

1. The forces on the gusset plate of a joint in a bridge truss act as shown in figure1. Determine the magnitudes of the two forces P and F to maintain equilibrium of the joint.

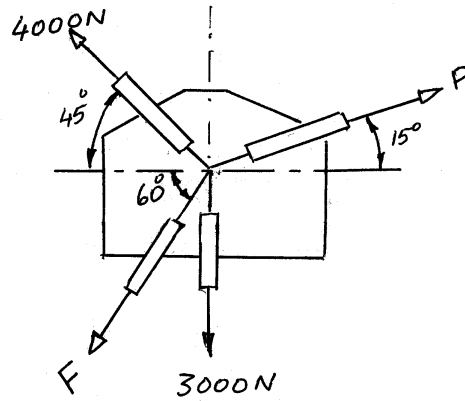
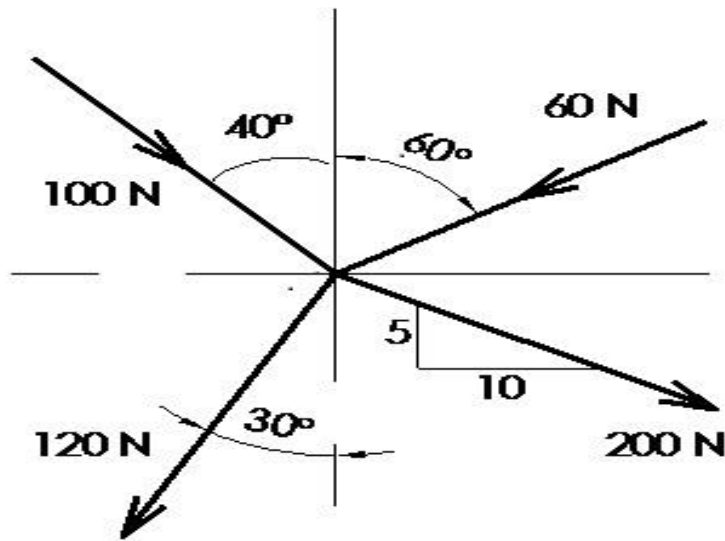


Fig.1

2. Find the magnitude and direction of the Resultant force of given force system (shown below).

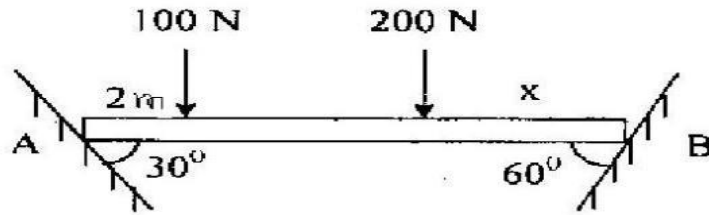


3. Determine the resultant of a system of Concurrent forces having the following magnitudes and passing through the origin and the indicated points.

- P = 3000 N (+12, +6, -4)
- Q = 5000 N (-3, -4, +12)
- F = 2800 N (+6, -3, -6)

4.

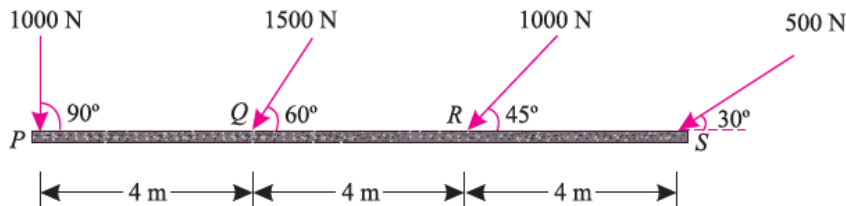
A horizontal bar 10 m long and of negligible weight rests on rough inclined planes as shown in the figure. If the angle of friction is 15° , how close to B may the 200 N force be applied before motion impends.



