

ENGINEERING MECHANICS

CHAPTER 4: COPLANAR NON-CONCURRENT FORCES

Lecture 2:

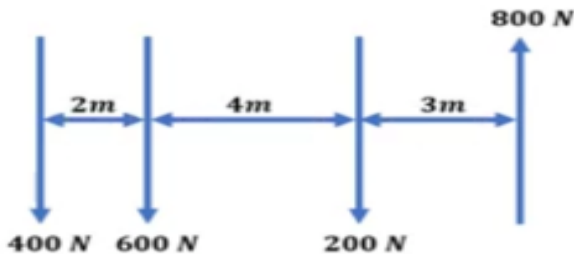
Resultant of funicular or Link polygon:

Funicular or Link polygon: A funicular or link polygon is an open or closed figure that is not necessarily plane and that is formed by a rope or cord acted upon at a number of points by forces acting in different directions.

It is drawn to find the exact position of resultant in the space diagram. It is obtained from the rays of polar diagram.

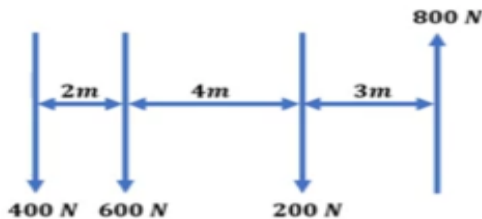
NOTE: Polar diagram is the diagram constructed from vector diagram, by selecting a suitable point as pole to which each point of vector diagram is connected.

Problem1: Four forces of magnitude 400N, 600N, 200N, 800N are acting as shown in figure. Find the magnitude, direction and position of the resultant force using funicular polygon.



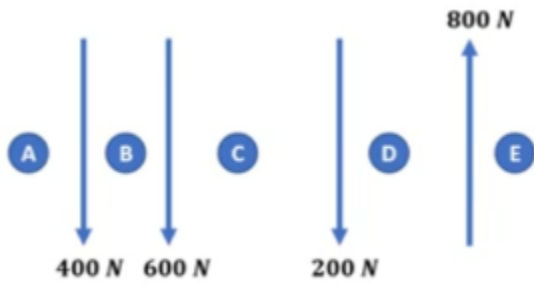
Solution:

Step1:

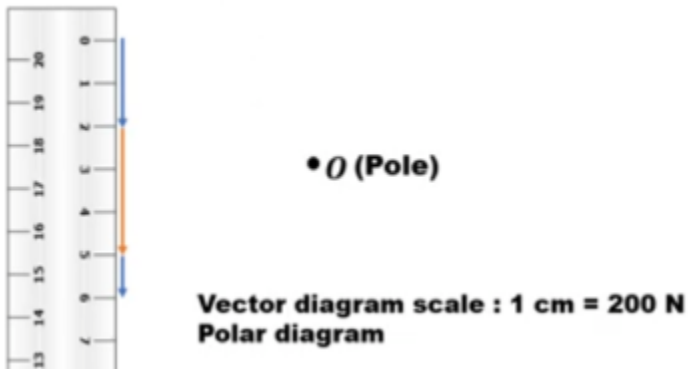


Space diagram scale : 1 cm = 1m

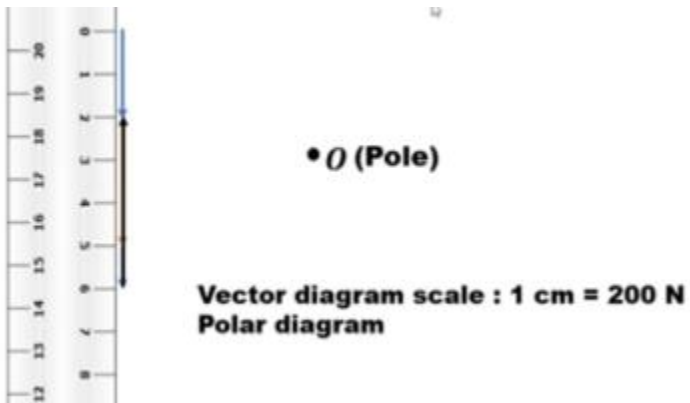
Step 2:



Step 3:

