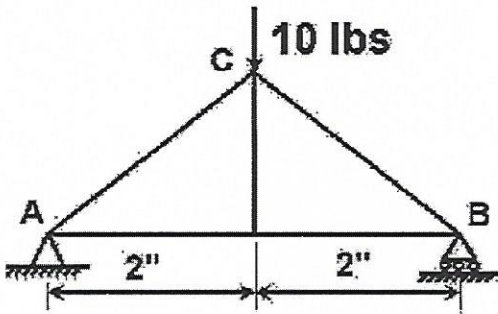


**POE Practice Test - Statics & Structures**

**Multiple Choice**

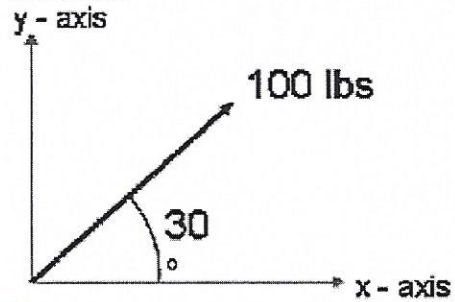
Identify the choice that best completes the statement or answers the question.

1. A quantity that has magnitude and direction is called \_\_\_\_\_.  
a. a scalar  
 b. a vector  
c. tension  
d. weight
2. According to the figure, what is the value of the reaction force that occurs in the vertical direction at point A.



- a. 10 lbs  
b. 15 lbs  
c. 20 lbs  
d. 5 lbs  
e. none of the above
3. An angle, whose sin is equal to 5/13, measures \_\_\_\_\_.  
a.  $67.4^\circ$   
b.  $30.0^\circ$   
 c.  $22.6^\circ$   
d.  $65.0^\circ$

4. What is the force of the vector in the x direction?



- a. 86.60 lbs  
b. 115.47 lbs  
c. 200 lbs  
d. 50 lbs  
e. none of the above.
5. Moment of inertia is a cross-sectional property that gives the engineer an indication of the stiffness of a particular shape. Its value can be used to  
 a. calculate the amount of deflection that occurs in structural beams.  
b. calculate the weight of a structural beam.  
c. locate the centroidal axis of a structural shape.  
d. describe the linear relationship between stress and strain.

6. According to the image below answer the following questions. (Angle ACB = 36.86)

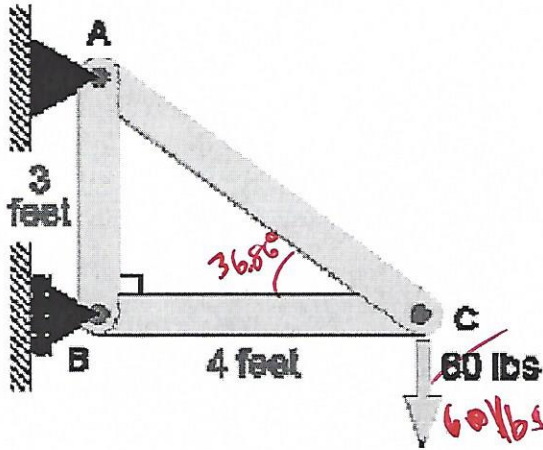
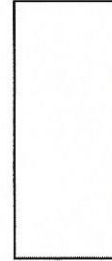


Figure 1

What is the magnitude of the reaction force in the x direction at Point A?

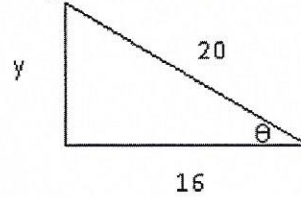
- a. 80 lbs
  - b. 45 lbs
  - c. 60 lbs
  - d. 55 lbs
  - e. none of the above.
7. What is the magnitude of the force on member AC?
- a. 36 lbs
  - b. 75 lbs
  - c. 80 lbs
  - d. 100 lbs
  - e. none of the above.
8. What is the magnitude of the force on member BC?
- a. 80 lbs
  - b. 75 lbs
  - c. 100 lbs
  - d. 36 lbs
  - e. none of the above.

