## **Trajectory: Angle-Launched Projectiles**

# Activity 1: Horizontal and Vertical Speed Question Group 1:

## Question 1:

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Rank the three indicated locations based on increasing horizontal speed  $(V_x)$  and vertical speed  $(V_y)$ .

	Vx	Vy
Α		
В		
D		



## **Question 2:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Rank the three indicated locations based on increasing horizontal speed  $(V_x)$  and vertical speed  $(V_y)$ .

	Vx	Vy
A		
С		
D		



## **Question 3:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Rank the three indicated locations based on increasing horizontal speed  $(V_x)$  and vertical speed  $(V_y)$ .

	Vx	Vy
В		
D		
Ε		



#### Question Group 2: Question 4:

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Rank the three indicated locations based on increasing horizontal speed  $(V_x)$  and vertical speed  $(V_y)$ .





## **Question 5:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Rank the three indicated locations based on increasing horizontal speed  $(V_x)$  and vertical speed  $(V_y)$ .

	Vx	Vy
F		
Η		
I		



## **Question 6:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Rank the three indicated locations based on increasing horizontal speed  $(V_x)$  and vertical speed  $(V_y)$ .

	Vx	Vy
Ε		
G		
I		



## Question Group 3: Question 7:

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Rank the three indicated locations based on increasing horizontal speed  $(V_x)$  and vertical speed  $(V_y)$ .

	Vx	Vy
В		
Ε		
F		



## **Question 8:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Rank the three indicated locations based on increasing horizontal speed  $(V_x)$  and vertical speed  $(V_y)$ , beginning with the smallest.





## **Question 9:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Rank the three indicated locations based on increasing horizontal speed ( $V_x$ ) and vertical speed ( $V_y$ ), beginning with the smallest.

	Vx	Vy
В		
Ε		
G		



# Question Group 4: Question 10:

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Which phrases best describe the changes occurring to the horizontal speed  $(V_x)$  and vertical speed  $(V_y)$  as the ball travels from **location A** to **location D**?



# Horizontal Speed (V<sub>x</sub>):

Increases the entire time Decreases the entire time First increases, then decreases First decreases, then increases Never changes

# Vertical Speed (V<sub>y</sub>):

#### Question 11:

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Which phrases best describe the changes occurring to the horizontal speed  $(V_x)$  and vertical speed  $(V_y)$  as the ball travels from **location B** to **location E**?



#### Horizontal Speed (V<sub>x</sub>):

Increases the entire time Decreases the entire time First increases, then decreases First decreases, then increases Never changes

#### Vertical Speed (V<sub>y</sub>):

Increases the entire time Decreases the entire time First increases, then decreases First decreases, then increases Never changes

## **Question 12:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Which phrases best describe the changes occurring to the horizontal speed ( $V_x$ ) and vertical speed ( $V_y$ ) as the ball travels from **location A** to **location E**?



## Horizontal Speed (V<sub>x</sub>):

Increases the entire time Decreases the entire time First increases, then decreases First decreases, then increases Never changes

## Vertical Speed (V<sub>y</sub>):

## Question Group 5 Question 13:

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Which phrases best describe the changes occurring to the horizontal speed  $(V_x)$  and vertical speed  $(V_y)$  as the ball travels from **location E** to **location H**?



#### Horizontal Speed (V<sub>x</sub>):

Increases the entire time Decreases the entire time First increases, then decreases First decreases, then increases Never changes

#### Vertical Speed (Vy):

Increases the entire time Decreases the entire time First increases, then decreases First decreases, then increases Never changes

## **Question 14:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Which phrases best describe the changes occurring to the horizontal speed ( $V_x$ ) and vertical speed ( $V_y$ ) as the ball travels from **location F** to **location I**?



## Horizontal Speed (V<sub>x</sub>):

Increases the entire time Decreases the entire time First increases, then decreases First decreases, then increases Never changes

## Vertical Speed (V<sub>y</sub>):

#### **Question 15:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Which phrases best describe the changes occurring to the horizontal speed  $(V_x)$  and vertical speed  $(V_y)$  as the ball travels from **location E** to **location I**?



## Horizontal Speed (V<sub>x</sub>):

Increases the entire time Decreases the entire time First increases, then decreases First decreases, then increases Never changes

## Vertical Speed (V<sub>y</sub>):

## Question Group 6: Question 16:

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Which phrases best describe the changes occurring to the horizontal speed  $(V_x)$  and vertical speed  $(V_y)$  as the ball travels from **location A** to **location H**?



## Horizontal Speed (V<sub>x</sub>):

Increases the entire time Decreases the entire time First increases, then decreases First decreases, then increases Never changes

#### Vertical Speed (V<sub>y</sub>):

Increases the entire time Decreases the entire time First increases, then decreases First decreases, then increases Never changes

## **Question 17:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Which phrases best describe the changes occurring to the horizontal speed ( $V_x$ ) and vertical speed ( $V_y$ ) as the ball travels from **location B** to **location G**?



## Horizontal Speed (V<sub>x</sub>):

Increases the entire time Decreases the entire time First increases, then decreases First decreases, then increases Never changes

# Vertical Speed (V<sub>y</sub>):

#### **Question 18:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Which phrases best describe the changes occurring to the horizontal speed  $(V_x)$  and vertical speed  $(V_y)$  as the ball travels from **location D** to **location H**?



