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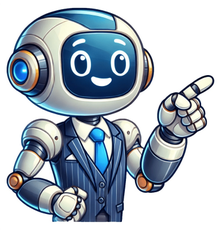

A tree casts a shadow 15 meters long. The angle of elevation of the sun is 45 degrees. Find the height of the tree. a) 15 metersb) 10.6 metersc) 21.2 metersd) 30 metersAnswer: a) 15 meters From the top of a building 30 meters high, the angle of depression of a car on the ground is 60 degrees. Find the distance of the car from the building. a) 15 metersb) 30 metersc) 60 metersd) 45 metersAnswer: b) 30 meters Two poles of heights 6 meters and 11 meters stand on a plane ground. If the distance between the feet of the poles is 12 meters, find the distance between their tops. a) 5 metersb) 10 metersc) 13 metersd) 15 metersAnswer: a) 5 meters Q4. An observer 1.5 meters tall is 20 meters away from a flagpole. If the angle of elevation to the top of the flagpole is 30 degrees, what is the height of the flagpole? a) 15 metersb) 30 metersc) 10 metersd) 20 metersAnswer: c) 10 meters Q5. The angle of elevation of a ladder leaning against a wall is 60 degrees. If the ladder is 8 meters long, how high does it reach on the wall? a) 43 metersb) 4 metersc) 8 metersd) 42 metersAnswer: a) 43 meters Q6. A kite flyer lets out a string of 100 meters. If the angle of elevation of the kite is 30 degrees, how high is the kite? a) 50 metersb) 86.6 metersc) 100 metersd) 75 metersAnswer: b) 86.6 meters From the top of a hill, the angles of depression of two consecutive mileposts, situated at the same side of the hill, are found to be 30 degrees and 45 degrees. Find the height of the hill. a) 100 metersb) 150 metersc) 200 metersd) 250 metersAnswer: c) 200 meters A 20-meter ladder reaches a window 16 meters high on a building. What is the distance between the foot of the ladder and the building? a) 12 metersb) 18 metersc) 14 metersd) 15 metersAnswer: a) 12 meters The shadow of a building is 50 meters when the angle of elevation of the sun is 30 degrees. Find the height of the building. a) 25 metersb) 50 metersc) 100 metersd) 75 metersAnswer: b) 50 meters A flagpole casts a shadow of 15 meters when the angle of elevation of the sun is 60 degrees. Find the height of the flagpole. a) 7.5 metersb) 10 metersc) 15 metersd) 20 metersAnswer: a) 7.5 meters From the top of a tower 40 meters high, the angles of depression of two boats on opposite banks of a river are 30 degrees and 45 degrees. Find the width of the river. a) 20 metersb) 30 metersc) 40 metersd) 50 metersAnswer: b) 30 meters An airplane is flying at an altitude of 5000 meters. If the angle of elevation from the ground is 30 degrees, find the horizontal distance the airplane has covered. a) 8660 metersb) 5000 metersc) 7500 metersd) 4330 metersAnswer: a) 8660 meters A person standing 15 meters away from a building observes that the angle of elevation to the top of the building is 60 degrees. Find the height of the building. a) 15 metersb) 30 metersc) 25.98 metersd) 25 metersAnswer: c) 25.98 meters The angle of elevation of the top of a mountain is 45 degrees. If the mountain is 100 meters high, find the distance from the observer to the top of the mountain. a) 100 metersb) 141.42 metersc) 200 metersd) 70.71 metersAnswer: b) 141.42 meters The angle of elevation of the top of a tower is 30 degrees. If the tower is 50 meters high, find the horizontal distance from the point of observation to the base of the tower. a) 25 metersb) 50 metersc) 100 metersd) 75 metersAnswer: a) 25 meters A ladder is placed against a wall in such a way that it reaches a window 12 meters high If the ladder makes an angle of 45 degrees with the ground, find the length of the ladder. a) 12 metersb) 16.97 metersc) 20 metersd) 15 metersAnswer: b) 16.97 meters The angle of elevation of the top of a tree is 60 degrees. If the tree is 20 meters high, find the distance from the observer to the tree. a) 20 metersb) 40 metersc) 34.64 metersd) 17.32 metersAnswer: c) 34.64 meters A person at the top of a building 25 meters high observes a car at an angle of depression of 30 degrees. Find the distance between the person and the car. a) 25 metersb) 50 metersc) 43.3 metersd) 20 metersAnswer: c) 43.3 meters The angle of elevation of the top of a tower is 60 degrees. If the tower is 30 meters high, find the distance from the point of observation to the base of the tower. a) 15 metersb) 30 metersc) 60 metersd) 20 metersAnswer: b) 30 meters A person standing on the bank of a river observes that the angle of elevation of a tree on the opposite bank is 45 degrees. If the tree is 25 meters high, find the width of the river. a) 25 metersb) 35.36 metersc) 50 metersd) 17.68 metersAnswer: b) 35.36 meters The angle of elevation of the top of a cliff is 75 degrees. If the cliff is 50 meters high, find the distance