9. A true 2 x 6 beam (the actual dimensions are 2 inches by 6 inches) is standing upright with the shorter side as its base. Find the moment of inertia of the beam.

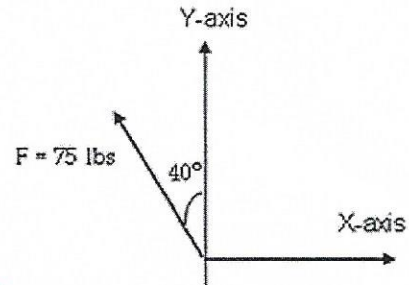


$$I_{xx} = \frac{bh^3}{12}$$

- a. 40 in<sup>4</sup>
  - b. 4 in<sup>4</sup>
  - c. 3.6 in<sup>4</sup>
  - d. 36 in<sup>4</sup>
10. Given the lengths of the sides of the following triangle, what is the value of angle  $\theta$ ?



- a. 30°
  - b. 36.9°
  - c. 53.1°
  - d. 60°
11. Given the lengths of the sides of the triangle above, what is the value of y?
- a. 18
  - b. 14
  - c. 10
  - d. 12
12. The x-component of the vector below would be \_\_\_\_\_.



- a. -48.2 lbs
- b. -57.6 lbs
- c. 48.2 lbs
- d. 57.6 lbs

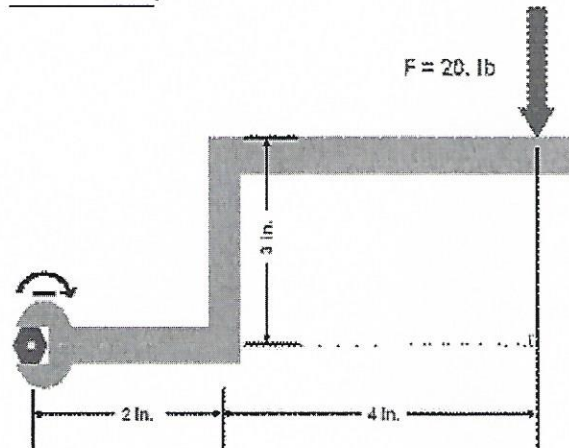
13. The y-component of the vector above would be \_\_\_\_\_.

- a. -48.2 lbs
- b. -57.6 lbs
- c. 48.2 lbs
- d. 57.6 lbs

14. If another force of 10 lbs in the positive x-direction were added to the vector above, what would be the x-component of the resultant force?

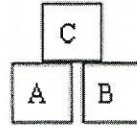
- a. -58.2 lbs
- b. -47.6 lbs
- c. -38.2 lbs
- d. -67.6 lbs

15. The moment of the wrench below would be \_\_\_\_\_.



- a. 40 lb-in
- b. 80 lb-in
- c. 60 lb-in
- d. 120 lb-in

16. Which of the following is the free body diagram for block A?



- a.
- b.
- c.
- d.

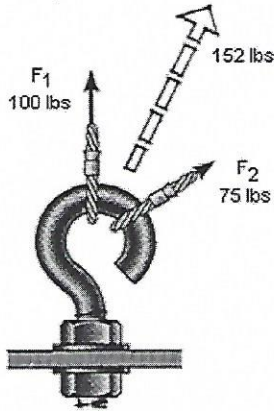
17. Force and velocity are examples of \_\_\_\_\_.

- a. vector quantities
- b. scalar quantities
- c. mass properties
- d. moments

18. When the sum of the forces and moments in a structural system equals zero, that system is said to be in a state of \_\_\_\_\_ equilibrium

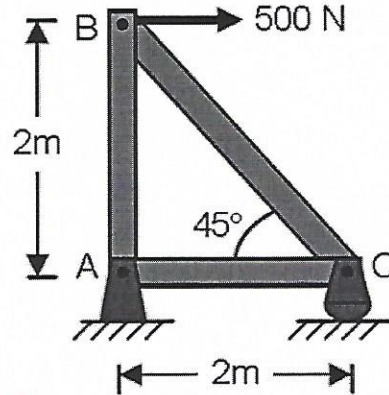
- a. stressed
- b. strained
- c. dynamic
- d. static

19. As shown in Figure 8, a \_\_\_\_\_ force has the same effect on a body as two or more forces acting concurrently on that body.



