Reminders

- LON-CAPA went down last night. ☹
- So, 1st exam is tomorrow in class. ☺
- LearnSmart is still due tomorrow.
- Homework 2 is still due Sunday at 8pm.
- Exam 2 is still next Monday in class.

CHECK YOUR CLICKER GRADE!
(DEADLINE NEXT FRIDAY)

2D Kinematics

Is it real?

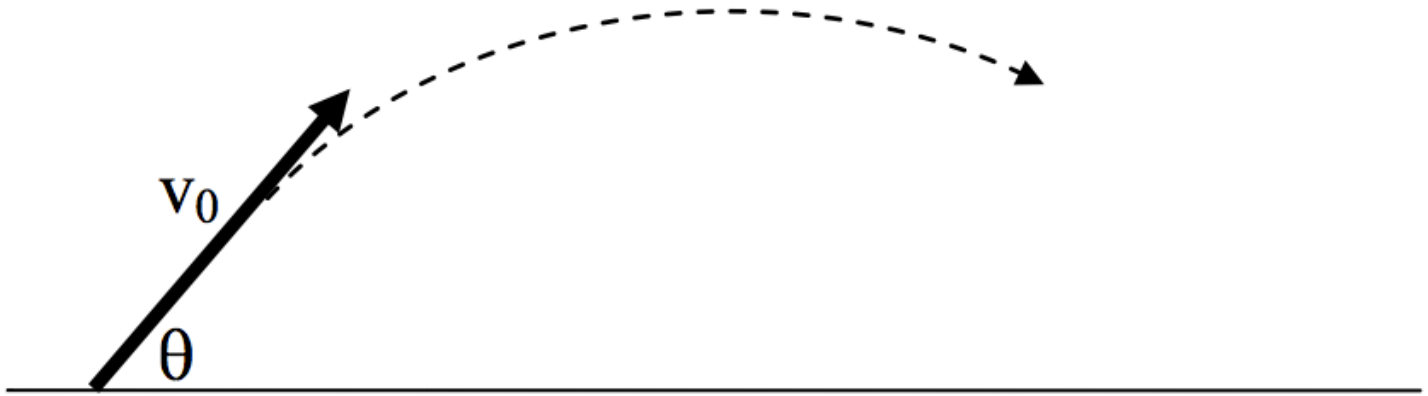
https://www.youtube.com/watch?v=3wAjpMP5eyo

A) Yes

B) No

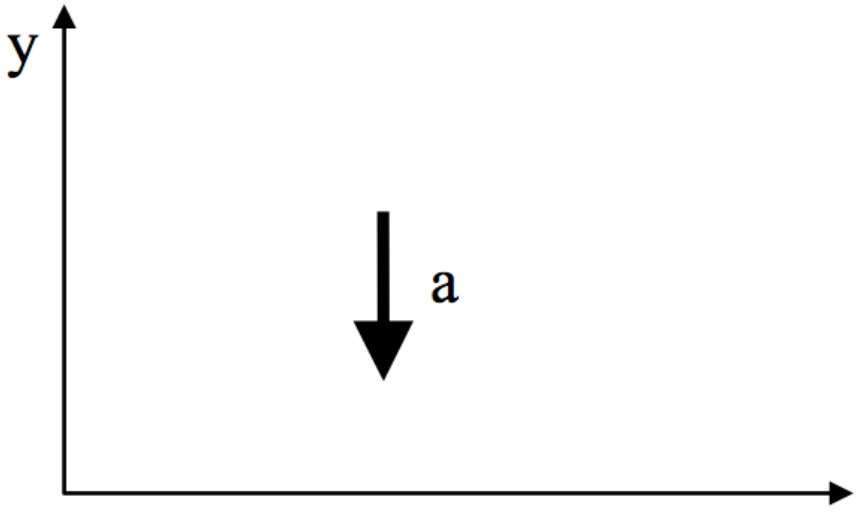
How could you decide?

3-1) A projectile is fired at an angle θ (above the horizontal) with an initial **speed** v_0. What is the x-component of the velocity vector?



A) $v_0 \cos \theta$
B) $v_0 \sin \theta$
C) Neither of these

3-2) The acceleration vector for an object is shown. From the graph, what can you say about the x- and y-components of the acceleration vector?



A) a_x is negative; a_y is positive.
B) a_x is positive; a_y is negative.
C) a_x is positive; a_y is positive.
D) a_x is negative; a_y is negative.
E) None of these.

