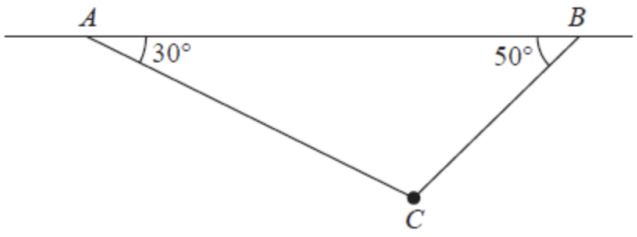
Question 1:



A particle of weight W newtons is attached at C to two light inextensible strings AC and BC. The other ends of the strings are attached to fixed points A and B on a horizontal ceiling. The particle hangs in equilibrium with AC and BC inclined to the horizontal at 30° and 50° respectively.

The tension in BC is 6 N.

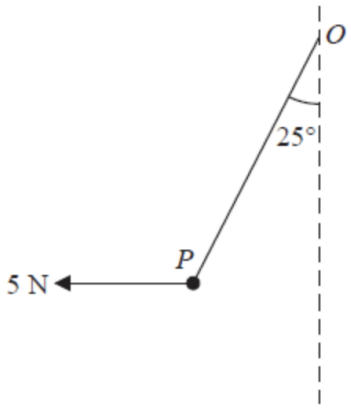
(a) Find the tension in AC.

[3]

(b) Find the value of W.

[3]

Question 2:



A particle P of weight W newtons is attached to one end of a light inextensible string. The other end of the string is attached to a fixed point O. A horizontal force of magnitude 5 N is applied to P. The particle P is in equilibrium with the string taut and with OP making an angle of 25° to the downward vertical.

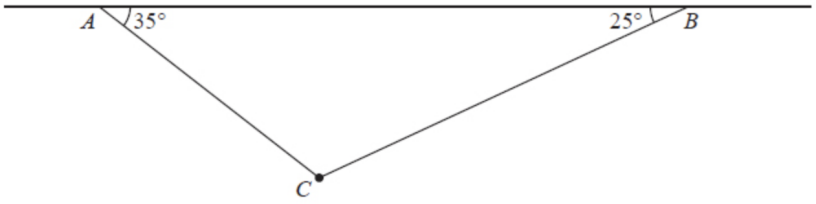
(a) Find the tension in the string.

[3]

(b) Find the value of W.

[3]

Question 3:



A particle of weight 8 N is attached at C to the ends of two light inextensible strings AC and BC. The other ends, A and B, are attached to a fixed horizontal ceiling. The particle hangs at rest in equilibrium, with the strings in a vertical plane. The string AC is inclined at 35° to the horizontal and the string BC is inclined at 25° to the horizontal.

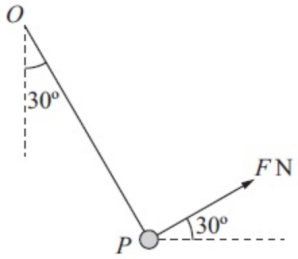
(a) Find the tension in the string AC.

[4]

(b) Find the tension in the string BC.

[4]

Question 4:



A particle P of mass 2 kg is attached to one end of a light string, the other end of which is attached to a fixed point O. The particle is held in equilibrium, with OP at 30° to the downward vertical, by a force of magnitude F newtons. The force acts in the same vertical plane as the string and acts at an angle of 30° to the horizontal.

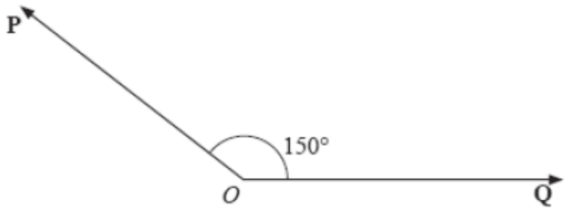
(a) Find the value of F.

[4]

(b) Find the tension in the string.

[4]

Question 5:



Two forces **P** and **Q** act on a particle at a point O. The force **P** has magnitude 15 N and the force **Q** has magnitude X newtons. The angle between **P** and **Q** is 150°. The resultant of **P** and **Q** is **R**.

The angle between **R** and **Q** is 50°.

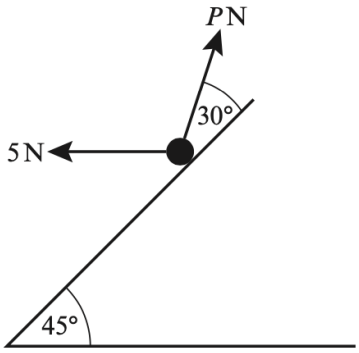
(a) Find the magnitude of **R**.

[4]

(b) Find the value of X.

[5]

Question 6:



A particle of weight 20 N rests in equilibrium on a smooth inclined plane. It is maintained in equilibrium by the application of two external forces. One of the forces is a horizontal force of 5 N, the other is a force P N acting at an angle of 30° to the plane.

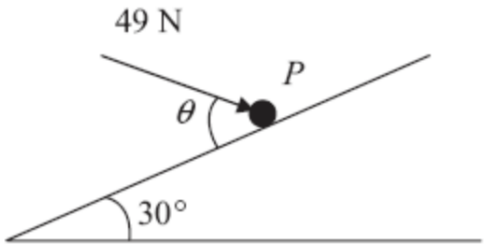
(a) Find the value of P.

[4]

(b) Find the magnitude of the normal reaction between the particle and the plane.

[4]

Question 7:



A particle P of mass 6 kg lies on the surface of a smooth plane. The plane is inclined at an angle of $30°$ to the horizontal. The particle is held in equilibrium by a force of magnitude 49 N, acting at an angle θ to the plane. The force acts in a vertical plane through a line of greatest slope of the plane.

(a) Find the value of $\cos\theta$.

[3]

(b) Find the normal reaction between P and the plane.

[4]

The direction of the force of magnitude 49 N is now changed. It is now applied horizontally to P so that P moves up the plane. The force again acts in a vertical plane through a line of greatest slope of the plane.

(c) Find the initial acceleration of P.

[4]

Numerical Answers:

(1) (a) $T = 4.45$ N
(b) $W = 6.82$ N

(2) (a) $T = 11.83$ N
(b) $W = 10.72$ N

(3) (a) $T_A = 8.37$ N
(b) $T_B = 7.57$ N

(4) (a) $F = g = 9.8$ N
(b) $T = \sqrt{3}g = 17.0$ N

(5) (a) $|\mathbf{R}| = 9.79$ N
(b) $X = 19.3$ N

(6) (a) $P = 20.4$ N
(b) $R = 0.40$ N

(7) (a) $\cos\theta = \frac{3}{5}$
(b) $R = 90.1$ N
(c) $a = 2.17$ ms^{-2}