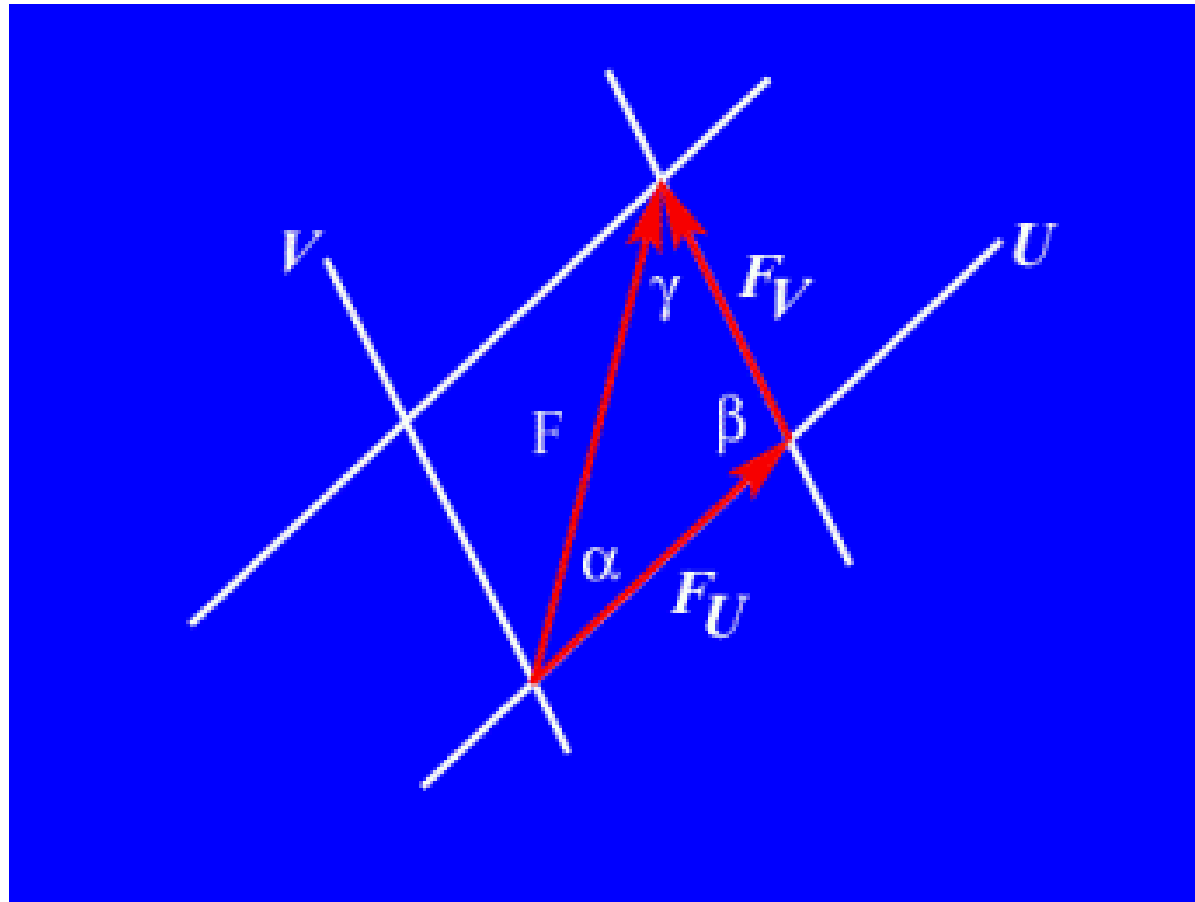


Lecture - 6

Ambar K. Mitra

Vector Addition

Vectors obey parallelogram law of addition.



Sine Rule

$$\frac{F}{\sin \beta} = \frac{F_U}{\sin \gamma} = \frac{F_V}{\sin \alpha}$$

Cosine Rule

$$F^2 = F_U^2 + F_V^2 - 2F_U F_V \cos \beta$$

You can write two more cosine rules. What are those?