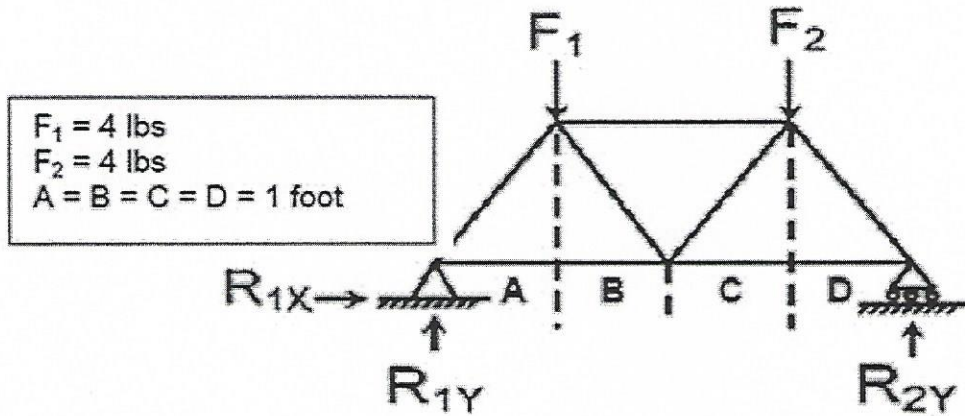
- a. compressive
- b. tensile
- c. resultant
- d. reaction

20. Study the truss system shown in Figure 9. How many reaction forces would replace the roller joint (C) if a free body diagram of the truss system was drawn?



- a. 1
- b. 2
- c. 3
- d. 4

21. According to the figure, what will be the **combined magnitude** of the reaction forces  $R_{1Y}$  and  $R_{2Y}$ ?

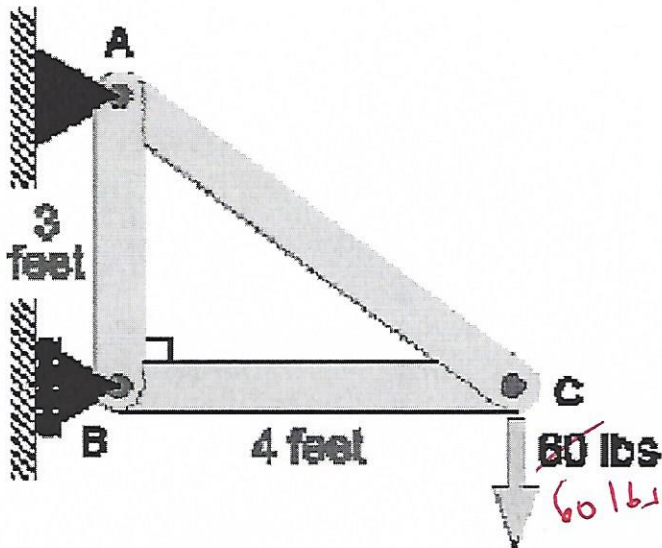


- a. 4 lbs
- b. 8 lbs
- c. 12 lbs
- d. 16 lbs
- e. none of the above.



**Problem**

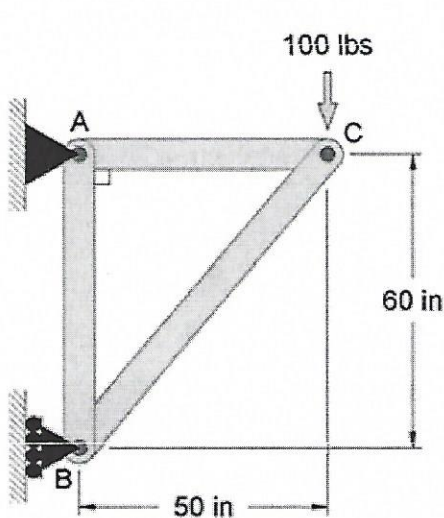
22. According to the image below answer the following questions. (Angle ACB = 36.86)