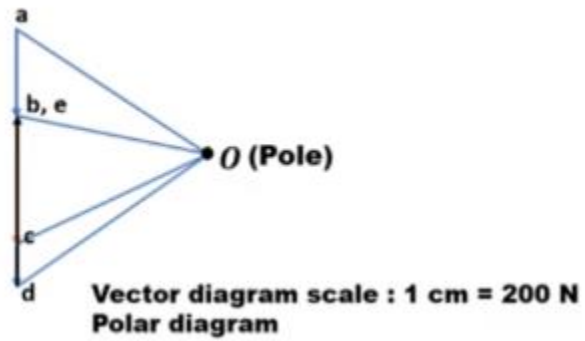


Step 4:

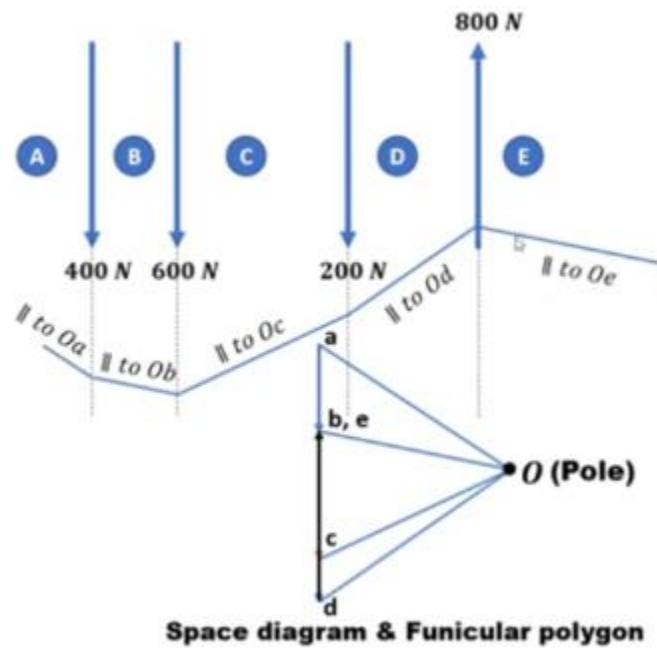


Step 5:

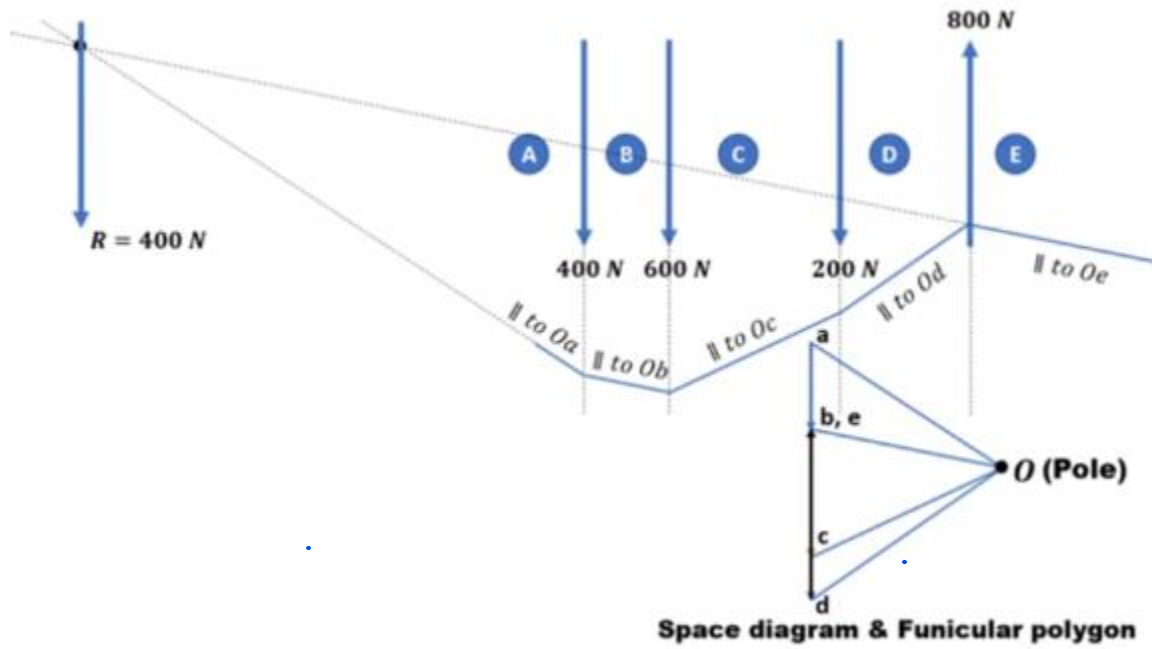
$$R = l(ae) \text{ in cm} \times \text{Scale}$$
$$R = 2 \times 200$$
$$R = 400 \text{ N}$$



