Horizontal projectile motion problems worksheet answers

Projectile Motion Worksheet

1) A ball rolls with a speed of 2.0 m/s across a level table that is 1.0 m above the floor. Upon reaching the edge of the table, it follows a parabolic path to the floor. How far along the floor is the landing spot from the table? [0.90 m]

2) A rescue pilot drops a survival kit while her plane is flying at an altitude of 2000.0 m with a forward velocity of 100.0 m/s. If air friction is disregarded, how far in advance of the starving explorer's drop zone should she release the package? [2020 m]

3) A rifle is fired horizontally and travels 200.0 m [E]. The rifle barrel is 1.90 m from the ground. What speed must the bullet have been travelling at? Ignore friction. [321 m/s]

4) A skier leaves the horizontal end of a ramp with a velocity of 25.0 m/s [E] and lands 70.0 m from the base of the ramp. How high is the end of the ramp from the ground? [38.5 m]

5) An astronaut stands on the edge of a lunar crater and throws a half-eaten Twinkie™ horizontally with a velocity of 5.00 m/s. The floor of the crater is 100.0 m below the astronaut. What horizontal distance will the Twinkie™ travel before hitting the floor of the crater? (The acceleration of gravity on the moon is $1/6^{th}$ that of the Earth). [55.3 m]

6) A baseball player leads off the game and hits a long home run. The ball leaves the bat at an angle of 30.0° from the horizontal with a velocity of 40.0 m/s. How far will it travel in the air? [141 m]

7) A golfer is teeing off on a 170.0 m long par 3 hole. The ball leaves with a velocity of 40.0 m/s at 50.0° to the horizontal. Assuming that she hits the ball on a direct path to the hole, how far from the hole will the ball land (no bounces or rolls)? [9.38 m]

8) A punter in a football game kicks a ball from the goal line at 60.0° from the horizontal at 25.0 m/s.
   a) What is the hang time of the punt? [4.41 s]
   b) How far down field does the ball land? [55.2 m]

9) A cannon fires a cannonball 500.0 m downrange when set at a 45.0° angle. At what velocity does the cannonball leave the cannon? [70.0 m/s at 45.0°]

10) A lovesick lad wants to throw a bag of candy and love notes into the open window of his girlfriend's bedroom 10.0 m above. Assuming it just reaches the window, he throws the love gifts at 60.0° to the ground:
   a) At what velocity should she throw the bag? [16.2 m/s at 60.0° to the ground]
   b) How far from the house is he standing when he throws the bag? [11.5 m]

PHYSICS 12 PROJECTILE MOTION WORKSHEET 2

1. A rock is thrown horizontally from a cliff at 25 m/s.
   a) What will its horizontal and vertical velocities be after 2.0 s?
   b) What will its velocity be (magnitude and direction) after 3.0 s?
   c) What will its displacement be after 3.0 s?

2. A ball is projected horizontally with velocity 'v' m/s from a point 245 m above the ground.
   a) How long does it take to reach the ground?
   b) If it strikes the ground 84 m horizontally from the point of projection, what is the value of **v**?

3. A boy standing on top of a hill throws a stone horizontally. The stone hits the ground at the foot of the hill 2.5 s later. How high is the hill?

4. A projectile is shot upward at a 60° angle with the ground at 65 m/s.
   a) What are the vertical and horizontal components of its velocity?
   b) How far has the projectile gone horizontally after 4.0 seconds?

5. The muzzle velocity of a projectile fired from a gun has an upward component of 49 m/s and a horizontal component of 60 m/s.
   a) What maximum height does the projectile reach?
   b) How far forward does it go? (assume a level surface)

6. A bullet is fired from a height of 45 m and hits the ground 2000 m away. With what velocity does the bullet leave the gun?

7. A projectile is fired at 12.5 m/s at an angle of 53.1° with the horizontal from a point 75.0 m above the ground.
   a) How long does it take to reach the ground?
   b) What maximum height does it reach?
   c) What horizontal distance does it travel before striking the ground?
   d) With what velocity does it strike the ground?

