Projectile motion launched horizontally

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Sketch the motion of a horizontally launched projectile on the axis below. Which of the following affects the motion of a projectile launched horizontally. Which statement describes the horizontal motion of a horizontally launched projectile. Give an example of a projectile launched horizontally and describe its motion. How would you describe the horizontal motion of a horizontally launched projectile. What factors affect the motion of a projectile launched horizontally. Horizontally launched projectile motion worksheet. Projectile motion for an object launched horizontally.

By the end of this section, you will be able to: Identify and explain the properties of a bullet, such as acceleration due to gravity, range, maximum height and trajectory. Determine the position and speed of a bullet in different points in its trajectory. Apply the motion independence principle to solve bullet motion problems. The bike of the bullet is the motion of an object cast or projected in the air, subject only to the acceleration of gravity. The object is called a bullet, and his journey is called his trajectory. The movement of the falling objects, as it is covered in problem-solving basics for one-dimensional kinematics, is a simple one-dimensional type of bullet movement in which there is no horizontal movement. In this section, we consider the two-dimensional bullet motion, such as that of a calcium or other object for which air resistance is negligible. The most important fact to remember here is that the movements along perpendicular axes are independent and therefore can be analyzed separately. This fact was discussed in a two-sized kinematics: introduction, where vertical and horizontal movements have been seen to be independent. The key to analyze the two-dimensional projector movement is to insert it into two movements, one along the horizontal axis and the other along the vertical. (This selection of axes is the most sensitive, because acceleration due to gravity is vertical â € "so, there will be no acceleration along the horizontal axis when air resistance is negligible.) How it is It is customary, we call the horizontal axis XE the vertical axis y. Figure 1 illustrates the notation for movement, where s is defined as the total displacement and X and Y are its components along the horizontal and vertical axes, respectively. The magnitude of these vectors are S, X and Y. (Note that in the last section we used the notation A to represent a vector with AX and AY components. If you continue this format, we would call the movement S with SX and SY components. However, to simplify the notation, we will simply represent the component vectors as XE y.) Of course, to describe the bike we must face speed and acceleration, as well as by shift. We must also find their components along the Xâ € "and the Y-Ax. We will assume that all the forces except gravity (such as air resistance and friction, for example) are negligible. The acceleration components are therefore very simple: AY = â € "g = â €" 9.80 m / s2. (Note that this definition presupposes that the direction upwards is defined as the positive direction. If the coordinate system is organized, instead of such that the downward direction is positive, then acceleration due to gravity takes a value Positive.) Because gravity is vertical, AX = 0. Both accelerations are constant, in that kinematic equations can be used. Translation: translation: [Latex] {v} {2} = {{v} _ {0}} {2} + 2nd \ left (x- {x} _ {0} \ Right)\ [/ Latex]. Figure 1. The total displacement of a football at a point along its path. The S vector has x and y components along the horizontal and vertical axles. Its magnitude is S, and it does a Î¸ angle with the horizontal. Given these assumptions, the following steps are then used to analyze the movement of the bullet: Step 1. They resolve or break the movement into horizontal and vertical components along the X and Y axes. These axes are perpendicular, so ax = a cos¸â and ayâ = a sin Î¸ is used. The size of S moving components along these axes is xey. The magnitudes of the V speed components are vx = v cos î¸â and vy = v sin Î¸â where V is the speed scale and î¸ is its direction, as shown in 2. The initial values are indicated with an index 0, as usual. Step 2. Treating the movement as two separate independent