SCIENCE FOUNDATIONS

Circular motion

Difficulty level: Advanced

Science Foundations

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Overview of the concept

This is how you explain why a car needs grip to stay on a roundabout, why a satellite stays in orbit, and why a spinning ride pushes you outward. A driver who takes a bend too fast finds out what happens when there is not enough grip to hold the turn. An engineer uses the same idea to bank a racetrack curve or design a safe roundabout. Knowing circular motion tells you why things that spin need something pulling them inward to keep going around.



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Rule

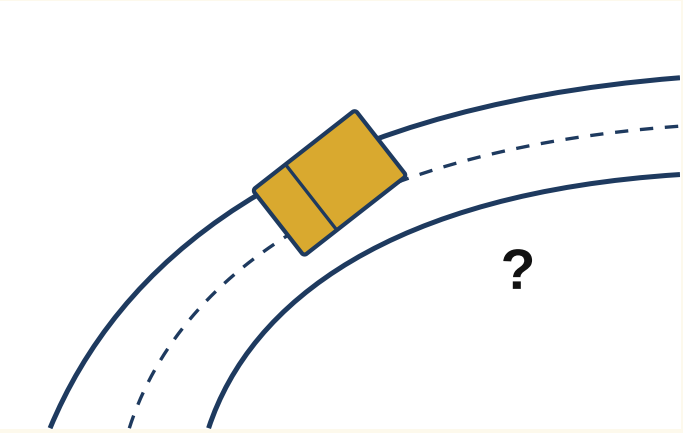
Circular motion: an object moving in a circle is always accelerating toward the centre of the circle, even at constant speed, because its direction keeps changing.

A force pointing toward the centre, called the centripetal force, is what keeps it turning.

Worked examples

EXAMPLE 1

Q A car turns a corner at steady speed. Which way is its acceleration?



SOLUTION

Ask what changes: speed stays the same, direction changes.

Changing velocity means acceleration exists.

Direction: toward the centre of the turn.

The result is acceleration toward the centre.

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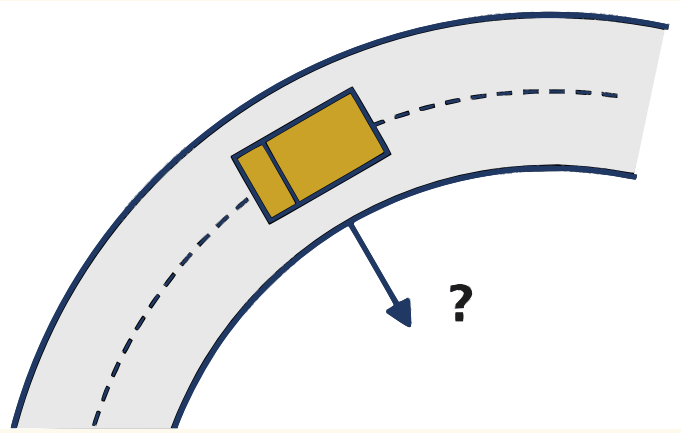
EXAMPLE 2

Q What provides the centripetal force for a car turning?



SOLUTION

Ask what pulls toward the centre: the tyres grip the road.

That grip is friction, acting toward the centre.

Label it the centripetal force.

The result is friction toward the centre.

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Practice questions

1 Centripetal acceleration points where?

- A Toward the centre
- B Away from the centre
- C Along the direction of motion
- D Opposite the direction of motion

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2 At constant speed in a circle, does velocity change?

- A Yes
- B No

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3

At constant speed in a circle, does speed change?

A Yes

B No

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4

A satellite orbits Earth at steady speed. Which way is its acceleration?

A Toward the centre

B Away from the centre

C Along the direction of motion

D Opposite the direction of motion

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5 What provides the centripetal force for a stone whirled on a string?

- A Tension
- B Gravity
- C Friction
- D Air resistance

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6 What provides it for a planet?

- A Gravity
- B Tension
- C Friction
- D Magnetism

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7 Without a centre force, what path?

- A Straight line
- B Circle
- C Spiral inward
- D It stops at once

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8 Centripetal means what?

- A Centre-seeking
- B Centre-fleeing
- C Speed-seeking
- D Straight-moving

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9 Faster around the same circle: force becomes?

- A Larger
- B Smaller
- C It stays the same
- D It becomes zero

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10 Smaller circle at same speed: force becomes?

- A Larger
- B Smaller
- C It stays the same
- D It becomes zero

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ANSWER KEY

1. Toward the centre

2. Yes

3. No

4. Toward the centre

5. Tension

6. Gravity

7. Straight line

8. Centre-seeking

9. Larger

10. Larger

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