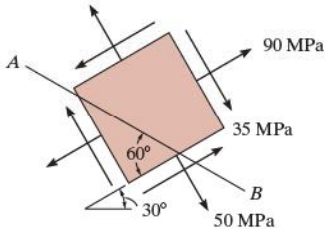
9–6. The state of stress at a point in a member is shown on the element. Determine the stress components acting on the inclined plane AB. Solve the problem using the method of equilibrium described in Sec. 9.1.



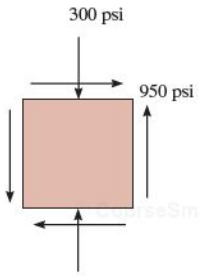
Prob. 9–6

9–7. Solve Prob. 9–2 using the stress-transformation equations developed in Sec. 9.2.

***9–8.** Solve Prob. 9–4 using the stress-transformation equations developed in Sec. 9.2.

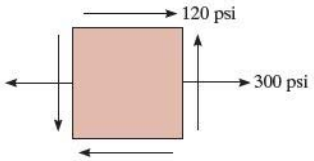
9–9. Solve Prob. 9–6 using the stress-transformation equations developed in Sec. 9.2. Show the result on a sketch.

9–10. Determine the equivalent state of stress on an element if the element is oriented 30° counterclockwise from the element shown. Use the stress-transformation equations.



Prob. 9–10

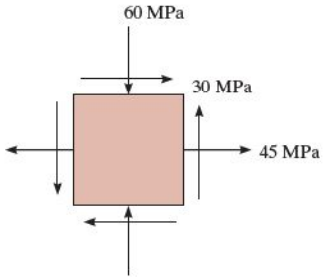
9–11. Determine the equivalent state of stress on an element if the element is oriented 60° clockwise from the element shown.



Prob. 9–11

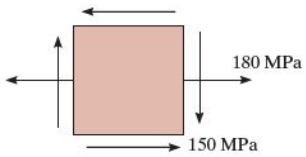
***9–12.** Solve Prob. 9–6 using the stress-transformation equations.

9–13. The state of stress at a point is shown on the element. Determine (a) the principal stresses and (b) the maximum in-plane shear stress and average normal stress at the point. Specify the orientation of the element in each case.



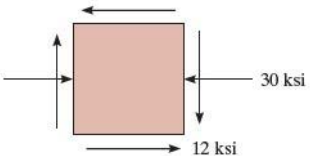
Prob. 9–13

9–14. The state of stress at a point is shown on the element. Determine (a) the principal stresses and (b) the maximum in-plane shear stress and average normal stress at the point. Specify the orientation of the element in each case.



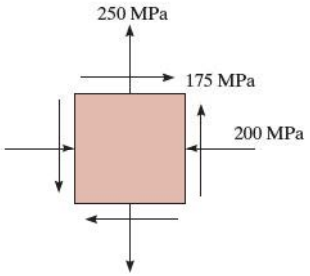
Prob. 9–14

9–15. The state of stress at a point is shown on the element. Determine (a) the principal stresses and (b) the maximum in-plane shear stress and average normal stress at the point. Specify the orientation of the element in each case.



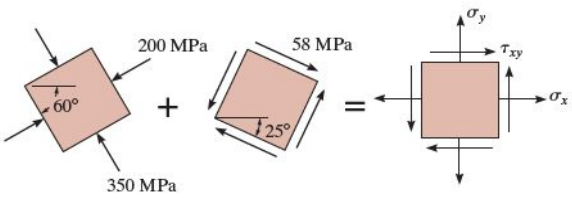
Prob. 9–15

***9–16.** The state of stress at a point is shown on the element. Determine (a) the principal stresses and (b) the maximum in-plane shear stress and average normal stress at the point. Specify the orientation of the element in each case.



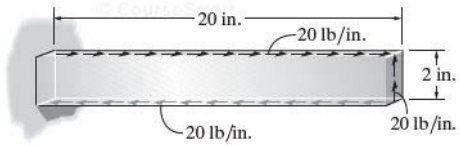
Prob. 9–16

9–17. A point on a thin plate is subjected to the two successive states of stress shown. Determine the resultant state of stress represented on the element oriented as shown on the right.



