

A-Level Physics

Name: _____ Score: _____

1. One radian is the angle for which the arc length equals the:
☐ area
☐ radius
☐ circumference
☐ diameter
2. An object moving round a circle at constant speed is still accelerating because:
☐ it is slowing down
☐ its speed keeps increasing
☐ no resultant force acts
☐ its velocity keeps changing direction
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 zero
- ☐ always friction

A-Level Physics

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.