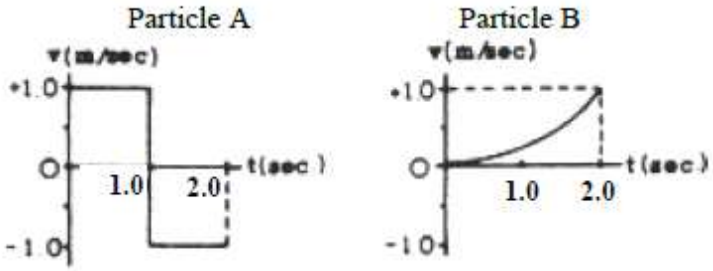
HONORS FIZZIX PREX #1 2015 (Ch1 & 2) - SOLUTIONS

Multiple Guess Section:

1.

Questions 2 – 4 relate to two particles that start at x = 0 at t = 0 and move in one dimension independently of one another. Graphs, of the velocity of each particle versus time are shown below



Which particle is farthest from the origin at t = 2 seconds.
(A) A (B) B (C) they are in the same location at t = 2 seconds (D) They are the same distance from the origin, but in opposite directions (E) It is not possible to determine

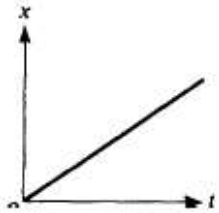
Area bounded by the curve is the displacement By inspection of particle A the positive area between 0 and 1s will be countered by an equal negative area between 1 and 2s. **B**

2.

A body moving in the positive x direction passes the origin at time t = 0. Between t = 0 and t = 1 second, the body has a constant speed of 24 meters per second. At t = 1 second, the body is given a constant acceleration of 6 meters per second squared in the negative x direction. The position x of the body at t = 11 seconds is
(A) + 99m (B) + 36m (C) – 36 m (D) – 75 m (E) – 99 m

Between 0 and 1 s; $d_1 = vt$; from 1 to 11 seconds; $d_2 = v_0t + \frac{1}{2} at^2$; $d = d_1 + d_2$ **C**

3.



The displacement, x, of an object moving along the x-axis is shown above as a function of time, t. The acceleration of this object must be
(A) zero (B) constant but not zero (C) increasing (D) decreasing (E) equal to g

Since the slope is positive and constant, so is the velocity, therefore the acceleration must be zero **A**

4.

An object is released from rest on a planet that has no atmosphere. The object falls freely for 3.0 meters in the first second. What is the magnitude of the acceleration due to gravity on the planet?
(A) 1.5 m/s^2 (B) 3.0 m/s^2 (C) 6.0 m/s^2 (D) 10.0 m/s^2 (E) 12.0 m/s^2

From rest, h = ½ gt2 **C**

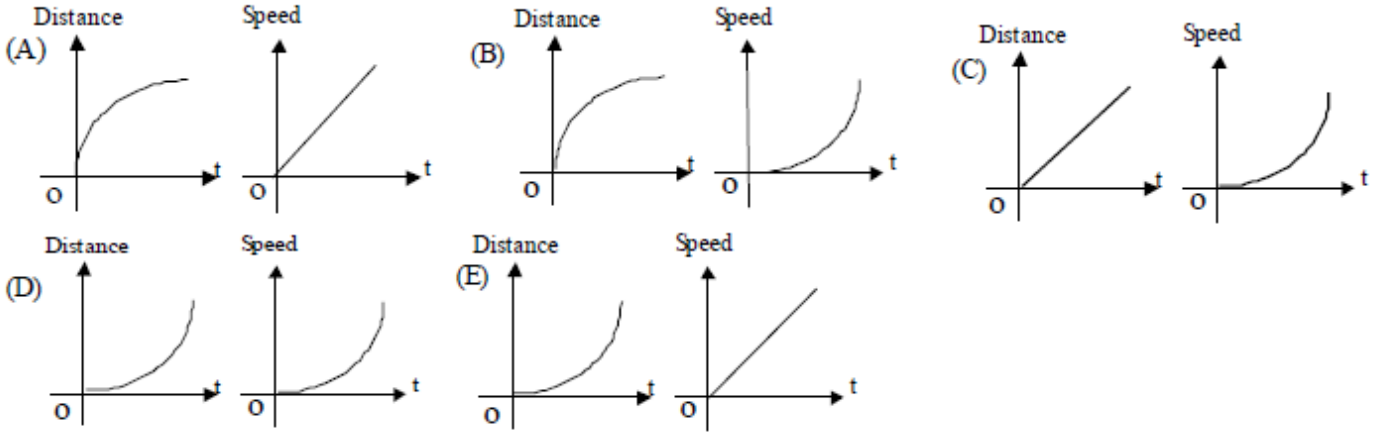
5.

An object released from rest at time t = 0 slides down a frictionless incline a distance of 1 meter during the first second. The distance traveled by the object during the time interval from t = 1 second to t = 2 seconds is
(A) 1 m (B) 2 m (C) 3 m (D) 4 m (E) 5 m

From the equation d = ½ at2, displacement is proportional to time squared. Traveling from rest for twice the time gives 4 times the displacement (or 4 m). Since the object already travelled 1 m in the first second, during the time interval from 1 s to 2 s the object travelled the remaining 3 m **C**

6.