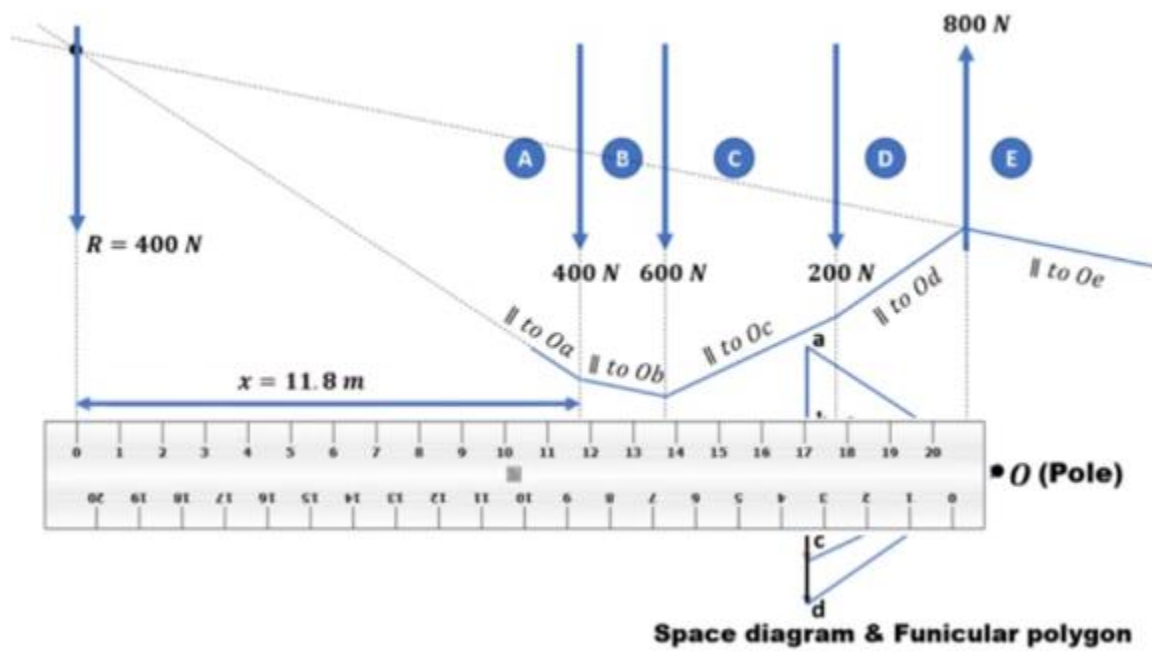
Step 6:



Step 7:

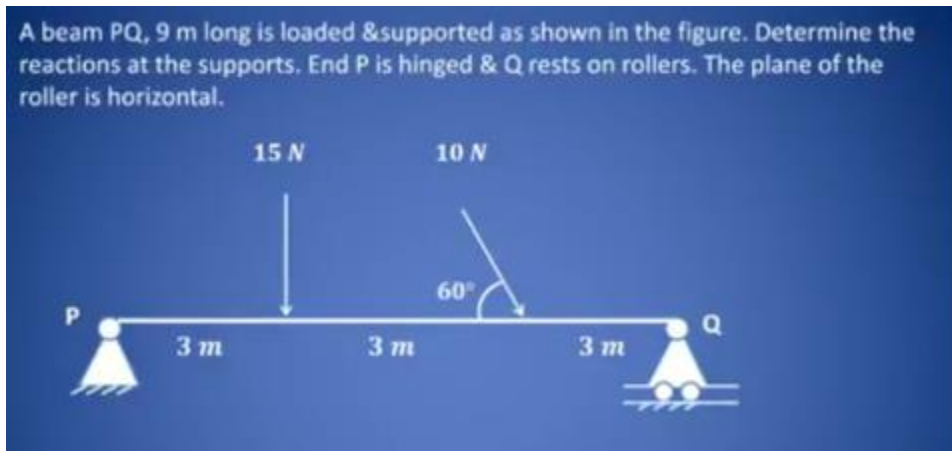


Step 8:

