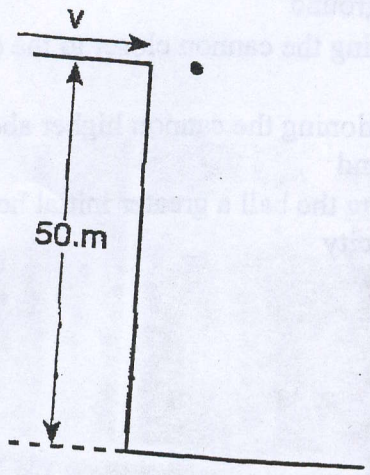
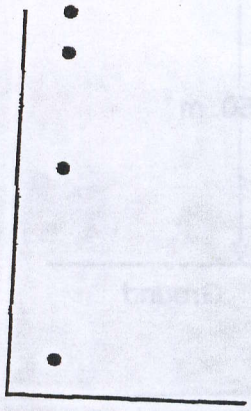
Projectile test #3 Sample From last year

(1) A ball is projected horizontally to the right from a height of 50. meters, as shown in the diagram below.

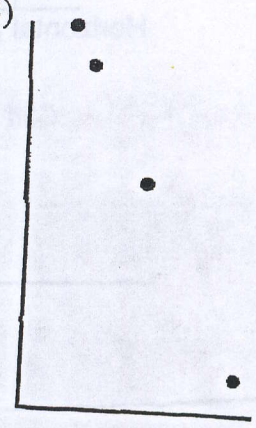


Which diagram best represents the position of the ball at 1.0-second intervals? [Neglect air resistance.]

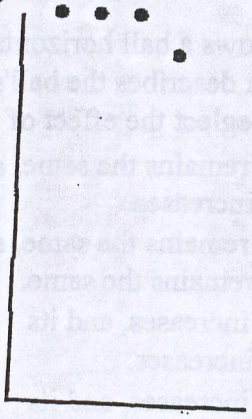
(1)



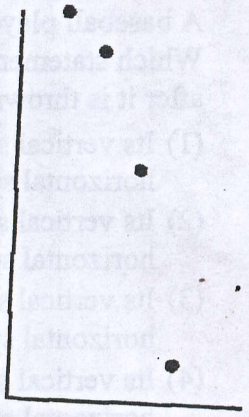
(3)



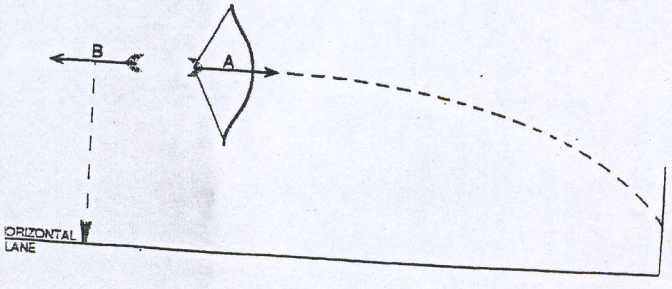
(2)



(4)



) Above a flat horizontal plane, an arrow, *A*, is shot horizontally from a bow at a speed of 50 meters per second, as shown in the diagram below. A second arrow, *B*, is dropped from the same height and at the same instant as *A* is fired.



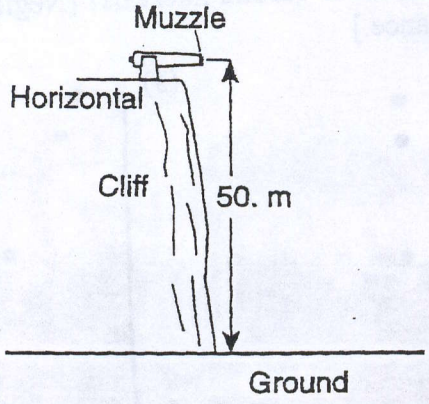
Neglecting air friction, compared to the amount of time *A* takes to strike the plane, the amount of time *B* takes to strike the plane is

(1) less

(2) greater

(3) the same

(3) The diagram below shows the muzzle of a cannon located 50. meters above the ground. When the cannon is fired, a ball leaves the muzzle with an initial horizontal speed of 250. meters per second. [Neglect air resistance.]



Which action would most likely increase the time of flight of a ball fired by the cannon?