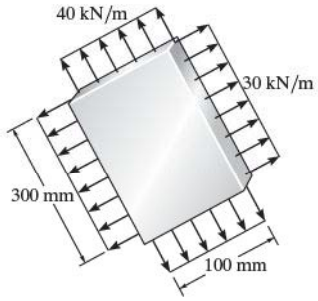
Prob. 9–17

9–18. The steel bar has a thickness of 0.5 in. and is subjected to the edge loading shown. Determine the principal stresses developed in the bar.



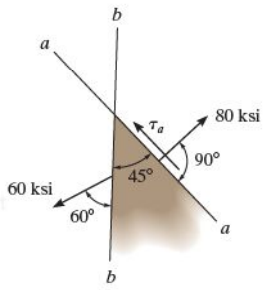
Prob. 9–18

9–19. The steel plate has a thickness of 10 mm and is subjected to the edge loading shown. Determine the maximum in-plane shear stress and the average normal stress developed in the steel.



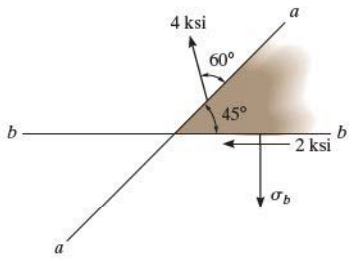
Prob. 9–19

***9–20.** The stress acting on two planes at a point is indicated. Determine the shear stress on plane *a–a* and the principal stresses at the point.



Prob. 9–20

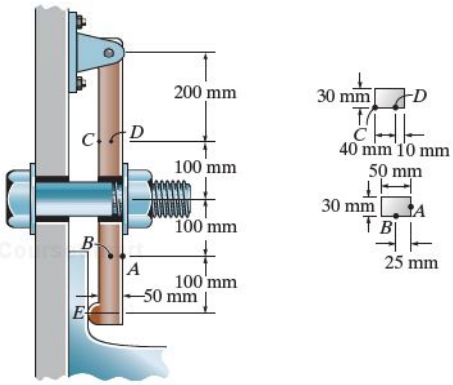
9–21. The stress acting on two planes at a point is indicated. Determine the normal stress σ_b and the principal stresses at the point.



Prob. 9–21

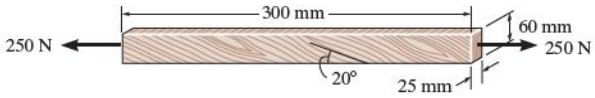
9–22. The clamp bears down on the smooth surface at E by tightening the bolt. If the tensile force in the bolt is 40 kN, determine the principal stresses at points A and B and show the results on elements located at each of these points. The cross-sectional area at A and B is shown in the adjacent figure.

9–23. Solve Prob. 9–22 for points C and D.



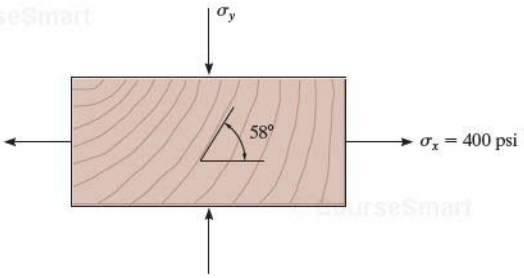
Probs. 9–22/23

*9–24. The grains of wood in the board make an angle of 20° with the horizontal as shown. Determine the normal and shear stress that act perpendicular to the grains if the board is subjected to an axial load of 250 N.



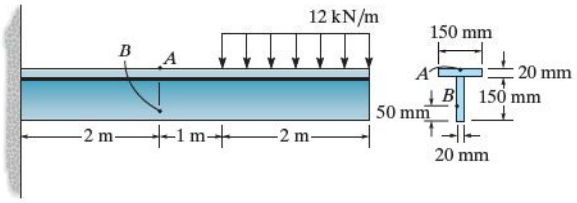
Prob. 9–24

9–25. The wooden block will fail if the shear stress acting along the grain is 550 psi. If the normal stress $\sigma_x = 400$ psi, determine the necessary compressive stress σ_y that will cause failure.



