

Week 10 - Uniform Circular Motion and Gravity

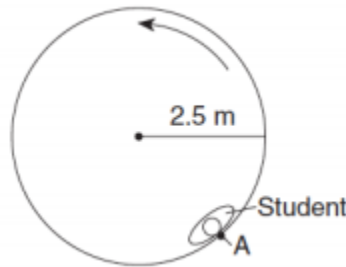
Read Page 106-107 (Centripetal Acceleration)

TQ1. How can an object have a constant speed but still be accelerating?

TQ2. For an object moving in a circular motion, where does the acceleration always point?

TQ3. What does the word centripetal in centripetal acceleration mean?

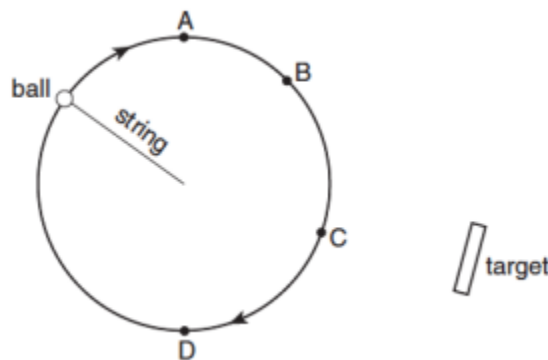
TQ4. What is the equation for centripetal acceleration (top of page 108)?



CQ5. A student is shown above on an amusement park ride spinning in a counter-clockwise circular motion. Which vector below best represents the centripetal acceleration of the student at point A?



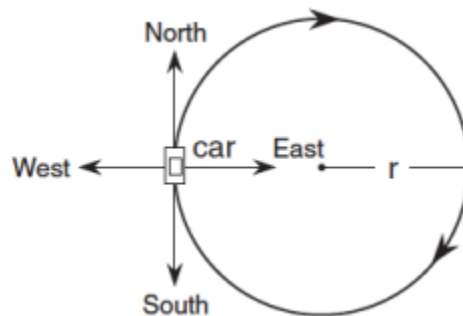
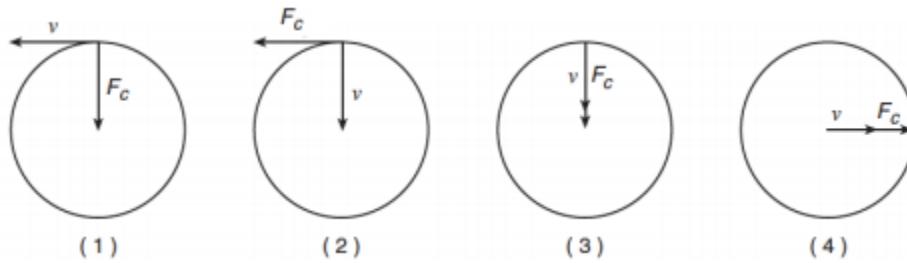
QQ6. If the student in CQ5 has a mass of 70 kg and is spinning at a constant speed of 5.0 m/s at a radius of 2.5m from the center, what is the magnitude of the student's centripetal acceleration?



CQ7. If a ball is attached to the string (as shown above) and is moving in a clockwise circular motion, which point should the string be released in order for the ball to hit the target?

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CQ8. If a car rounds a track with a radius, which diagram below best represents the velocity and the centripetal force on the car?



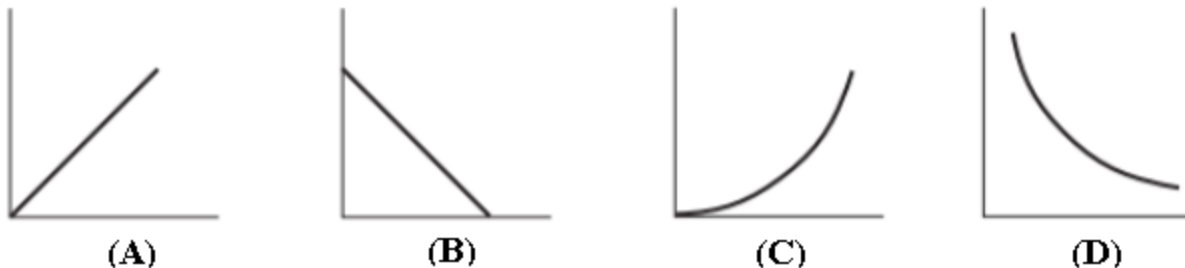
CQ9. A car rounds a curve, as shown above. Which direction best represents the acceleration on the car?

CQ10. Which direction best represents the force on the car (from the diagram above)?

CQ11. Which direction best represents where the car will travel if it hits a patch of ice at the exact point it is at (from the diagram above)?

QQ12. A 2000 kilogram car travels at a constant speed of 12 m/s around a circular curve of radius 30 m. What is the magnitude of the centripetal acceleration of the car as it goes around the curve?