(1) pointing the muzzle of the cannon toward the ground
(2) moving the cannon closer to the edge of the cliff
(3) positioning the cannon higher above the ground
(4) giving the ball a greater initial horizontal velocity

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(4) 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.

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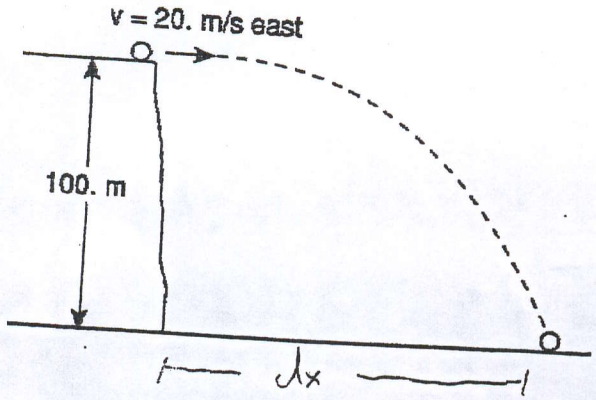
(5) A ball is thrown horizontally from the top of a building with an initial velocity of 15 meters per second. At the same instant, a second ball is dropped from the top of the building. The two balls have the same

(1) path as they fall
(2) final velocity as they reach the ground
(3) initial horizontal velocity
(4) initial vertical velocity

6 to 8

Base your answers to questions 7 and 8 on the diagram below which shows a ball projected horizontally with an initial velocity of 20. meters per second east, off a cliff 100. meters high. [Neglect air resistance.]



(6) During the flight of the ball, what is the direction of its acceleration?

(1) downward
(2) upward
(3) westward
(4) eastward

(7) How many seconds does the ball take to reach the ground?

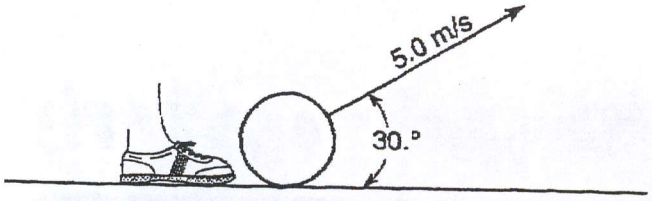
(1) 4.5 s
(2) 20. s
(3) 9.8 s
(4) 2.0 s

(8) How far does the ball travel forward?

d_x = ____ meters (Fill in)

9 to 11

Base your answers to questions **18** and **19** 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) 18. What is the magnitude of the horizontal component of the ball's initial velocity?

(1) 2.5 m/s
(2) 4.3 m/s
(3) 5.0 m/s
(4) 8.7 m/s

(10) 19. If the angle between the horizontal and the direction of the 5.0-meters-per-second velocity decreases from 30.° to 20.°, the horizontal distance the ball travels will

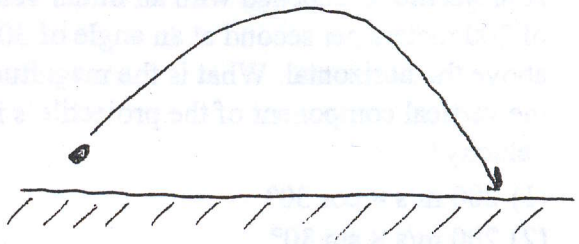
(1) decrease
(2) increase
(3) remain the same

(11) What will the balls time of rise, & total time in air be

t_{rise} = _____ t_{Total} = _____

(12) A golf ball is hit at an angle of 45° above the horizontal. What is the acceleration of the golf ball at the highest point in its trajectory? [Neglect friction.]

(1) 9.8 m/s^2 upward
(2) 9.8 m/s^2 downward
(3) 6.9 m/s^2 horizontal
(4) 0.0 m/s^2



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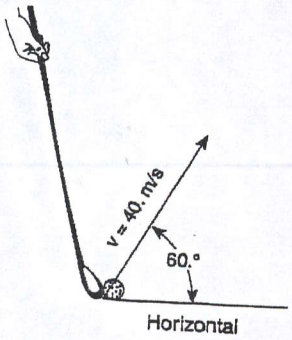
13 & 14. The diagram below shows a golf ball being struck by a club. The ball leaves the club with a speed of 40. meters per second at an angle of 60.° with the horizontal.