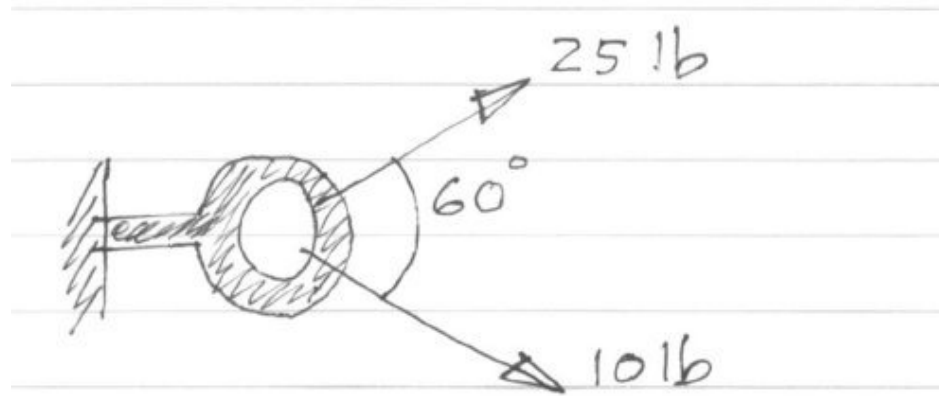
BUT REMEMBER YOU CAN USE ONLY ONE COSINE RULE OF YOUR CHOICE.

Count Equations and Unknowns

- We can write 3 equations for a triangle (2 sine rules and 1 cosine rule).
- These 3 equations contain 6 quantities.
- When 3 quantities are given, we can calculate the rest.
- There is one exceptional, unsolvable situation. What is it?

Problem - 1

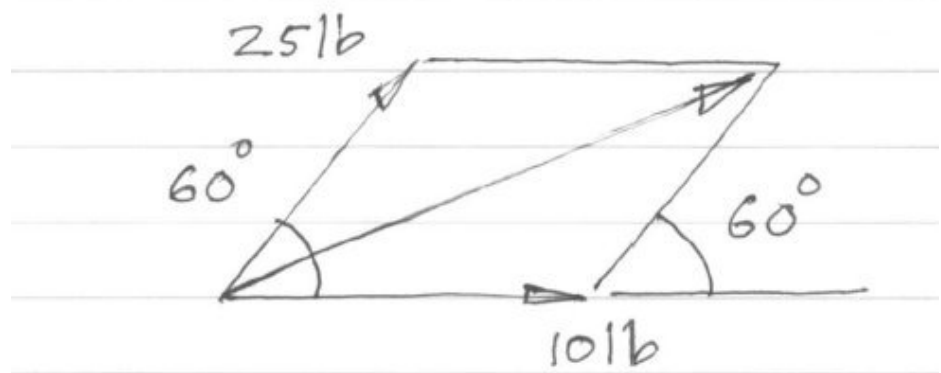
Two forces are applied on a hook. Find the magnitude of the resultant force.



$$F_U = 10$$

$$F_V = 25$$

$$\beta = 120^\circ$$



Problem - 2

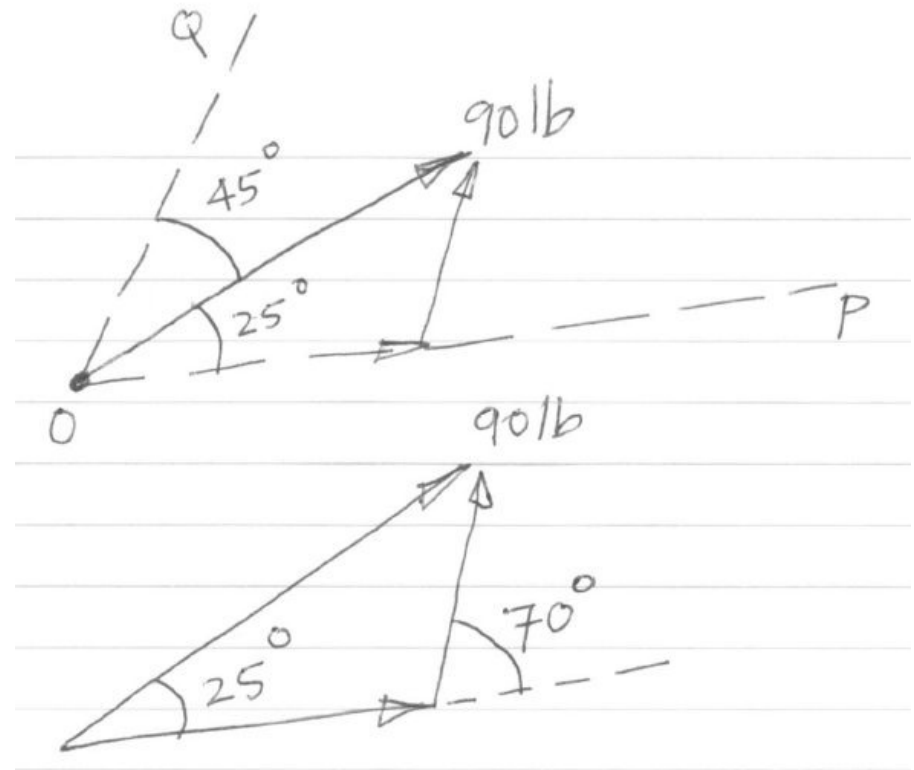
We want to apply two forces along cables OP and OQ such that the resultant is 90lb.