movements, one horizontal and the other vertical. Cinematic equations for horizontal and vertical movement take the following forms: Horizontal movement (AX = 0) â = X0 + VXT VXÂ = Â V0xâ = Â VXÂ = Speed is a constant. (ii) (ii) (ii) (ii) (iii) (iii) (iii) (ii) (iii) (iii) (iii) (iii) (iii) (iiii) (iii) (iii) (iiiii) (iiiiii)) (ii)) (iiiiiiiii) (ii) (ii)) (ii))) (iiiii) (ii)) (iiiiiiii) (ii))) (iiiii) (iiiiiiiiiii) (ii) (iiiiiiiiiii) (iiiiiii))))) (iiii) (iii) (i) (ii) (ii) (iii) (iiii) (ii) Step 3. Solve for the incognitors in the two separate movements - one horizontal and one vertical. Note that the only common variable between movements is time t. The problem solving procedures here are the same as monodimensional cinematics and are illustrated in the examples solved below. Step 4. Recombine the two movements to find total shift s and speed v. Because x â€ "e y -motions are perpendicular, we determine these vectors using the techniques outlined in the addition of vector and subtraction:¸wt },wt },wt },w },w },w },w },w },w },w },w },w },w,w },w,w },w },w },w },w },w,w } },w,w },w,w } } } } } },w },w,w,w,w,w η η } η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η η Figure 2. (a) We analyze the movement of the two-dimensional bullet by interrupting it in two separate independent movements along the vertical and horizontal axes. (b) The horizontal movement is simple, since AX = 0 and VX is therefore constant. (c) the speed in the vertical direction begins to decrease when the object increases; At its highest point, theVertical is zero. While the object falls back to the earth, the vertical speed increases in size again but points in the opposite direction to the initial vertical speed. (d) the x Ã ¢ â,¬ "and y -motions are recombined to give total total speed Any point on the trajectory. During a fireworks display, a shell is fired in the air with an initial speed of 70.0 m / s with a angle of 75.0 ° over the horizontal, as illustrated in Figure 3. The fuse is timed to turn on the shell just as it reaches its highest point above the ground. (a) calculate the height in which the shell explodes. (b) How long was it going between the launch of the shell and the explosion? (c) What is the horizontal shift of the shell when it explodes? Strategy As air resistance is negligible for the unexploded shell, you can use the method of analysis described above. The movement can be broken into horizontal and vertical movements in which Axâ = 0 and Ayâ = â€ "g. We can then define x0 and Y0 to be zero and solve the desired quantities. Solution for (a) for â€ œHeightâ€ "we mean the altitude or vertical position Y above the starting point. The highest point in any trajectory, called Apice, is reached when Vy = 0. Since we know the initial and final speeds as well as the initial position, we use the following equation to find Y: Figure 3. The trajectory of a shell of fireworks. The fuse is set to explode the shell at the highest point of its trajectory, which is at a height of 233 m and 125 m horizontally. Since Y0 and VY are both zero, the equation simplifies solving for Y provides [lattice] y = \ frac {{{v} _ {}}}} {2}} {2G}\\ [/ LATEX]. Now we have to find V0y, the component of the initial speed in the Y direction. It is given by V0Y = V0 Sin Î¸, where V0y is the initial speed of 70.0 m / s, and Î¸0â = 75.0o is the initial angle. So, VOY = V0 SIN Î¸0 = (70,0 m / s) (pected 75o) = 67,6 m / s and y is [latex] y = \ frac {\ left (67.6 \ text {m / s}\ right) {2}} {2 \ Sx (9.80 \ text {m / s} {2}\ right)}\\\ Note that it is positive, the initial speed is positive, as is the maximum height, but the acceleration due to gravity is negative. Also note that the maximum height depends only on the vertical component of the initial speed, so that any bullet with an initial vertical component of 67.6 m/s of speed reaches a maximum height of 233 m (transferring air resistance). The numbers in this example are reasonable to display the large fireworks, whose shells reach such heights before exploding. In practice, air resistance is not completely negligible, and therefore the initial speed should be a little larger than that date to achieve the same height. Solution for (b) As in many physics problems, there is more than one way to solve for the moment at the highest point. In this case, the simplest method is to use [Latex] y = {y} _ {0} + \ frac {1} {2} \ SINISTRA ({V} _ {0Y} + {V} _ {Y}REFT) T \\ [/ LATEX]. Since Y0 is zero, this equation simply reduces [latex] y = \ frac {1} {2} \ left ({v} _ {0y} + {v} _ {y} \ right) t \\ [/ Latex]. Note that the final vertical velocity, VY, at the highest point is zero. Therefore, [latex] \ begin {array} {lll} t & = & \ frac {2Y} {\ \ left ({v} _ {0y} + {v} _ {y}}}} right) } = \ frac {2 \ left (\ text) {233 {233 m/s}\right)\\ Discussion for (b) This time it is also reasonable for large fireworks. When you are able to see the launch of fireworks, you will notice several seconds pass before the shell explodes. (Another way of finding time is using [latex]y={y}_{0}+{v}_{0y}t-\frac{1}{2}{\text{gt}}^{2}\[/latex], and solving the square equation for t.) Solution for (c) Since air resistance is negligible, ax=0 and horizontal speed is constant, as the solution for (c) The horizontal shift is horizontal velocity multiplied by time as indicated by x = x0 + vxt, where x0 is equal to zero: x = vxt, where vx is the x-component of speed, which is given by vx = v0 cos θ0 Now, vx = v0 cos θ0 = (70.0 m/s)(cos 75o) = 18.1 m/s The t time for both movements is the same, and so x is x = (18,1 m/s) (6.90 s) = 125 m. Discussion for (c) Horizontal movement is a constant speed in the absence of air resistance. The horizontal shift found here could be useful to keep the fireworks fragments falling on the spectators. Once the shell explodes, the air resistance has an important effect, and many fragments land directly below. In solving part (a) of the previous example, the expression we found for you is valid for any bullet motion in which air resistance is negligible. Call the maximum height y=h; then, [latex]h=\frac{{{v}_{0y}}^{2g}\[/latex]. This equation defines the maximum height of a bullet and depends only on the vertical component of the initial speed. It is important to configure a coordinate system when analyzing the bullet movement. A part of the definition of the coordinate system is to define a origin for x and y positions. Often, it is convenient to choose the initial position of the object as the origin such that x0 = 0 and y0 = 0. It is also important to define positive and negative directions in x and y directions. Typically, we define the positive vertical direction as upwards, and the positive horizontal direction is usually the direction of the object movement. When this is the case, vertical acceleration, g, assumes a negative value (from when it is directed down to Earth). However, it is occasionally useful to define coordinates differently. For example, if you are analyzing the movement of a ball thrown down from the top of a cliff, it may make sense to define the positive direction downwards since the ball movement is exclusively in the downward direction. If this is the case, g takes a positive value. Kilauea in Hawaii is the most active volcano in the world. very active volcanoes typically expel red-hot rocks and lava rather than smoke and ash. Suppose a large rock is expelled from the volcano with a speed25,0 m/s and at an angle 35,0o above the horizontal, as shown in Figure 4. the rock hits the side of the volcano at an altitude of 20.0 m lower than its starting point. (a) calculates the necessary timeto follow this path. (b) What are the size and direction of rock speed? Figure 4. The trajectory of a rock expelled from the volcano of Kilauea. Strategy again, which solves this two-dimensional movement in two independent one-dimensional movements will allow us to solve the desired quantities. The time when a bullet is in the air is governed by its vertical movement alone. We'll solve first. While the rock is increasing and falling vertically, the horizontal movement continues at a constant speed. This example requires the final speed. Therefore, the vertical and horizontal results will be recombined to obtain V and î¸v at the last time it is determined in the first part of the example. Solution for (a) While the rock is in the air, it rises and then falls in a final position 20,0 m below its initial share. We can find time for this by using [Latex] y = {y} _ {0} + {V} _ {0Y} T- \ frac {1} {2} {\text {gt}} {2} \\ [/ Latex]. If we take the initial position Y0 to be zero, then the final position is Yâ = â'20.0 m. Now the initial vertical speed is the vertical component of the initial speed, found by Voy = V0 Sinâ Î¸0â = (25.0 m / s) (pected 35.0o) = 14.3 m / s. Replace known