Quiz A2.2

Circular motion

1. Three statements are made for an object moving on a circular path:

   I   The object has acceleration if its speed is changing
   II   The object has acceleration if the direction of velocity is changing
   III   The object has acceleration if the velocity is changing

   Which statements are correct?

   A I and II
   B I and III
   C II and III
   D I, II and III

2. What is an estimate of the angular speed of Earth around the Sun?

   A 10^{-3} rad s^{-1} **B** 10^{-5} rad s^{-1} **C** 10^{-7} rad s^{-1} **D** 10^{-9} rad s^{-1}

3. What is the centripetal acceleration of an object that moves on a circular path of radius 0.5 m making 2 revolutions per second?

   A $2\pi^2$ m s^{-2} **B** $4\pi^2$ m s^{-2} **C** $8\pi^2$ m s^{-2} **D** $16\pi^2$ m s^{-2}

4. The coefficient of static friction between the tyres of a car and the road is 0.6. What is the maximum speed with which this car can take a horizontal circular bend of radius 60 m?

   A $\sqrt{180}$ m s^{-1} **B** $\sqrt{360}$ m s^{-1} **C** $\sqrt{600}$ m s^{-1} **D** $\sqrt{720}$ m s^{-1}
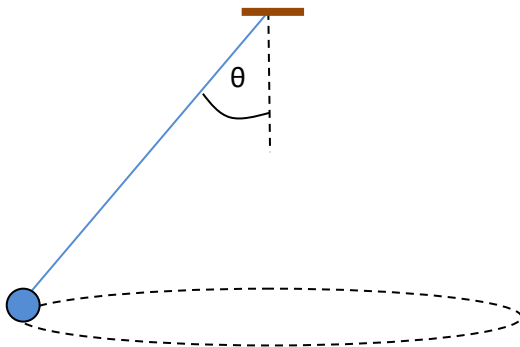
5. A body of mass m is on a horizontal table. A string joins it with another body of mass M through a hole in the table. The mass m rotates on a horizontal circle of radius R with speed v such that M is stationary.
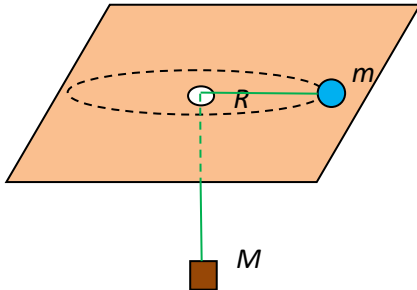
What is the ratio $\dfrac{m}{M}$?

A $\dfrac{gR}{v^2}$ **B** $\dfrac{v^2}{gR}$ **C** $\dfrac{R}{v^2}$ **D** $\dfrac{v^2}{R}$
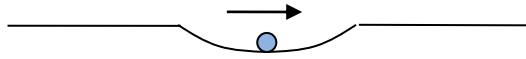
6. A mass moves on a horizontal circular path attached to a string that makes an angle θ with the vertical.

What is the magnitude of the acceleration of the mass?

A g **B** $g\sin\theta$ **C** $g\cos\theta$ **D** $g\tan\theta$

**7.** The particle enters a path that is part of a circle of radius 12 m.

At the position shown, the normal force on the particle from the road is three times the weight of the particle. What is the speed of the particle at this position?

A $\sqrt{120}$ m s^{-1} **B** $\sqrt{240}$ m s^{-1} **C** $\sqrt{360}$ m s^{-1} **D** $\sqrt{480}$ m s^{-1}
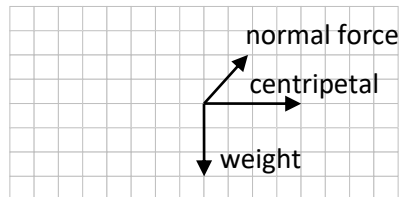
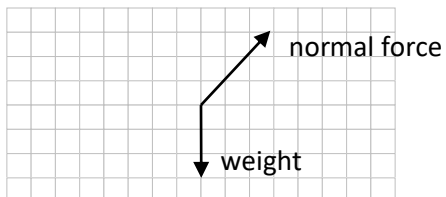**8.** A particle moves on the inside surface of a hemispherical bowl on a horizontal circular path.

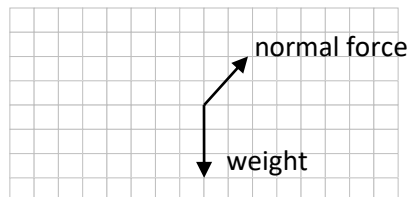Which is a free body diagram of the forces on the particle at the position shown?
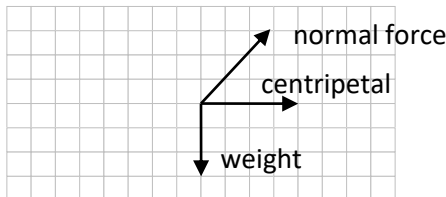

A

B

C

D

9. A string breaks when the tension in it reaches 50 N. A mass is attached to a string of length 3.0 m and made to rotate in a horizontal circle with speed 5.0 m s^{-1}. What is the maximum value of the mass so that the string does not break?

A 3.0 kg   **B** 6.0 kg   **C** 9.0 kg   **D** 12 kg

10. A hemispherical bowl of radius R rotates about a vertical axis with angular speed ω. A particle on the inside surface of the bowl is at rest **relative to the bowl** at a distance r from the axis.
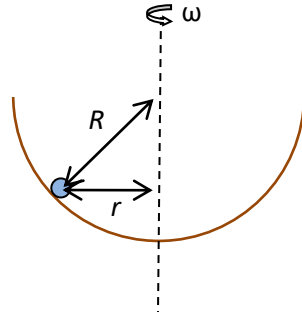
Which is correct?

A $\omega^2 = \dfrac{g}{\sqrt{R^2 - r^2}}$

B $\omega^2 = \dfrac{g}{R - r}$

C $\omega^2 = \dfrac{g}{R}$

D $\omega^2 = \dfrac{g}{r}$

Quiz A2.2 Answers	
1	D
2	C
3	C
4	B
5	A
6	D
7	B
8	C
9	B
10	A