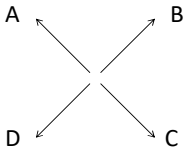
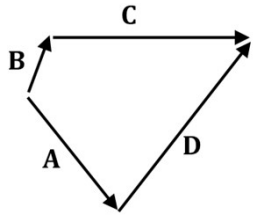
Vectors **Q** and **R** have the same magnitude. If vector **Q** is in the +x direction and vector **R** is in the –y direction, what is the direction of vector **T** = **Q** – **R?**



E) None of these

Consider the vector diagram shown. Which of the equations correctly describes the diagram?



A) $\vec{A} + \vec{B} + \vec{C} + \vec{D} = \mathbf{0}$

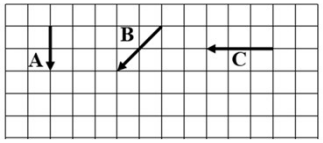
B) $\vec{A} + \vec{B} + \vec{C} = \vec{D}$

C) $\vec{A} + \vec{B} = \vec{C} + \vec{D}$

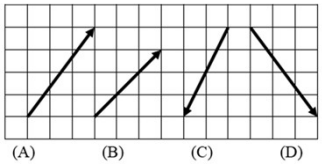
D) $\vec{A} + \vec{D} = \vec{B} + \vec{C}$

E) None of these is correct!

Three vectors, $\vec{A}$, $\vec{B}$, and $\vec{C}$ are as shown:



Which vector is $\vec{S} = \vec{A} + \vec{B} - \vec{C}$?



E) None of these

You are adding two vectors, one of length 20 and the other of length 40 units. What is the only possible resultant magnitude that you can obtain out of the following choices?

A) 0

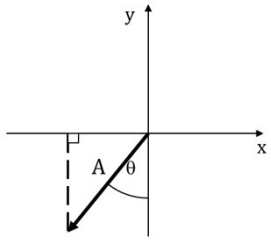
B) 18

C) 37

D) 64

E) 100

The solid line has length A and makes an angle θ with the negative y-axis. What is the length of the dashed line?



A) $A\cos\theta$

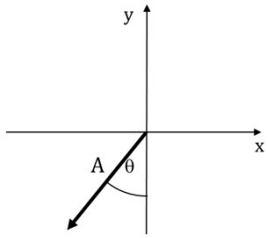
B) $A\sin\theta$

C) $A\tan\theta$

D) $\frac{\text{si}}{A}$

E) $\frac{\text{co}}{A}$

What is the correct expression for A_y, the y-component of the vector $\vec{A}$?



A) $A\cos\theta$

B) $A\sin\theta$

C) $-A\cos\theta$

D) $-A\sin\theta$

E) None of these

How many of the following equations make no sense?

$$\vec{A} = \hat{\mathbf{j}}$$

$$\vec{A} = 3\hat{\mathbf{i}} + \hat{\mathbf{j}} - 5\hat{\mathbf{j}}$$

$$\vec{C} = \vec{A}/3$$

$$\vec{C} = \vec{A} + \hat{\mathbf{i}}$$

$$\vec{C} = 4 - \hat{\mathbf{i}}$$

A) 0 (they all make sense!)

B) 1

C) 2

D) 3

E) 4 or more are nonsense

The vector **A** has length 5. The vector **B** has magnitude 4. You have no other information about the two vectors. Which one of the following statements about the vector **A**+**B** must be true?

A) The magnitude of the vector **A**+**B** must be between 5 and 9.

B) The magnitude of the vector **A**+**B** must be between 0 and 5.

C) The magnitude of the vector **A**+**B** must be between 0 and 9.

D) The magnitude of the vector **A**+**B** must be between 1 and 9.

E) None of the above must be true…

The components of vectors **A** and **B** are given by: $A_x = 1$, $A_y = 1$, $B_x = -2$, $B_y = 2$. What is the direction of vector **C** = **A** + **B** ?

A) Up and right

B) Up and left

C) Down and right

D) Down and left

E) None of these, it is parallel to an axis.

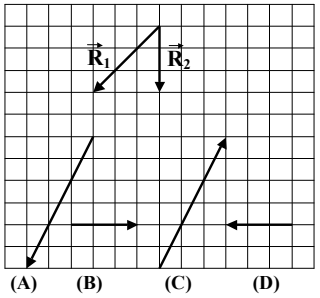
If the instantaneous velocity of a car is zero ($v = 0$), can the acceleration of the car be non-zero?

A) yes

B) no

C) depends on the velocity

The position vector of a particle moving with constant velocity is shown at an early time t_1 and a later time t_2. Which arrow shows the direction of the velocity vector?



A) A

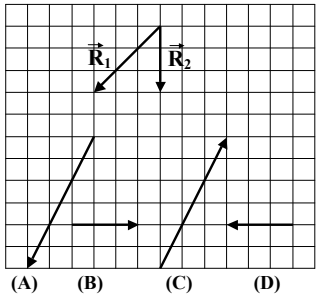
B) B

C) C

D) D

E) None of these

The position vector of a particle moving with constant velocity is shown at an early time t_1 and a later time t_2. Which arrow shows the direction of the velocity vector?