8. A projectile is fired at an angle θ above the horizontal from a point 80 m above the ground. If the vertical component of the initial velocity is 30 m/s upwards,
   a) how long does the projectile take to land?
   b) calculate the angle θ if the projectile travels 576 m.

9. A stone is projected upwards at 30° to the horizontal from a point 175 m above the ground, with initial velocity 20 m/s.
   a) How long does the stone take to reach the ground?
   b) What is the range of the projectile?
   c) What is the velocity of the object when it strikes the ground?

1 a) 25 m/s, 19.6 m/s down b) 38.6 m/s @ 49.6° down c) 87 m @ 30.5° down 2 a) 7.1 s b) 12 m/s 3. 31 m

Name _____ **Period** _____**Projectile Motion Worksheet #2**

1. A football is kicked in the air during the opening kickoff. The ball leaves the tee at an angle of 53° and at a speed of 28 m/s. Calculate the time it takes for the ball to hit the ground, the max height of the ball, and the distance the ball went downfield.

2. A daredevil is shot out of a cannon at 45° to the horizontal with an initial speed of 25.0 m/s. Calculate the time it takes him to hit the net, how high the circus tent must be for him not to hit the top, and where the net needs to be placed.

3. A battleship fires its cannons at an enemy ship. If the projectile leaves the guns at 400 m/s at an angle of 75°, calculate the time it takes the shell to hit the enemy ship, the maximum height of the projectile, and how far away the enemy ship is to the battleship.

4. A baseball player hits a pitch at an angle of 42° degrees to the horizontal at a speed of 35 m/s. Calculate the time it takes the baseball to hit the ground, the maximum height of the ball, and the distance the ball travels.

5. A Frisbee is thrown at an angle of 39° to the horizontal at a speed of 13.0 m/s. Calculate the time the Frisbee is in the air, the maximum height, and the distance the Frisbee travels.

6. A stuntman in a car hits a ramp with an angle of 42° to the horizontal at a speed of 41.7 m/s. Calculate the time the car is in the air, the maximum height of the car, and the distance the car travels.

II. Calibration

a. Set up:

1. Materials: projectile launcher, wood block, meter sticks, string, nut, blank and carbon paper, masking tap
2. Place launcher on a table (table should have a horizontal top)

b. Procedure:

1. Measure distance from bottom of the projectile (when in launch position) to the floor. The best way to do this is with a plumb bob, which can easily be made with string and a pen. If you don't know what a plumb bob is, ask google.

Height (m)	

2. Fire the launcher 10 times to determine average horizontal distance from the projectile's center to the center of the hit pattern on the paper, as well as the uncertainty in your average $\Delta x_{avg} = \frac{s}{2\sqrt{N}}$

Trial	Distance (m)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Average	
Uncertainty	

PHet Lab #2 Projectile motion

http://phet.colorado.edu/sims/projectile-motion/projectile-motion_en.html

Do not answer the lettered questions (just think about them.) Record table and solve only the application ?s.

1. Click on the above link.
2. Try using some of the different objects in the pull down menu **without** air resistance.
3. Now try the different objects **with** air resistance
   a. What does air resistance do to a projectile? Why?
   b. Why does a bowling ball go farther than a golf ball even though a golf ball has a smaller drag?
   c. Why does a human go so much farther than a Buick when they have the same drag coefficient?
4. Physics frictionless environment; so turn drag off. Move the target to 20 meters from cannon by pulling the "x" away from the tape measure and try to fire the golf ball with these parameters, record your results:

Angle (degrees)	75°	45°	15°	89.4°	9.3°
Initial Speed (m/sec)	20 m/sec	14 m/sec	18 m/sec	98 m/sec	24.8 m/sec
Hit or Miss					
Time in the air					
Vertex Height (m)					
Range (m)					

   e. Which angle requires the fastest speed in order to hit the target? Why?
   f. Which angle requires the slowest speed to hit the target? Why?
   g. How did the shots with the smallest angles go just as far as the shots that were in the air the longest?
   h. Why do the X's get closer together as you get to the top of the parabola?
   i. What happens to the speed of the golf ball as you get closer to the top of the parabola? Does the horizontal speed change or only the vertical speed?

