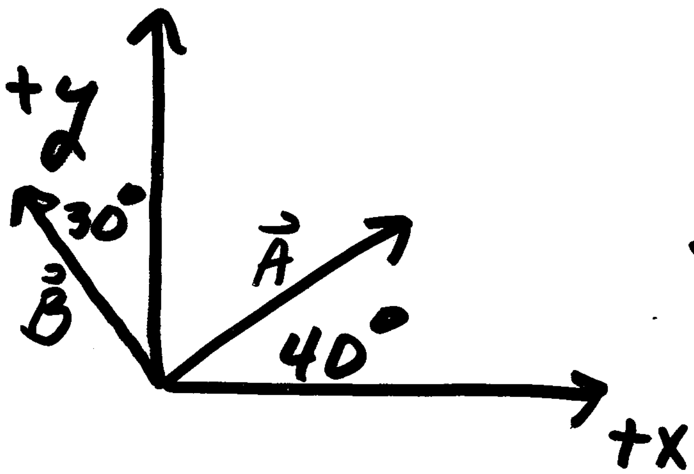
Read 3.7, 3.8

Study Questions, Eq. sheet, answers, solutions on class web page

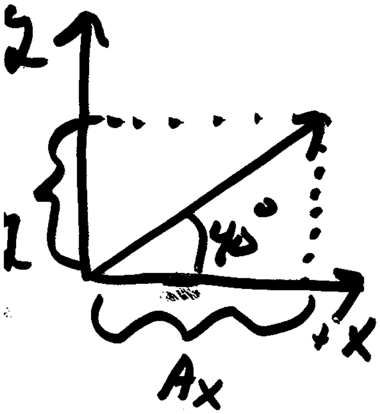
Exam Monday
16 Questions
multiple choice
Dominated by chapter 2, 3

H.W #3 solutions available
Friday Morning

ex) length of A = 5.00 m
length of B = 7.00 m



- Find components of $\vec{A}$ + $\vec{B}$
- Find $\vec{C} = \vec{A} + \vec{B}$

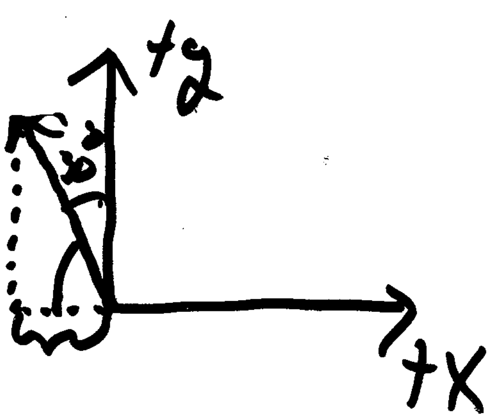


$A_x = A\cos 40° = 5\,m \cos 40°$

$\boxed{3.83\,m}$

$A_y = A\sin 40°$

$A_y = 5\sin 40° = \boxed{3.21\,m}$



$B_x = B\sin 30° =$

$7\sin 30° = \boxed{-3.50\,m}$

$B_y = B\cos 30° = 7\cos 30°$

$= \boxed{6.06\,m}$

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

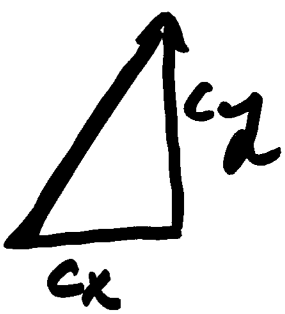
$\vec{A} = A_x + A_y$ $\qquad$ $C_x = A_x + B_x$

$\vec{B} = B_x + B_y$ $\qquad$ $C_y = A_y + B_y$

$\vec{C} = C_x + C_y$

$C_x = 3.83 - 3.50 = 0.33\ m$

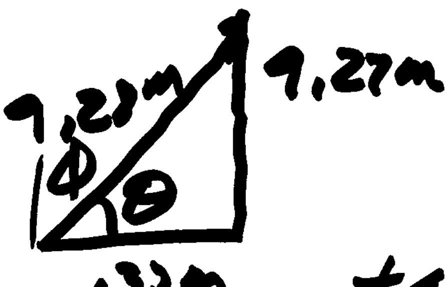
$C_y = 3.21 + 6.06 = 9.27\ m$



$|C| = \sqrt{C_x^2 + C_y^2}$

$= \sqrt{(.33)^2 + (9.27\ m)^2} =$

9.28 m



$\tan\theta = \dfrac{9.27\ m}{.33\ m}$

$\sin\theta = \dfrac{9.27\ m}{9.28\ m} \Rightarrow \underline{\theta = 88^\circ}$

