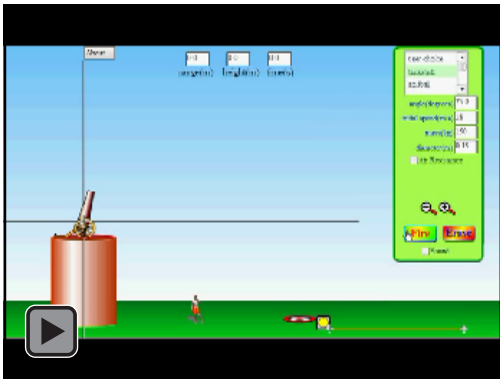


# PROJECTILE MOTION

[http://phet.colorado.edu/sims/projectile-motion/projectile-motion\\_en.html](http://phet.colorado.edu/sims/projectile-motion/projectile-motion_en.html)

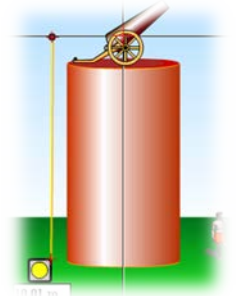
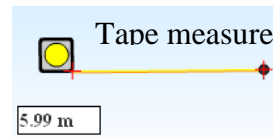


1. With the cannon on the ground, shoot a tank shell at different angles without changing the speed. Which angle will send the object the farthest? (you will need to try several different angles to figure this out).

Angle \_\_\_\_\_ Distance \_\_\_\_\_ Speed \_\_\_\_\_

2. Keeping the speed constant, compare the distance an object travels when shot from the ground and from a cannon 10 meters above the ground (use tape measure) above the ground. Which travels the farthest?

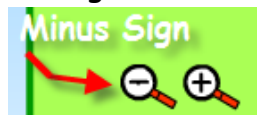
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3. Now let's compare different projectiles. Keeping everything constant except for the projectile, compare the distance each travels with the wind resistance unchecked. Record your results.

| Object       | Cannon Height | Angle | Speed | Distance |
|--------------|---------------|-------|-------|----------|
| Tank Shell   |               |       |       |          |
| Golf Ball    |               |       |       |          |
| Baseball     |               |       |       |          |
| Bowling Ball |               |       |       |          |
| Football     |               |       |       |          |
| Pumpkin      |               |       |       |          |
| Adult Human  |               |       |       |          |
| Piano        |               |       |       |          |
| Buick        |               |       |       |          |

4. Now repeat the above procedure with the wind resistance checked. You might want to set the speed at about 50 m/s and click the minus sign a few times (this will allow you to find your shots when they go really far).



| Object       | Cannon Height | Angle | Speed | Distance |
|--------------|---------------|-------|-------|----------|
| Tank Shell   |               |       |       |          |
| Golf Ball    |               |       |       |          |
| Baseball     |               |       |       |          |
| Bowling Ball |               |       |       |          |
| Football     |               |       |       |          |
| Pumpkin      |               |       |       |          |
| Adult Human  |               |       |       |          |
| Piano        |               |       |       |          |
| Buick        |               |       |       |          |

5. Using the tank shell projectile, try to hit the target. You may shoot as many shots as you need. Complete the chart below.

| Cannon Height<br>(use tape measure) | Angle<br>(degrees) | Target Distance<br>(use tape measure) | Initial Speed<br>m/s |
|-------------------------------------|--------------------|---------------------------------------|----------------------|
| 0 meters (on ground)                | 45                 | 20                                    |                      |
| 5 meters                            | 0                  | 13                                    |                      |
|                                     | 0                  | 18                                    | 18                   |
| 20 meters                           |                    | 10                                    | 15                   |
| 0 meters (on ground)                | 68.5               | 44                                    |                      |
| 15 meters                           |                    | 4                                     | 18                   |
|                                     | 7.6                | 49.5                                  | 22                   |
| 12 meters                           | 66                 | 18                                    |                      |
| 5 meters                            |                    | 13                                    | 22                   |
| 0 meters (on ground)                | 0                  |                                       | 50                   |
| 10 meters                           | 0                  | 15                                    |                      |
| 20 meters                           |                    | 48                                    | 18                   |
| 0 meters (on ground)                |                    | 60                                    | 25                   |
|                                     | 78                 | 15                                    | 18                   |
| 0 meters (on ground)                | 45                 |                                       | 100                  |

6. Two player challenge:

Player 1 sets up the shot for player 2 who tries to zero in and score with the fewest number of shots. Then player 2 sets up the shot for player 1. A game consists of 11 rounds, the player who wins the most number of rounds wins the challenge.

SCORE CARD

| Round                   | Player one<br>Name | Player two<br>Name |
|-------------------------|--------------------|--------------------|
| 1                       |                    |                    |
| 2                       |                    |                    |
| 3                       |                    |                    |
| 4                       |                    |                    |
| 5                       |                    |                    |
| 6                       |                    |                    |
| 7                       |                    |                    |
| 8                       |                    |                    |
| 9                       |                    |                    |
| 0                       |                    |                    |
| 11                      |                    |                    |
| <b>Total Rounds won</b> |                    |                    |

7. What happens when the Greek Guy standing next to the cannon gets hit by a projectile? (you probably already tried to nail him!)

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