Engineering Statics HW 1 Notes

1. Put each force into vector form (cosine along the x-axis, sine along the y-axis). Sum the vectors.
   The magnitude can be calculated using the Pythagorean theorem.
   The angle can be calculated using an arc tangent of the resulting vector.

2. Note that the axes are rotated. Calculate the remaining angle (90-20-40).

3. The angle between the force vector and the v axis is (180-120+40).

4. Note that the vector has an angle that is more than 90 degrees from the x-axis. Don't ignore this fact.

5. Put each force into vector form, and then sum the components.
   Note that the 30N force is pointing *towards* the origin.

6. Put each force into vector form, and then sum the components.
   Hint: The force at C is in the negative X and negative y directions.

7. Put each force into vector form, and then sum the components.
   To determine the angles from the various axes, use the law of cosines. This requires that you convert the resultant force into a unit vector (you get this by dividing each component of the resultant by the magnitude of the resultant). Then take the arc-cosine of each unit vector component.

8. Use the law of cosines to calculate the angle of the vector with the z-axis.
   $\text{SQRT}((F \cos \alpha)^2 + (F \cos \beta)^2 + (F \cos \gamma)^2) = 50$ lb
   Determine the unknown (γ).

9. The force F1 can be put into vector form using the ratios provided:
   $(7/25\ F_1)\boldsymbol{j}$ and $(24/25\ F_1)\boldsymbol{k}$
   Use method of cosines to determine the angles.

10. Put the force into vector form using the *difference* from one end point to the other.

11. Sum the two distance vectors. Then determine the distance using the Pythagorean theorem.

12. Given the x and y distances, use the Pythagorean theorem to calculate the distance z.

13. Convert each force into vector form. Sum the vectors to get the resultant. Use the method of cosines to determine the angles between the resultant and each axis.

14. I would recommend using dot product. Convert each force into vector form. Take the dot product of the two vectors. The result is the cosine of the angle. (Don't forget to use unit vectors, or at least divide by the magnitude of the vector.)

15. I would recommend using dot product. Convert the force and the pole into vector forms. For the pole, I would be inclined to have the vector start at the end (point A) and directed towards the origin (point O). Take the dot product of the force vector and the pole vector. The result is the cosine of the angle. (Don't forget to use unit vectors, or at least divide by the magnitude of the vector.)