$\cos\theta = \dfrac{.33\ m}{9.28\ m}$

PROJECTILE MOTION

IN EARTH'S GRAVITATIONAL FIELD, acceleration = CONST

so we can use 4-kinematic equations

$a = g = -9.8\ m/s^2$ [y-dir]

$$v_y = v_{oy} - gt$$
$$y = y_o + v_{oy} t - \frac{1}{2} g t^2$$
$$y = y_o + \frac{1}{2}(v_o + v_y) t$$
$$v_y^2 = v_{oy}^2 - 2g(y - y_o)$$

How about in X-DIRECTION?

Do we have acceleration in X-DIRECTION?

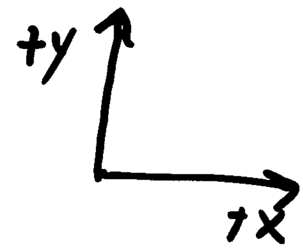
NO

IN X-DIRECTION $\vec{a} = 0$
(objects falling near earth's surface)

4-kinematic Eq's become

$V_x = V_0$ $X = X_0 + V_{0x}\, t$	$\vec{a} = 0$	X-DIR

- No acceleration in X-DIR
- $a = -g$ in y-dir

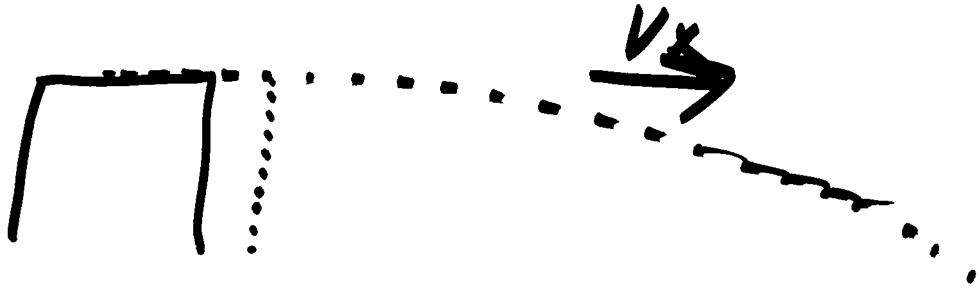


Key to solving problems

X + Y ARE

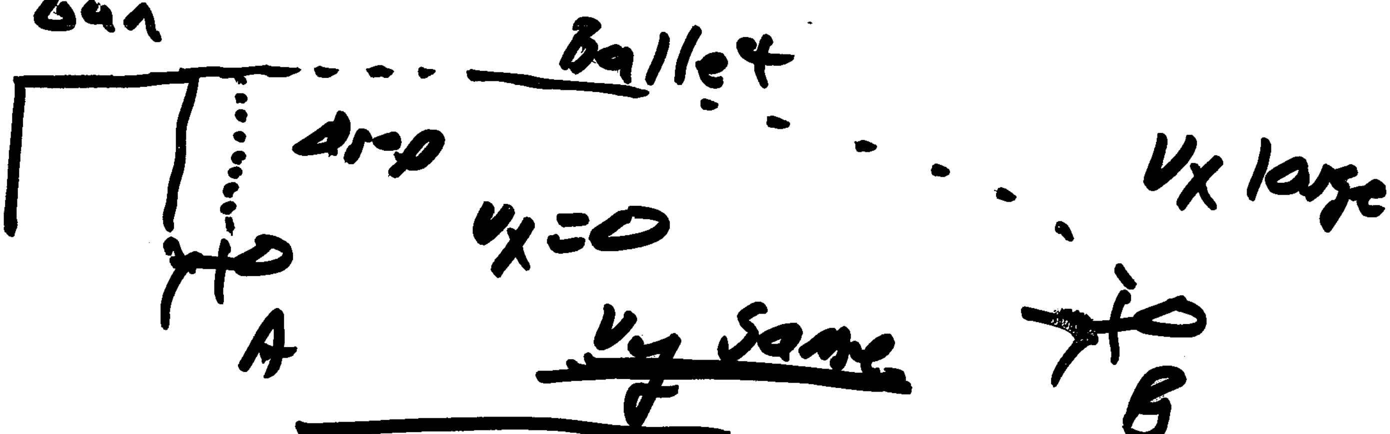
INDEPENDENT

what is happening in X-DIR has NO Effect on what is happening in Y-DIR



time in air?
Same

Same velocity



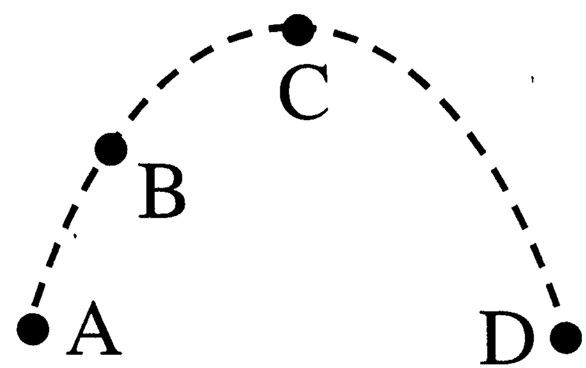
$v_x = 0$

v_y same

$$V = \sqrt{V_x^2 + V_y^2}$$

Interactive Question