## Horizontal Speed (V<sub>x</sub>):

Increases the entire time Decreases the entire time First increases, then decreases First decreases, then increases Never changes

## Vertical Speed (Vy):

Increases the entire time Decreases the entire time First increases, then decreases First decreases, then increases Never changes

#### **Question 19:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. Which phrases best describe the changes occurring to the horizontal speed  $(V_x)$  and vertical speed  $(V_y)$  as the ball travels from **location C** to **location I**?



## Horizontal Speed (V<sub>x</sub>):

Increases the entire time Decreases the entire time First increases, then decreases First decreases, then increases Never changes

## Vertical Speed (V<sub>y</sub>):

#### Activity 2: Horizontal and Vertical Speed Question Group 7: Question 20:

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. A set of horizontal velocity ( $V_x$ ) and vertical velocity ( $V_y$ ) vectors is shown for location B. Drag three of the six provided vector combinations to locations C, E, and H to accurately indicate the velocity vectors for these locations.



Sample Graphic

**Given Location B:** 



Drag 3 of these to Locations C, E, and H:



#### Question 21:

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. A set of horizontal velocity ( $V_x$ ) and vertical velocity ( $V_y$ ) vectors is shown for location C. Drag three of the six provided vector combinations to locations D, E, and G to accurately indicate the velocity vectors for these locations.



NOTE: The given graphic and the three correct answer options and three incorrect options are programmatically generated and vary from one user's experience to another.

## **Question 22:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. A set of horizontal velocity ( $V_x$ ) and vertical velocity ( $V_y$ ) vectors is shown for location D. Drag three of the six provided vector combinations to locations B, E, and F to accurately indicate the velocity vectors for these locations.



#### Question Group 8: Question 23:

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. A set of horizontal velocity ( $V_x$ ) and vertical velocity ( $V_y$ ) vectors is shown for location H. Drag three of the six provided vector combinations to locations B, E, and G to accurately indicate the velocity vectors for these locations.



NOTE: The given graphic and the three correct answer options and three incorrect options are programmatically generated and vary from one user's experience to another.

## Question 24:

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. A set of horizontal velocity ( $V_x$ ) and vertical velocity ( $V_y$ ) vectors is shown for location G. Drag three of the six provided vector combinations to locations C, E, and H to accurately indicate the velocity vectors for these locations.



## Question 25:

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. A set of horizontal velocity ( $V_x$ ) and vertical velocity ( $V_y$ ) vectors is shown for location F. Drag three of the six provided vector combinations to locations D, E, and H to accurately indicate the velocity vectors for these locations.



NOTE: The given graphic and the three correct answer options and three incorrect options are programmatically generated and vary from one user's experience to another.

# **Question Group 9:**

## **Question 26:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. A set of horizontal velocity ( $V_x$ ) and vertical velocity ( $V_y$ ) vectors is shown for location A. Drag three of the six provided vector combinations to locations C, F, and H to accurately indicate the velocity vectors for these locations.



## **Question 27:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. A set of horizontal velocity ( $V_x$ ) and vertical velocity ( $V_y$ ) vectors is shown for location A. Drag three of the six provided vector combinations to locations B, D, and G to accurately indicate the velocity vectors for these locations.



NOTE: The given graphic and the three correct answer options and three incorrect options are programmatically generated and vary from one user's experience to another.

#### **Question 28:**

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. A set of horizontal velocity ( $V_x$ ) and vertical velocity ( $V_y$ ) vectors is shown for location I. Drag three of the six provided vector combinations to locations B, D, and G to accurately indicate the velocity vectors for these locations.



#### Question 29:

A ball is launched upward at an angle. The diagram shows its location at 1-second intervals. A set of horizontal velocity ( $V_x$ ) and vertical velocity ( $V_y$ ) vectors is shown for location I. Drag three of the six provided vector combinations to locations C, F, and H to accurately indicate the velocity vectors for these locations.



#### Activity 3 – Time, Time, Time Question Group 10 Question 30 - 32

A ball is launched upward at an angle. The diagram at the right shows approximate values of the horizontal and vertical velocity vectors and values at a time of 0.0 seconds. Match the three timers to three of the provided velocity vectors. Drag to a vector and release.





NOTE: The given time, the three target times, the three correct and incorrect answer options are programmatically generated and vary from one user's experience to another.

#### Question Group 11 Question 33 - 35

A ball is launched upward at an angle. The diagram at the right shows the horizontal and vertical velocity vectors and values at a time of 0.0 seconds. Match the three timers to three of the provided velocity vectors. Drag to a vector and release.

NOTE: The given time, the three target times, the three correct and incorrect answer options are programmatically generated and vary from one user's experience to another.

#### Question Group 12 Question 36 - 38

A ball is launched upward at an angle. The diagram at the right shows the horizontal and vertical velocity vectors and values at a time of 1.0 seconds. Match the three timers to three of the provided velocity vectors. Drag to a vector and release.

NOTE: The given time, the three target times, the three correct and incorrect answer options are programmatically generated and vary from one user's experience to another.

#### Question Group 13 Question 39 - 41

A ball is launched upward at an angle. The diagram at the right shows the horizontal and vertical velocity vectors and values at a time of 4.0 seconds. Match the three timers to three of the provided velocity vectors. Drag to a vector and release.

NOTE: The given time, the three target times, the three correct and incorrect answer options are programmatically generated and vary from one user's experience to another.