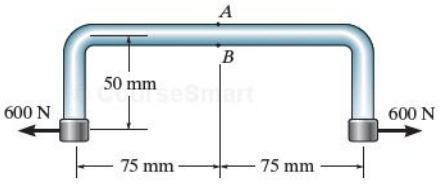
Prob. 9–25

9–26. The T-beam is subjected to the distributed loading that is applied along its centerline. Determine the principal stresses at points A and B and show the results on elements located at each of these points.



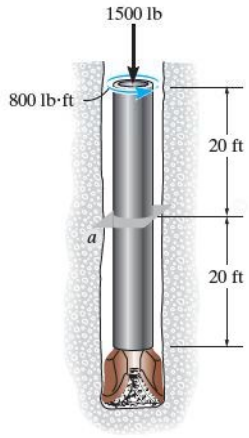
Prob. 9–26

9–27. The bent rod has a diameter of 15 mm and is subjected to the force of 600 N. Determine the principal stresses and the maximum in-plane shear stress that are developed at point A and point B. Show the results on properly oriented elements located at these points.



Prob. 9–27

9–35. The drill pipe has an outer diameter of 3 in., a wall thickness of 0.25 in., and a weight of 50 lb/ft. If it is subjected to a torque and axial load as shown, determine (a) the principal stresses and (b) the maximum in-plane shear stress at a point on its surface at section *a*.

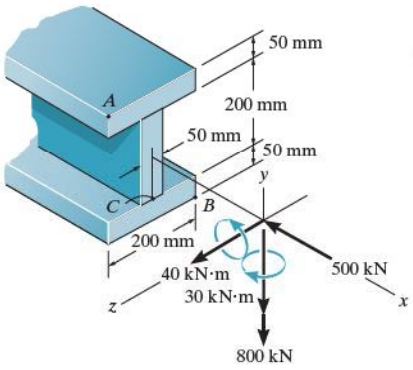


Prob. 9–35

*9–36. The internal loadings at a section of the beam are shown. Determine the principal stresses at point *A*. Also compute the maximum in-plane shear stress at this point.

9–37. Solve Prob. 9–36 for point *B*.

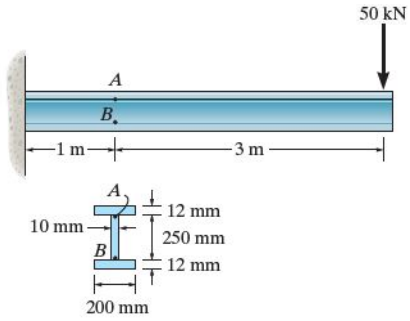
9–38. Solve Prob. 9–36 for point *C*, located in the center on the bottom of the web.



Probs. 9–36/37/38

9–39. The wide-flange beam is subjected to the 50-kN force. Determine the principal stresses in the beam at point *A* located on the *web* at the bottom of the upper flange. Although it is not very accurate, use the shear formula to calculate the shear stress.

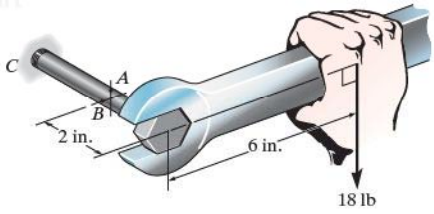
*9–40. Solve Prob. 9–39 for point *B* located on the *web* at the top of the bottom flange.



Probs. 9–39/40

9–41. The bolt is fixed to its support at *C*. If a force of 18 lb is applied to the wrench to tighten it, determine the principal stresses developed in the bolt shank at point *A*. Represent the results on an element located at this point. The shank has a diameter of 0.25 in.

9–42. Solve Prob. 9–41 for point *B*.



Probs. 9–41/42

PROBLEMS

***9–56.** Solve Prob. 9–4 using Mohr's circle.

9–57. Solve Prob. 9–2 using Mohr's circle.

9–58. Solve Prob. 9–3 using Mohr's circle.

9–59. Solve Prob. 9–10 using Mohr's circle.