(13) 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

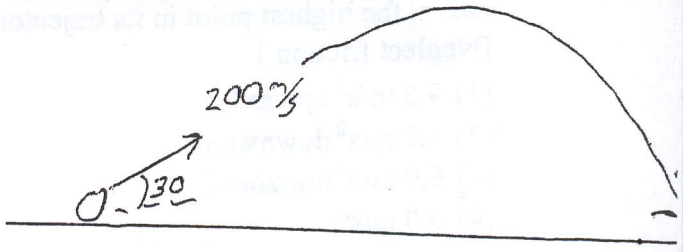
(14) The ball reaches a maximum height of

d_y = _____ meters

15 & 16

(15) A projectile is launched with an initial velocity of 200 meters per second at an angle of 30° above the horizontal. What is the magnitude of the vertical component of the projectile's initial velocity?

(1) 200 m/s × cos 30°
(2) 200 m/s × sin 30°
(3) $\frac{200 \text{ m/s}}{\sin 30°}$
(4) $\frac{200 \text{ m/s}}{\cos 30°}$



(16) The projectiles maximum height will be

d_y = ____ meters

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(17) The path of a projectile fired at a 30° angle to the horizontal is best described as

(1) parabolic
(2) linear
(3) circular
(4) hyperbolic

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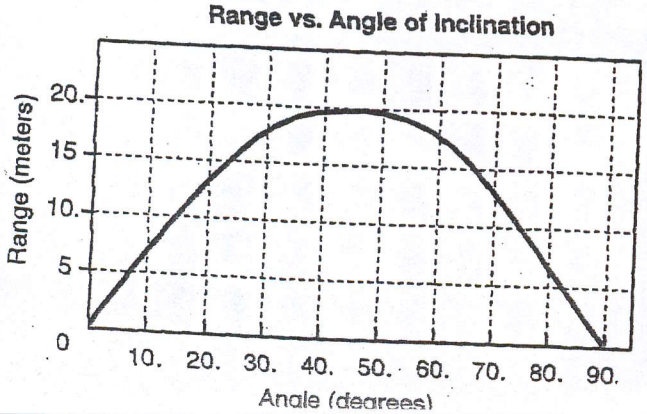
(18) Projectiles are fired from different angles with the same initial speed of 14 meters per second. The graph below shows the range of the projectiles as a function of the original angle of inclination to the ground, neglecting air resistance.



The graph shows that the range of the projectiles is

(1) the same for all angles
(2) the same for angles of 20.° and 80.°
(3) greatest for an angle of 45°
(4) greatest for an angle of 90.°

(19) An archer uses a bow to fire two similar arrows with the same string force. One arrow is fired at an angle of 60.° with the horizontal, and the other is fired at an angle of 45° with the horizontal. Compared to the arrow fired at 60.°, the arrow fired at 45° has a

(1) longer flight time and longer horizontal range
(2) longer flight time and shorter horizontal range
(3) shorter flight time and longer horizontal range
(4) shorter flight time and shorter horizontal range

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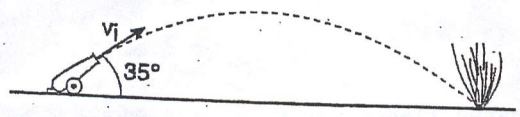
A cannon elevated at an angle of 35° to the horizontal fires a cannonball, which travels the path shown in the diagram below.
[Neglect air resistance and assume the ball lands at the same height above the ground from which it was launched.]



15. If the ball lands 7.0×10^2 meters from the (20) cannon 10. seconds after it was fired, what is the horizontal component of its initial velocity?

