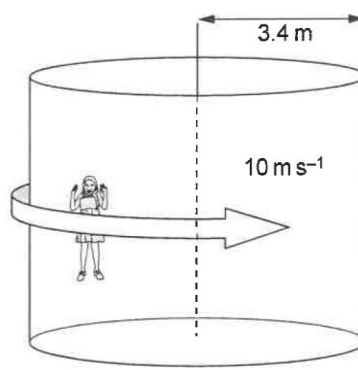


4

An amusement park ride spins customers so fast that they are 'held' to the sides of a vertical wall as shown in Fig. 3.1.



**Fig. 3.1**

A girl of mass 60 kg is spun around at a constant speed of  $10 \text{ m s}^{-1}$  in a circular path of radius 3.4 m.

|

**(a)**

Explain why the girl is accelerating even though her speed is constant.

|

.....

.....

.....

..... [2]

|

**(b)**

**(i)**

Calculate the centripetal force on the girl.

|

centripetal force = ..... N [2]

|

**(ii)**

The wall of the ride exerts a frictional force  $f$  on the girl given by

$$f = \mu N$$

where  $N$  is the normal contact force exerted by the wall on the girl and  $\mu$  is a constant that depends on the roughness of the wall.

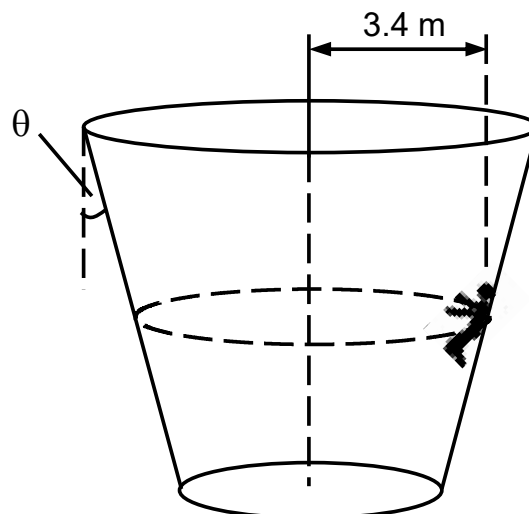
Determine the value of  $\mu$ . Explain your working.

|

$$\mu = \dots\dots\dots [3]$$

(c)

In another similar ride, the wall of the ride is tilted at an angle  $\theta$  to the vertical, as shown in Fig 3.2.



**Fig. 3.2**

The same girl is being spun around at the same constant speed of  $10 \text{ m s}^{-1}$  in a circular path of radius 3.4 m. The girl's feet is not touching the floor of the ride.

Explain whether the girl can remain at constant height while the ride is spinning, if the wall is frictionless.

|

.....

.....

.....

..... [2]

|

[Total: 9]

**[Turn over**