values making yields â'20.0 m = (14.3 m / s) Tâ '(4,90 m / s2) T2. Reorganization terms give a square equation in T: (4,90 m / s2) T2 "(14,3 m / s) Tâ '(20,0 m) = 0. This expression is a square equation of the AT2 module + BT + C = 0, where the constants are AÂ = 4.90, Bâ = â â â â â â â â â â â â,¬14.3, and câ = â Its solutions are provided by the square formula: [latex] t = \ frac {-BPM \ sqrt {{b} {2} -4\text {ac}}} {\text {2}\text {a}}\\\ [/ Latex] This equation produces two solutions: tÂ = 3.96 and tÂ = â € "1.03. (It is left as an exercise for the reader to check these solutions). Time is T = 3,96 S or -1.03 s. The negative value of time implies an event before the beginning of the movement, and so we discard it. So, tâ = 3,96 s. The time for the movement of the bullet is completely determined by the vertical movement. Then any bullet that has an initial vertical velocity of 14,3 m / s and 20,0 m soil under its initial altitude will spend 3,96 s in the air. Solution for (b) From the information now in hand, we can find the horizontal and vertical final speeds VX and VY and combine them to find the total speed V and angle Î¸0 does with the horizontal. Of course, VX is constant so you can solve it in any horizontal position. In this case, we chose the starting point as we know both the initial speed and the initial angle. Therefore: Â VXÂ = v0â Cosâ Î¸0 = (25.0 m / s) (COS 35o) = 20,5 m / s The final vertical speed is provided by the following equation: [Latex] {v} _ {y} = {V } _ {0Y} \ Text {GT}\ [/ Latex], where v0y was found partly (a) to bem / s. Thus, VY = 14. 3 m / s Â ¢ '(9.80 m / s 2) (3.96 s) so that vyÂ ¢ = Â,24.5 m / s. To find the size of the final speed V we combine its perpendicular components, using the following equation: equation: m/s}) ^{2}+{ ({-24.5}\text{ m/s}) ^{2}}\\[/latex] which is equal to 31.9 m/s. The direction Â© Î§v lies from the equation: Â© Î§v = tan Â¢¢¢¢ 1 (vy / vx) so Â Î§vÂ¨ = tanÂ¢¢¢¢¢¢¢1 (Â¢¢¢¢1.19). So, is Î§vÂ¨¨¨¨¨¨¨¨¨¨¨¨¨¨. The negative angle indicates that the velocity is 50.1Â¨¨¨ below the horizontal. This result is consistent with the fact that the final vertical velocity is negative and thus downward, as one would expect, since the final altitude is 20.0 m lower than the initial altitude. (See Figure 4.) One of the most important things illustrated by the movement of the bullet is that the vertical and horizontal movements are independent of each other. Galileo was the first to fully understand this characteristic. He used it to predict the range of a bullet. On flat ground, we define the interval as the horizontal distance R traveled by a projectile. Galileo and many others were interested in the range of projectiles intended primarily for military purposes, such as targeted cannons. However, studying the range of projectiles can shed light on other interesting phenomena, such as the orbits of satellites around the Earth. Let's consider the bullet's range further. Figure 5. Projectile trajectories on flat ground. (a) The higher the initial velocity v0, the greater the interval for a given initial angle. (b) The effect of the initial angle is on the range of a projectile with a given initial velocity. Note that the range is the same for 15o and 75o, although the maximum heights of these routes are different. How does the initial velocity of a projectile affect its range? Obviously, the higher the initial velocity v0, the greater the interval, as shown in Figure 5 (a). The starting angle is Î§0 also has a dramatic effect on the range, as shown in Figure 5 (b). For a fixed initial velocity, such as that which can be produced by a cannon, the maximum range is obtained with Â© Î§0Â¨¨ = 45Â¨o. This only applies to conditions that neglect the strength of the air. If you consider the resistance of the air, the maximum angle is about 38°. It is interesting to note that for every initial angle, except 45°, there are two angles that give the same range, the sum of these angles is 90°. The range also depends on the value of the acceleration of gravity g. Lunar astronaut Alan Shepherd was able to drive a golf ball from a long distance on the Moon because gravity is weaker there. The range R of a projectile on a flat ground for which the resistance of the projectile is negligible is given by [latex]R=\frac{{{v}_{0}^{2}\theta }_{0}}{g}\\[/latex], where v0 is the initial velocity and Î§0 is the initial angle