Engineering Statics HW 2 Notes

1. Using a cross product, define a vector from point P to point A, let's call it ***r***. The applied force vector we will call F. The resulting moment is r crossed with ***F***, or ***r*** x ***F***. The magnitude can be determined using the Pythagorean theorem on the result of the cross product.
2. Using a cross product, define a vector from point P to point A, let's call it ***r***. The applied force vector we will call F. The resulting moment is r crossed with ***F***, or ***r*** x ***F***.
3. Define a vector from point A to point B. Use cross product to calculate the moment about point A.
   For the force at point C, the horizontal force will be the same as that at point B (-95 cos 55). The horizontal force at C must have *the same moment* about point A as the force at B does. Since only a horizontal force will be used, it would be the horizontal force multiplied by the distance, 0.9m.
4. I can suggest using cross product, but there is an easier way. For the force F1 use the magnitude of the force times the horizontal distance. For the force F2, use 4/5 of the magnitude of the force. The other component has no effect on the moment. For force F3, use the horizontal component (F1 sin 30) at a distance of 0.5 ft.
5. Use a cross product between the origin, O, and the force, F, to get the moment. To get the moment about the Oa axis, use a dot product. Don't forget to convert the axis Oa to a unit vector before doing this.
6. Same as #5.
7. A couple is a moment generated by two forces. Looking at the diagram the sum of forces is obviously zero. The nice thing is that the magnitude of the couple can be determined by taking a sum of moments about *any* point. So pick a convenient point. If you sum the moments about the origin, O, you need to calculate two cross products. If you are lazy (in a productive way) you could take the calculate the moment about point A caused by the force at point B. There is only one cross product now. The force at point A can be ignored because it passes through the point we are taking the moment through, having no effect on the moment.
8. I would pick one of two locations to calculate the sum of moments: the upper left corner where the force is pointed to the lower left; or the lower right corner of the beam where the two forces intersect. If we use the upper left, the sum of moments is determined solely by the two forces located in the lower right because both of the other forces pass through the point we are taking the moment about, thus having no effect on the moment.
   The 190 lb force to the left (lower right) imparts a moment of (-190 lb* 1.5 ft) clockwise. The other force has two components: a vertical component (3/5 F * 4ft), and a horizontal component (4/5 F * 1.5ft). Both of these imparts a

counterclockwise moment. The sum of all three moments must be 310 lbft. Solve for F.

9. Take a cross product where the vector from point P to point A is ***r***, and use the force at A in vector form as ***F***. ***r*** x ***F*** gets you the moment in vector form. The force portion of the solution is the force at point A. Honest.
10. This problem is a little harder, but essentially the same as #9. Sum the moments about the origin, O. That is your moment. Now sum the forces that are used. That is your force.