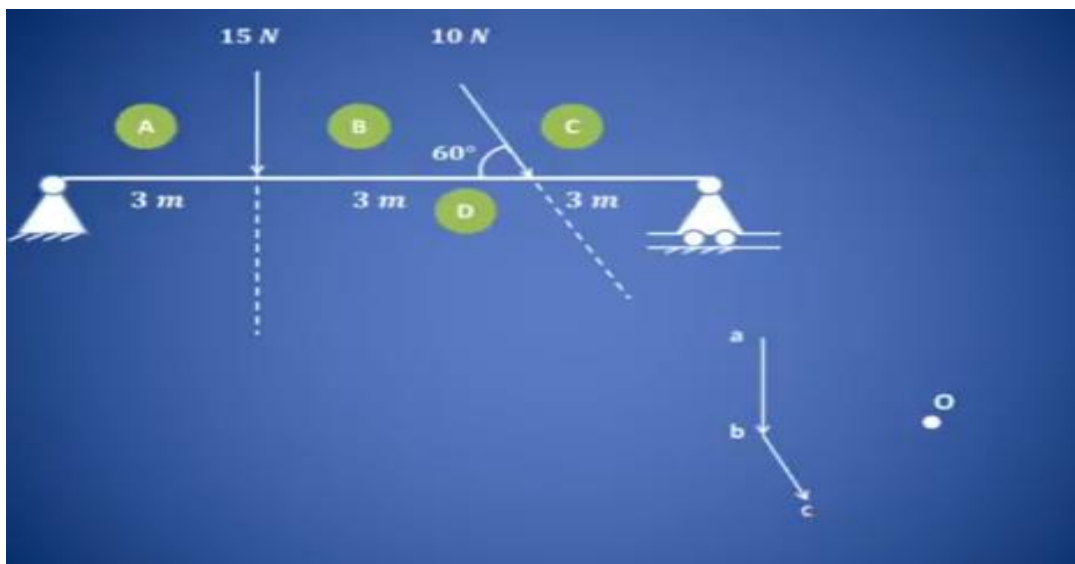
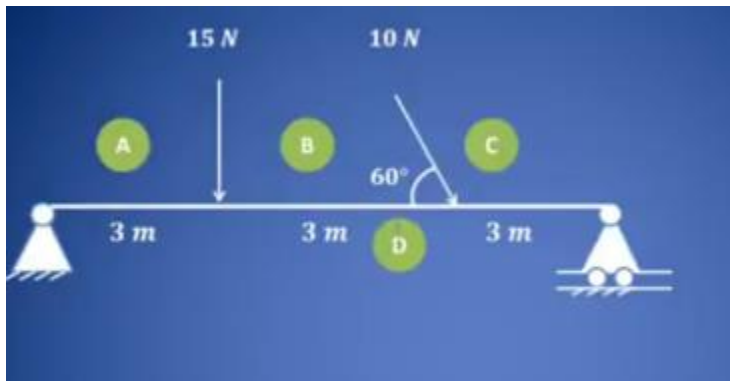


Problem 2:

