Pg. 11 Example Problems Solutions

1)

X	Y
$a_x = 0 \frac{m}{s^2}$	$a_y = -9.81 m/s^2$
	$v_{iy} = 0 m/s$
$t = 5.0 s$	

A) $d_y = v_{iy}t + \frac{1}{2}a_y t^2$

$d_y = \frac{1}{2}(-9.81 m/s^2)(5.0 s)^2$

$d_y = -123 m$ (DROP)

B) $d_x = v_{ix}t + \frac{1}{2}a_x t^2 \rightarrow v_{ix} = \frac{d_x}{t} = \frac{300 m}{5.0 s} = 60 m/s$

C) $v_{fx} = v_{ix} + a_x t$

$v_{fx} = v_{ix} = 60 m/s$

$v_{fy} = v_{iy} + at$

$v_{fy} = (-9.81 m/s^2)(5.0 s)$

$v_{fy} = -49 m/s$

D) $d_x = v_{ix}t + \frac{1}{2}a_x t^2$

$d_x = (60 \frac{m}{s})(2.0 s)$

$d_x = 120 m$

$d_y = v_{iy}t + \frac{1}{2}a_y t^2$

$d_y = \frac{1}{2}(-9.81 m/s^2)(2.0 s)^2$

$d_y = -20.0 m$

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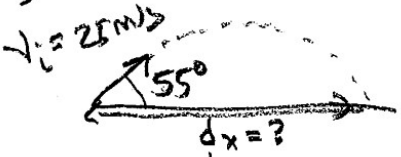
2) $v_i = 25 m/s$



X	Y
$a_x = 0 m/s^2$	$a_y = -9.81 m/s^2$
$v_{ix} = v_i \cos\theta$	$v_{iy} = v_i \sin\theta$
$v_{ix} = (25 \frac{m}{s})\cos 55°$	$v_{iy} = (25 \frac{m}{s})\sin 55°$
$v_{ix} = 14.3 m/s$	$v_{iy} = 20.5 m/s$

A) $d_x = v_x t$

$v_x =$ NEED

$d_x = (14.3 \frac{m}{s})(4.18 s)$

$d_x = 59.8 m$

$v_{fy} = v_{iy} + a_y t_{up}$ (v_{fy} AT MAX HEIGHT)

$t_{up} = \frac{v_{fy} - v_{iy}}{a_y}$

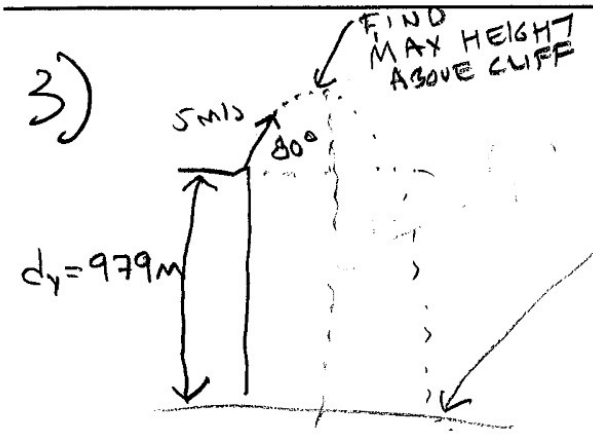
$t_{up} = \frac{-20.5 m/s}{-9.81 m/s^2}$

$t_{up} = 2.09 s$

$t_{TOTAL} = 2t_{up} = 4.18 s$

B) 35°

3)



X	Y
$a_x = 0 \frac{m}{s^2}$	$a_y = -9.81 m/s^2$
$V_{ix} = V_i \cos\theta$	$V_{iy} = V_i \sin\theta$
$V_{ix} = (5\frac{m}{s})\cos 80°$	$V_{iy} = (5 m/s)\sin 80°$
$V_{ix} = 0.87\frac{m}{s}$	$V_{iy} = 4.92 m/s$

