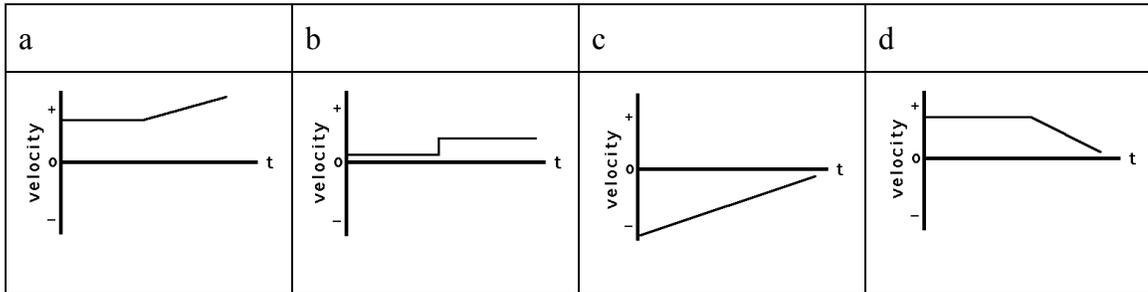


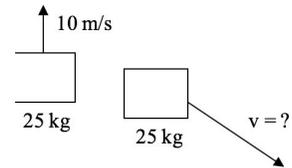
T16

1. A projectile is fired at an angle of 28 degrees to the horizontal with an initial velocity of 24 m/s. Find the range. (a) 38 m (B) 49 m (C) 58 m (D) 69 m (E) None
2. Sketch a velocity-time graph for an object which first moves with a constant speed in the + direction, and then moves with a negative acceleration.



3. You're a 76 kg boater, initially at rest in a stationary 45 kg boat, steps out of the boat and onto the dock. If the boater moves out of the boat with a velocity of 2.5 m/s to the right, what is the final velocity of the boat? (a) 5.2 m/s (B) 4.2 m/s (C) 3.2 m/s (D) 2.2 m/s (E) None

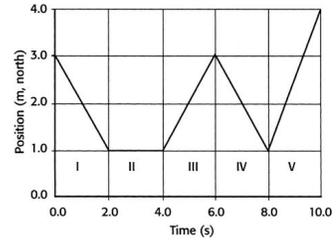
4. Part 1: A cannon shoots a grenade into the air. The grenade has a mass of 50 kg and travels to the right with a speed of 105 m/s. Part 2: You now shoot off a new grenade, with identical mass and velocity to the one in part 1 and it explodes in mid-air. This time, however, it forms just two fragments. One flies straight up (25 kg with 10 m/s), and one downward and to the right (25 kg). Find its Velocity. (a) 205 m/s (B) 200 m/s (C) 225 m/s (D) 210 m/s (e) None



5. A cart with mass 4m has a velocity v before it strikes another cart of mass 3m at rest. The two carts couple and move off together with a velocity of (A) v/2 (B) 4v/7 (C) 3v/5 (D) 2v/3 (E) None
6. A .015 kg ball moves to the right at .225 m/s collide with a .030 kg ball moving left at .180 m/s. After the collision, the smaller ball moves to the left at .315 m/s. Find velocity of .030 kg ball after the collision. (a) .05 m/s (B) .09 m/s (C) .011 m/s (D) None
7. Rank in decreasing order the distances traveled by objects having the following pairs of average velocity and time of motion.

I. $v_{avg} = +2.0 \text{ m/s}, Dt = 2.0 \text{ s}$	(a) I,II,III
II. $v_{avg} = +3.0 \text{ m/s}, Dt = 2.0 \text{ s}$	(b) II,III,I
III. $v_{avg} = -3.0 \text{ m/s}, Dt = 3.0 \text{ s}$	(c) II,I,III
	(d) III,II,I
	(e) None

8. The position vs. time graph on the right shows the motion of a dog pacing along a fence. Describe the dog's motion when it is at 1.0 m for the first time. (a) It rests for 2.0 seconds (b) It changes direction from south to north (C) It moves for 2.0 seconds (D) It rests for 1 second (E) None
9. Rashidul Bari dropped a hammer from the top of Empire State Building. Find its velocity at the end of 3 seconds? (A) 29.4 m/s (B) 39.4 m/s (C) 49.4 m/s (D) 59.4 m/s (E) None