Simulation

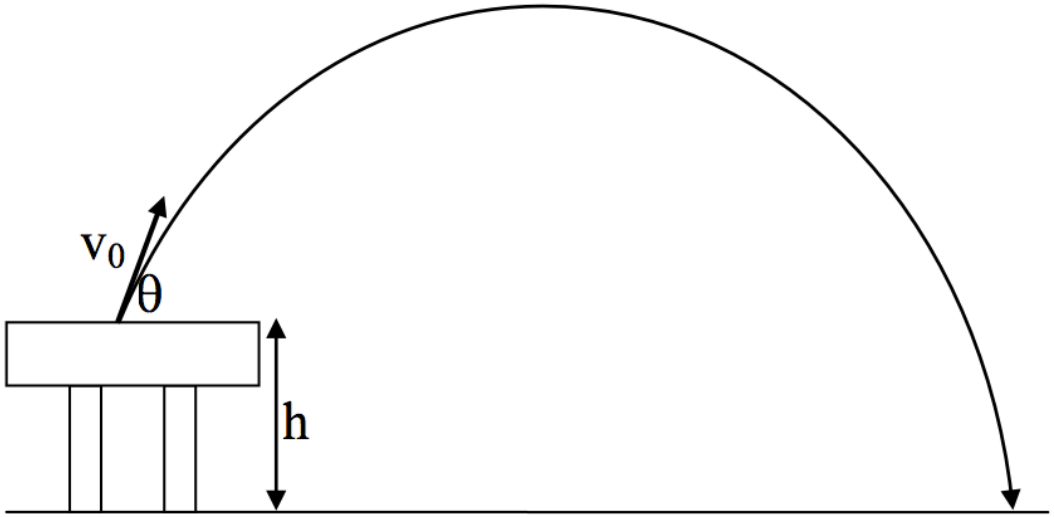
http://phet.colorado.edu/en/simulation/projectile-motion

3-3) A projectile is fired at an angle θ with an initial speed v_0 from a table that is a height h above the floor. The projectile strikes the floor with a final speed v given by the formula:

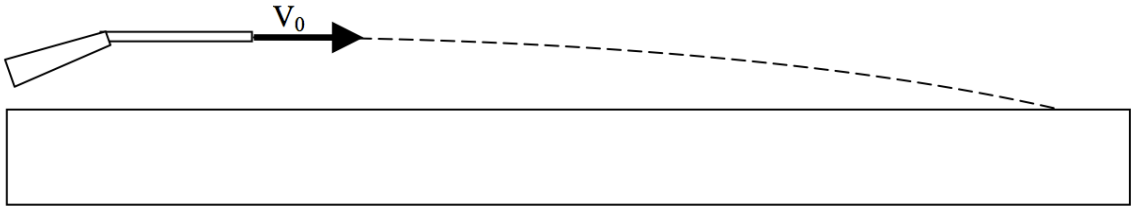
$$v = \sqrt{v_x^2 + v_y^2}$$

Which is the correct formula for v_x?

A) $v_x = v_0 \cos\theta$
B) $v_x = v_0 \sin\theta$
C) Neither of these



3-4a) A bullet is fired horizontally from a rifle on the Moon (where there is no air). The initial speed of the bullet when it leaves the gun barrel is v_0. Assume that the ground is perfectly level (and endless).

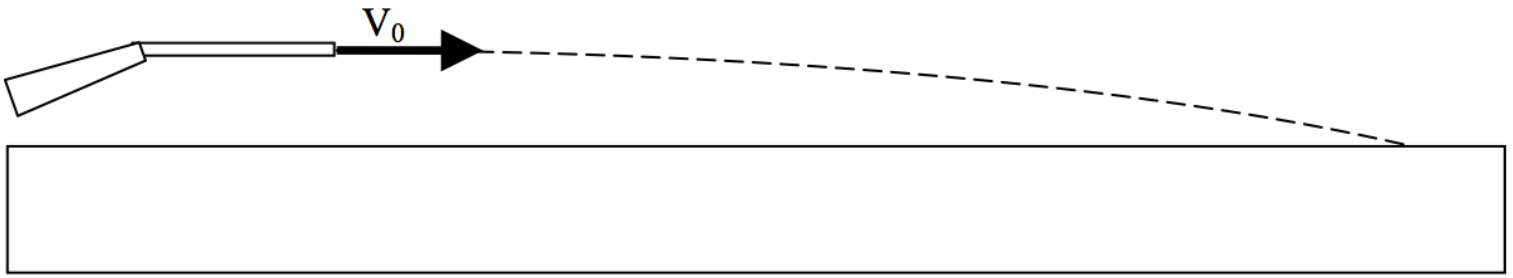


I) During its entire flight, the minimum speed of the bullet is vo.
II) The acceleration of the bullet is constant during its flight.
III) The time it takes for the bullet to hit the ground increases as v_0 is increased.

