

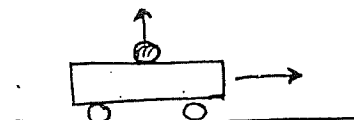
REVIEW
UNIT 4 ~~REVIEW~~
PROJECTILE MOTION

NAME _____ Period _____

Projectile Motion Formulas

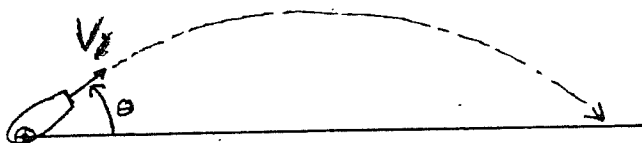
$$v_x = v \cos \theta; \quad v_y = v \sin \theta; \quad t_y = t_x = v_y / g; \quad t_{\text{total}} = 2 t_y; \quad \text{range} = v_x t_x = 2 v^2 \sin \theta \cos \theta / g = v^2 \sin 2\theta / g$$

Questions 1-4 refer to the ballistic cart demonstration in which a metal sphere resting in the cart is shot upward into the air soon after the cart was released by the pushing demonstrator:



1. ____ The sphere will fall in front of the cart if the cart's ~~speed~~ ^{velocity} ...
A. increases B. decreases C. remains constant in magnitude D. remains constant in magnitude and direction
2. ____ The sphere will miss the cart to the side if the cart's ~~speed~~ ^{velocity} ...
A. increases B. decreases C. remains constant in magnitude D. remains constant in magnitude and direction
3. ____ The sphere will fall in back of the cart if the cart's ~~speed~~ ^{velocity} ...
A. increases B. decreases C. remains constant in magnitude D. remains constant in magnitude and direction
4. ____ The sphere will fall in back into the cart only if the cart's ~~speed~~ ^{velocity} ...
A. increases B. decreases C. remains constant in magnitude D. remains constant in magnitude and direction

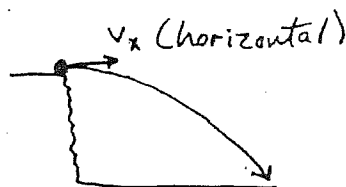
Questions 5-13 refer to a cannon ball which is fired with an initial velocity v and angle θ :



5. ____ The maximum vertical distance (max. height) occurs when θ equals:
A. 30° B. 45° C. 55° D. 75° E. 90°
6. ____ The maximum horizontal distance (range) occurs when θ equals:
A. 30° B. 45° C. 55° D. 75° E. 90°
7. ____ If $\theta = 15^\circ$, the cannon ball can also be given the same range if θ equals:
A. 30° B. 45° C. 55° D. 75° E. 90°
8. ____ The maximum height occurs when:
A. angle θ equals 45° B. V_x is a maximum C. the cannon ball is halfway through its flight D. $V_y = 0$.
9. ____ If the initial velocity v is maintained constant, as the angle θ decreases:
A. the horizontal and vertical components of velocity become smaller.
B. The horizontal and vertical components of velocity become larger.
C. The horizontal velocity component increases and the vertical component decreases.
D. The vertical velocity component increases and the horizontal component decreases.

10. ____ During the cannon ball's flight, the horizontal acceleration is:
 A. always zero B. zero just at the top of the trajectory C. 9.8 m/s^2 up D. 9.8 m/s^2 down
11. ____ During the cannon ball's flight, the vertical acceleration is:
 A. always zero B. zero just at the top of the trajectory C. 9.8 m/s^2 up D. 9.8 m/s^2 down
12. ____ During the cannon ball's flight, the horizontal velocity (neglecting air friction) is:
 A. a constant non-zero number B. slowing as it rises C. slowing as it falls D. zero E. 9.8 m/s^2 down
13. ____ During the cannon ball's flight, the vertical velocity (neglecting air friction) is:
 A. a constant non-zero number B. slowing as it rises C. slowing as it falls D. zero E. 9.8 m/s^2 down

Questions 14-20 refer to a ball thrown horizontally off a 21 meter high cliff with velocity $v_x = 13 \text{ m/s}$. Assume the ground is perfectly horizontal and neglect air resistance.



14. ____ About what time horizontally is the ball in the air after being thrown:
 A. 4.3 m B. 1.5 s C. 2.1 m D. 2.1 s E. 2.1 m/s
15. ____ About what time vertically is the ball in the air after being thrown:
 A. 4.3 m B. 1.5 s C. 2.1 m D. 2.1 s E. 2.1 m/s
16. ____ What is the range of ball:
 A. 54.6 m B. 54.6 s C. 27.3 m D. 27.3 m/s^2 E. -9.8 m/s^2
17. ____ What is the acceleration of the ball horizontally?
 A. -9.8 m/s^2 B. 0 m/s^2 C. 27.3 m/s^2 D. -9.8 m/s E. gravity
18. ____ If another ball 13 times more massive is thrown horizontally 13 times faster, the range of this second ball will be:
 A. 13 times as far B. 169 times as far C. the same D. the square root of 13 times as much
19. ____ If another ball 13 times more massive is thrown horizontally 13 times faster, the time it takes to fall vertically to the ground for this second ball will be:
 A. 13 times as far B. 169 times as far C. the same D. the square root of 13 times as much
20. ____ Which of the following statements is correct?
 A. Vertical and horizontal components of the ball are independent
 B. The time to fall (vertically) if just dropped is equal to the time for the range (horizontally)
 C. Acceleration on the ball is constant throughout its flight even if thrown at an angle
 D. All of the above

Twenty more points of problem solving on the test. Any five of eight questions/problems.