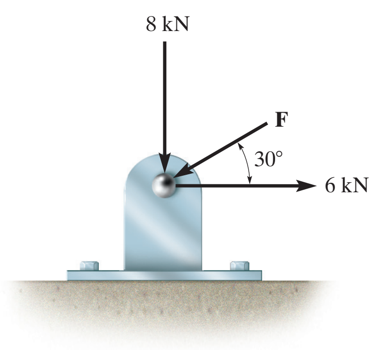
2–29. If $F_B = 3$ kN and $\theta = 45°$, determine the magnitude of the resultant force and its direction measured clockwise from the positive x axis.

2–30. If the resultant force of the two tugboats is required to be directed toward the positive x axis, and F_B is to be a minimum, determine the magnitude of $\mathbf{F}_R$ and $\mathbf{F}_B$ and the angle θ.



Probs. 2–28/29/30

2–31. Determine the magnitude of force $\mathbf{F}$ so that the resultant $\mathbf{F}_R$ of the three forces is as small as possible. What is the minimum magnitude of $\mathbf{F}_R$?



Probs. 2–31