

12. Motion in a circle

Starter Quiz · 课前小测

A-Level Physics

Name: _____ Score: _____

1. One radian is the angle for which the arc length equals the:

- ☐ radius
- ☐ diameter
- ☐ circumference
- ☐ area

2. An object moving round a circle at constant speed is still accelerating because:

- ☐ its velocity keeps changing direction
- ☐ its speed keeps increasing
- ☐ it is slowing down
- ☐ no resultant force acts

3. How many radians are there in a complete circle?

_____ rad

4. An object moves at $4.0 \frac{\text{m}}{\text{s}}$ round a circle of radius 2.0 m. Find its centripetal acceleration.

_____ m/s^2

5. An object goes once round every 2.0 s. What is its angular speed?

_____ rad/s

6. The centripetal force points toward the centre of the circle.

- ☐ True ☐ False

7. Angular speed equals 2π divided by the _____.

8. A 2.0 kg ball moves at $4.0 \frac{\text{m}}{\text{s}}$ round a circle of radius 2.0 m. What centripetal force is needed?

_____ N

9. A point at radius 0.50 m turns at $\omega = 4.0 \frac{\text{rad}}{\text{s}}$. What is its linear speed?

_____ m/s

10. The centripetal force is:

- ☐ the net result of real forces (tension, gravity, friction...)

☐ a brand-new kind of force

☐ always friction

☐ always zero

1. radius

$\theta = \frac{s}{r}$, so when the arc s equals the radius r , the angle is exactly one radian.

2. its velocity keeps changing direction

Velocity is a vector. Even at constant speed, the changing direction means a changing velocity — an acceleration toward the centre.

3. 6.28 rad

A full circle has arc $s = 2\pi r$, so $\theta = \frac{2\pi r}{r} = 2\pi \approx 6.28$ rad.

4. 8 m/s²

$$a = \frac{v^2}{r} = \frac{4.0^2}{2.0} = 8.0 \frac{\text{m}}{\text{s}^2}.$$

5. 3.14 rad/s

$$\omega = \frac{2\pi}{T} = \frac{2\pi}{2.0} = \pi \approx 3.14 \frac{\text{rad}}{\text{s}}.$$

6. True

Yes — always toward the centre, perpendicular to the velocity.

7. period

$$\omega = \frac{2\pi}{T} \text{ — the whole turn } (2\pi) \text{ divided by the time for one turn.}$$

8. 16 N

$$F = \frac{mv^2}{r} = \frac{2.0 \times 4.0^2}{2.0} = 16 \text{ N.}$$

9. 2 m/s

$$v = r\omega = 0.50 \times 4.0 = 2.0 \frac{\text{m}}{\text{s}}.$$

10. the net result of real forces (tension, gravity, friction...)

It is whatever real force(s) happen to point to the centre — not a separate force of its own.