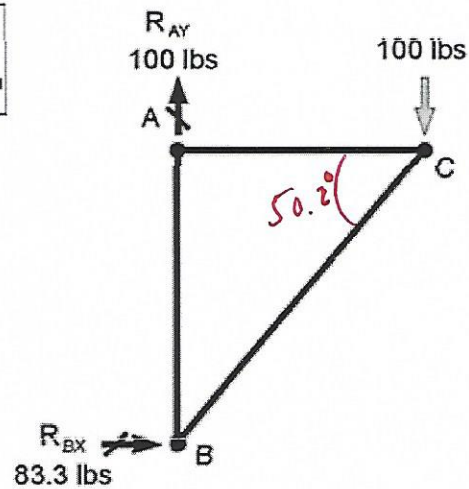
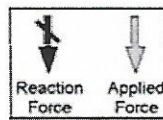
**Figure 1**

What is the magnitude of the reaction force in the x direction at Point A

*80 lbs*



**Figure 1**



**Figure 2**

23.

Study the truss in Figure 1 and its (incomplete) free body diagram in Figure 2, and answer the following questions.

- Calculate the length of truss member BC. (answer precision = 0.0) *78.10 in*
- Calculate the magnitude and direction of the missing reaction force that occurs at joint A. Then, draw and label that reaction force on Figure 2. (answer precision = 0.0)

24. Study the truss in Figure 1 and its free body diagram in Figure 2, and answer the following questions.

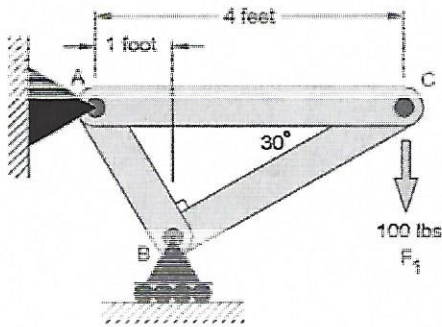


Figure 1

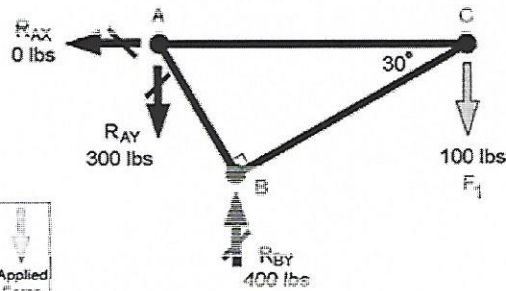
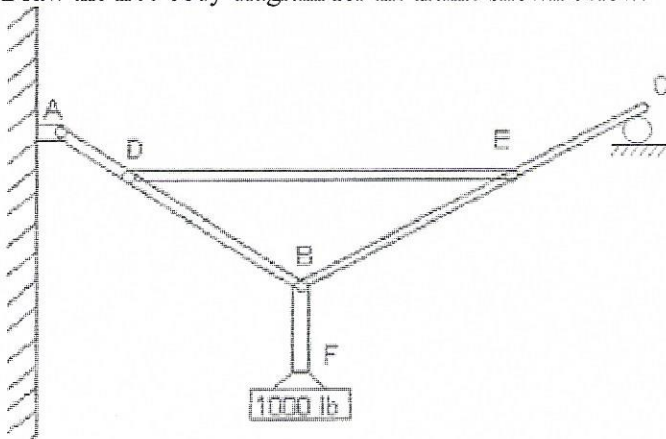