APPLICATION PROBLEMS:

1. *CLIFF PROBLEM:* Pull the cannon up to 18 meters vertical. Place the target at 34 meters horizontal and level with ground. Solve for the Vr of a horizontal shot. Once you have calculated the range, you may use the computer. Plug in your solution and fire to see if you truly understand how to calculate this.

2. *DUDE PERFECT PROBLEM:* Pull the cannon down to level. Place the target at 34 meters horizontal and 34 meters vertical. Solve for the Vr and the angle required for firing the ***zenith*** through this elevated target. Once you have calculated the Vr and the angle, you may use the computer. Plug in your solution and fire to see if you truly understand how to calculate this.

Horizontal projectile motion class 11. Horizontal projectile motion formula class 11. Horizontal projectile motion questions. Problems on horizontal projectile motion. Problems on projectile motion with solutions.

Home » Unit 2: Two Dimensional Motion: Projectile and Non-Projectile » Horizontal Projectile Motion Math 7.A pelican flying horizontally drops a fish from a height of 8.1 m. The fish travels 9.3 m horizontally before it hits the ground. What was the pelican's speed? 7.32 m/s 8. If you launch a ball horizontally, moving at a speed of 2.00 m/s from a table that is 1.5 m tall, how far from the base would it land? 1.1 m Thank you for your participation! Projectile problems are presented along with detailed solutions. These problems may be better understood when projectile equations are first reviewed. An interactive html 5 applet may be used to better understand the projectile equations.Problems with Detailed SolutionsProblem 1An object is launched at a velocity of 20 m/s in a direction making an angle of 25° upward with the horizontal.a) What is the maximum height reached by the object?b) What is the total flight time (between launch and touching the ground) of the object?c) What is the horizontal range (maximum x above ground) of the object?d) What is the magnitude of the velocity of the object just before it hits the ground?Solution to Problem 1 Problem 2A projectile is launched from point O at an angle of 22° with an initial velocity of 15 m/s up an incline plane that makes an angle of 10° with the horizontal. The projectile hits the incline plane at point M.a) Find the time it takes for the projectile to hit the incline plane.b)Find the distance OM. Solution to Problem 2Problem 3A projectile is to be launched at an angle of 30° so that it falls beyond the pond of length 20 meters as shown in the figure.a) What is the range of values of the initial velocity so that the projectile falls between points M and N? Solution to Problem 3Problem 4A ball is kicked at an angle of 35° with the ground.a) What should be the initial velocity of the ball so that it hits a target that is 30 meters away at a height of 1.8 meters?b) What is the time for the ball to reach the target? Solution to Problem 4Problem 5A ball kicked from ground level at an initial velocity of 60 m/s and an angle θ with ground reaches a horizontal distance of 200 meters.a) What is the size of angle θ?b) What is time of flight of the ball? Solution to Problem 5Problem 6A ball of 600 grams is kicked at an angle of 35° with the ground with an initial velocity V0.a) What is the initial velocity V0 of the ball if its kinetic energy is 22 Joules when its height is maximum?b) What is the maximum height reached by the ball Solution to Problem 6Problem 7A projectile starting from ground hits a target on the ground located at a distance of 1000 meters after 40 seconds.a) What is the size of the angle θ?b) At what initial velocity was the projectile launched? Solution to Problem 7Problem 8The trajectory of a projectile launched from ground is given by the equation y = -0.025 x2 + 0.5 x, where x and y are the coordinate of the projectile on a rectangular system of axes.a) Find the initial velocity and the angle at which the projectile is launched. Solution to Problem 8Problem 9Two balls A and B of masses 100 grams and 300 grams respectively are pushed horizontally from a table of height 3 meters. Ball has is pushed so that its initial velocity is 10 m/s and ball B is