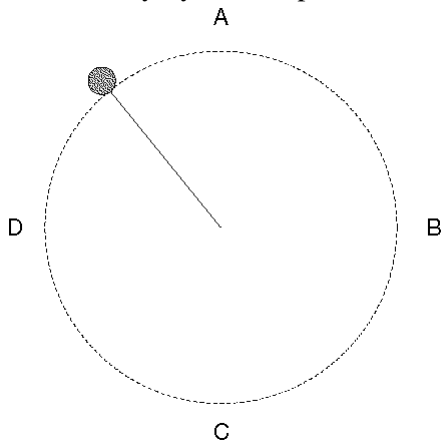


Circular Motion in the Horizontal Plane

Identify the letter of the choice that best completes the statement or answers the question.

Yo-yo Diagram

A yo-yo is fully extended and is being swung clockwise in a horizontal circle on a frictionless surface. It takes 3.5 s for the yo-yo to complete one revolution. The yo-yo travels a distance of 5.3 m from point A to point C.



- ___ 1. Use the yo-yo diagram. At the point labelled “D,” what would be the direction of the velocity vector?
- ←
 - ↑
 -
 - ↓
 - perpendicular to the object’s motion
- ___ 2. Use the yo-yo diagram. What would be the direction of the acceleration vector at the point labelled “D”?
- ←
 - ↑
 -
 - ↓
 - perpendicular to the object’s motion
- ___ 3. Use the yo-yo diagram. What is the length of the string?
- 1.7 m
 - 1.8 m
 - 2.7 m
 - 5.3 m
 - 17 m
- ___ 4. Use the yo-yo diagram. What would be the magnitude of the velocity?
- 1.5 m/s
 - 1.7 m/s
 - 3.0 m/s
 - 4.8 m/s
 - 9.5 m/s

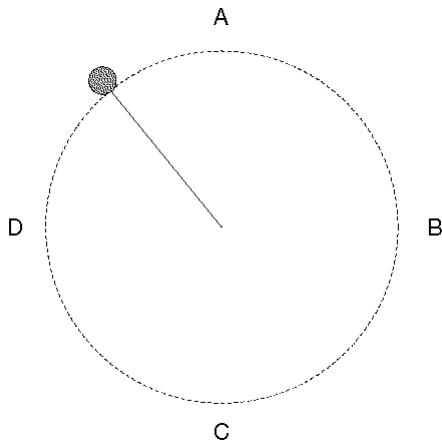
- _____ 5. Use the yo-yo diagram. What would be the magnitude of the acceleration?
- 17 m/s^2
 - 5.3 m/s^2
 - 1.7 m/s^2
 - 1.3 m/s^2
 - 0.42 m/s^2
- _____ 6. A 750 g rock is attached to a string that is 1.20 m in length. A centripetal force of 7.23 N acts on the rock when it is moving in a horizontal circle on a frictionless surface. What is the velocity of the rock?
- 11.6 m/s
 - 9.30 m/s
 - 3.40 m/s
 - $2.94 \times 10^{-1} \text{ m/s}$
 - $1.08 \times 10^{-1} \text{ m/s}$
- _____ 7. A small child stands on the outer edge of a carousel that is 3.50 m in diameter. What centripetal force will the 35.0 kg child experience if the carousel makes four revolutions in 10 s?
- $3.0 \times 10^4 \text{ N}$
 - $1.5 \times 10^4 \text{ N}$
 - $9.7 \times 10^2 \text{ N}$
 - $7.7 \times 10^2 \text{ N}$
 - $3.9 \times 10^2 \text{ N}$
- _____ 8. The centripetal force acting on a mass of 300 g that is moving in a horizontal circle is 25 N. If it takes the mass 0.64 s to complete one revolution, what is the length of the string to which the mass is attached?
- 19 cm
 - 86 cm
 - 1.2 m
 - 3.4 m
 - 5.2 m
- _____ 9. A mass of 250 g is attached to a string that is 50 cm in length. The centripetal force acting on the mass is 21 N. How many revolutions will occur in 5.0 s?
- 0.48 revolutions
 - 1.2 revolutions
 - 2.1 revolutions
 - 2.4 revolutions
 - 10.3 revolutions
10. A 68 kg cyclist executes a turn and experiences a centripetal force of 120 N. If the cyclist took the turn at a speed of 5.3 m/s, what is the radius of the curve?
11. A 250 g rock is attached to a string that is 90 cm in length. The force of tension in the string is 50 N when the rock is moving in a horizontal circle on a frictionless surface. How many revolutions does the rock make in 1.0 s?
12. A wooden horse is 6.2 m from the centre of a carousel. The carousel makes five revolutions every minute. What centripetal force will be experienced by a 32 kg child riding the horse?

13. A mass of 300 g is attached to a string that is 1.21 m in length. The mass is whirled in a horizontal circle on a surface and completes 7.00 rotations in a time of 2.71 s. The force of tension in the string is 92.7 N. Determine the force of friction between the mass and the surface.
14. The Moon has a mass of 7.34×10^{22} kg and takes 27.3 days to make one revolution around Earth. The Moon has an average distance of 3.80×10^8 m from Earth.
- Determine the centripetal force acting on the Moon.
 - What force is responsible for this centripetal motion?

Graphics

For the following questions, use the graphics provided to review terms or skills. Add any missing labels, draw any missing parts, or use the graphics to help you answer a question.

15. A 1.2 kg rock attached to a string is whirled clockwise in a horizontal circle on a frictionless surface. The rock moves 8.7 m, moving from point A to point D, and completes five revolutions in a time of 7.2 s. Determine the tension in the string.



16. A skipping device consists of a 750 g ball attached to a string that is 85.0 cm in length, with a loop on the other end to slip over a person's ankle. The person moves his or her leg to whirl the ball in a horizontal circle and jumps over the rope on the other leg. In one exercise, a student determines that the ball completes 12.0 rotations in a time of 4.23 s. The coefficient of friction between the ball and the ground is 0.71. Determine the force of tension in the string.
17. A 10 g coin is placed 20 cm from the centre of a turntable. The coin remains stationary on the moving turntable as the angular speed is increased. The coin slides off the turntable when it reaches a speed of 45 revolutions per minute (rpm). Determine the coefficient of static friction between the coin and the turntable.
18. A 1000 kg car is travelling along a flat section of the highway at a speed of 90.0 km/h. The driver notices a curve in the road ahead, with a radius of 150 m.
- If the pavement is dry and the coefficient of friction between the car tires and the road is 0.820, determine if the car can safely navigate the curve.
 - If the weather has been stormy and the coefficient of friction between the car tires and the road is reduced to 0.340, determine if the car can safely navigate the curve.

