Projectile Motion Simulation Lab

- Go to https://phet.colorado.edu/
- Go to Search and type in "Projectile Motion"
- Click on Projectile Motion (HTML5)
- Click the Play button on the Simulation Graphic
- Click on Lab

Cliff Problem (Investigating the Height and the Distance Traveled)

1. Click on the cannon and lift it up until it is at a height of 3 m
2. Click on the cannon and lower it until the angle is 0 degrees
3. Click below the cannon and change the initial speed to 16 m/s
4. Using your height of 3 m. Calculate the time it will take the cannonball to reach the ground and record it here: _____ seconds.
5. Using your time and your initial speed, calculate the approximate distance you should place the target and record it here: _____ meters.
6. Did you hit your target? Circle your answer: Yes or No

Doubling the Height of the Cliff

7. Click on the cannon and double the height to 6 meters high.
8. Keep the angle at 0 degrees.
9. Keep the initial speed at 16 m/s.
10. Using your new height of 6 m, calculate the time and record it here: _____ seconds.
11. Using the new time and your initial speed, calculate the approximate distance of the target and record it here: _____ meters.
12. Did you hit your target? Circle your answer: Yes or No
13. Did doubling the height double the original distance the cannonball traveled? Circle your answer: Yes or No

Quadrupling the Height of the Cliff

14. Click on the cannon and quadruple the initial height to 12 meters high.
15. Keep the angle at 0 degrees.
16. Keep the initial speed at 16 m/s.
17. Using your new height of 12 m, calculate the time and record it here: _____ seconds.
18. Using the new time and your initial speed, calculate the approximate distance of the target and record it here: _____ meters.
19. Did you hit your target? Circle your answer: Yes or No
20. Did quadrupling the height double the original distance the cannonball traveled? Circle your answer: Yes or No
21. What is the relationship between the height of a projectile and its horizontal distance traveled?

    _____

Cliff Problem (Investigating the Initial Speed and Distance Traveled)

22. Click on the cannon and lift it up until it is at a height of 10 m
23. Click on the cannon and lower it until the angle is 0 degrees
24. Click below the cannon and change the initial speed to 5 m/s
25. Using your height of 10 m. Calculate the time it will take the cannonball to reach the ground and record it here: _____ seconds.
26. Using your time and your initial speed, calculate the approximate distance you should place the target and record it here: _____ meters.
27. Did you hit your target? Circle your answer: Yes or No

Doubling the Initial Speed of the Cannonball

28. Keep the height at 10 meters, keep the angle at 0 degrees, and double the initial speed to 10 m/s.
29. Using your height of 10 m, calculate the time and record it here: _____ seconds.
30. Using the time and your new initial speed, calculate the approximate distance of the target and record it here: _____ meters.
31. Did you hit your target? Circle your answer: Yes or No
32. Did doubling the initial speed double the original distance the cannonball traveled? Circle your answer: Yes or No

Quadrupling the Initial Speed of the Cannonball

33. Keep the height at 10 meters, keep the angle at 0 degrees, and quadruple the initial speed to 20 m/s.
34. Using your height of 10 m, calculate the time and record it here: _____ seconds.
35. Using the time and your new initial speed, calculate the approximate distance of the target and record it here: _____ meters.
36. Did you hit your target? Circle your answer: Yes or No
37. What did quadrupling the initial speed do to the original distance the cannonball traveled?
    _____
38. What is the relationship between the initial speed and the horizontal distance traveled?
    _____

Graphing:

On the axes below, sketch the graphs of the horizontal and vertical components of the cannonball's velocity *v* as a function of time *t* between *t* = 0, when the cannonball is launched and *t* = T, when the cannonball hits the target. Label *t* = T for the horizontal component of the cannonball's velocity and the vertical component of the cannonball's velocity.