

**Course Code: ESC106A**

**Course Title: Construction Materials and Engineering Mechanics**

**Lecture No. 14:**

**Problems on Coplanar Concurrent Force Systems**

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# Lecture Intended Learning Outcomes

**At the end of this lecture, students will be able to:**

- Apply the method of resolution and find the resultant of coplanar concurrent force system
- Solve for the unknown forces given the resultant of concurrent force system
- Calculate the angles of applied forces given the resultant of concurrent force system



# Contents

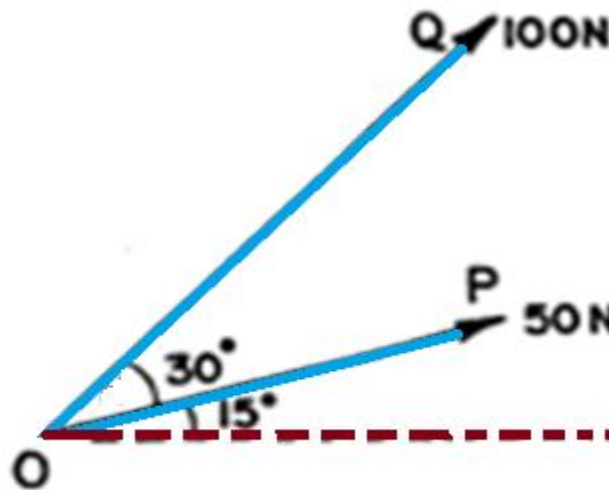
- **Analysis of Coplanar Concurrent and Non-Concurrent System of Forces**

Resultant of Concurrent force systems by method of Resolution-  
Numerical problems



# Problems

1. Two forces are acting at a point O as shown in the figure. Determine the resultant in magnitude and direction.

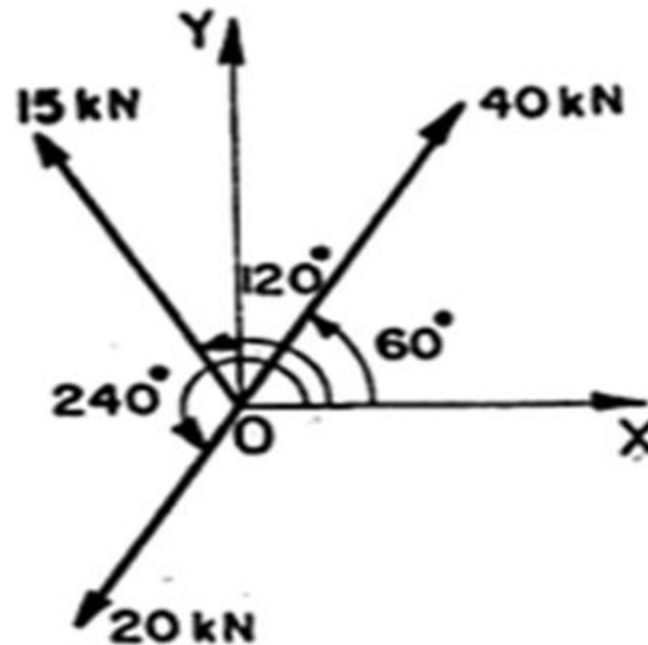


$$R = 145.46 \text{ N}$$

$$\alpha = 35.10^\circ$$

# Problems

2. Three forces of magnitude 40 kN, 15 kN and 20 kN are acting at a point O as shown in the fig. The angles made by the 40 kN, 15 kN and 20 kN forces with the x-axis are  $60^\circ$ ,  $120^\circ$  and  $240^\circ$  respectively. Determine the magnitude and the direction of the resultant force.