(1) 70. m/s
(2) 49 m/s
(3) 35 m/s
(4) 7.0 m/s

16. If the angle of elevation of the cannon is (21) decreased from 35° to 30.°, the vertical component of the ball's initial velocity will

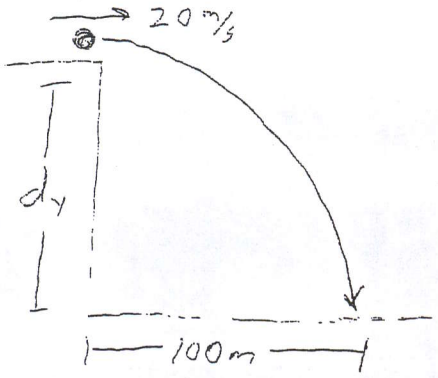
(1) decrease and its horizontal component will decrease
(2) decrease and its horizontal component will increase
(3) increase and its horizontal component will decrease
(4) increase and its horizontal component will increase

17. If the ball's time of flight is 10. seconds, what is (22) the vertical component of its initial velocity?

(1) 9.8 m/s
(2) 49 m/s
(3) 70. m/s
(4) 98 m/s

PROBLEM 1 –

A ball is fired horizontally from the top of a cliff of unknown height at a forward velocity of 20 m/s. The ball strikes the ground at a distance of 100 meters from the cliffs base.



A – How many seconds is ball in air. (Show equ., Sub., & Units) (If you can't get it use 4 for rest of problem)

B- How high is the cliff ? (Show equ, Sub, & units)

C-During the flight the horizontal velocity of the ball - (Increases, Decreases, Stay same)

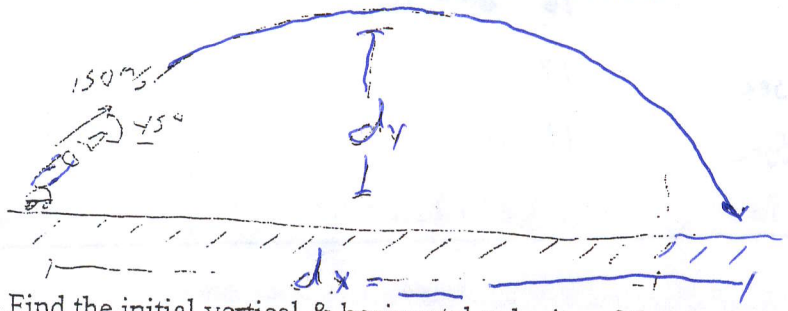
D- If the forward velocity of ball is double, How will this effect –

Time in air –

Forward distance traveled –

PROBLEM 2 –

A cannon is fired at 150 m/s at 45° above the horizontal.



A – Find the initial vertical & horizontal velocity of the cannon shell.

B – Find the time of rise & total time in air.

C- Find the maximum height reached (Show equ., sub., & unit)

D- Find maximum forward distance traveled (Show equ, sub, & unit

E- If angle were increased to 70° How would that effect –

Time in air –

Horizontal distance -

Answers

1 - 4
2 - 3
3 - 3
4 - 4
5 - 4
6 - 1
7 - 1
8 - $d_x = 90m$
9 - 2
10 - 1
11 - $t_{rise} = .25 sec$
$t_{Total} = .5 sec$
12 - 2
13 - 3
14 - 60.6m
15 - 2
16 - 500m
17 - 1
18 - 3
19 - 4
20 - 1
21 - 2
22 - 2

Problems

1 (a) $V_x = \frac{d_x}{t}$ $\quad 20 m/s = \frac{100m}{t}$

$t = 5 sec$

(b) $a = 10 m/s^2$
$V_{iy} = 0 m/s$
$t = 5 sec$
$d_y = ?$

$d_y = V_{iy} t + \frac{1}{2} a t^2$
$d_y = 0 + \frac{1}{2}(10 m/s^2)(5s)^2$
$d_y = 125m$

(c) V_{Hor} stays same

(d) Time - No effect
For dist - Doubles

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2 A) $150 m/s (\sin 45) = 106 m/s$
$V_x = 150 m/s (\cos 45) = 106 m/s$

B) rise
$V_{iy} = 106 m/s$
$V_{fy} = 0 m/s$
$a = -10 m/s^2$
$t = ?$

$V_{fy} = V_{iy} + at$
$0 = 106 m/s + (-10 m/s^2) t$
$t = 10.6 sec$ rise

$t_{Total} = 21.2 sec$

C) $d_y = \frac{1}{2}(V_{iy} + V_{fy}) t$
$= \frac{1}{2}(0 m/s + 106 m/s) 10.6s$
$d_y = 561.8m$

D) $V_x = \frac{d_x}{t}$ $\quad 106 m/s = \frac{d_x}{21.2 sec}$

$d_x = 2247m$

E) Time ↑
Hor dist ↓