

**Course Code: ESC106A**  
**Course Title: Construction Materials and Engineering  
Mechanics**

**Lecture No. 17:**  
**Problems on Coplanar Non-Concurrent Force  
Systems**

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# Lecture Intended Learning Outcomes

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

- Describe Varignon's Theorem
- Apply the method of resolution and find the resultant of coplanar non concurrent force system
- Solve the unknown forces given the resultant of non concurrent force system
- Calculate the angles of applied forces given the resultant of concurrent force system



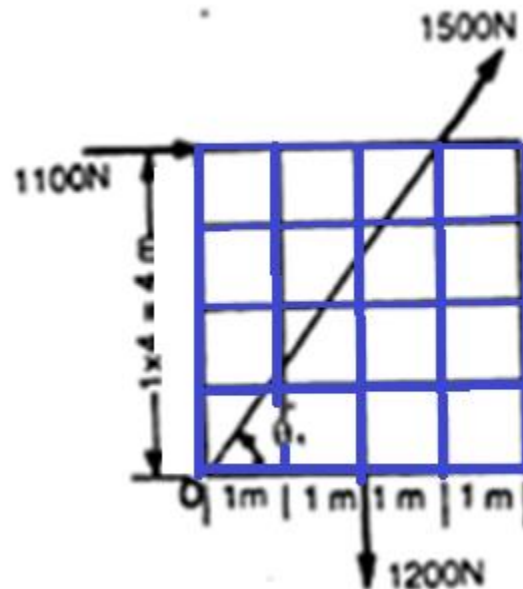
# Contents

Varignon's theorem, coplanar non concurrent force system, problems on coplanar non concurrent force system



# Problems

1. The resultant of four forces of which 3 are shown in the figure is only a couple of moment  $4800\text{Nm}$  of clockwise direction. If each square is one meter on each side, Determine the fourth force completely. Locate it on the system of forces given.

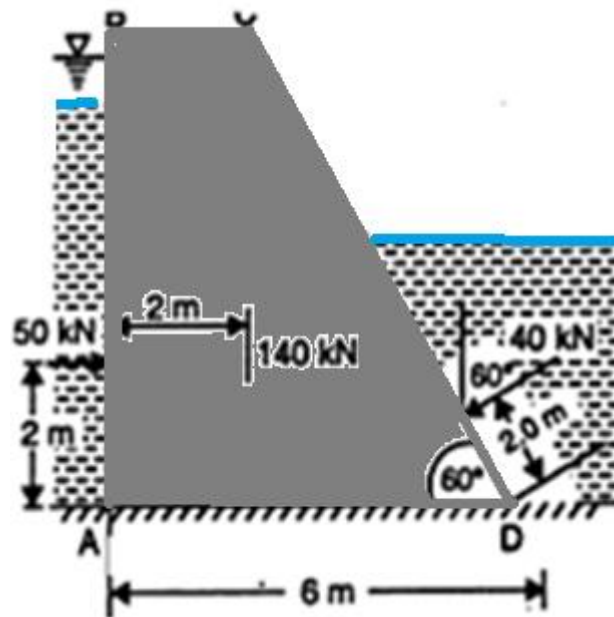


$$P = -2000\text{N}$$
$$x = 1\text{m}$$



# Problems

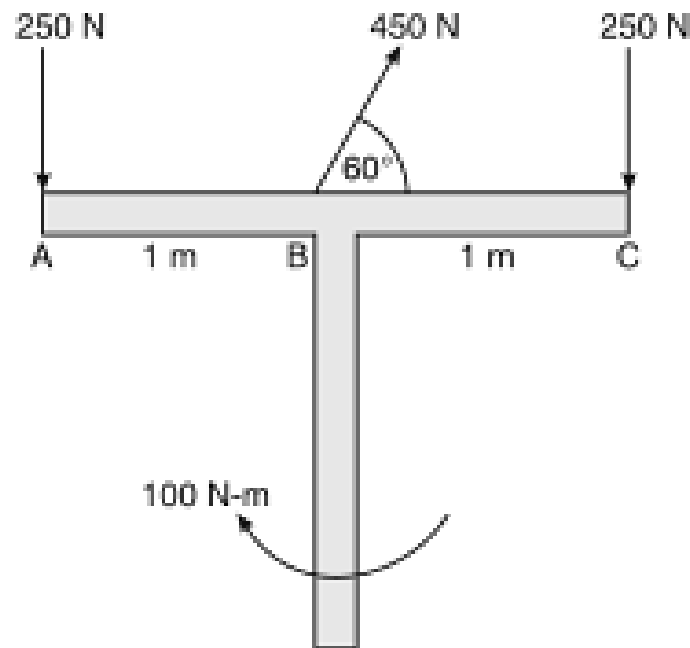
2. Determine the magnitude and x-intercept of the resultant of the force system acting on the dam section as shown in the figure