A) A

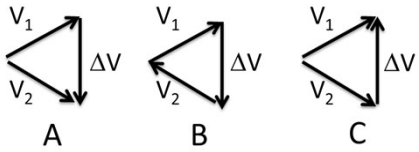
B) B

C) C

D) D

E) None of these

Which diagram(s) below depict(s) the equation $\vec{V}_1 + \Delta\vec{V} = \vec{V}_2$ correctly?



D) All three (A, B, and C) are correct!

E) None of these

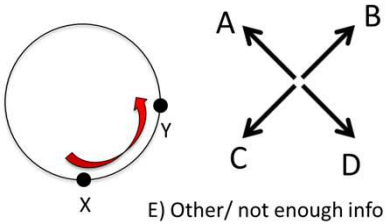
Which ball hits the ground first?

A) The dropped one hits the ground first

B) The one launched horizontally hits the ground first

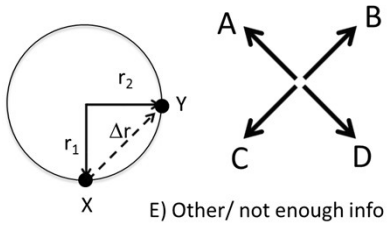
C) They both hit the ground at the same time

An object moves around a circle at steady speed. At t_1 it is at X, at t_2 (later) it is at Y. What is the direction of its average velocity during that time period?



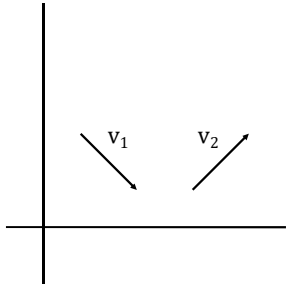
E) Other/ not enough info

An object moves around a circle at steady speed. At t_1 it is at X, at t_2 (later) it is at Y. What is the direction of its average velocity during that time period?



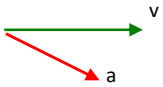
E) Other/ not enough info

A particle is moving with constant acceleration. Its velocity vector at two different times is shown below. ($t_1 < t_2$) What is the direction of the acceleration?



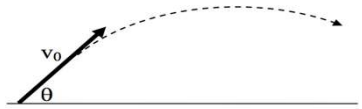
A)
B)
C)
D)
E) Some other direction

The velocity vector and the acceleration vector of an object are known at a particular instant of time, as shown. What can you conclude?



A) The object is speeding up at this instant
B) The object is slowing down at this instant
C) The object has a constant speed at this instant
D) More information is needed to answer the question!!!

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



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

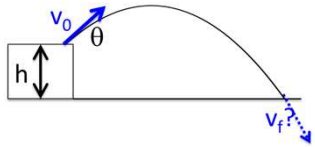
The ball will land…

A) Back in the cannon
B) In front of the cannon
C) Behind the cannon

A projectile (angle θ, initial speed v_0) is shot from a table a height h above the floor. It strikes the floor with final speed v_f given by the formula

$$v_f = \sqrt{{v_{f,x}}^2 + {v_{f,y}}^2},$$

What is the formula for $v_{f,x}$?

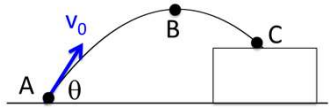


A) $v_0 \cos\theta$

B) $v_0 \sin\theta$

C) Neither of these

A projectile (angle θ, initial speed v_0) is shot from a slingshot at ground level. It lands on a roof. Where is the projectile's speed a minimum?



A) Right after launch

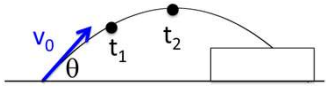
B) At the apex

C) Just before hitting

D) Speed is constant!

E) Not enough information…

Consider the velocities at t_1 and t_2. These are the velocity vectors v_1 and v_2. Draw a $\vec{v}_1 + \Delta\vec{v} = \vec{v}_2$ vector diagram! What is the direction of $\Delta\vec{v}$, the change in velocity between t_1 and t_2?



A) Up ↑

B) Down ↓

C) Up and right ↗

D) Down and right ↘

E) None of these

A pellet is fired horizontally on the Moon (where there is no air). The initial speed when it leaves the barrel is v_0. Assume the ground is level (and endless!). True or false: During its flight the acceleration of the pellet is constant.

A) True

B) False

C) It depends…

A pellet is fired horizontally on the Moon (where there is no air). The initial speed when it leaves the barrel is v_0. Assume the ground is level (and endless!). True or false: During its flight the minimum speed of the pellet is v_0.

A) True

B) False

C) It depends…

A pellet is fired horizontally on the Moon (where there is no air). The initial speed when it leaves the barrel is v_0. Assume the ground is level (and endless!). True or False: The time it takes for the pellet to hit the ground increases as v_0 is increased.