pushed so that its initial velocity is 15 m/s.a) Find the time it takes each ball to hit the ground.b) What is the difference in the distance between the points of impact of the two balls on the ground? Solution to Problem 9Projectile Motion Calculator and Solver report this adMore To Explore In this worksheet, we will practice solving problems about projecting bodies horizontally from a point above the ground. Q1: A particle was projected horizontally from a point 42 m above the ground at 32 m/s. Find, to one decimal place, the time it took the particle to reach the ground. Take g=9.8/ms. Q2: A ball is rolled along a smooth horizontal surface from a point 6 m away from the edge of the surface with an initial velocity of 30 m/s. Given that the surface is suspended 2.5 m above the ground, find the total time taken for the ball to reach the ground from its initial position. Give your answer to 2 significant figures. Take the acceleration of gravity g=10/ms. Q3: An arrow is fired horizontally from a bow at a target at a speed of 74 m/s. The arrow hits the target at a point 15 cm below the point from which it left the bow. Modeling the arrow as a projectile moving freely under gravity g=9.8/ms in a vertical plane perpendicular to the plane of the target, find the horizontal distance between the bow and the target. Give your answer to two decimal places. Q4: Liam threw a ball horizontally at a speed of 10.5 m/s toward a vertical target. The ball moved freely under gravity in a plane perpendicular to the target and hit the target at a height 12.1 cm below the height from which it was thrown. Taking g=9.8/ms, find the horizontal distance the ball traveled. Q5: A rock was thrown horizontally from the top of a tower at 20.8 m/s. It flew for 2.4 seconds before hitting the ground. Calculate the distance s between the base of the tower and the point where the rock landed, and find the height h of the tower. Take g=9.8/.ms As=49.92m, h=56.448m Bs=99.84m, h=28.224m Cs=24.96m, h=28.224m Ds=99.84m, h=112.896m Es=49.92m, h=28.224m Q6: Jackson threw a stone horizontally at 30 m/s from the top of a cliff. Given that it landed on the ground 32 meters below, find the distance between Jackson and where the stone landed to the meter. Take g=9.8/ms. Q7: A ball is thrown horizontally from the top of a tower of length 150 m. It lands on the ground at a horizontal distance of 100 m from the base of the tower. Find the initial velocity at which the ball is thrown, taking the acceleration due to gravity g=9.8/ms. Give your answer to two decimal places. Q8: A particle is projected horizontally at an initial velocity of U m/s from a point 30 m above the ground. The particle lands at a horizontal distance of 200 m from the point of projection. Assuming that the particle moves freely under gravity, find U. Give your answer to 3 significant figures. Take the acceleration of gravity g=9.8/ms. Q9: A brick of mass 3 kg is projected along a rough plane at 10 m/s. After traveling for 8 m, the brick leaves the plane and falls 2.5 m to the ground. The total time of motion from the moment of projection to landing on the ground is 2 s, and the acceleration of gravity is g=9.8/ms. Find, to one decimal place, the total time that the brick is in contact with the rough plane. Find, to one decimal place, the coefficient of friction between the brick and the plane. Find, to one decimal place, the horizontal distance from the point of projection to the point where the brick lands. Q10: Mason was honing his stone-skimming skills at a lake. He finds that for the stone to skim well it must hit the surface of the lake at an angle of 31◦ or less to the horizontal. What is the minimum speed v at which he must throw the stone for it to skim well, given that he throws it horizontally from a height of 96 cm? Give your answer in meters per second, correct to one decimal place. When he throws the stone at this speed, at what distance x does the stone first hit the water? Give your answer in meters, correct to one decimal place. Take g=9.8/ms. Av=5.1/ms, x=2.3m Bv=7.2/ms, x=1.4m Cv=5.1/ms, x=1.6m Dv=7.2/ms, x=3.2m Ev=7.2/ms, x=2.3m

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