

- 1 In a child's toy, a small ball moves along a smooth track. The ball moves down a straight slope and then travels around a vertical circular loop, as shown in Fig. 1.1.

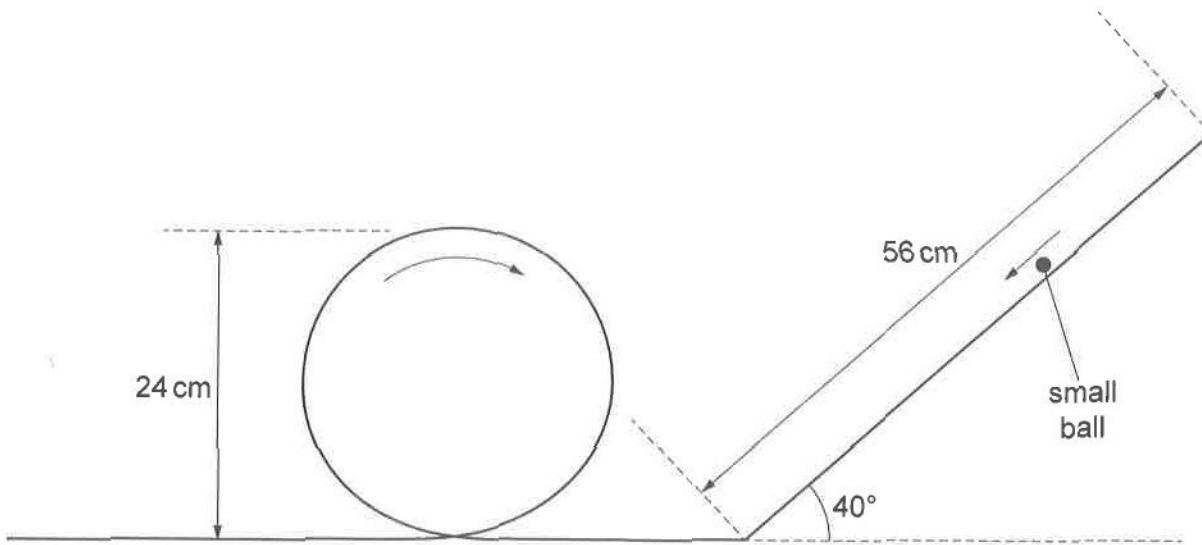


Fig. 1.1

The loop has a diameter of 24 cm.

The slope has a length of 56 cm and is inclined at an angle of 40° to the horizontal.  
Initially, the ball is at rest at the top of the slope.

(a) For the ball moving down the slope:

(i) calculate the acceleration of the ball

$$\text{acceleration} = \dots \text{ ms}^{-2} [2]$$

(ii) use your answer in (a)(i) to determine the speed of the ball at the bottom of the slope.

$$\text{speed} = \dots \text{ ms}^{-1} [2]$$





- (b) The speed of the ball at the top of the loop is  $1.5 \text{ ms}^{-1}$ , as shown in Fig. 1.2.

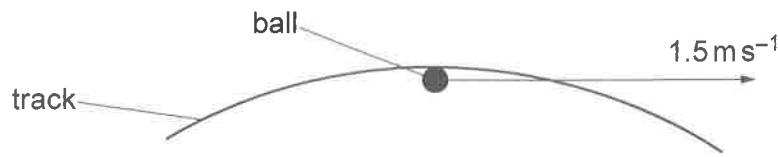


Fig. 1.2

The ball has a mass of 72g.

Determine, for the ball at the top of the loop:

- (i) the magnitude of the centripetal force acting on the ball

force = ..... N [2]

- (ii) the magnitude and direction of the force due to the track acting on the ball.

force = ..... N

direction .....  
[3]

[Total: 9]

