

What is Circular Motion?

Worksheet

In circular motion, an object needs a centripetal force $F = mv^2/r$, directed toward the center of the circle, to keep it on its curved path - otherwise it would move in a straight line.

$$a_c = \frac{v^2}{r}$$

Questions

1. In circular motion, the centripetal force points

- A) Away from the center
- B) Toward the center
- C) Tangent to the circle
- D) In the direction of velocity

2. What is the formula for centripetal force?

- A) $F = ma$
- B) $F = mv/r$
- C) $F = mgh$
- D) $F = kx$

3. If speed doubles while mass and radius stay the same, centripetal force becomes

- A) Double
- B) Half
- C) Four times
- D) The same

4. What is the unit of centripetal acceleration?

- A) N
- B) kg
- C) m/s
- D) m/s^2

5. A 0.5 kg ball on a 1 m string spins at 4 m/s. Find the centripetal force.

6. A 1000 kg car rounds a curve of radius 50 m at 20 m/s. Find the centripetal force needed.

7. A 500 kg satellite orbits at radius 710 m with speed 7500 m/s. Find the centripetal force.

8. Define: What is centripetal force?

9. Define: Why does a constant-speed circular object still accelerate?

10. Define: What is centripetal acceleration?

Answer Key

1. B) Toward the center - Centripetal means 'center-seeking' - the force always points toward the center.
2. B) $F = mv^2/r$ - $F = mv^2/r$ relates force to mass, speed squared, and radius.
3. C) Four times - Force v , so doubling speed quadruples the force.
4. C) m/s^2 - Acceleration is always measured in m/s^2 , same as any other acceleration.
5. $F = mv^2/r$ $F = 0.5 \cdot 4 / 1$ $F = 0.5 \cdot 16 / 1$ $F = 8$ N
6. $F = mv^2/r$ $F = 1000 \cdot 20^2 / 50$ $F = 1000 \cdot 400 / 50$ $F = 8000$ N
7. $F = mv^2/r$ $F = 500 \cdot 7500^2 / (710)$ $F = 500 \cdot 56,250,000 / 7,000,000$ $F = 4017.9$ N
8. The net force directed toward the center of a circular path that keeps an object moving in a circle: $F = mv^2/r$.
9. Because velocity is a vector - direction is constantly changing, which means acceleration exists even if speed doesn't.
10. $a = v^2/r$, directed toward the center of the circle.

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