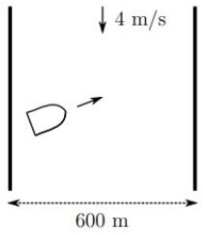
2. A car travels directly north on a straight highway at a constant speed of 80 km/hr for a distance of 25 km. The car then continues directly north at a constant speed of 50 km/hr for a distance of 75 more kilometers. The average speed of the car for the entire journey is closest to

   (A) 55.2 km/hr
   (B) 57.5 km/hr
   (C) 65 km/hr
   (D) 69.6 km/hr
   (E) 72.5 km/hr

5. A projectile is launched with speed v_0 off the edge of a cliff of height h, at an angle θ from the horizontal. Air friction is negligible. To maximize the horizontal range of the projectile, θ should satisfy

   (A) $45° < \theta < 90°$
   (B) $\theta = 45°$
   (C) $0° < \theta < 45°$
   (D) $\theta = 0°$
   (E) $\theta < 45°$ or $\theta > 45°$, depending on the values of h and v_0.

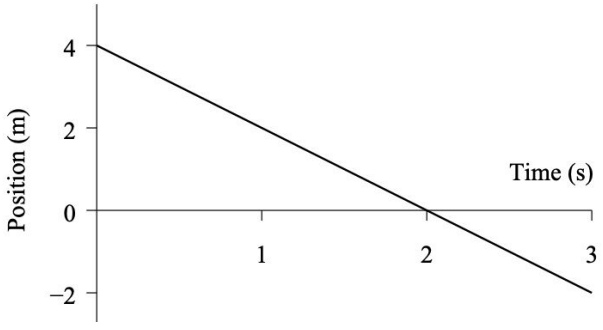
1. A 600 meter wide river flows directly south at 4.0 m/s. A small motor boat travels at 5.0 m/s in still water and points in such a direction so that it will travel directly east relative to the land.



   The time it takes to cross the river is closest to

   (A) 67 s
   (B) 120 s
   (C) 150 s
   (D) 200 s
   (E) 600 s

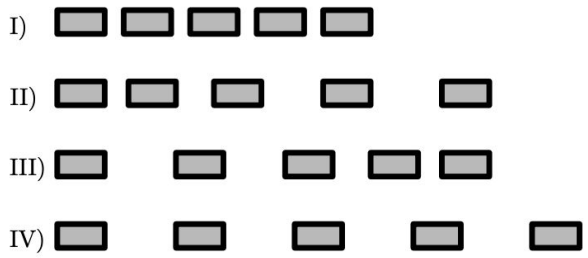
3. The position *vs.* time graph for an object moving in a straight line is shown below. What is the instantaneous velocity at $t = 2$ s?



2. A cannonball is launched with initial velocity of magnitude v_0 over a horizontal surface. At what minimum angle θ_{min} above the horizontal should the cannonball be launched so that it rises to a height H which is larger than the horizontal distance R that it will travel when it returns to the ground?

   (A) 28.5 km
   (B) 30.3 km
   (C) 31.2 km
   (D) 36.5 km
   (E) 38.9 km

4. Several identical cars are standing at a red light on a one-lane road, one behind the other, with negligible (and equal) distance between adjacent cars. When the green light comes up, the first car takes off to the *right* with constant acceleration. The driver in the second car reacts and does the same 0.2 s later. The third driver starts moving 0.2 s after the second one and so on. All cars accelerate until they reach the speed limit of 45 km/hr, after which they move to the right at a constant speed. Consider the following patterns of cars.

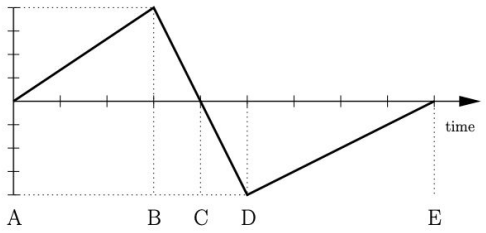


   Just before the first car starts accelerating to the right, the car pattern will qualitatively look like the pattern in I. After that, the pattern will qualitatively evolve according to

   (A) First I, then II, and then III.
   (B) First I, then II, and then IV.
   (C) First I, and then IV, with neither II nor III as intermediate stage.
   (D) First I, and then II.
   (E) First I, and then III.

