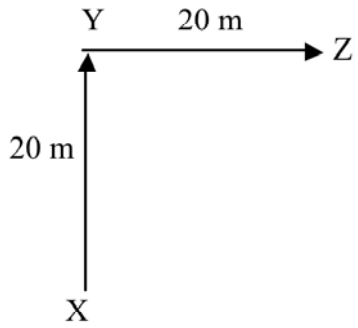
Support Worksheet – Topic 2, Worksheet 1

1 A particle moves on a circle with constant speed. Sketch a graph to show the variation with time of the magnitude of the displacement of the body for one full revolution. Assume that at $t = 0$ s the displacement is zero. [2]

2 The diagram shows the motion of a particle that starts at X, moves to Y and then ends up at Z. The motion lasts for 5.0 s.



Calculate:

a the average speed. [1]

b the average velocity for this motion. [2]

3 Give one example of a motion for which, at a particular instant of time,

a the velocity is zero but the acceleration is not. [1]

b the velocity is non-zero but the acceleration is zero. [1]

4 A particle moves on a straight line with constant acceleration. The initial velocity of the body is $4.0\ \text{m s}^{-1}$ and becomes $6.0\ \text{m s}^{-1}$ 4.0 s later. Determine the distance travelled by the particle in this time. [1]

5 A body is dropped from rest from a large height. Draw sketch graphs to show the variation with time of the speed of the object when air resistance:

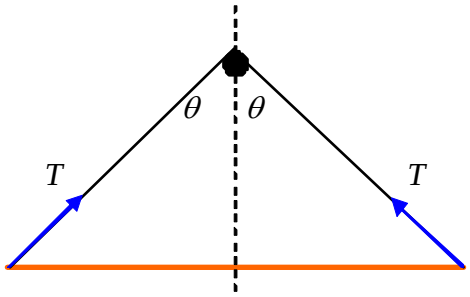
a is negligible. [1]

b is not negligible. [1]

6 A body is dropped from a small height above the ground. Air resistance is negligible. The body rebounds to its original height. Draw a sketch graph to show the variation with time of the velocity of the body from $t = 0$ s until it reaches its original height again. [2]

7 The weight of a body on Earth ($g = 9.8\ \text{N kg}^{-1}$) is 24 N. Calculate the weight of this body on the surface of a planet where $g = 2.2\ \text{N kg}^{-1}$. [1]

8 A rod of weight W is held horizontal by a string attached to the rod's ends. The string goes over a peg.



The tension in the string is T. The magnitude of the force of the peg on the string is

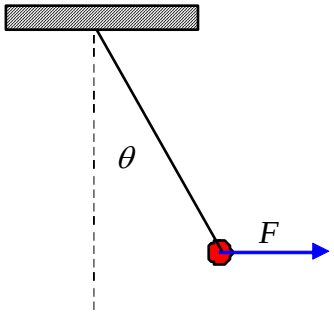
A W

B $2T$

C $2T\cos\theta - W$

D $2T\sin\theta - W$ [1]

9 A ball of weight W hangs from a string that is attached to the ceiling. A horizontal force F acts on the body so that the ball is in equilibrium with the string making an angle θ to the vertical.



Which of the following relations is correct?

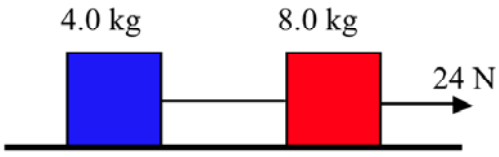
A $F = W$

B $F = W\sin\theta$

C $F = W\cos\theta$

D $F = W\tan\theta$ [1]

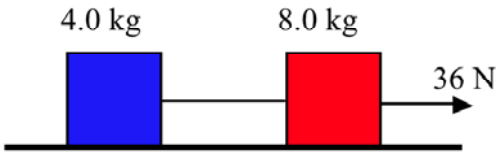
10 Calculate the tension in the string in the diagram below. Friction is neglected.



[2]

11 How would the answer to the previous problem change, if at all, if the positions of the two masses are interchanged? [1]

12 Calculate the tension in the string in the diagram below. The frictional force opposing the motion of the 4.0 kg body is 8.0 N and that for the 8.0 kg body is 16 N.



[2]