Use the Velocity Vs. Time graph on the right for problems 10-15:

10. What is the acceleration of the object between 0 s and 2 s?

- A. 0 m/s² B. 1 m/s² C. 2 m/s²
 D. 3 m/s² E. 4m/s²

11. What is the acceleration of the object between 2 s and 6 s?

- A. 0 m/s² B. 1 m/s² C. 2 m/s²
 D. 3 m/s² E. 4m/s²

12. What is the magnitude of acceleration of the object between 6 s and 10 s?

- A. 0 m/s² B. 1 m/s² C. 2 m/s² D. 3 m/s²
 E. 4m/s²

13. How far from the origin does the object move in first 2 s?

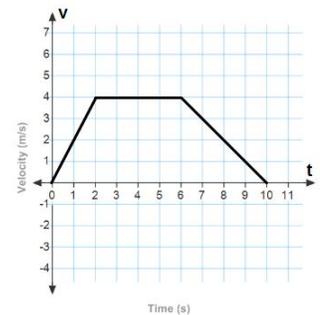
- A. 4 m B. 16 m C. 20 m D. 28 m E. 36 m

14. How far from the origin does the object move in first 6 s?

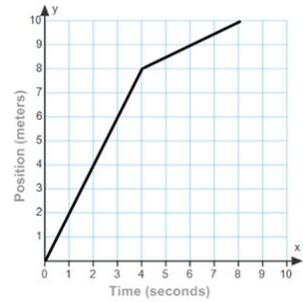
- A. 4 m B. 16 m C. 20 m D. 28 m E. 36 m

15. How far from the origin does the object move in first 10 s?

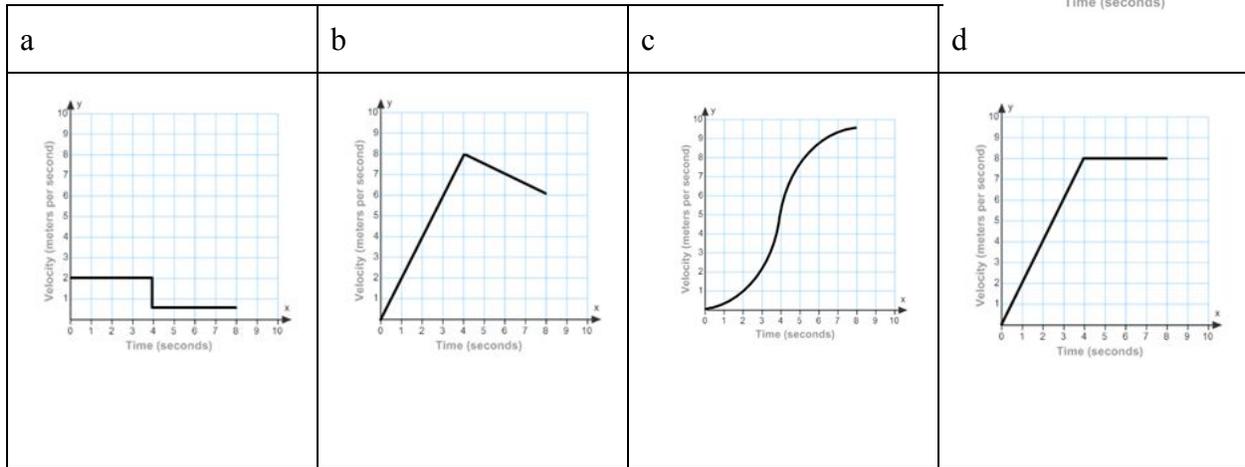
- A. 4 m B. 16 m C. 20 m D. 28 m E. 36 m



The position vs. time graph of a moving object is shown to the right. Use this graph to answer questions 16 through 17



16. What is the average acceleration from 4 s to 8 s?
 A. 0 m/s^2 B. 1 m/s^2 C. 2 m/s^2 D. 3 m/s^2 E. 4 m/s^2
17. Which of the following is the velocity vs. time graph?



