1. A car starts from rest and accelerates uniformly at $3.0\ m/s^2$ for 8 seconds.
   (a) What is its final velocity?
   (b) How far does it travel during this time?

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2. A ball is thrown horizontally from the top of a 45 m building with a speed of 12 m/s.
   (a) How long does it take to hit the ground?
   (b) How far from the base of the building does it land?

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3. A velocity-time graph shows a linear increase from 0 m/s to 20 m/s in 10 seconds, followed by a constant velocity for 5 seconds, and then a uniform decrease to 0 m/s in 5 seconds.
   (a) Sketch the graph.
   (b) Calculate the total distance traveled.

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4. A boat moves across a river at 4.0 m/s relative to the water. The river flows at 3.0 m/s.
   (a) Calculate the resultant velocity of the boat.
   (b) If the river is 60 m wide, how long does it take the boat to cross?

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5. A rock is dropped from a height of 80 m.
   (a) How long does it take to reach the ground?
   (b) What is its velocity just before impact?

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6. A car's velocity increases according to $v(t) = 2t^2\ m/s$.
   (a) Determine the acceleration at $t = 3$.
   (b) Find the distance traveled in the first 5 seconds.

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7. A sprinter runs a 100 m race in 9.58 s. Calculate their average speed in km/h.

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8. A car drives 4 km east, then 3 km north, and finally 4 km west.
   (a) What is the total distance traveled?
   (b) What is the car's displacement?

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9. A train moving at 20 m/s comes to a stop in 50 s.
   (a) Calculate the acceleration.
   (b) How far does it travel while stopping?

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10. A car accelerates uniformly from 0 m/s to 20 m/s over 5 seconds, then travels at a constant speed for 10 seconds, and finally decelerates uniformly to rest in 5 seconds. Calculate the total distance traveled.

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11. A 10 kg box is suspended by two ropes at angles of 30◦ and 60◦ with the ceiling. Calculate the tension in each rope.

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12. A 5.0 kg box slides down a frictionless incline of 30◦.
    (a) Find the acceleration of the box.
    (b) Determine the normal force acting on the box.

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13. A 15 kg crate is pushed with a horizontal force of 50 N, and the coefficient of kinetic friction is 0.3.
    (a) Calculate the frictional force.
    (b) Determine the net force and acceleration.

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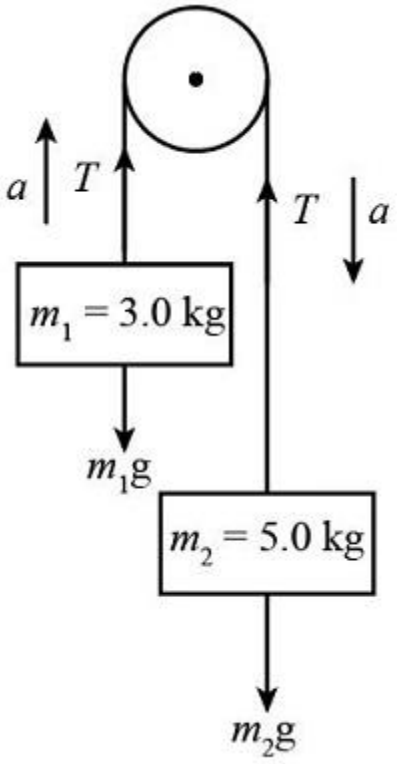
14. Two masses, m1=5.0 kg and m2=3.0 kg, are connected by a light string over a frictionless pulley.
    (a) Find the acceleration of the system.
    (b) Determine the tension in the string.



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15. A 60 kg person stands in an elevator.
    (a) What is the normal force when the elevator accelerates upward at $2.0\ m/s^2$?
    (b) What is the normal force when it accelerates downward at $2.0\ m/s^2$?

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16. A car is moving around a flat curve with a radius of 50 m. The coefficient of static friction is 0.6.
    (a) What is the maximum speed the car can travel without skidding?

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17. A 20 kg box is pushed with a force of 100 N at an angle of 30◦ to the horizontal. The coefficient of kinetic friction is 0.2.
    (a) Calculate the normal force.
    (b) Determine the acceleration of the box.

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18. Two forces, 50 N at 30◦ and 70 N at 120◦, act on a 10 kg object. Find the resultant acceleration of the object.

19. A rocket of mass 500 kg generates a thrust of 10,000 N.
    (a) Calculate its acceleration.
    (b) How long does it take to reach a speed of 100 m/s if starting from rest?

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20. A horse pulls a cart forward. According to Newton's third law, the cart pulls back on the horse with an equal and opposite force. Explain why the cart moves forward if the forces are equal and opposite.