from the base of the cliff to the point of observation. a) 13.54 metersb) 50 metersc) 57.74 metersd) 132.69 metersAnswer: c) 57.74 metersWhat is the angle of elevation of the sun when a 30-meter high pole casts a shadow of 20 meters?A) 30 degreesB) 45 degreesC) 60 degreesD) 75 degreesAnswer: B) 45 degreesA ladder is 10 meters long and makes an angle of 60 degrees with the ground. How high does the ladder reach on the wall?A) 5 metersB) 7.5 metersC) 8.66 metersD) 10 metersAnswer: C) 8.66 metersIf the angle of elevation of a tower from a point is 45 degrees and the distance from the point to the tower is 50 meters, what is the height of the tower?A) 35.36 metersB) 50 metersC) 70.71 metersD) 100 metersAnswer: C) 70.71 metersA man is standing on the top of a 50-meter high building. He observes a car at an angle of depression of 30 degrees. What is the distance between the car and the building?A) 25 metersB) 50 metersC) 86.6 metersD) 100 metersAnswer: C) 86.6 metersIf the angle of elevation of a cloud from a point 60 meters above a lake is 30 degrees, find the distance of the cloud from the point.A) 60 metersB) 120 metersC) 173.2 metersD) 346.4 metersAnswer: C) 173.2 metersA tree casts a shadow 24 meters long when the angle of elevation of the sun is 45 degrees. What is the height of the tree?A) 12 metersB) 16 metersC) 24 metersD) 48 metersAnswer: C) 24 metersA tower stands vertically on the ground. From a point on the ground, the angle of elevation of the top of the tower is 60 degrees and from another point 10 meters away from the first point, the angle of elevation of the top of the tower is 30 degrees. Find the height of the tower.A) 10 metersB) 20 metersC) 30 metersD) 40 metersAnswer: B) 20 metersA kite is flying at a height of 60 meters. The length of the string is 100 meters. What is the angle of elevation of the kite?A) 30 degreesB) 45 degreesC) 60 degreesD) 75 degreesAnswer: A) 30 degreesA man observes a bird on the top of a tree with an angle of elevation of 30 degrees. If the man is 10 meters away from the tree, what is the height of the tree?A) 5 metersB) 10 metersC) 17.32 metersD) 20 metersAnswer: C) 17.32 metersA vertical pole of height 15 meters casts a shadow 12 meters long on the ground. What is the angle of elevation of the sun?A) 45 degreesB) 50 degreesC) 60 degreesD) 75 degreesAnswer: A) 45 degreesA person standing 20 meters away from a tower observes the angle of elevation of the top of the tower as 30 degrees. What is the height of the tower?A) 10 metersB) 15 metersC) 20 metersD) 30 metersAnswer: B) 15 metersIf a pole of height 6 meters casts a shadow 4 meters long, what is the angle of elevation of the sun?A) 30 degreesB) 45 degreesC) 60 degreesD) 75 degreesAnswer: B) 45 degreesA ladder is placed against a wall. If the ladder is 10 meters long and the foot of the ladder is 6 meters away from the wall, how high up the wall does the ladder reach?A) 6 metersB) 8 metersC) 9.8 metersD) 10 metersAnswer: C) 9.8 metersA kite is flying at an angle of elevation of 60 degrees. If the kites string is 100 meters long, how high isthe kite above the ground?A) 50 metersB) 86.6 metersC) 100 metersD) 173.2 metersAnswer: C) 100 metersThe angle of elevation of the top of a tower from a point 30 meters away from its base is 45 degrees. What is the height of the tower?A) 30 metersB) 302 metersC) 45 metersD) 452 metersAnswer: B) 302 metersA person standing on the bank of a river observes that the angle of elevation of a tree on the opposite bank is 60 degrees. If the width of the river is 50 meters, how far is the tree from the person?A) 25 metersB) 50 metersC) 503 metersD) 100 metersAnswer: C) 503 metersA man on a cliff observes a boat at an angle of depression of 30 degrees, which is sailing directly towards the cliff. If the boat is 100 meters away from the cliff and the cliff is 50 meters high, how far has the boat sailed from its initial position?A) 25 metersB) 50 metersC) 75 metersD) 100 metersAnswer: B) 50 metersA man observes the angle of elevation of a kite as 60 degrees. If the kites string is 100 meters long, how high is the kite above the ground?A) 50 metersB) 86.6 metersC) 100 metersD) 173.2 metersAnswer: A) 50 metersA vertical pole of height 20 meters casts a shadow 15 meters long on the ground. What is the angle of elevation of the sun?A) 37 degreesB) 45 degreesC) 53 degreesD) 60 degreesAnswer: A) 37 degreesThe angle of elevation of the top of a tower from a point 40 meters away from its base is 30 degrees. What is the height of the tower?A) 20 metersB) 203 metersC) 30 metersD) 303 metersAnswer: D) 303 metersA man standing 15 meters away from a lamppost observes that the angle of elevation of the top of the lamppost is 30 degrees. What is the height of the lamppost?A) 