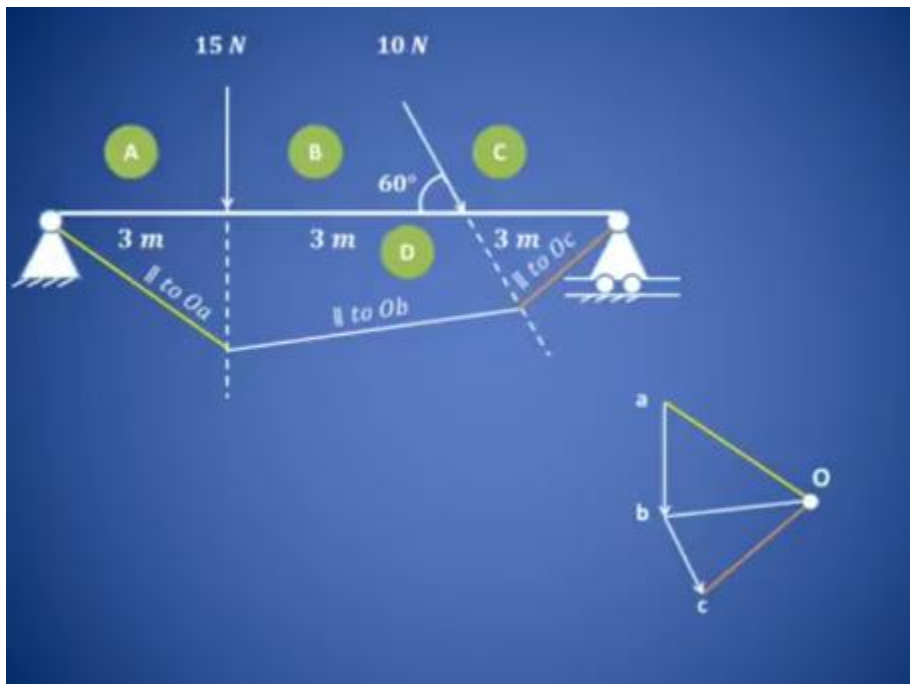
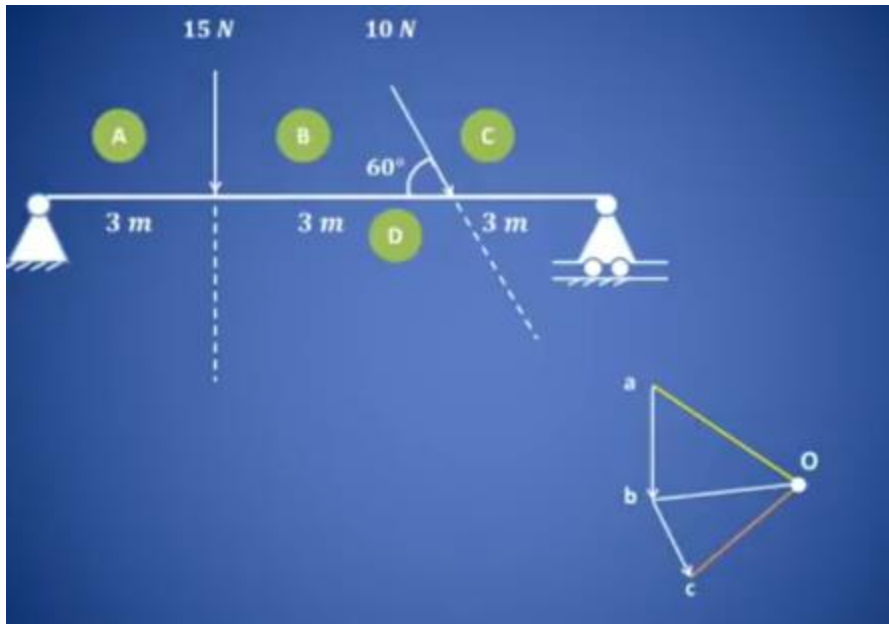
A beam PQ, 9 m long is loaded & supported as shown in the figure. Determine the reactions at the supports. End P is hinged & Q rests on rollers. The plane of the roller is horizontal.

