Mechanics 1 Tutorial 2 9 October 2018

Question 1

A particle moves at constant acceleration in a straight line. It starts from rest and during the seventh second of its motion it covers 15 m.

(a) Determine the magnitude of the acceleration.

(b) Determine the speed of the particle after it has covered 100 m.

Question 2

Determine the time required for a car to travel 1 km along a road if the car starts from rest, reaches a maximum speed at some intermediate point, and then stops at the end of the road. The car can accelerate at 1.5 m/s^2 and decelerate at 2 m/s^2.

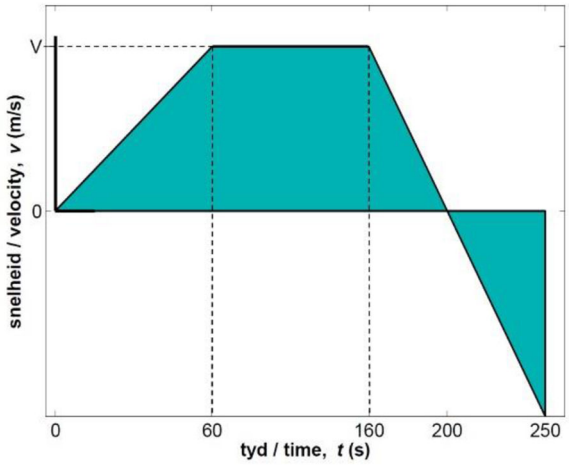
Question 3

The $v - t$ graph describes the velocity of a particle moving in a straight line. Determine V given that:

(a) the average velocity is 6.5 m/s in the positive direction.

(b) the average speed is 13 m/s.

(c) the average acceleration between 60 and 250 seconds is -0.5 m/s^2.



Question 4

A lift moves upwards from rest and accelerates at 0.9 m s^{-2} for 3 s. The lift then travels for 6 s at constant speed and finally slows down, with a constant deceleration, stopping in a further 4 s.

(i) Sketch a velocity-time graph for the motion. [3]

(ii) Find the total distance travelled by the lift. [2]

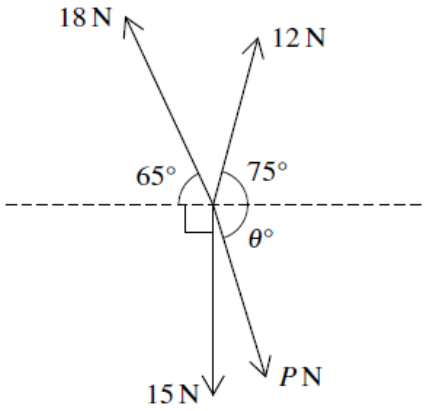
Question 5

A three ton truck (mass = 3000 kg) moves at 36 km/h on a straight road. It is brought to rest by a constant deceleration over a distance of 50 m.

(a) Determine the magnitude of the resistance force.

(b) Determine how long it takes the truck to come to rest.

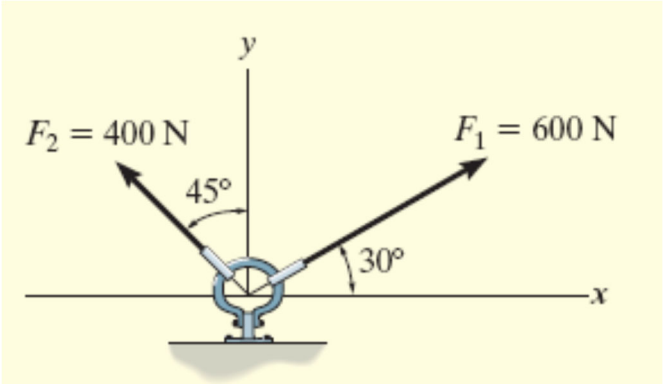
Question 6



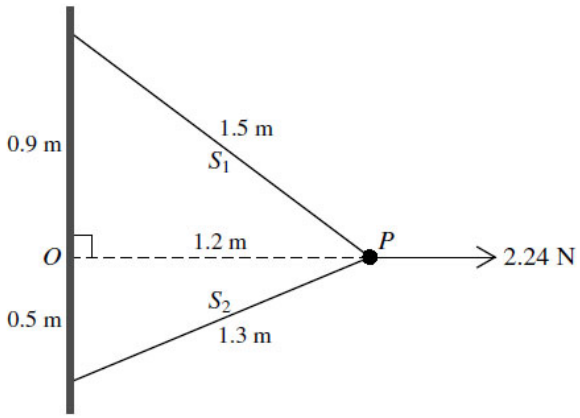
The coplanar forces shown in the diagram are in equilibrium. Find the values of P and θ.

Question 7

The link is subjected to two forces $\mathbf{F}_1$ and $\mathbf{F}_2$. Determine the magnitude and orientation of the resultant force.



Question 8



A particle P of weight 1.4 N is attached to one end of a light inextensible string S_1 of length 1.5 m, and to one end of another light inextensible string S_2 of length 1.3 m. The other end of S_1 is attached to a wall at the point 0.9 m vertically above a point O of the wall. The other end of S_2 is attached to the wall at the point 0.5 m vertically below O. The particle is held in equilibrium, at the same horizontal level as O, by a horizontal force of magnitude 2.24 N acting away from the wall and perpendicular to it (see diagram). Find the tensions in the strings. [6]