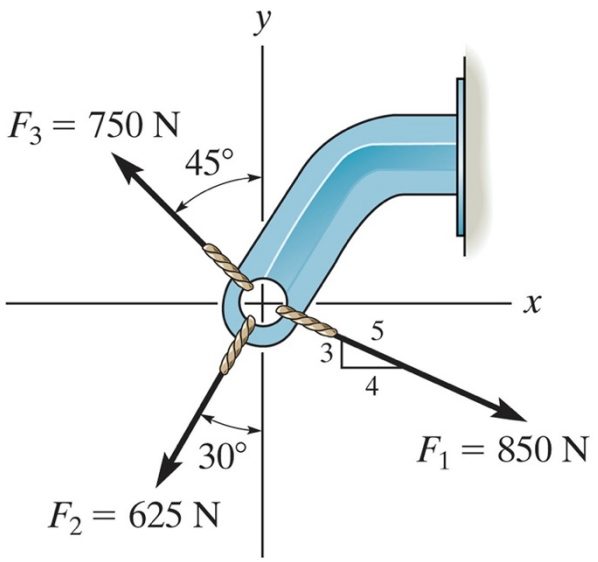
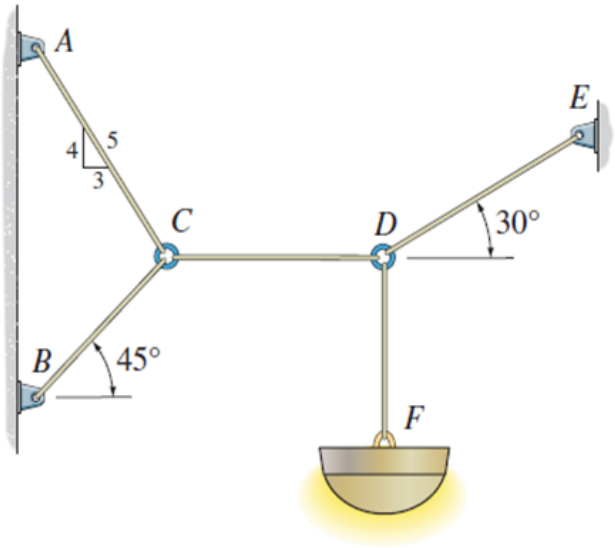
Instructions:

- Read the questions carefully. Detail all steps of your solution and include free-body diagrams. Writing only the equations and their solutions is not enough for full points.
- Make sure your answers include units.

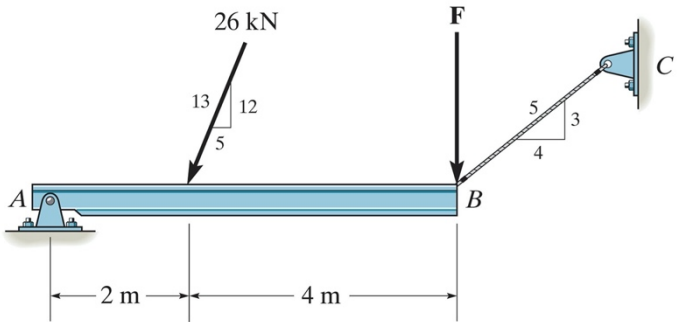
Exercise 1 (15%)
Determine the magnitude of the resultant force and its direction, measured counterclockwise from the positive *x* axis.



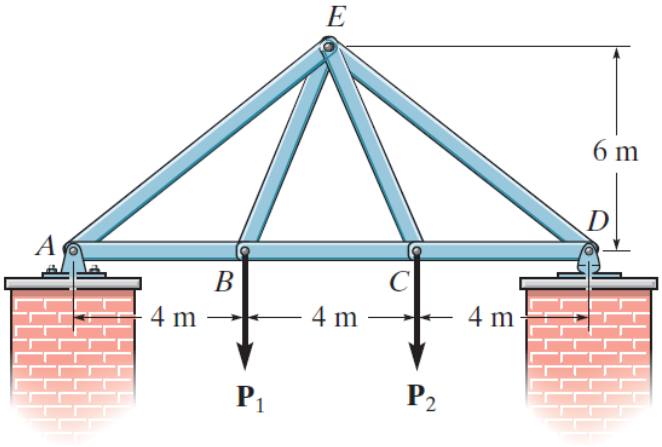
Exercise 2 (20%)
Determine the tension in each cord as a function of the lamp's mass *m*. Find the maximum mass of the lamp that the cord system can support so that no single cord develops a tension exceeding 400 N.



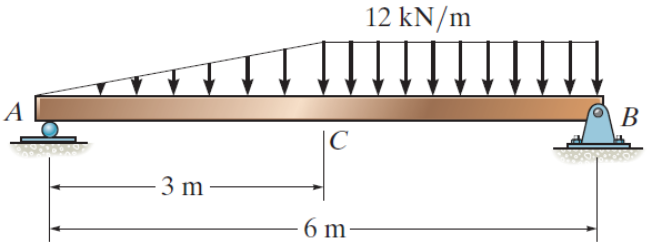
Exercise 3 (15%)
If rope *BC* will fail when the tension becomes 50 kN, determine the greatest vertical load *F* that can be applied to the beam at *B*. What is the magnitude of the reaction at *A* for this loading? Neglect the thickness of the beam.

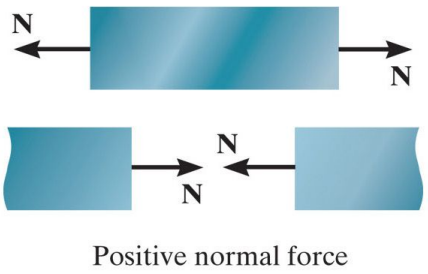


Exercise 4 (25%)
Determine the force in each member of the truss and state if the members are in tension or compression. Set $P_1 = 3$ kN, $P_2 = 6$ kN.

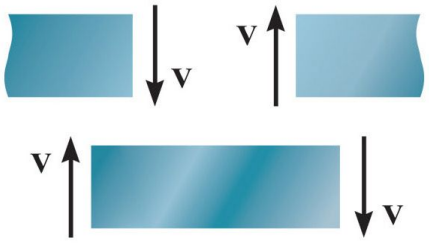


Exercise 5 (25%)
Draw the shear and moment diagrams for the beam.

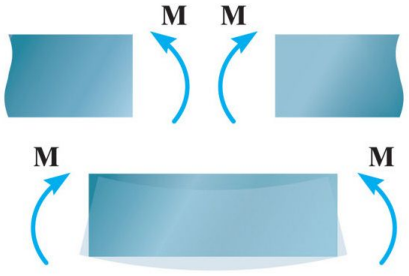




Positive normal force



Positive shear



Positive moment