Which of the following pairs of graphs shows the distance traveled versus time and the speed versus time for an object uniformly accelerated from rest?



Uniformly accelerated means the speed-time graph should be a stright line with non-zero slope. The corresponding distance-time graph should have an increasing slope (curve upward) **E**

7.

A rock is dropped from the top of a 45-meter tower, and at the same time a ball is thrown from the top of the tower in a horizontal direction. Air resistance is negligible. The ball and the rock hit the level ground a distance of 30 meters apart. The horizontal velocity of the ball thrown was most nearly
(A) 5 m/s (B) 10 m/s (C) 14.1 m/s (D) 20 m/s (E) 28.3 m/s

From a height of 45 m (= ½ gt2) it takes 3 seconds to strike the ground. In that time, the ball thrown traveled 30 m. v = d/t **B**

8.

In the absence of air friction, an object dropped near the surface of the Earth experiences a constant acceleration of about 9.8 m/s^2. This means that the
(A) speed of the object increases 9.8 m/s during each second
(B) speed of the object as it falls is 9.8 m/s
(C) object falls 9.8 meters during each second
(D) object falls 9.8 meters during the first second only
(E) rate of change of the displacement with respect to time for the object equals 9.8 m/s^2

9.8 m/s2 can be thought of as a change in speed of 9.8 m/s per second. **A**

9.

A 500-kilogram sports car accelerates uniformly from rest, reaching a speed of 30 meters per second in 6 seconds. During the 6 seconds, the car has traveled a distance of
(A) 15 m (B) 30 m (C) 60 m (D) 90 m (E) 180 m

$$\bar{v} = \frac{v_i + v_f}{2} = \frac{d}{t}$$

D

vi = 0 m/s; vf = 30 m/s; t = 6 s;

10.

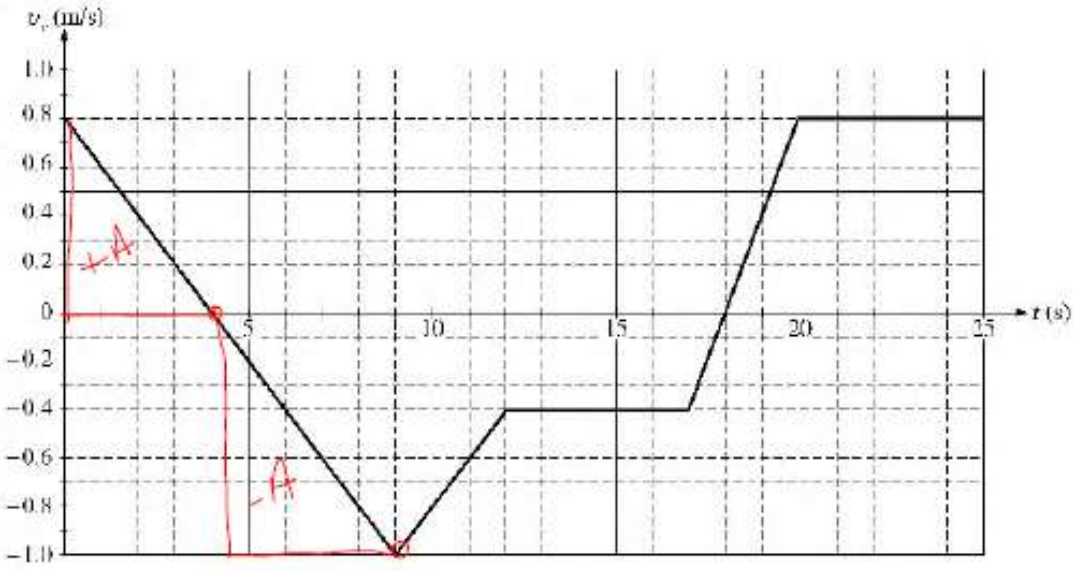
An object is shot vertically upward into the air with a positive initial velocity. Which of the following correctly describes the velocity and acceleration of the object at its maximum elevation?

	Velocity	Acceleration
(A)	Positive	Positive
(B)	Zero	Zero
(C)	Negative	Negative
(D)	Zero	Negative
(E)	Positive	Negative

While the object momentarily stops at its peak, it never stops accelerating downward. D

FREE-RESPONSE SECTION:

A 0.50 kg cart moves on a straight horizontal track. The graph of velocity v_x versus time t for the cart is given below.



(a) Indicate every time t for which the cart is at rest. t = 4 & 18 sec

(b) Indicate every time interval for which the speed (magnitude of velocity) of the cart is increasing. 4-9, 18-20

(c) Determine the horizontal position x of the cart at $t = 9.0$ s if the cart is located at $x = 2.0$ m at $t = 0$.

Area $\frac{1}{2}bh - \frac{1}{2}bh$

$\frac{1}{2}4(.8) - \frac{1}{2}(5)(1)$

$1.6 - 2.5$

-0.9

$\Delta x = 2 - .9 =$ 1.1 m

(d) On the axes below, sketch the acceleration a *versus* time t graph for the motion of the cart from $t = 0$ to $t = 25$ s.