A) $V_{fy} = ?$ FIRST FIND MAX HEIGHT ABOVE CLIFF

$$V_{fy}^2 = V_{iy}^2 + 2a_y d_y$$

$$d_y = \frac{V_{fy}^2 - V_{iy}^2}{2a_y}$$

$$d_y = \frac{-(4.92 m/s)^2}{2(-9.81 m/s^2)} = 1.23 m$$

TOTAL FALL FROM MAX HEIGHT $= 979m + 1.23m$

$= \boxed{980.23 m}$

$$V_{fy}^2 = V_{iy}^2 + 2a_y d_y$$

($V_{iy} = 0$ FROM MAX HEIGHT)

$$V_{fy} = \sqrt{2(-9.81 m/s^2)(-980.23 m)}$$

$$\boxed{V_{fy} = -139 m/s}$$

B) t TO MAX HEIGHT

$$V_{fy} = V_{iy} + a_y t$$

$$t = \frac{-V_{iy}}{a_y} = \frac{-4.92 m/s}{-9.81 m/s^2}$$

$$t_{to} = 0.50 s$$

t TO FALL FROM MAX HEIGHT

$$V_{fy} = V_{iy} + a_y t$$

$$t = \frac{V_{fy}}{a_y} = \frac{-139 m/s}{-9.81 m/s^2} = 14.2 s$$

$$t_{TOTAL} = 0.50 s + 14.2 s = \boxed{14.7 s}$$

C) $d_x = V_{ix} t_{TOTAL}$

$$d_x = (.87 m/s)(14.7 s) = \boxed{12.8 m}$$

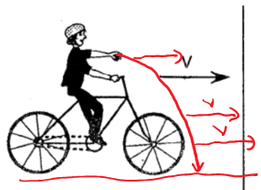
Wednesday, October 17, 2018 8:57 AM

Name

Projectile Motion Review Packet

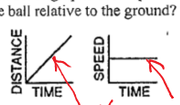
Regents Physics

1. The diagram to the right represents a bicycle and rider traveling to the right at a constant speed. A ball is dropped from the hand of the cyclist.

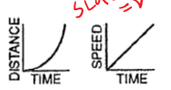


Which set of graphs best represents the horizontal motion of the ball relative to the ground? [Neglect air resistance.]

1)

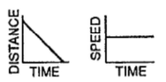


2)



3)

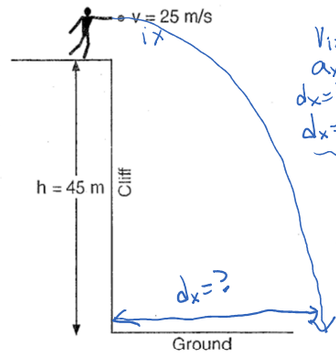
4)



2. A baseball player throws a ball horizontally. Which statement best describes the ball's motion after it is thrown? [Neglect the effect of friction.]
   1) Its vertical speed remains the same, and its horizontal speed increases.
   2) Its vertical speed remains the same, and its horizontal speed remains the same.
   3) Its vertical speed increases, and its horizontal speed increases.
   4) Its vertical speed increases, and its horizontal speed remains the same.

3. A rock is thrown horizontally from the top of a cliff at 12 meters per second. Approximately how long does it take the rock to fall 45 meters vertically? [Assume negligible air resistance.]
   1) 1.0 s
   2) 5.0 s
   3) 3.0 s
   4) 8.0 s

4. The diagram below shows a student throwing a baseball horizontally at 25 meters per second from a cliff 45 meters above the level ground.



Approximately how far from the base of the cliff does the ball hit the ground? [Neglect air resistance.]
   1) 45 m
   2) 75 m
   3) 140 m
   4) 230 m

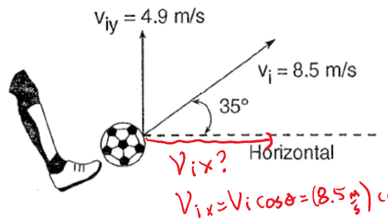
5. A 2-kilogram block is dropped from the roof of a tall building at the same time a 6-kilogram ball is thrown horizontally from the same height. Which statement best describes the motion of the block and the motion of the ball? [Neglect air resistance.]
   1) The 2-kg block hits the ground first because it has no horizontal velocity.
   2) The 6-kg ball hits the ground first because it has more mass.
   3) The 6-kg ball hits the ground first because it is round.
   4) The block and the ball hit the ground at the same time because they have the same vertical acceleration.

6. The diagram below represents the path of an object after it was thrown.

What happens to the object's acceleration as it travels from *A* to *B*? [Neglect friction.]
   1) It decreases.
   2) It increases.
   3) It remains the same.

Base your answers to questions **7** and **8** on the information and diagram below.

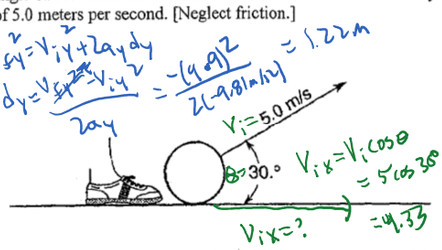
A child kicks a ball with an initial velocity of 8.5 meters per second at an angle of 35° with the horizontal, as shown. The ball has an initial vertical velocity of 4.9 meters per second and a total time of flight of 1.0 second. [Neglect air resistance.]