A) All of the above statements are true.
B) Only two of these statements is true.
C) Only one of these statements is true.

3-4b) As the bullet falls it's speed is given by:

A) v_0
B) v_0+gt
C) $\text{sqrt}(v_0^2+(gt)^2)$
D) v_0-gt



Reminders

- Exam scores coming soon
  (check them for typos)
- Solutions will be posted as soon as I get the grades

I found that the first exam was…

A) way too short.
B) too short.
C) just right.
D) too long.
E) way too long.

I found that the material on the first exam was…

A) too straight-forward.
B) straight-forward.
C) just fine.
D) difficult.
E) too difficult.

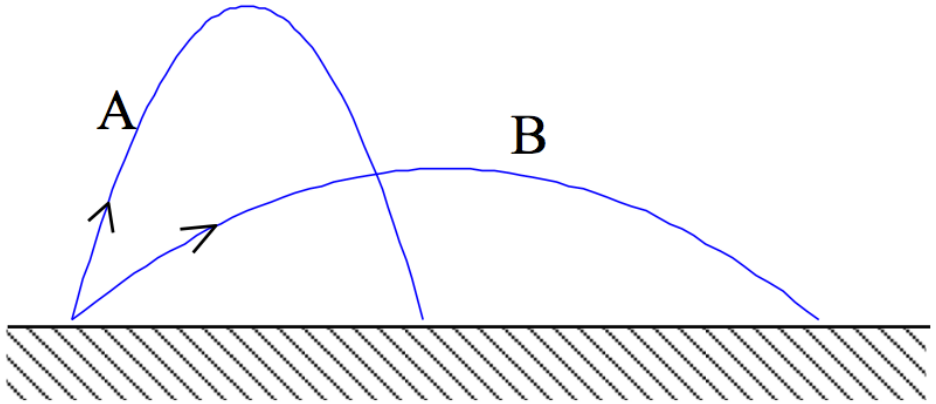
I felt that the homework and the exam were aligned well.

A) Strongly agree
B) Agree
C) Neutral
D) Disagree
E) Strongly disagree

The topics on the first exam were … to what I expected for the chapter.

A) really close
B) close
C) sort of close
D) not close
E) not close all

3-5) Two projectiles are fired from a cannon. For projectile A, the cannon is tilted upward at an angle twice that of projectile B. Both projectiles are fired with the same initial speed. (As usual, neglect air resistance.)



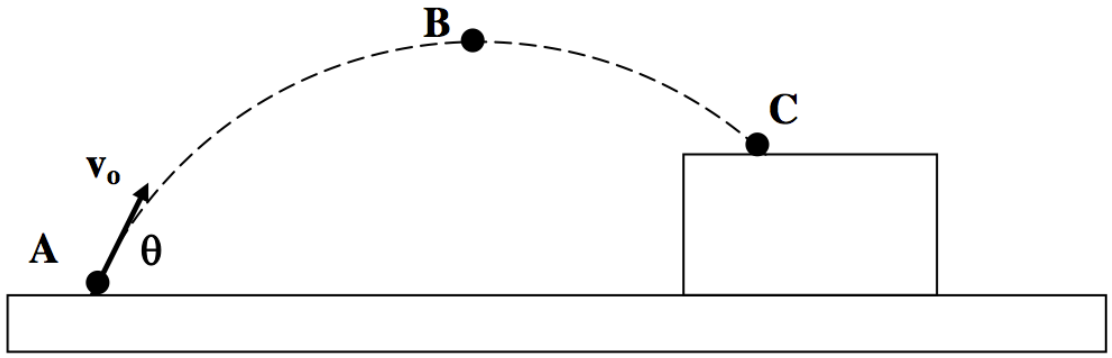
Which projectile was in the air longer?

A) A B) B

C) A and B were in the air the same length of time.