Find the forces along the cables.

$$F = 90$$

$$\alpha = 25^\circ$$

$$\beta = 110^\circ$$



Problem - 3

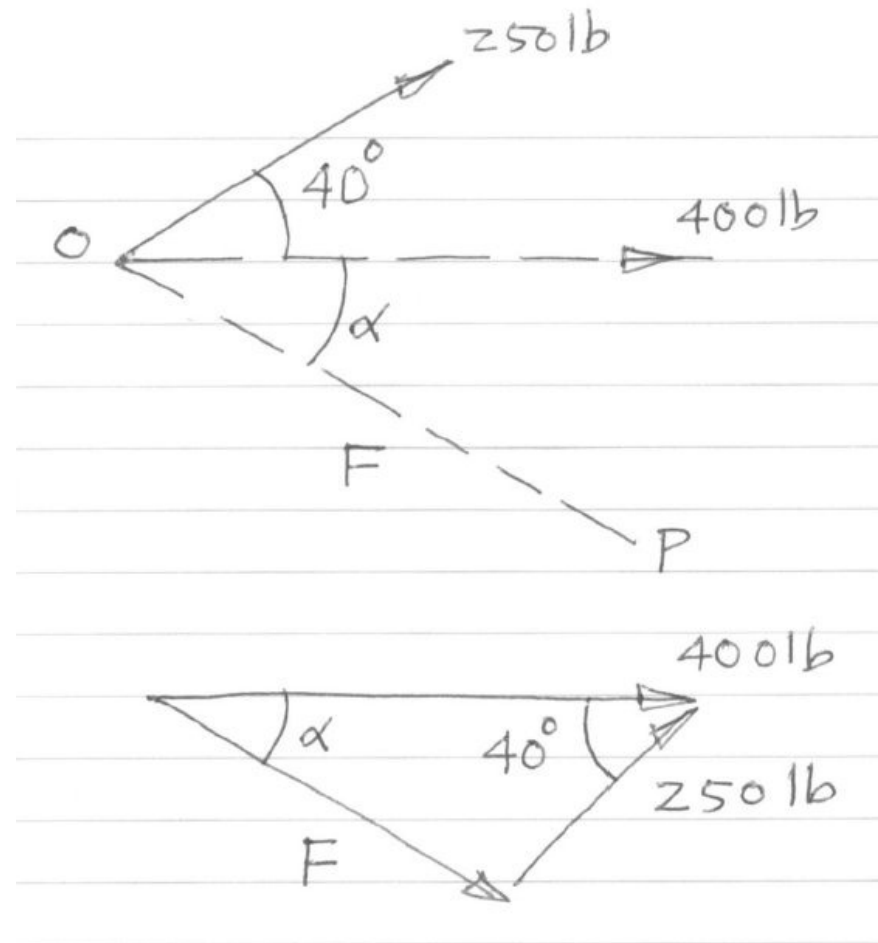
One 250lb force is applied on a hook. A second force along cable OP makes the resultant as 400lb horizontal.

Find the force along OP.

$$F = 400$$

$$F_V = 250$$

$$\gamma = 40^\circ$$



Problem - 4

A 100lb traffic light is suspended with two cables.

Find the forces along the cables.

$$F = 100$$

$$\alpha = 40^\circ$$

$$\gamma = 60^\circ$$