18. A student attaches a rope to a 20 kg box of books. He pulls with a force of 90 N at an angle of 30 degree with the horizontal. The coefficient of kinetic friction between the box and sidewalk is .5. The acceleration is close to (a) .12 m/s/s (B) 134 m/s/s (C) 136 m/s/s (D) 138 m/s/s (E) None

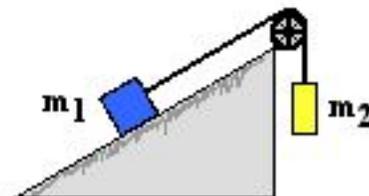
19. A crate is pulled to the right (positive x axis) with a force of 950 N, to the left with a force of 1520 N, upward with 5120 N and downward with 4050 N. Find the net force (a) 1210 at 62 degree above the 1520 N force (B) 25 N (C) 30 N (D) 35 N (E) None

20. A 65 kg woman descends in an elevator that briefly accelerates at 0.10 g downward when leaving the floor. She stands on a scale that read in Kg. During this acceleration, what does the scale read in Kg? (A) 52 Kg (B) 59 Kg (C) 65 Kg (D) 69 Kg (E) None

21. A 6.0-newton force and an 8.0-newton force act concurrently on a point. As the angle between these forces increases from 20° to 80° , the magnitude of their resultant (a) Decrease from 14 to 10 (b) Decrease from 14.6 to 12.6 (C) Decrease from 13.8 to 10.8 (D) Decrease 12.8 to 11.8 (E) None

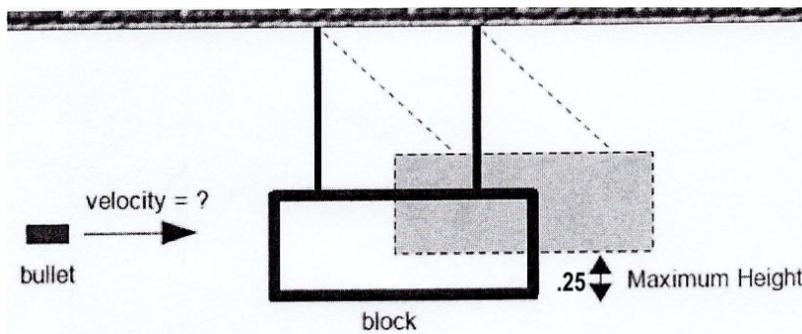
22. A 24 KG crate initially at rest on a horizontal floor requires a 165 N horizontal force to set it in motion. Once the chair in motion, a 127 N horizontal force keep it moving at a constant velocity. Find the coefficient of static and kinetic friction between create and the floor. (a) .67, .52 (B) .52, .67 (C) .26, .20(d) .20, .26 (E) None

23. (USE $g = -9.8 \text{ m/s}^2$) Consider the two-body situation at the right. A 3100 Kg crate (m_1) rests on an inclined plane and is connected by a cable to a 1000 kg mass (m_2). This second mass is suspended over a pulley. The incline angle is 30° and the surface has a coefficient of friction of 0.1. The acceleration is close to (a) .52 m/s/s (B) .59 m/s/s (C) 3 m/s/s (d) .67 m/s/s (e) None



24. Find the distance between a .300 kg ball and a .400 kg ball if the magnitude of gravitational force between them is $8.9 \times 10^{-11} \text{ N}$ (a) $3 \times 10^{-1} \text{ m}$ (B) $4 \times 10^{-2} \text{ m}$ (C) $5 \times 10^{-3} \text{ m}$ (D) $3 \times 10^{-21} \text{ m}$ (E) None

25. A test used to measure the speed of bullets is to fire a bullet at a block of wood that is hung like a pendulum. By measuring the maximum vertical height of the block of the wood with the bullet lodge in it, allow one to calculate the initial speed of the bullet. If a bullet has a mass of .2 kg and the block has a mass of 3kg, when the bullet collide with the block of the wood the pendulum swing to a maximum height of .25 m. Find velocity of the bullet?



(a) 6.145 j (B) 5.145 j (C) 4.145 j (d) 3.145 j (E) None

Short Response (Extra Credit) :

You're driving your car towards an intersection. Rashidul Bari, who drives a Porsche, is stopped at the red light. You're traveling at 40 km/h. As you are 15 m from the light, the light turns green, and the Porsche accelerates from rest at 3 m/s^2 . You continue at constant speed.

1. How far from the stop line do you pass the Porsche? At what time, measured from when the light turned green, do you pass the Porsche? (5 points)
2. As the Porsche keeps accelerating, it eventually catches up to you again. At what time, measured from when the light turned green, does it pass you? (5 points)