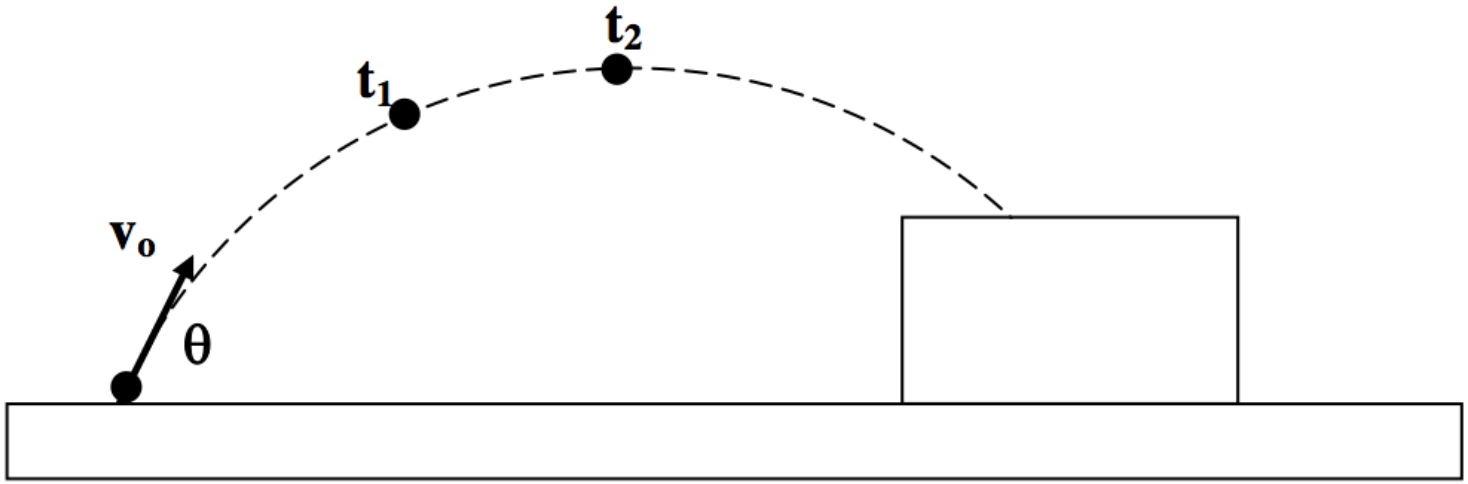
D) Not enough information to answer the question.

3-6) A pellet is fired from a slingshot with initial speed v_0 at an angle θ. The projectile lands on a building. Where is the speed of the projectile a **minimum**?



A) Immediately after the pellet is launched.
B) At the apex of the trajectory.
C) Just before the pellet hits the building.
D) None of these, the speed is constant

3-7) Consider the velocities at times t_1 and t_2. These are the velocity vectors $\mathbf{V_1}$ and $\mathbf{V_2}$. Draw the $\mathbf{V_1} + \Delta\mathbf{V} = \mathbf{V_2}$ vector diagram. What is the direction of $\Delta\mathbf{V}$, the change in velocity between t_1 and t_2?



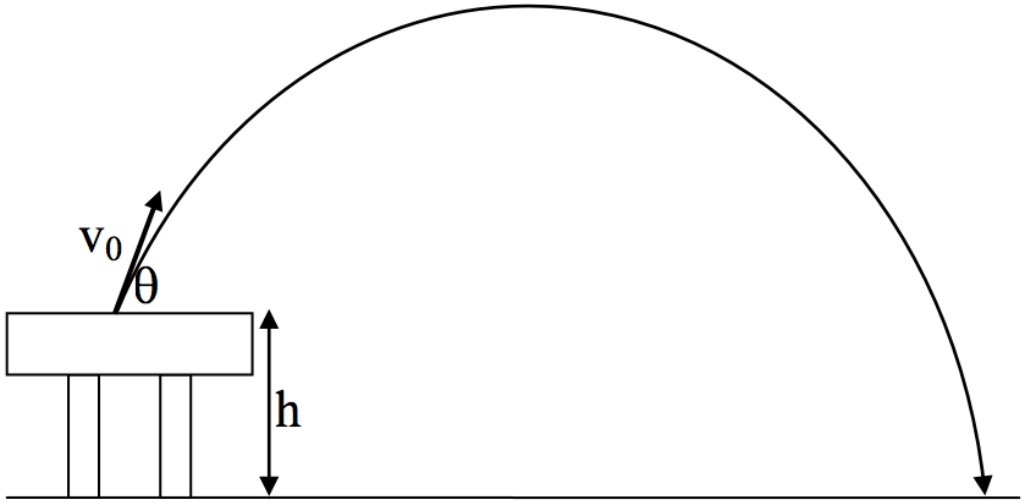
A) Straight up
B) Straight down
C) Upper right
D) Lower right

3-8) True or False: If the speed of an object is constant, its acceleration must be zero.