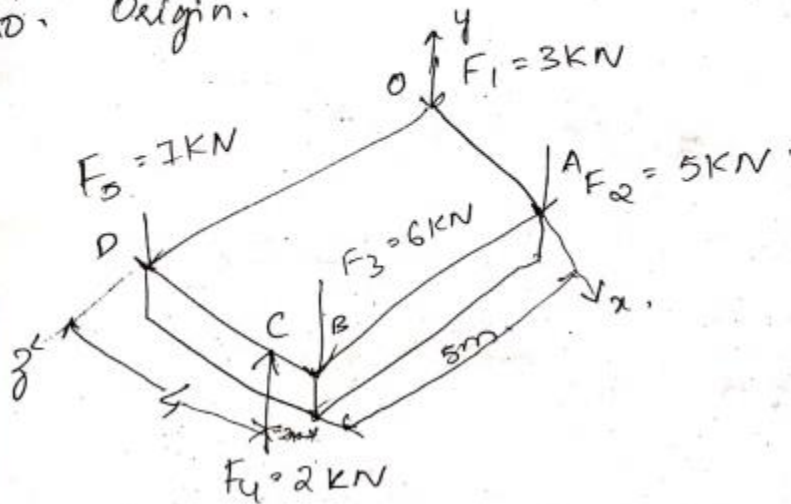
5.

Example 2.9. A horizontal line PQRS is 12 m long, where $PQ = QR = RS = 4$ m. Forces of 1000 N, 1500 N, 1000 N and 500 N act at P, Q, R and S respectively with downward direction. The lines of action of these forces make angles of 90° , 60° , 45° and 30° respectively with PS. Find the magnitude, direction and position of the resultant force.