A tennis ball is thrown upward at an angle from point A and follows a parabolic path as shown. (The motion is shown from the time the ball leaves the person's hand until just before it hits the ground.)

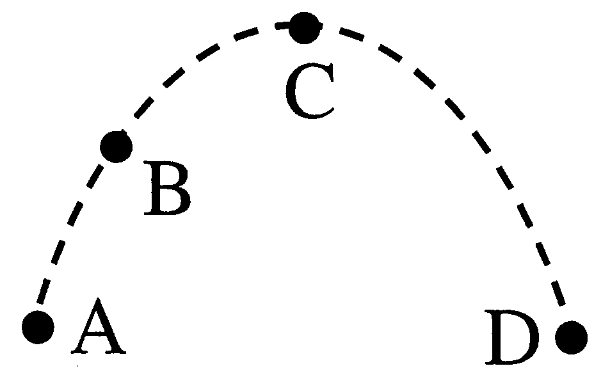


At what point is the horizontal velocity equal to the horizontal velocity at A?

A) B
B) C
C) D
D) All of the above
E) None of the above

Interactive Question

A tennis ball is thrown upward at an angle from point A and follows a parabolic path as shown. (The motion is shown from the time the ball leaves the person's hand until just before it hits the ground.)

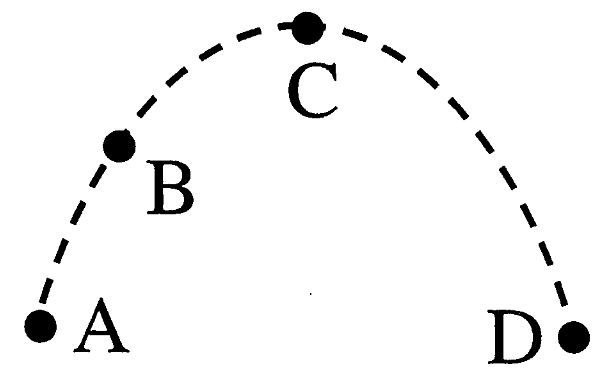


At what point is the vertical acceleration equal to zero?

A) A
B) B
C) C
D) D
E) None of the above

Interactive Question

A tennis ball is thrown upward at an angle from point A and follows a parabolic path as shown. (The motion is shown from the time the ball leaves the person's hand until just before it hits the ground.)

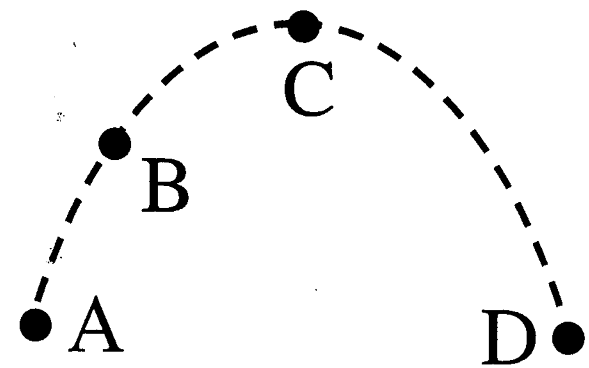


At what point is the horizontal acceleration equal to zero?