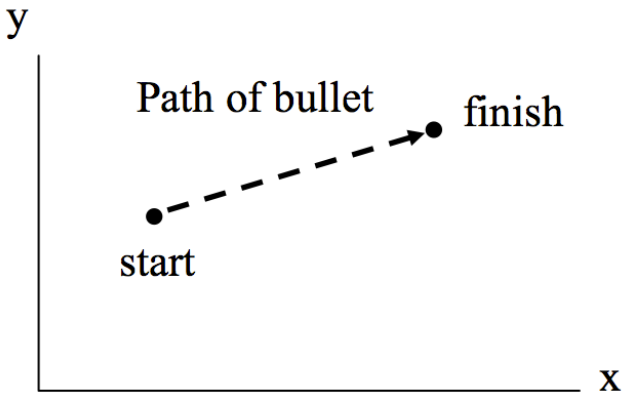
A) True
B) False

3-14) A projectile is fired at an angle θ with an initial speed v_0 from a table that is a height h above the floor. You want to determine the time of flight.

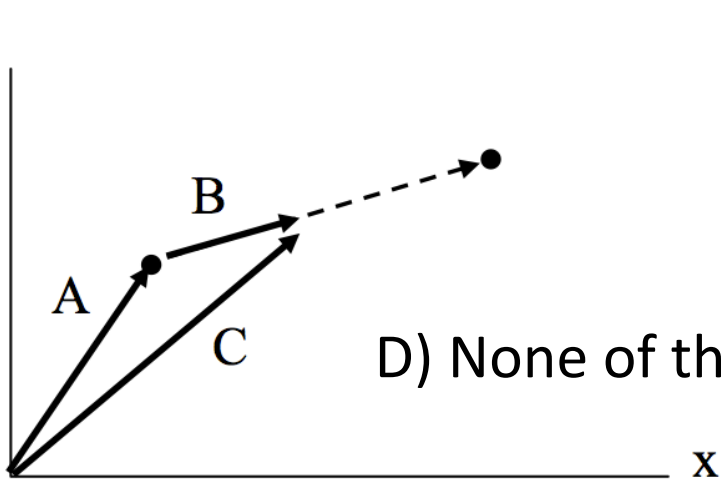
Work with folks around you to determine the appropriate kinematic equation to start this problem. What does it look like for this problem?
Click anything when you are done.



3-9) A hunter shoots a monkey in intergalactic space (where there is no gravity). The bullet flies in a straight line and hits the monkey. The path of the bullet is described by the vector equation $\vec{r} = \vec{r}_0 + \vec{v}_0\, t$

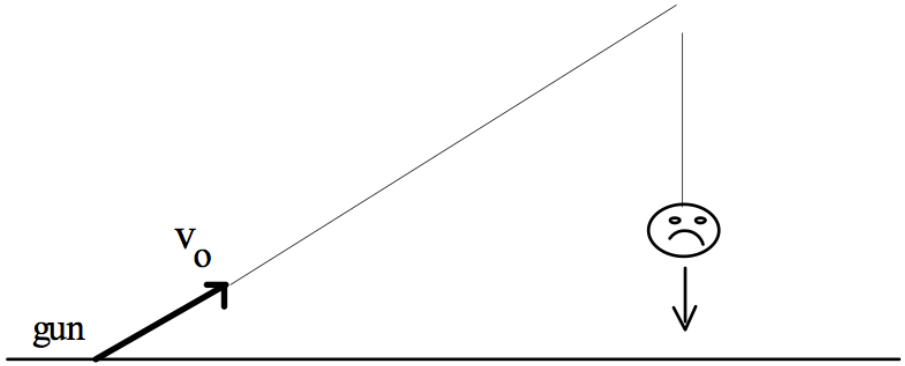


When the time t is such that the bullet is half-way to the monkey, the vector $\vec{r}$ is which vector on the diagram?



D) None of these

3-10) A rifle is accurately aimed at a rabid monkey hanging from the branch of a tree. The instant the gun is fired, the monkey releases the branch and starts falling. The monkey is well within the range of the rifle. The initial speed of the bullet is v_0. What happens?



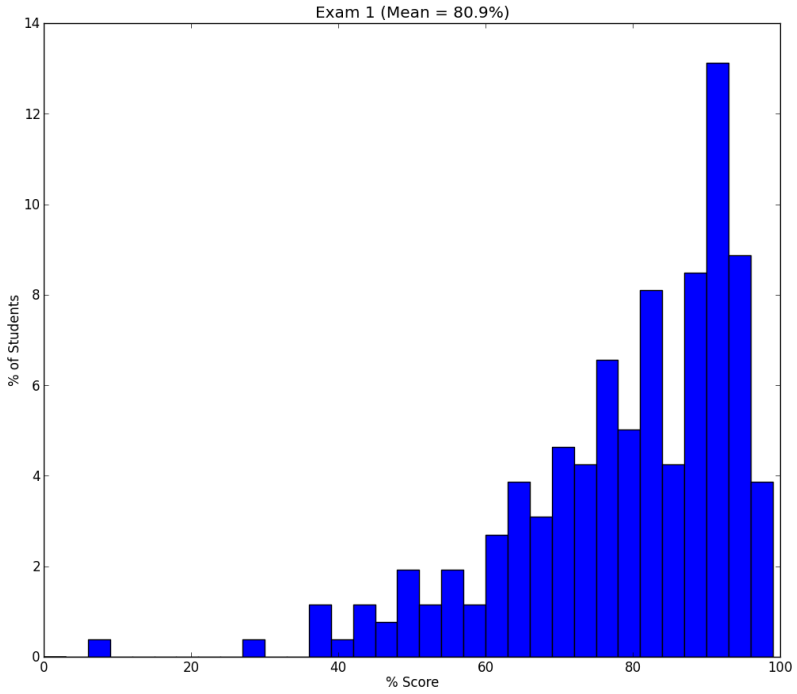
A) The bullet finds its target, regardless of the value of v_0. (Assuming v_0 large enough to reach the air below the monkey.)
B) The bullet hits the monkey only if v_0 is large enough.
C) The bullet misses.