***9–60.** Solve Prob. 9–6 using Mohr's circle.

9–61. Solve Prob. 9–11 using Mohr's circle.

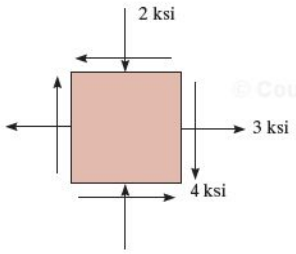
9–62. Solve Prob. 9–13 using Mohr's circle.

9–63. Solve Prob. 9–14 using Mohr's circle.

***9–64.** Solve Prob. 9–16 using Mohr's circle.

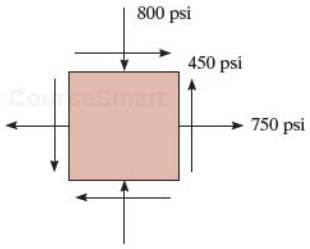
9–65. Solve Prob. 9–15 using Mohr's circle.

9–66. Determine the equivalent state of stress if an element is oriented 20° clockwise from the element shown. Show the result on the element.



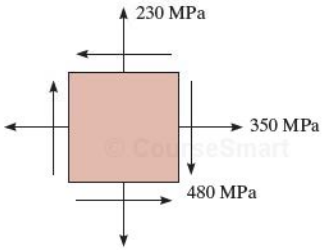
Prob. 9–66

9–67. Determine the equivalent state of stress if an element is oriented 60° counterclockwise from the element shown.



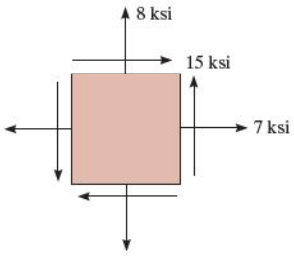
Prob. 9–67

***9–68.** Determine the equivalent state of stress if an element is oriented 30° clockwise from the element shown.



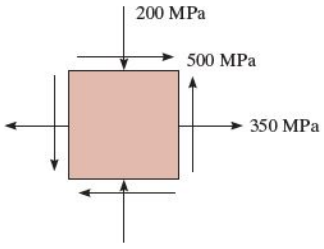
Prob. 9–68

9–69. Determine the equivalent state of stress if an element is oriented 30° clockwise from the element shown. Show the result on the element.



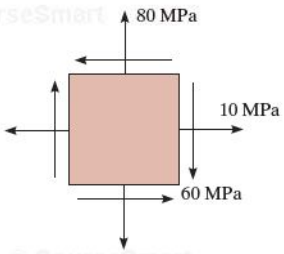
Prob. 9–69

9–70. Determine (a) the principal stress and (b) the maximum in-plane shear stress and average normal stress. Specify the orientation of the element in each case.



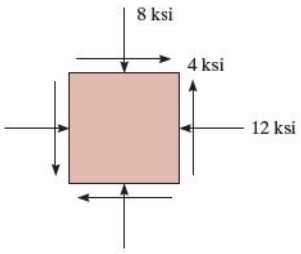
Prob. 9–70

9–71. Determine (a) the principal stresses and (b) the maximum in-plane shear stress and average normal stress. Specify the orientation of the element in each case.



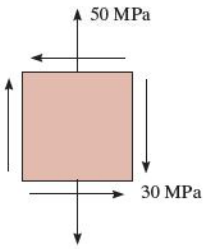
Prob. 9–71

9–73. Determine (a) the principal stresses and (b) the maximum in-plane shear stress and average normal stress. Specify the orientation of the element in each case.



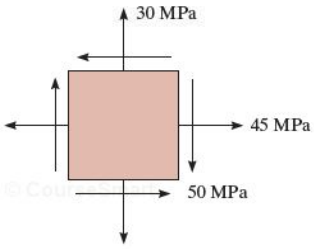
Prob. 9–73

***9–72.** Determine (a) the principal stresses and (b) the maximum in-plane shear stress and average normal stress. Specify the orientation of the element in each case.



Prob. 9–72

9–74. Determine (a) the principal stresses and (b) the maximum in-plane shear stress and average normal stress. Specify the orientation of the element in each case.



Prob. 9–74