7. The horizontal component of the ball's initial velocity is approximately
   1) 3.6 m/s
   3) 4.9 m/s
   ✗ 2) 7.0 m/s
   4) 13 m/s

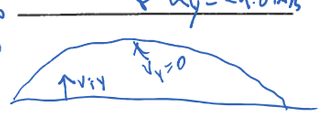
8. The maximum height reached by the ball is approximately
   ✗ 1) 1.2 m
   3) 4.9 m
   2) 2.5 m
   4) 8.5 m

Base your answers to questions **9** and **10** on the diagram below which represents a ball being kicked by a foot and rising at an angle of 30.° from the horizontal. The ball has an initial velocity of 5.0 meters per second. [Neglect friction.]



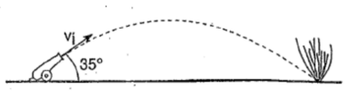
9. What is the magnitude of the horizontal component of the ball's initial velocity?
   1) 2.5 m/s
   3) 5.0 m/s
   ✗ 2) 4.3 m/s
   4) 8.7 m/s

10. As the ball rises, the vertical component of its velocity
    ✗ 1) decreases
    3) remains the same
    2) increases



11. Base your answer to the following question on the information and diagram below.

A cannon elevated at an angle of 35° to the horizontal fires a cannonball, which travels the path shown in the diagram below.
[Neglect air resistance and assume the ball lands at the same height above the ground from which it was launched.]



If the ball lands 7.0×10^2 meters from the cannon 10. seconds after it was fired, what is the horizontal component of its initial velocity?
   ✗ 1) 70. m/s
   3) 35 m/s
   2) 49 m/s
   4) 7.0 m/s

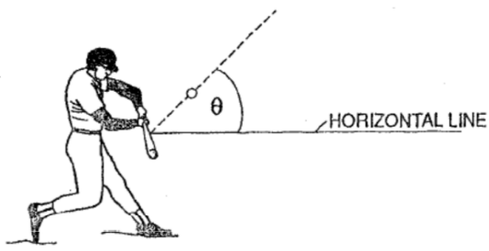
12. A projectile is fired with an initial velocity of 62 meters per second at an angle, θ, above the horizontal. If the projectile's initial horizontal speed is 55 meters per second, then angle θ measures approximately
    1) 13°
    3) 63°
    ✗ 2) 27°
    4) 75°

13. A bullet is fired from a rifle with a muzzle velocity of 100. meters per second at an angle of 30.° above the horizontal. What is the magnitude of the vertical component of the muzzle velocity?
    1) 0.0 m/s
    3) 87. m/s
    ✗ 2) 50. m/s
    4) 100. m/s

14. Four cannonballs, each with mass M and initial velocity V, are fired from a cannon at different angles relative to the Earth. Neglecting air friction, which angular direction of the cannon produces the greatest projectile height?
    ✗ 1) 90°
    3) 45°
    2) 70°
    4) 20°

15. A projectile is fired from a gun near the surface of Earth. The initial velocity of the projectile has a vertical component of 98 meters per second and a horizontal component of 49 meters per second. How long will it take the projectile to reach the highest point in its path?
    1) 5.0 s
    3) 20. s
    ✗ 2) 10. s
    4) 100. s

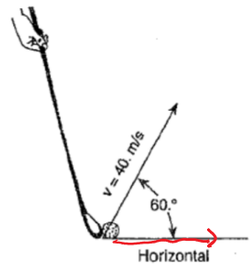
16. The diagram below shows a baseball being hit with a bat. Angle θ represents the angle between the horizontal and the ball's initial direction of motion.



Which value of θ would result in the ball traveling the longest horizontal distance? [Neglect air resistance.]

1) 30°
2) 45°
3) 60°
4) 75°

17. The diagram below shows a golf ball being struck by a club. The ball leaves the club with a speed of 40. meters per second at an angle of 60.° with the horizontal.



If the ball strikes the ground 7.1 seconds later, how far from the golfer does the ball land? [Assume level ground and neglect air resistance.]

1) 35 m
2) 71 m
3) 140 m
4) 280 m

18. Base your answer to the following question on the information below.

A ball is projected vertically upward from the surface of the Earth with an initial speed of +49 meters per second. The ball reaches its maximum height in 5.0 seconds. (Disregard air resistance.)

What is the maximum height reached by the ball?

1) 24.5 m
2) 49.0 m
3) 122.5 m
4) 245 m