3-8) True or False: If the speed of an object is constant, its acceleration must be zero.

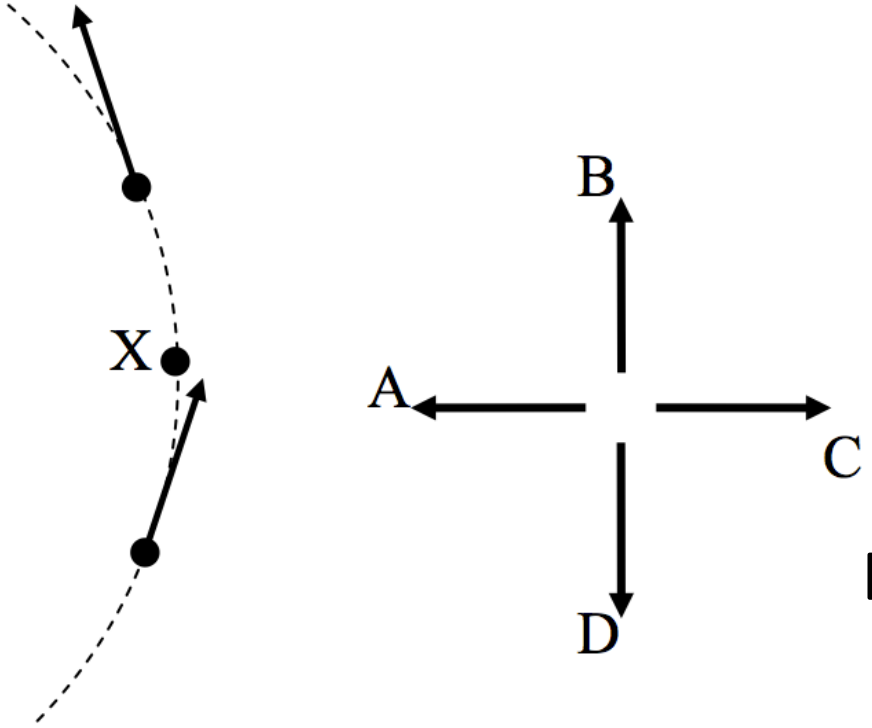
A) True
B) False

Reminders

- Exam Scores posted (avg. 9.7/12 = 81%)
- Clicker scores reposted (Fix by Sept 20th)