A) True

B) False

C) It depends…

A pellet is fired horizontally on the Moon (where there is no air). The initial speed when it leaves the barrel is v_0. Assume the ground is level (and endless!). As the pellet falls, its speed at time t is given by… (let g be the "local gravity" on the moon)

A) v_0

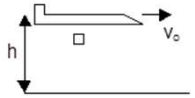
B) $v_0 + gt$

C) $\sqrt{{v_0}^2 + (gt)^2}$

D) $v_0 - gt$

E) None of these

A flaming physics text is dropped from an airplane flying at height h at constant horizontal velocity and speed v_0. Neglecting air resistance, the text will...



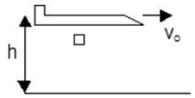
A) quickly lag behind the plane.

B) remain vertically under the plane.

C) move ahead of the plane.

D) it depends how fast the plane is flying.

A flaming physics text is dropped from an airplane flying at height h at constant horizontal velocity and speed v_0. Neglecting air resistance, what is the speed with which the text hits the ground?

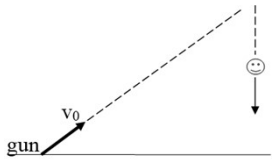


A) $v_0 + \sqrt{2gh}$

B) $\sqrt{v_0 + 2gh}$

C) Neither of these is right

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?

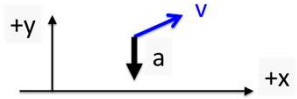


A) The bullet finds its target, regardless of the value of v_0 (assuming v_0 is still large enough to reach the air below the monkey).

B) The bullet hits the monkey only if v_0 is large enough.

C) The bullet misses!

Velocity and acceleration vectors for an object are shown. What can we say about the x- and y-components of the acceleration?



A) $a_x > 0, \quad a_y > 0$

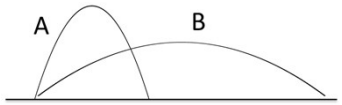
B) $a_x > 0, \quad a_y < 0$

C) $a_x = 0, \quad a_y > 0$

D) $a_x = 0, \quad a_y < 0$

E) None of these

Two fireworks are launched. For firework A, the launcher tilts up at an angle twice that of B. Both fireworks have the same initial speed. (As usual, neglect air resistance) Which projectile was in the air longer?



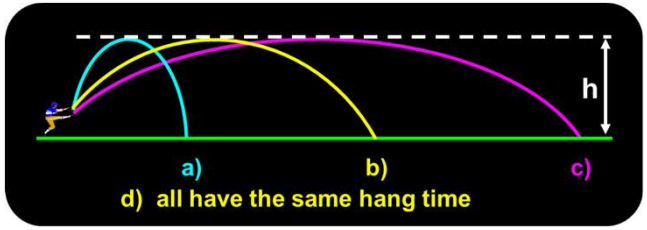
A) A

B) B

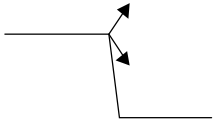
C) A and B are in the air for equal time

D) Not enough information…

Which of the three punts has the longest hang time?



A distraught student standing at the edge of a cliff throws one calculator straight up and another calculator straight down at the same initial speed. Neglecting air resistance, the one which hits the ground with the greatest speed is the one thrown…



A) upward.

B) downward.

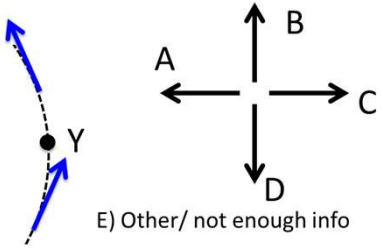
C) neither–they both hit at the same speed.

True or false: If the speed of an object moving in 2-D is constant, its acceleration must be zero.

A) True

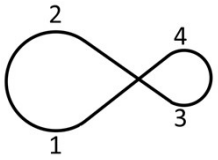
B) False

A particle moves on the path shown, with constant speed. Its velocity vector at two different times is shown. What is the direction of acceleration when it is at pt Y?



E) Other/ not enough info

A car travels around a track at constant speed. Of the three choices given below, over which one portion of the track is the magnitude of the acceleration the largest?



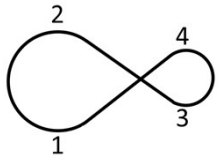
A) 1 to 2

B) 2 to 3

C) 3 to 4

D) Same everywhere

A car travels around a track at constant speed. Of the three choices given below, over which one portion of the track is the magnitude of the acceleration the smallest?



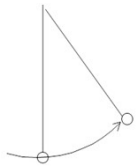
A) 1 to 2

B) 2 to 3

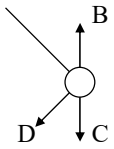
C) 3 to 4

D) Same everywhere

A simple pendulum is swinging back and forth. What is the direction of the acceleration of the pendulum mass at the moment when it is at maximum displacement to the right?



A) Zero



E) None of these