relative to the horizontal. The proof of this equation is left as an end-of-chapter problem (hints are given), but it fits the main characteristics of the bullet range as described. When it comes to the scope of a On the ground, it is assumed that R is very small compared to the circumference of the earth. If, however, the interval is wide, the earth moves away under the bullet and acceleration of gravity gravity changes along the way. The range is larger than expected by the gamma equation given above because the projectile has further to fall than it would on the ground. (See Figure 6.) If the initial velocity is large enough, the projectile enters orbit. This is called escape velocity. This possibility was recognized centuries before it could be realized. When an object is in orbit, the Earth moves away from under the object at the same rate as it falls. So the object falls continuously but never hits the surface. These and other aspects of orbital motion, such as the rotation of the Earth, will be analytically and in depth later in this text. Once again we see that thinking about one topic, such as the range of a bullet, can lead us to other topics, such as the orbits of the Earth. In Velocity Addition, we will look at velocities addition, which is another important aspect of two-dimensional kinematics and will also provide information beyond the immediate topic. Figure 6. Bullet to satellite. In any case shown here, a projectile is thrown from a very high tower to avoid the resistance of the air. As the initial velocity increases, the radius of action increases and becomes longer than it would be on flat ground because the Earth moves away below its path. With a sufficiently large initial velocity, orbit is reached. Blast a Buick out of a cannon! Learn more about the movement of the bullet by firing various objects. Set the angle, start velocity and ground. Add resistance to the air. Play a game of this simulation trying to hit a target. Click to start the simulation. Projectile motion is the motion of an object through the object subject only to acceleration of gravity. To solve the projectile motion problems, perform the following steps: 1. Determine a coordinate system. Then, solve the position and/or velocity of the object in the horizontal and vertical components. The components of position s are given by the quantities xÂ¯ and y, and the components of velocity v are given by vx =Â¯ as is and vy = v sinÂ¯ Â¯, where vÂ¯ is the magnitude of the velocity and Â¯ is its direction. 2. Analyze the motion of the projectile in the horizontal direction using the following equations: Horizontal motion (ax = 0) equals x = x0 + vxt vxÂ¯=Â¯ v0xÂ¯ =Â¯ vxÂ¯ = the velocity is a constant. 3. Analyze the vertical motion of the projectile using the following equations: Vertical motion (assuming positive on ay = -g = -9.8 m/s2) [latex]y={y}_{0}+\frac{1}{2}\left ({v}_{0y}+{v}_{y}\right) t\[/latex] [latex]{v}_{y}={v}_{0y}-\text{gt}\[/latex] [latex]y={y}_{0}+{v}_{0y}t-\frac{1}{2}{\mathrm{gt}}^{2}\\\\[/latex] [latex]{{{v}_{y}}}^{2}={v}_{0y}^{2}-2g\left (y-{y}_{0}\right) \\[/latex]. 4. Recombine the horizontal and vertical components Verticals of the location and / or speed using the following equations: [LATEX] s = sqrt {x} ^ {2} + {y} ^ {2} \\ [/ latex] Âž i§ = tanÂ ¢ Â |1 (y / x) [latex] v = sqrt {{{v} _ {x}}}}}}} ^ {{v} _ {y} ^ {2}} [/ LATEX] i§VÂ, = TanÂ ¢ â¤1â, (VY / VX). The maximum height H of a bullet bullet with v0y v0y vertical initial v0y is given by [latex] h = \ frac {{v} _ {0y} {2g} {2g}} \ [/ latex.] the maximum horizontal distance traveled from a bullet is called interval. the r range of a bullet on a level plane launched at an angle Î¸0· above the horizontal with the initial velocity v0 is given by [latex] r = \ frac {v} _ {0} _ {0} {2} text {\ sin} {2 \ theta} _ {0} {g} {g} [/ latex.] 1. answer the following questions for the movement of the bullet on the level ground assuming negligible air resistance (the initial angle is neither 0o nor 90 °): (a) is the speed that is always zero? (b) when is the minimum speed? A maximum? (c) can be the speed that is ever equal to the initial speed at a time other than t = 0? (d) Can speed be the same as the initial speed at a time other than that at = 0? 