$$R = 160.74 \text{ kN}$$
$$x = 2.625 \text{ m}$$

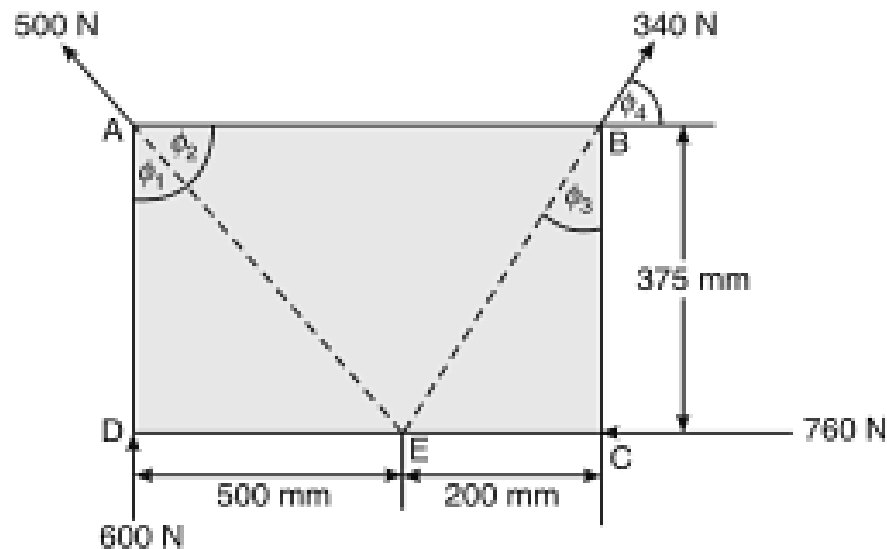
# Problems

3. A bracket is subjected to a coplanar force system as shown in the figure. Determine the magnitude and line of action of single resultant of the system. If the resultant is to pass through B, what should be the magnitude and direction of a couple.



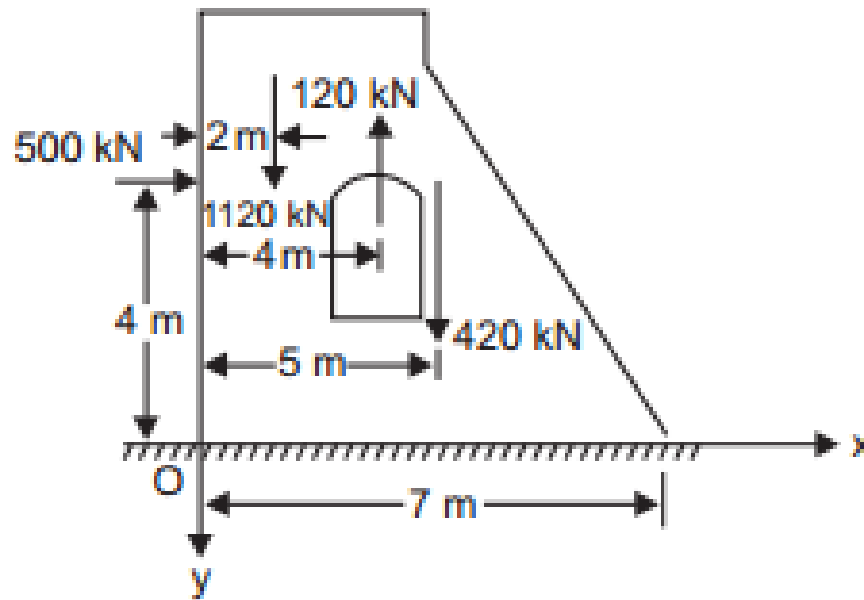
# Problems

- 4.(a) Four forces act on a 700mmx375mm plate as shown in the figure. Find the resultant of these forces and
- (b) Locate the point where the line of action of the resultant intersects the edge AB of the plate.



# Problems

5. Various forces to be considered for the stability analysis of a dam are shown in the Figure. The dam is safe if the resultant force passes through middle third of the base. Verify whether the dam is safe.



$$x = 4.126 \text{ m}$$



# Summary

- The forces can be resolved and the resultant of Coplanar Non Concurrent force system can be obtained
- The concept of Varignon theorem is applied to obtain the moment of the resultant force

