

- 3 (a) An object travelling in a circle of radius  $r$  at constant speed  $v$  is accelerating. By drawing a vector diagram to show the combination of vectors, explain how this is possible.

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- (b) A rider of mass 60 kg was confined in a Rotor, an amusement park ride. The Rotor is a large vertical barrel, rotated about a vertical axis through its centre. The radius of the barrel is 2.5 m. When the barrel is rotated sufficiently fast, the floor is dropped and the rider is stuck to the wall of the barrel.

Fig. 3.1 shows a side-view of the position of a rider when the floor was dropped.

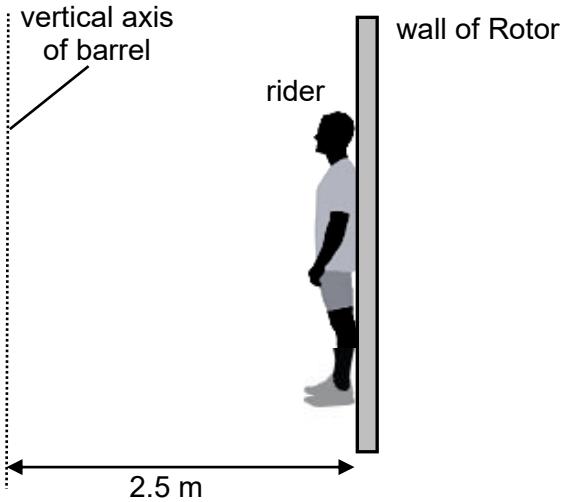


Fig. 3.1 (not drawn to scale)

- (i) On Fig. 3.1, draw arrows to show the forces acting on the rider and label the forces clearly. [2]

- (ii) Explain why the rider is able to go around in a circle without falling off.

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- (iii) The barrel rotates at a uniform rate of 33 revolutions per minute.

Calculate the acceleration of the rider.

$$\text{acceleration} = \dots \text{m s}^{-2}$$

[2]

- (iv) State and explain the amount of work done on the rider throughout the acceleration in (b)(iii).

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[2]