Solution. The system of the given forces is shown in Fig. 2.7

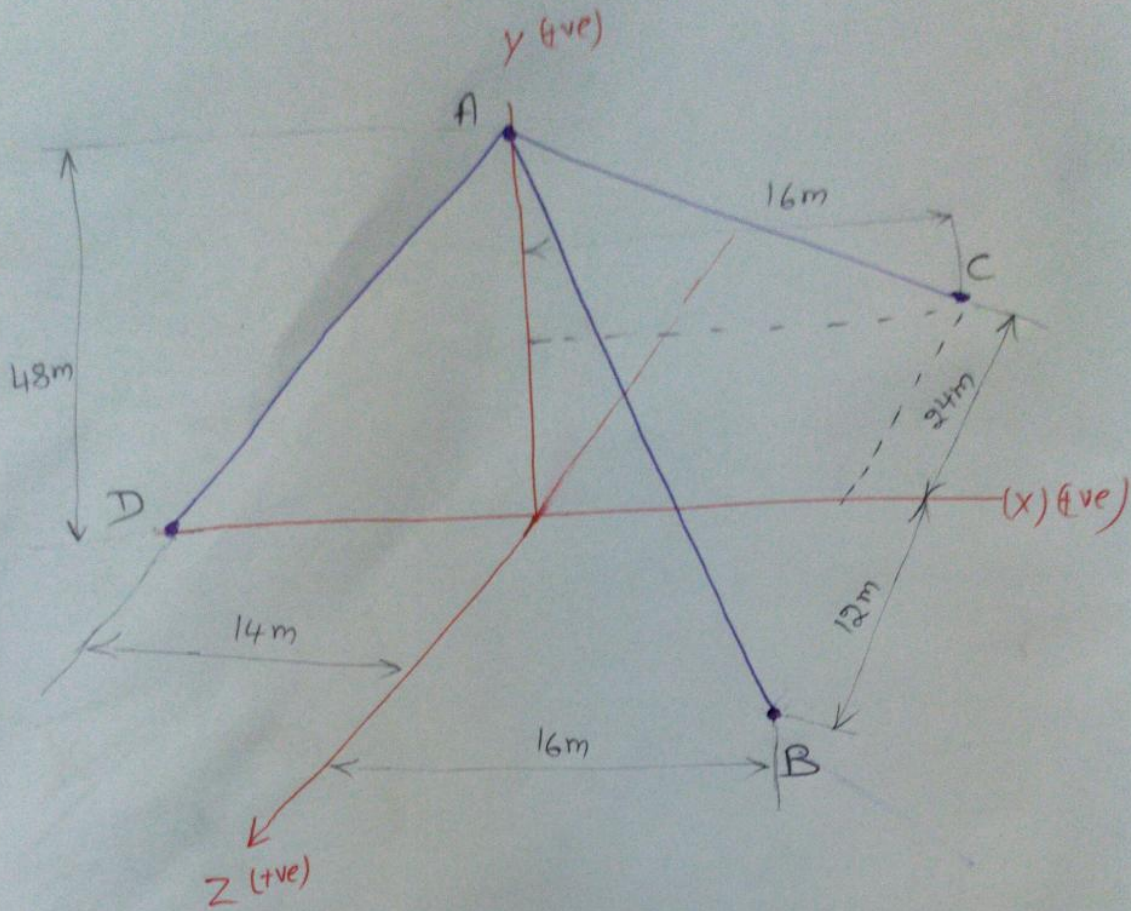


① 5 vertical forces are acting on a horizontal plane as shown in below figure. Find the resultant of the forces. and point of application with respect to origin.



6.

7.



9) Knowing that the tension AC is $T_{AC} = 20\text{ kN}$
 Determine the required values of tension T_{AB} and T_{AD} so that the resultant of the three forces applied at A is vertical and calculate resultant.

8.

Example 5.1. An electric light fixture weighing 15 N hangs from a point C , by two strings AC and BC . The string AC is inclined at 60° to the horizontal and BC at 45° to the horizontal as shown in Fig. 5.3

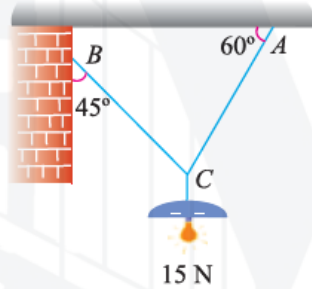


Fig. 5.3.

Using Lami's theorem, or otherwise, determine the forces in the strings AC and BC .

9. A vertical load of 1100 N is supported by the three bars as shown in figure 2. Points O , C and D are on the horizontal plane (i.e., XZ plane) while point B is 5 m above the XZ plane. Point A is along the Y axis, at a height of 20 m from the XZ plane