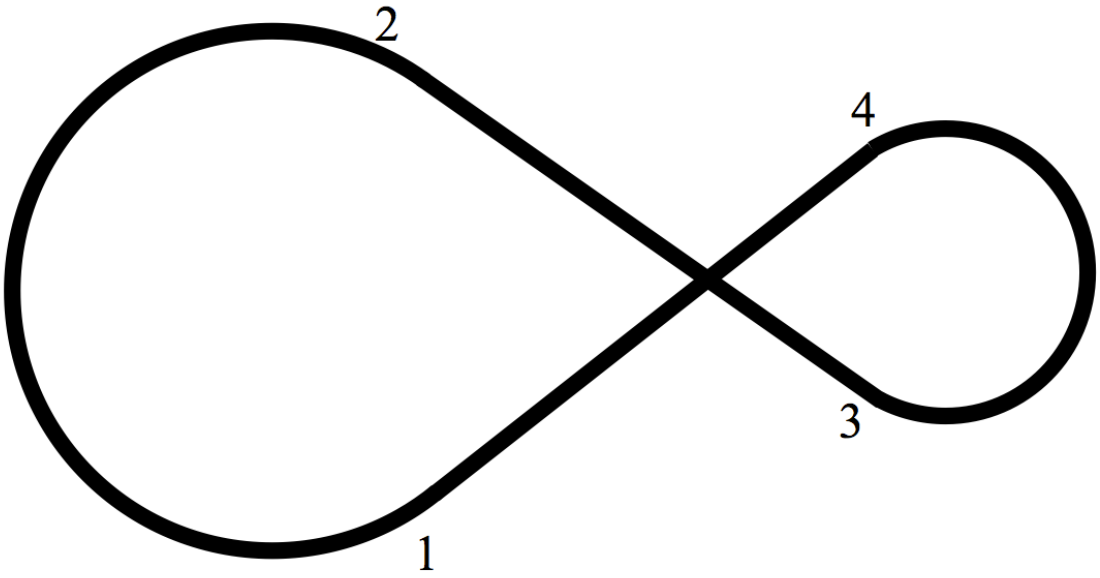


3-11) A particle is moving along the path shown, with constant speed. Its velocity vector at two different times is shown. What is the direction of the acceleration when the particle is at point X?



E) None of these

3-12) A race car travels around the track shown at constant speed. Over which portion of the track is the magnitude of the acceleration the smallest?



A) From 1 to 2
B) From 3 to 4
C) Neither of these
D) Both of these

Reference Frames & Relative Motion

Relative Motion

https://www.youtube.com/watch?feature=player_embedded&v=yPHoUbCNPX8#t=26

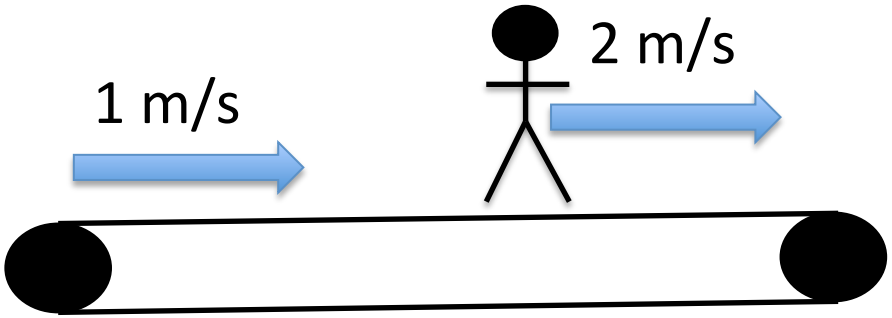
3-15) What does the motion of the baseball look like to the fixed camera?

A) It follows a parabolic trajectory
B) It falls straight down
C) Something else

3-16) How are $\mathbf{v}_{T/G}$, $\mathbf{v}_{B/T}$, and $\mathbf{v}_{B/G}$ related?

A. $\mathbf{v}_{B/G} = \mathbf{v}_{B/T} + \mathbf{v}_{T/G}$
B. $\mathbf{v}_{B/G} = \mathbf{v}_{B/T} - \mathbf{v}_{T/G}$
C. $\mathbf{v}_{B/G} = -\mathbf{v}_{B/T} + \mathbf{v}_{T/G}$
D. $\mathbf{v}_{B/G} = -\mathbf{v}_{B/T} - \mathbf{v}_{T/G}$
E. Something else

3-13) A child is running down a moving walkway at a speed of 2 m/s relative to the walkway. The walkway moves with a speed of 1 m/s relative to the ground. Which of the following correctly described the velocity of the child relative to the ground?



A. $\mathbf{v}_{c/g} = \mathbf{v}_{c/w} + \mathbf{v}_{w/g}$

B. $\mathbf{v}_{c/g} = \mathbf{v}_{c/w} - \mathbf{v}_{w/g}$

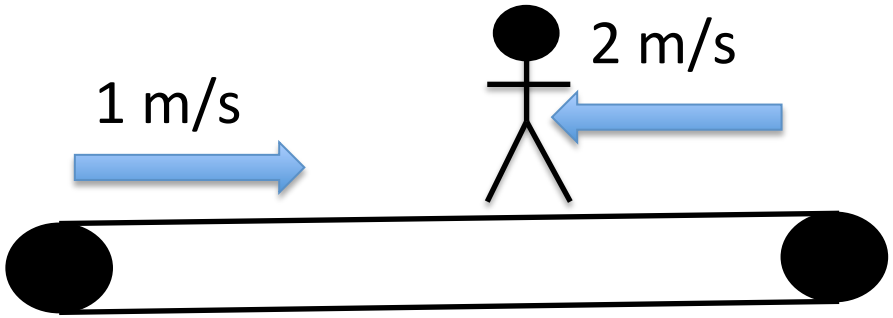
C. $\mathbf{v}_{c/g} = -\mathbf{v}_{c/w} - \mathbf{v}_{w/g}$

D. $\mathbf{v}_{c/g} = -\mathbf{v}_{c/w} + \mathbf{v}_{w/g}$

E. Something else

Remember! A relative to B is A/B

3-13) The child is running back along the same moving walkway at a speed of 2 m/s relative to the walkway. The walkway moves with a speed of 1 m/s relative to the ground. Which of the following correctly described the velocity of the child relative to the ground?



