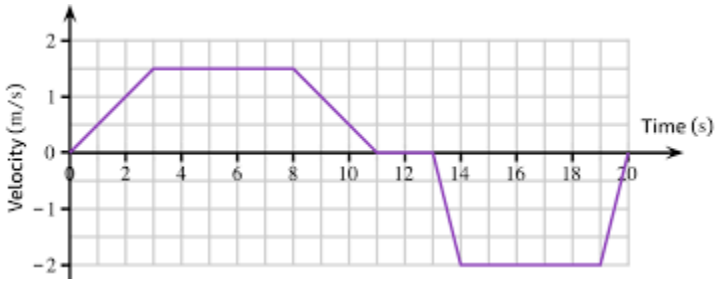
1. Explain why an object moving at a constant speed in a circle is considered to be accelerating, even though the speed does not change.

2. A 10.0 kg object is pushed along a horizontal surface with an applied force of 50.0 N at an angle of 30∘ below the horizontal. The coefficient of kinetic friction is 0.2.
   (a) Draw a free-body diagram for the object.
   (b) Calculate the normal force, the frictional force, and the net acceleration.

3. A ball is thrown horizontally from a height of 45.0 m with an initial speed of 10.0 m/s.
   (a) Determine the time it takes to hit the ground.
   (b) How far does the ball travel horizontally before hitting the ground?
   (c) Sketch a diagram showing the trajectory of the ball and label key points.

4. The velocity-time graph of an object is shown below.
   (a) Describe the motion of the object in terms of acceleration and deceleration.
   (b) Calculate the total distance traveled by the object over the 10.0 s interval.



5. Two masses, m1=5.0 kg and m2=3.0 kg, are connected by a light string over a frictionless pulley.
   (a) Write the equations of motion for each mass.
   (b) Solve for the acceleration of the system and the tension in the string.

6. A 15.0 kg block slides down a 30∘ incline with a coefficient of kinetic friction of 0.25.
   (a) Calculate the acceleration of the block.
   (b) If the incline is 10.0 m long, determine how long it takes the block to reach the bottom.

7. A car moves around a flat circular track at constant speed. If the car suddenly encounters a patch of ice (frictionless surface), explain what happens to the car's motion. Use Newton's laws to support your explanation.

8. A 1200 kg car rounds a curve of radius 50.0 m at 20.0 m/s.
   (a) Calculate the centripetal force required to keep the car moving in the curve.
   (b) If the coefficient of static friction is 0.60, determine whether the car will skid.

9. A 2.0 kg ball is swung in a vertical circle of radius 1.5 m. At the top of the circle, its speed is 3.0 m/s.
   (a) Calculate the tension in the string at the top.
   (b) Determine the minimum speed required at the top to maintain circular motion.

10. Describe an experiment you could conduct to measure the coefficient of static and kinetic friction between two surfaces. Include the materials needed, the procedure, and how you would calculate the coefficients.

11. A 500 kg roller coaster car passes over a hill with a radius of 20.0 m.
   (a) Calculate the normal force acting on the car when its speed is 10.0 m/s.
   (b) Determine the speed at which the car would just lose contact with the track.

12. A 60.0 kg person stands in an elevator that is accelerating upward at $2.0\ m/s^2$.
   a) Calculate the normal force acting on the person.
   (b) If the elevator accelerates downward at $2.0\ m/s^2$, what is the normal force?

13. A hockey puck slides across the ice with an initial velocity of 5.0 m/s. The coefficient of kinetic friction between the puck and the ice is 0.1.
   (a) Calculate the acceleration due to friction.
   (b) Determine how far the puck travels before coming to a stop.

14. A 0.5 kg ball is swung in a horizontal circle of radius 1.0 m at a constant speed of 6.0 m/s.
   (a) Calculate the centripetal acceleration.
   (b) Determine the tension in the string.

15. A 10.0 kg block is pushed along a horizontal surface with a force of 50.0 N applied at an angle of 20∘ above the horizontal. The coefficient of kinetic friction is 0.2.
   (a) Draw a free-body diagram of the block.
   (b) Calculate the normal force.
   (c) Determine the net force and acceleration of the block.

16. A 10.0 kg box is suspended by two ropes, one at an angle of 40∘ to the ceiling and the other at 50∘.
   (a) Draw a diagram of the forces acting on the box.
   (b) Calculate the tension in each rope.

17. A satellite orbits Earth at a constant speed. Explain why it is considered to be in free fall and why it does not crash into the Earth, even though gravity acts on it continuously.