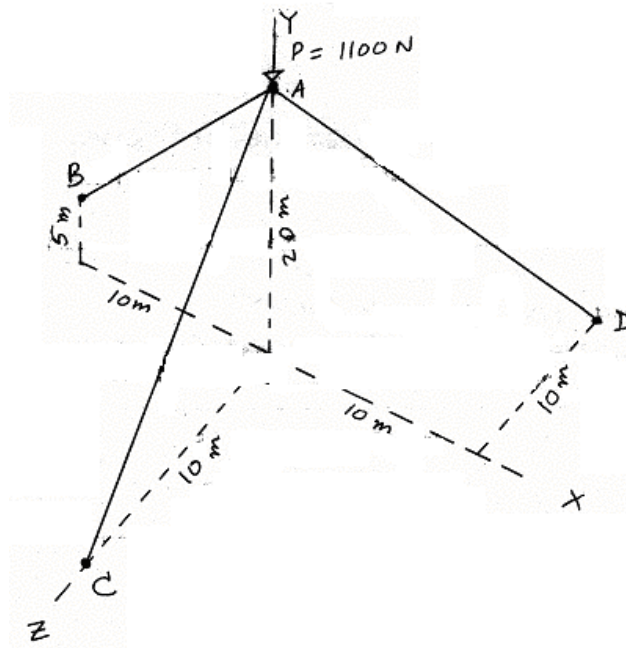
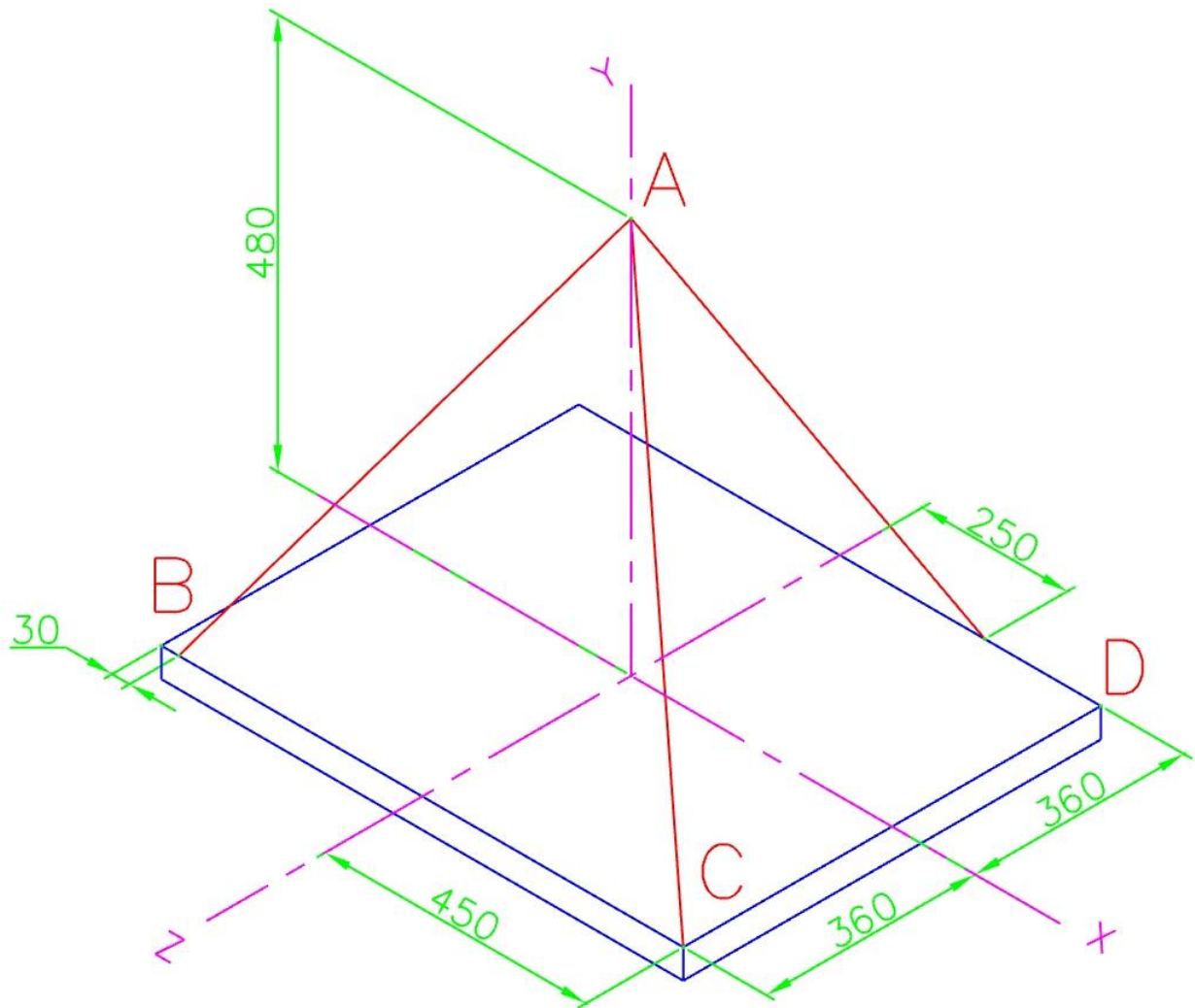


Fig.2

10. A rectangular plate is supported by 3 cables as shown in below figure. Knowing that tension in cable AD is 520N. find the components of force at point D.



1. Explain Varignon's theorem.
2. State the equations of equilibrium of Coplanar systems.
3. Define free body diagram, transmissibility of a force and resultant of a force.

4. What do you understand by a force and a force system. Classify the force systems.
5. Explain various force systems with neat sketches.
6. A force F is represented by $F = 5i + 2j + 3k$. what is the magnitude of force F . What are the direction cosines of F .
7. Express the force vector of a 100KN force, passing from point $A(2,4,1)$ to point $B(6,7,8)$.
8. Define force and What are the characteristics of a force.
9. State and prove lamis theorem .

- 10 Two forces of magnitude 4 and 5 Newtons act at an angle, of 60° the resultant force is equal to
- | | |
|----------|--------------------|
| (i) 6N | (ii) $\sqrt{61}$ N |
| (iii) 7N | (iv) 10 N |

- 11 Differentiate between kinematics and kinetics.