2. answer the following questions for the level-level bullet movement by assuming negligible air resistance (the initial angle is neither 0o nor 90 °): (a) is the acceleration ever zero? (b) is acceleration always in the same direction as a speed component? (c) is acceleration always opposite in the direction of a speed component? 3. for a fixed initial speed, the range of a bullet is determined by the angle to which it is shot. for all except the maximum, there are two angles that give the same range. Considering the factors that could affect the ability of an archer to hit a target, such as the wind, explain why it is preferable that the smaller angle (closer to the horizontal) is preferable. when would it be necessary for the archer to use the largest angle? Why the pointer in a football match or the highest trajectory? 4. during a demonstration of conferences, a professor places two coins on the edge of a table. then scrolls one of the coins horizontally from the table, simultaneously bouncing the other over the edge. describe the next movement of the two coins, in particular discuss whether they hit the floor at the same time. 1. a bullet is launched at ground level with an initial speed of 50.0 m/s at a angle of 30.0oâ "over the horizontal. hits a target over the ground 3,00 seconds later. What are the x and y distances from where the bullet was launched to where it lands? 2. a ball is kicked with an initial speed of 16 m / s in horizontal direction and 12 m / s in vertical direction. (a) at which speed the ball hits the ground? (b) how long does the ball remain in the air? (c) what maximum height is reached by the ball? 3. a ball is launched horizontally from the top of a building of 60,0 m and lands 100,0 m from the base of the building. ignores air resistance. (a) how long is the ball in the air? (b) what must have been the initial horizontal component of speed? (c) what is theVERTICAL OF SPEED Just before the ball hit the ground? (d) What is the speed (including both the horizontal and vertical components) of the ball just before hit the ground? 4. a) A Daredevil is trying to skip his bike on a line of parked from one end to the other, climbing a 32° ramp at a speed of 40.0 m/s (144 km/h). How many buses can you clear if the top of the take-off ramp is at the same height as the bus tops and the buses are 20.0 m long? (b) Discuss what your answer implies about the margin of error in this act, i.e. consider how much horizontal distance you have to travel to avoid reaching the end of the last bus. (Leave aside the resistance of the air.) 5. An archer throws an arrow at a target 75.0 m away; the bullâs eye of the target is at the same height as the drop height of the arrow. (a) At what angle must the arrow be released to hit the bull's eye if its initial velocity is 35.0 m/s? In this part of the problem, show explicitly how to follow the steps involved in solving projectile motion problems. (b) There is a large tree halfway between the goalkeeper and the target with a horizontal branch overhanging 3.50 m above the drop height of the arrow. Will the arrow pass over or under the branch? 6. A rugby player passes the ball 7.00 m through the field, where it is caught at the same hand height. (a) At what angle was the ball thrown if its initial velocity was 12.0 m/s, assuming the lesser of the two possible angles? (b) What other angle gives the same range and why should it not be used? (c) How long did it take for this passage? The 7. Check the intervals for projectiles in Figure 5Â¯ (a) for Â I§ = 45Ã"o and the initial velocities indicated. 8. Check the ranges shown for projectiles in Figure 5 (b) for an initial velocity of 50 m/s at the initial angles shown. 9. The cannon on a battleship can fire a projectile at a maximum distance of 32.0 km. (a) Calculate the initial velocity of the projectile. (b) What is the maximum height? (At its peak, the shell is more than 60% of the atmosphere, but the resistance of the air is not really negligible, as is supposed to ease the problem.) (c) The ocean is not flat, because the Earth is curved. Suppose the radius of the Earth is 6.37 Â 103. How many metres below will you be 32.0 km from the ship along a horizontal line parallel to the ship's surface? Does your answer imply that the error introduced by the flat Earth hypothesis in the motion of the projectile is significant here? The 10. An arrow is fired from a height of 1.5 m towards a cliff of height H. It is shot at a speed of 30 m/s at an angle of 60o above the horizontal. It lands on the top edge of the cliff 4.0 s later. (a) What is the height of the cliff? (b) What is the maximum height reached by the arrow along its trajectory? (c) What is the impact velocity of the arrow just before hitting the cliff? 