CQ13. Which graph below best represents the relationship between centripetal acceleration and speed (or velocity)?

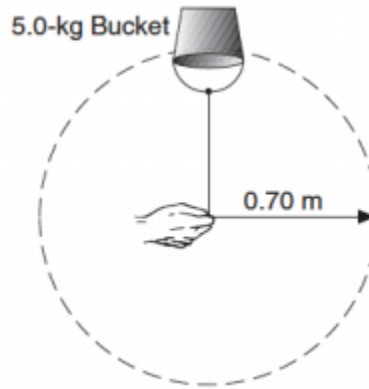


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Read Pages 110-111 (Centripetal Force)

TQ14. What is the combined form for the equation of Newton's 2nd Law for Uniform Circular Motion?

QQ15. A 20 kg object goes around a circular path with a radius of 5 m at a speed of 3 m/s. What is the frictional centripetal force necessary to keep this object in its circular path?



QQ16. If the 5.0 kg bucket at a radius of 0.70 m is traveling at 7.0 m/s, what is the centripetal force on the bucket?

QQ17. If a 2000 kg car is traveling at a constant speed around a curve with a radius of 4 m and has a centripetal frictional force of 32000 N acting on it, what is the speed of the car?

Read Page 114-115 (Vertical Circular Motion)

TQ18. Finish the equation for the normal force of a roller coaster at the **bottom** of the track:

$$F_N =$$

TQ19. Finish the equation for the normal force of a roller coaster at the **top** of the track:

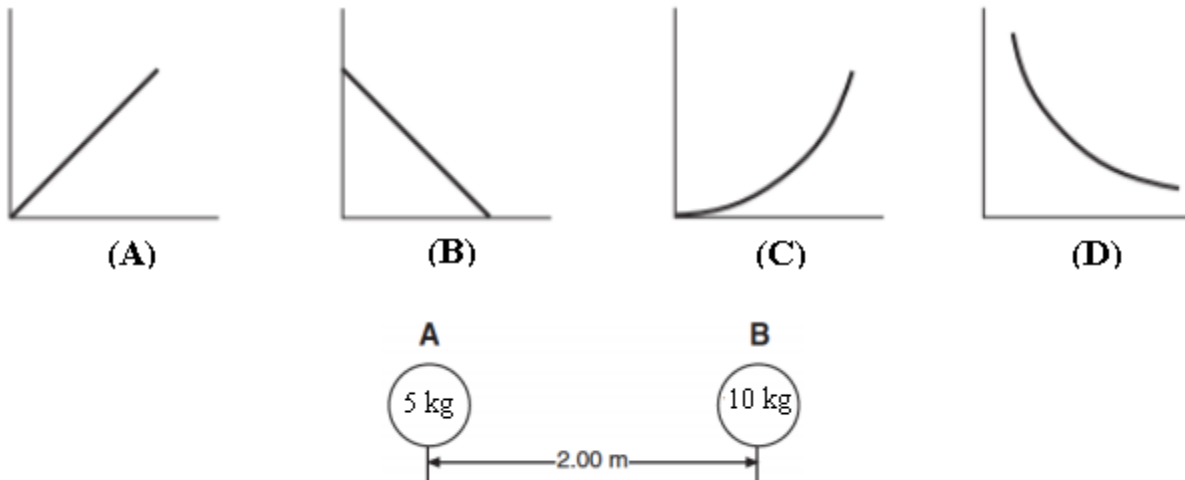
$$F_N =$$

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Read Page 118 (Universal Gravitation)

TQ20. What is the equation for Newton's Law of Universal Gravitation?

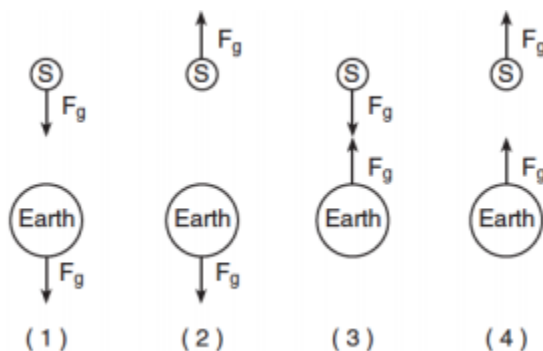
CQ21. Which graph below best represents the relationship between the gravitational force and the distance between two objects?



QQ22. Object A has a mass of 5.00 kg and is 2.00 m away from object B with a mass of 10.00 kg. What is the force of gravitational attraction that object A has due to object B?

QQ23. What will the force of gravitational attraction be for object B due to object A (in the diagram for QQ22)?

CQ24. A satellite orbits the Earth in a circular motion. Which diagram below best represents the forces of gravitational attraction between the satellite and the Earth?



CQ25. An object has a mass of 5.00 kg on Earth. What is the weight of this object on Earth and what is the weight of the object in space?

CQ26. What is the mass of the object in CQ25 in space?