A) A B) B
C) C D) D
E) All of the above

Interactive Question

A tennis ball is thrown upward at an angle from point A and follows a parabolic path as shown. (The motion is shown from the time the ball leaves the person's hand until just before it hits the ground.)

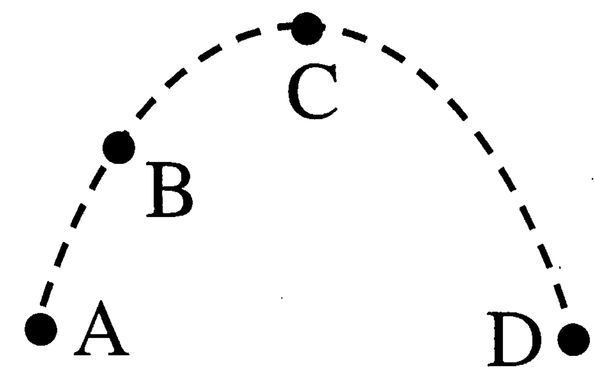


At what point is the velocity equal to zero?

A) A
B) B
C) C
D) D
E) None of the above

Interactive Question

A tennis ball is thrown upward at an angle from point A and follows a parabolic path as shown. (The motion is shown from the time the ball leaves the person's hand until just before it hits the ground.)



At what point is the vertical velocity equal to zero?

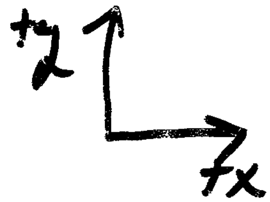
A) A
B) B
C) C
D) D
E) None of the above

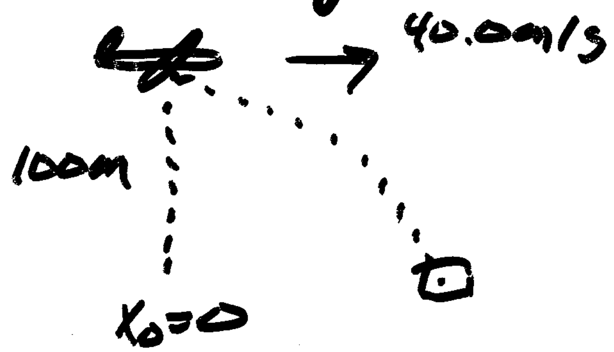
ex) A plane flying at a constant velocity of 40.0 m/s drops a package at a height of 100 m above ground.

a) where does package hit ground

b) what is velocity of package when it hits ground

c) where is plane when package hits ground





$$y = y_0 + v_{0y} t - \frac{1}{2} g t^2 \quad (v_{0y} = 0)$$

$$0 = 100\,m - \frac{1}{2} g t^2$$

$$100\,m = \frac{1}{2} g t^2$$

$$t = \sqrt{\frac{2 \cdot 100\,m}{9.8\,m/s^2}}$$

$$\boxed{t = 4.51\,s}$$

$$X = x_0 + V_x t \quad (x_0 = 0)$$

$$X = 40\,m/s \cdot 4.51\,s$$

$$\boxed{= 180\,m}$$

b) velocity $\boxed{v_x = 40\ \text{m/s}}$

$$v_y = \cancel{v_{y0}}^{\,0} - gt$$

$$= -9.8\ \text{m/s}^2 \cdot 4.51\ \text{s}$$

$$\boxed{v_y = -44.1\ \text{m/s}}$$

$$|V| = \sqrt{v_x^2 + v_y^2}$$

$$= \sqrt{(40\ \text{m/s})^2 + (-44.1\ \text{m/s})^2}$$

$$= \boxed{59.5\ \text{m/s}}$$

$$\tan\theta = \frac{v_y}{v_x}$$

$$\theta = \tan^{-1}\frac{v_y}{v_x}$$

$\boxed{\theta = 48^\circ \text{ above horizontal}}$

c) where is plane?

$$x = \cancel{x_0}^{\,0} + v_x t$$

$$40\ \text{m/s} \cdot 4.51\ \text{s} = \boxed{180\ \text{m}}$$