11:00. In the wide jump in A squat and then pushes away with your legs to see how far you can jump. Suppose that the leg extension from the crouching position is 0.600 m and that the acceleration obtained from this position is 1.25 times acceleration due to gravity, g. How far they can jump? Declare his hypotheses. (The increase in the range can be obtained with The arms in the direction of the jump.) The 12. The world jump record is 8.95 m (Mike Powell, USA, 1991). Considered a bullet, what is the maximum capacity obtainable from a person with a take-off speed of 9.5 m / s? Declare his hypotheses. The 13. Serving at a speed of 170 km / h, a tennis player affects the ball at a height of 2.5 m and with an inclination, Âž eraš̄â, under the horizontal. The service line is 11.9 m from the network, which is 0.91 m high. What is the corner that the ball passes through the network? The ball will land in the service box, whose output line is 6.40 m from the network? The 14. A football quarterback is moving back to the speed of 2.00 m / s when he throws a pass to a player of 18.0 m straight down. (a) If the ball is launched at an angle of 25.OÂÂ, compared to the ground and is captured at the same release height, what is its initial speed compared to the ground? (b) How long does it take to reach the receiver? (c) What is your maximum height above your release point? The 15. The headlights of the guns are regulated to aim at the top to compensate for the effect of gravity, making the gun precise only for a certain range. (a) If a weapon is spotted to hit targets located at the same height of the weapon and 100.0 m away, how much at the bottom the bullet if targeted directly to a distant target 150.0 m? The bullet speed is 275 m / s. (b) discussing qualitatively how a greater muzzle speed could affect this problem and which would be the effect of the resistance of the air. The 16. A eagle is flying horizontally to a speed of 3.00 m / s when the fish in its legs comes off and falls into the lake 5.00 m lower. Calculate the speed of the fish with respect to water when it hits the water. 17. An owl is bringing a mouse to the chicks in his nest. Its position at that time is 4.00 m west and 12.0 m above the center of the 30.0 cm diameter nest. The owl flies east to 3.50 m / s at a corner of 30âo under the horizontal when accidentally drops the mouse. Is the owl fortune to have the mouse that hit the nest? To answer this question, calculate the horizontal position of the mouse when 12.0 m fell. 18. Suppose a footballer kicks the ball from a distance of 30 m to the door. Find the initial ball speed if it passes just above the door, 2.4 m from the soil, given that the initial direction must be 40.OÂ, above the horizontal. 19. Can a goalkeeper to the door to kick a soccer ball in the opponent's door without the ball touches earth? The distance will be about 95 m. A goalkeeper can give the ball a speed of 30 m / s. The 20. The free throw line in the basketball is 4.57 m (15 ft) from the basket, which is located at 3.05 m (10 ft) above the floor. A player standing on the free throw line the ball at an initial speed of 7.15 m/s, releasing it at a height of 2.44 m (8 ft) from the ground. What angle above the horizontal should the ball be thrown to hit the basket exactly? Note that most players will use a large initial angle rather than a flat shotIt allows a wider margin of error. Explicitly shows how you follow the steps involved in solving bullet motion problems. 21. In 2007, Michael Carter (U.S.) set a world record in the jump set with a stroke of 24.77 m. What was the initial speed of the shot if you released it at a height of 2.10 m and threw it at an angle of 38.0ÂoÂ¢ above the horizontal? (Although the maximum distance for a bullet on level ground is reached at 45Â° when air resistance is neglected, the actual angle to get the maximum range is smaller; therefore, 38Â°Â" will give a range longer than 45Â° in the shot.) 22. A basketball player is running at 5.00 m/s directly towards the basket when he jumps into the air to crush the ball. It maintains its horizontal speed. (a) What vertical speed does it need to climb 0.750 m above the floor? (b) How far away from the trash can (measured horizontally) should the jump start to reach its maximum height at the same time as it reaches the trash can? 23. A football player punishing the ball at an angle of 45 Â°. Without a wind effect, the ball would travel horizontally 60.0 m. (a) What is the initial velocity of the ball? (b) When the ball is close to its maximum height it experiences a brief gust of wind which reduces its horizontal velocity by 1.50 m/s. How far does the ball travel horizontally? 