A. $\mathbf{v}_{c/g} = \mathbf{v}_{c/w} + \mathbf{v}_{w/g}$

B. $\mathbf{v}_{c/g} = \mathbf{v}_{c/w} - \mathbf{v}_{w/g}$

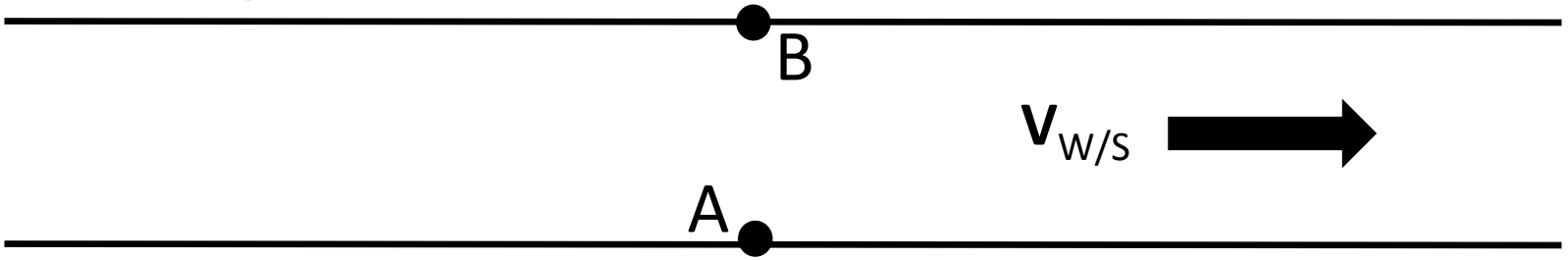
C. $\mathbf{v}_{c/g} = -\mathbf{v}_{c/w} - \mathbf{v}_{w/g}$

D. $\mathbf{v}_{c/g} = -\mathbf{v}_{c/w} + \mathbf{v}_{w/g}$

E. Something else

Remember! A relative to B is A/B

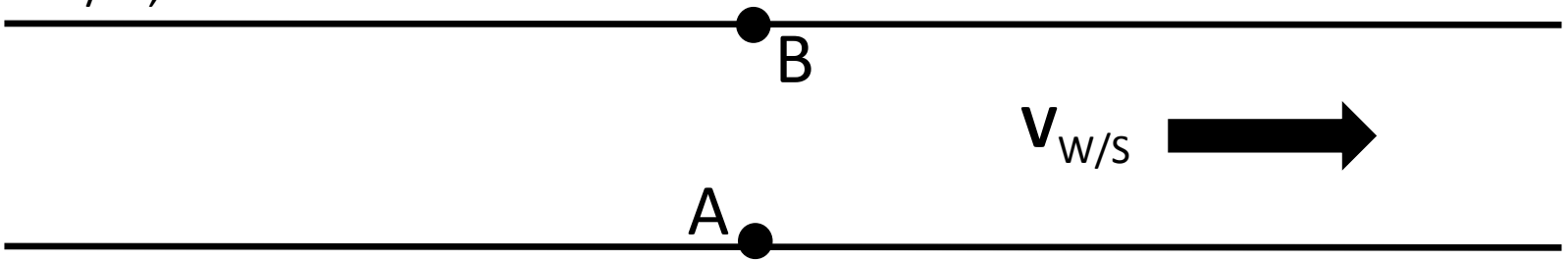
3-17) Two ports (A and B) are separated by a river that flows with a velocity $\mathbf{v}_{W/S}$ to the right. A boat captain is leaving A and heading directly to B. Which of the following is true?



I) She can travel at any speed and make to B.
II) She must direct the boat to the left a bit.
III) Her boat will have a higher speed relative to the shore than relative to the water.

A) I only B) II only C) III only
D) I and II E) II and III

3-18) To move straight across, how should $|\mathbf{v}_{W/S}|$ and $|\mathbf{v}_{B/W,x}|$ compare?



A) $|\mathbf{v}_{W/S}| > |\mathbf{v}_{B/W,x}|$
B) $|\mathbf{v}_{W/S}| < |\mathbf{v}_{B/W,x}|$
C) $|\mathbf{v}_{W/S}| = |\mathbf{v}_{B/W,x}|$