1. A bird flying in a straight line, initially at 10 m/s, uniformly increases its speed to 18 m/s while covering a distance of 40 m. What is the magnitude of the acceleration of the bird?

   (a) 0.1 m/s^2
   (b) 0.2 m/s^2
   (c) 2.0 m/s^2
   (d) 2.8 m/s^2
   (e) 5.6 m/s^2



1. If the graph is a graph of POSITION vs. TIME, then the squirrel has the greatest speed at what time(s) or during what time interval(s)?

   (A) From A to B
   (B) From B to C only
   (C) From B to D
   (D) From C to D only
   (E) From D to E

2. If, instead, the graph is a graph of VELOCITY vs. TIME, then the squirrel has the greatest speed at what time(s) or during what time interval(s)?

   (A) at B
   (B) at C
   (C) at D
   (D) at both B and D
   (E) From C to D

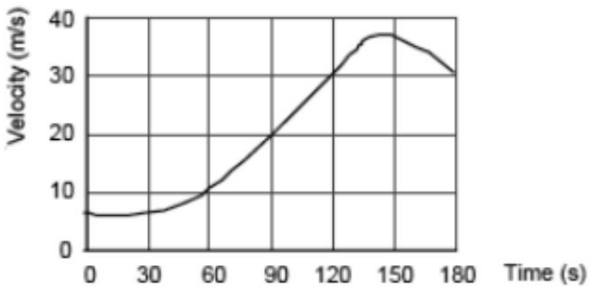
3. If, instead, the graph is a graph of ACCELERATION vs. TIME and the squirrel starts from rest, then the squirrel has the greatest speed at what time(s) or during what time interval?

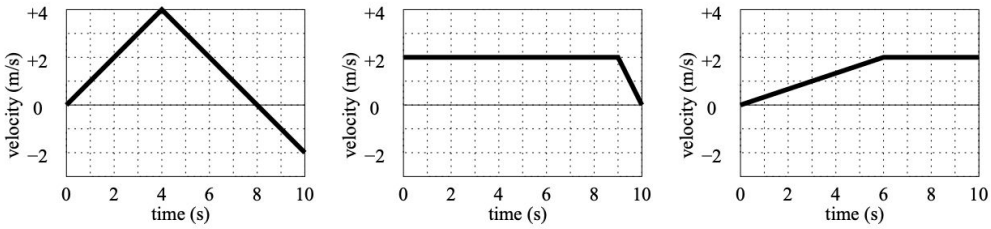
   (A) at B
   (B) at C
   (C) at D
   (D) at both B and D
   (E) From C to D

Is it possible for an object to have zero displacement given that the object had a nonzero acceleration?

2. The graph shows velocity as a function of time for a car. What was the acceleration at time = 90 seconds?

   (a) 0.22 m/s^2
   (b) 0.33 m/s^2
   (c) 1.0 m/s^2
   (d) 9.8 m/s^2
   (e) 30 m/s^2





Object I Object II Object III

2. Rank the *magnitudes* of the average acceleration during the ten second interval.

   (A) I > II > III
   (B) II > I > III
   (C) III > II > I
   (D) I > II = III
   (E) I = II = III

3. Rank the *magnitudes* of the maximum velocity achieved during the ten second interval.

   (A) I > II > III
   (B) II > I > III
   (C) III > II > I
   (D) I > II = III
   (E) I = II = III

4. Rank the *magnitudes* of the *distance* traveled during the ten second interval.

   (A) I > II > III
   (B) II > I > III
   (C) III > II > I
   (D) I = II > III
   (E) I = II = III

Next week's topic is TWO DIMENSIONAL KINEMATICS