24. It shows that the trajectory of a projector is parabolic, having the shape [latex] y = \ text {ax} + {\ text {bx}} ^ {2} \\ [/ Latex]. To get this expression, solve the equation [latex] x = {v} _ {0x} t \\ [/ latex] for tÂ¢ and replace it in the expression for [latex] y = {v} _ {0Y} t- \ left (1/2 \ right) {\ text {gt}}} ^ {2} \\ [/ Latex]. (These equations describe the X and Y positions of a projectile starting at the origin.) You should get an equation of the [Latex] module y = \ text {ax} + {\ text {bx}} ^ {2} \ \ [/ Latex] where A and B are constant. 25. Derive [latex] r = \ frac {{{v} _ {0}}}} {2}} text {\ Sin} {2 \ theta} _ {0}} {G} \\ [/ Latex] for The range of a projectile on the level level by finding the time t at which Y becomes zero and substituting this value of TÂ¢ in the expression for X is¬ "x0, noting that r = x is â¬" x0. 26. The results unreasonable (A) find the maximum range of a super cannon that has a muzzle speed of 4.0 km/s. (b) What is unreasonable of the range you found? (c) Is the premise unreasonable or is the available equation inapplicable? Explain your answer. (d) If such muzzle velocity could be achieved, discuss the effects of air resistance, thinning air with altitude and the curvature of the earth over the range of the super cannon. 27. Build your problem Consider a ball thrown on a fence. Build a problem where you calculate the ball needed the initial velocity for just the fence. Among the things to be determined are; The height of the fence, the distance from the fence to the ball release point and the height at which the ball is released. You should also consider if you can choose the initial speed for for ball and simply calculate the angle where it is launched. Also examine the possibility of multiple solutions given the distances and heights you have chosen. Air resistance: a friction force that slows the movement of objects while traveling through the air; When solving basic physics problems, it is assumed that air resistance is zero kinematics: the study of the movement without regard to the mass movement or force: moving an object according to the time bullet: an object that travels through the air and experiences only the acceleration due to the movement of the bullet by gravity: the movement of an object subject only to the acceleration of the range of gravity: the maximum horizontal distance a bullet travels through the trajectory: the path of a bullet through the air 1. Â x = 1,30 m Â-102, y = 30,9 m 3. (a) 3,50 sâ (b) 28,6 m / s (c) 34,3 m / sâ sâ (D) 44,7 m / s, 50.2o under horizontal 5. (a) Â 18.4oâ (b) The arrow will go beyond the branch. 7. [Latex] r = \ frac {{{{{{v} _ {0}}} {0}}} {2\ theta} _ {0} G}\ [/ Latex] for Î¸ = 45o, [Latex] r = \ frac {{{{{{v} _ {0}} {2}}}}}}}}} {G}\ [/ Latex] R = 91,9 m per v0 = 30 m / s; R = 163 m per V0; R = 255 m per v0 = 50 m / s 9. (a) 560 m / sâ (b) 800 Â-103 mâ (c) 80,0 m. This error is not significant because it is only 1% of the response in part (B). 11. 1.50 m, assuming the launch angle of the 45th 13th.â Î¸â = 6.1o. Yes, the ball lands at 5.3 m from network 15. (a) â'0,486 mâ (b) larger than the speed of the muzzle, the smaller the deviation in the vertical direction, because the time of the flight would be smaller. Air resistance would have the effect of decreasing flight time, thus increasing vertical deviation. 17. Â 4.23 m. No, the owl is not lucky; 19. NO, the maximum range (transferring air resistance) is about 92 m. 21. 15.0 m / s 23. (a) 24,2 m / sâ (b) The ball travels for a total of 57.4 m with the short wind gust. I'm sorry. [Latex] r = {v} _ {0}\ cos \ theta \ left (\ frac {{2v} _ {0}} sin \ theta} {g} \ right) = \ frac {{{{2v} _ {{2v} _ {0}} {2}}} Sin \ theta \ cos \ theta} {g}\ [/ Latex] Since [Latex] 2 \ Sin \ Theta \ cos \ theta = \ Sin 2 \ theta \\ [/ latex], the range is: [Latex] r = \ frac {{{{v} _ {0}} ^ {2}\ Sin 2 \ theta} {g}\ [/ Latex]. }\\ [/ Latex].