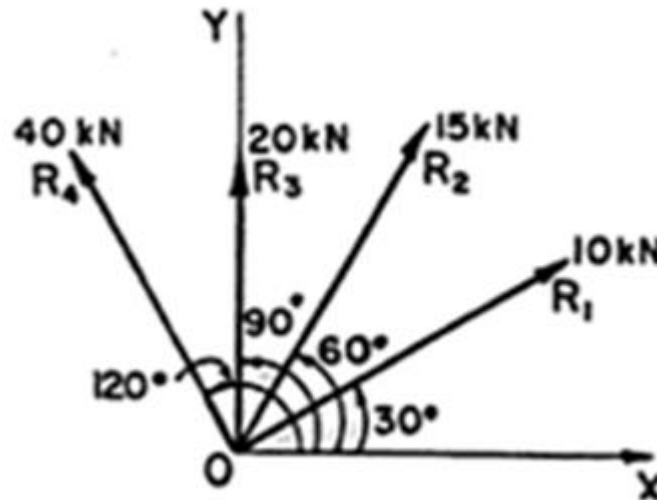


$$R=30.41\text{kN}$$



# Problems

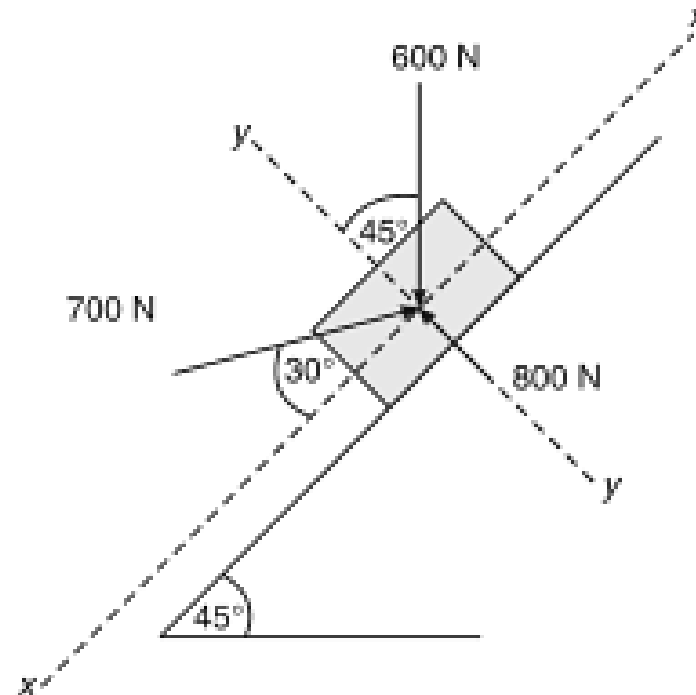
3. Three forces of magnitude 40 kN, 20 kN, 15kN and 10 kN are acting at a point O as shown in the fig . The angles made by the 40 kN, 20 kN, 15kN and 10 kN forces with the x-axis are  $120^\circ$ ,  $90^\circ$ ,  $60^\circ$ , and  $30^\circ$  respectively. Determine the magnitude and the direction of the resultant force.



$$R=72.73\text{kN}$$

# Problems

4. Determine the resultant of the system of the forces acting on the body as shown in the figure

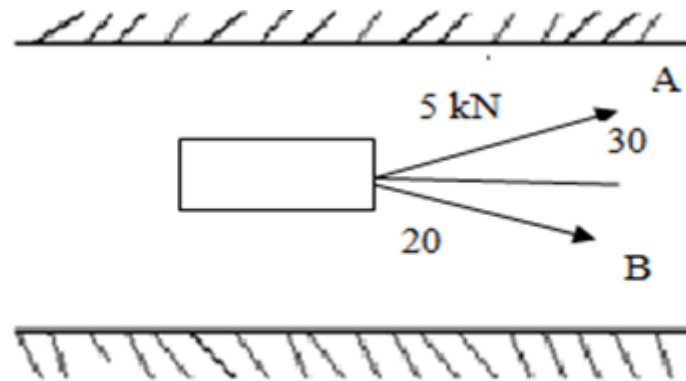


$$R=183.764\text{kN}$$

# Problems

5. A truck has to be pulled along a straight road as shown in Figure

- i) If the force applied along rope A is 5 kN inclined at  $30^\circ$ , what should be the force in the rope B, which is inclined at  $20^\circ$ , so that the vehicle moves along the road?
- ii) If a force of 4 kN is applied in rope B at what angle rope B should be inclined so that the vehicle is pulled along the road?



$$(i) F_B = 7.31 \text{ kN}$$

$$(ii) \alpha = 38.68^\circ$$



# Summary

- The forces can be resolved and the resultant of coplanar concurrent force system can be obtained
- The unknown forces can be evaluated if the resultant of concurrent force system and direction of the resultant is known