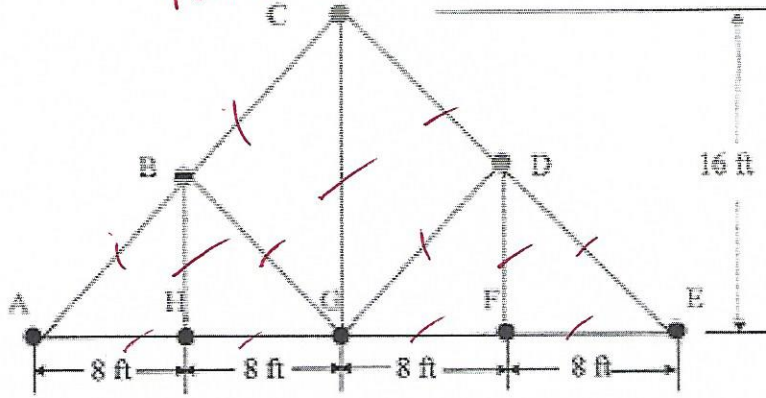
Figure 2

- Draw a point free body diagram for joint C and label all of the given information for that node (assume all member forces are tension).
  - Calculate the length of truss member BC. (answer precision = 0.000) *3.46 ft*
  - Using joint C, determine the magnitude and type of force (tension or compression) that is being carried by truss member BC. (answer precision = 0.0)
25. Draw the free body diagram for the frame shown below.



Point A is a Hinge  
Point C is a Roller

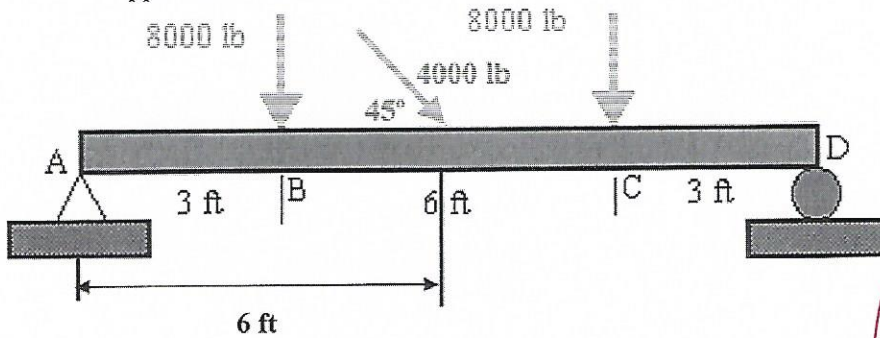
26. The roof truss of a residential structure is shown. The truss is symmetric about the centerline (CG), and the angles AHB, HGC, and GFD are each 90 degrees.
- Find angle ABH in the truss. *ABH = 45°*
  - How many linear feet of lumber are required to fabricate the truss? (Assume the lumber has no volume, only length. *131.8 ft.*)



~~ABH = 45°~~

$32 + 16 + 22.6 + 22.6 + 11.3 + 11.3$   
 $16 =$

27. For the loaded, simply supported beam shown in the diagram below, draw a free body diagram, and determine the external support reactions.

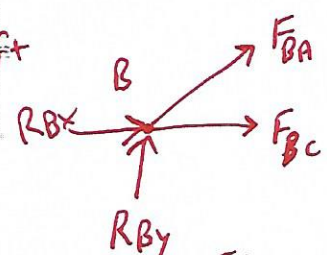
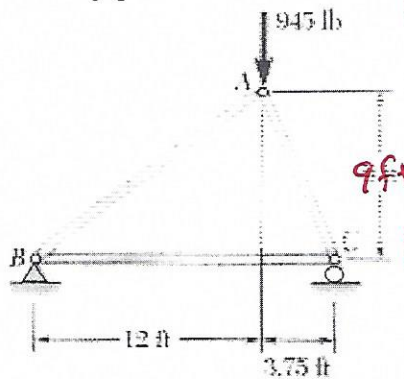


$Y = 16,000 \text{ lb} + 2828 = 18828 \text{ lb}$

$X = 2828$

$R_{Ax} = -2828 \text{ lb}$   
 $R_{Ay} = R_{Dy} = 9414 \text{ lb}$

28. Study the image below and answer the following questions.



- What are the three different sets of equations that are considered while solving the truss?  $\sum M = 0, \sum F_x = 0, \sum F_y = 0$
- Draw the free body diagram showing the reaction forces at joints B and C.
- Calculate the force (compressive or tensile) in each of the members of the truss. Show all work including the equation and substitution with units.