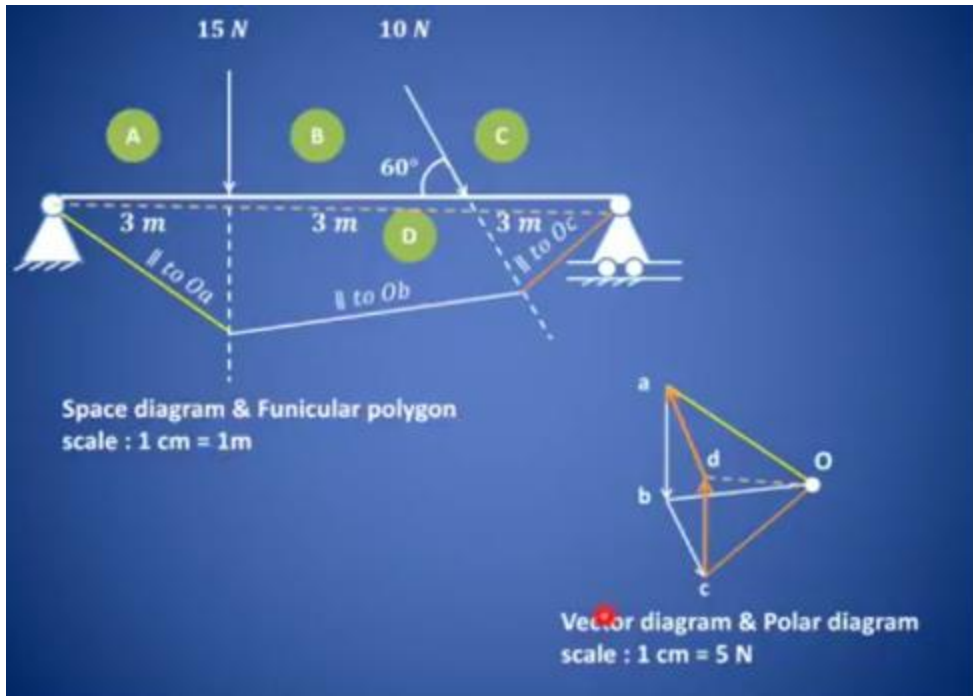


Solution:

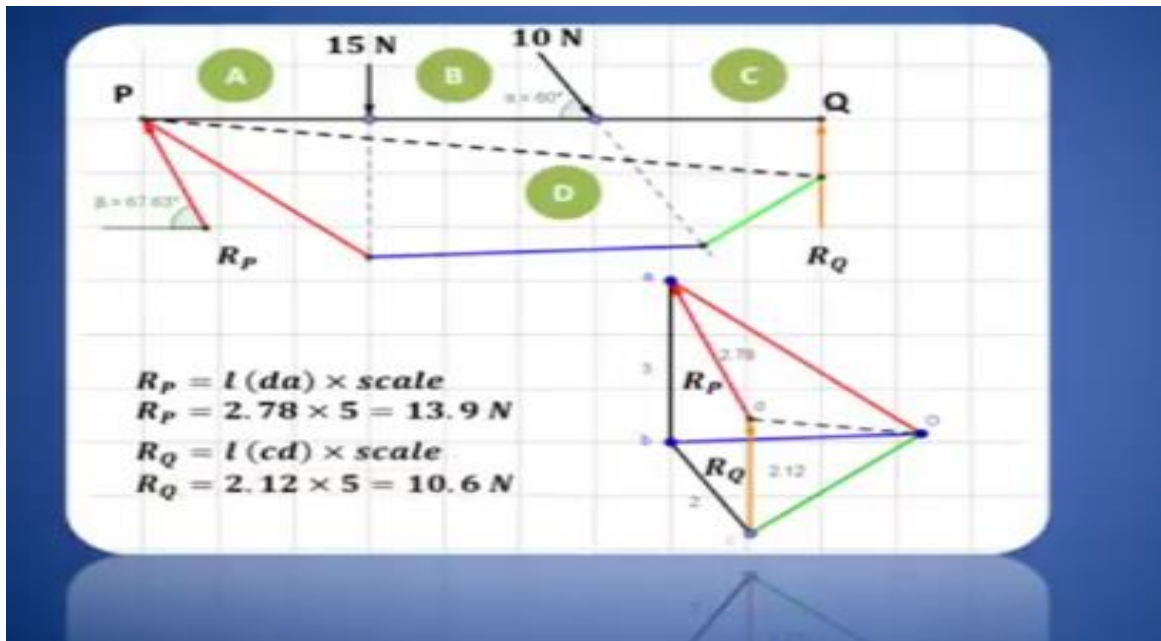


Taking scale 1cm = 5N





cd is vertical line representing the roller force and ad is inclined representing the hinged force.



The reaction at Q is perpendicular to the roller support which balances the 15N force .

The reaction at P is inclined to the hinged support as it balances the 10N force.