7.5 metersB) 15 metersC) 30 metersD) 303 metersAnswer: A) 7.5 metersA ladder 15 meters long leans against a wall forming an angle of 60 degrees with the ground. How high up the wall does the ladder reach?A) 7.5 metersB) 15 metersC) 153 metersD) 30 metersAnswer: B) 15 metersThe angle of elevation of the top of a tower from a point 50 meters away from its base is 60 degrees. What is the height of the tower?A) 25 metersB) 253 metersC) 50 metersD) 503 metersAnswer: B) 253 metersA man standing 30 meters away from a lamppost observes that the angle of elevation of the top of the lamppost is 45 degrees. What is the height of the lamppost?A) 15 metersB) 30 metersC) 302 metersD) 45 metersAnswer: C) 302 metersA 20-meter high tower casts a shadow 30 meters long. What is the angle of elevation of the sun?A) 37 degreesB) 45 degreesC) 53 degreesD) 60 degreesAnswer: A) 37 degreesA man observes the angle of elevation of a cliff as 45 degrees. If he is standing 20 meters away from the base of the cliff, what is the height of the cliff?A) 10 metersB) 20 metersC) 202 metersD) 30 metersAnswer: C) 202 metersThe angle of elevation of the top of a tower from a point 25 meters away from its base is 30 degrees. What is the height of the tower?A) 12.5 metersB) 25 metersC) 253 metersD) 50 metersAnswer: B) 25 metersA man observes the angle of elevation of a mountain as 60 degrees. If he is standing 100 meters away from the base of the mountain, what is the height of the mountain?A) 50 metersB) 100 metersC) 1003 metersD) 200 metersAnswer: C) 1003 metersA man observes the angle of elevation of the top of a tree as 30 degrees. If he is standing 20 meters away from the base of the tree, what is the height of the tree?A) 10 metersB) 20 metersC) 203 metersD) 30 metersAnswer: B) 20 metersThe angle of elevation of the top of a tower from a point 40 meters away from its base is 45 degrees. What is the height of the tower?A) 20 metersB) 40 metersC) 402 metersD) 60 metersAnswer: C) 402 meters Example 1: The height of a tower is 50m. The angle of elevation of the top of the tower from a point on A on the ground is 300. Find the distance between the bottom of the tower and point A.Sol: Here BC is tower of height 50m. In this question, we have to find theDistance AB. Now in ABC, tan300 = BC/AB1/3 = 50/AB AB=503 mLet us see one more example where the horizontal distance is given and the height of the object is asked.Example 2: While standing on the ground at a point A, if one looks at the top of a building the angle of elevation is 600. If A is 32m from the building, find the height of the building.Hence the height of the building is 323m.Next there are problems where a person observes two ships and the angles of depression/elevation are given and we have to find the distance between the ships etc.Example 3: From the top of a light house 80m high, two ships are observed. The angles of elevation of these ships as seen from the light house are found to be 450 and 300. Find the distance between the two ships. Sol: Here AB is the light house and the ships are at pointsC and D. Let CD = xIn ABC, tan450 =AB/AC 1 = 80/AC AC=80mHence AD = 80 + xIn BAD, tan300 =AB/AD 1/3 = 80/(80+x) (80+x) = 803 x=80(3-1) = 80 x 0.732 =58.56mHence the distance between the ships is 58.56 m. Example 4: On the roof of a building 20 m high, a boy is flying a kite. To keep that kite flying a thread of length 75 m is released. If the thread makes an angle of 450 with the horizontal, then at what height from the ground is the kite flying? Sol: Let AB is the building of height 20 m and BC is the string.In BDC, sin450 =CD/BC 1/2 = CD/BC 1/2 = CD/75 CD = 75/2 = 43.3mHence the distance above the ground = 20 + 43.3 = 63.3 m Example 5: Two poles of height 30 meters and 10 meters are erected on the ground. The top of the poles are tied by a wire of length 40 m. Find the angle made by the wire with the horizontal. Sol: Let AB and CD are the poles of heights 30 m and 10 m respectively.Let the angle made by the wire with horizontal is .In DEB, sin = BE/BD =20/40 = 1/2 sin = 300 Example 6: The angles of depression of the top and the bottom of a tree as seen from the top of a tower 90 meters high are 30 and 60 respectively. Find the height of the tree. Sol: Let AB is the tower of height 90 m and CD is the tree.In ABC, tan600 =AB/AC 3 = 90/AC AC = 303Hence DE = AC = 303mIn DEB, tan300 =BE/DE 1/3 = BE/303BE = 30mHence CD = AE = 90 30 = 60m. Example 7: The upper part of a tree is broken and the top touches the ground making an angle of 30. The distance of the point where the top touches the ground to the base of the tree is 72 m. What was the height of the tree? Sol: Let AC is the tree which broke at point B so that the top C touches the ground. Here AC = 72 mIn ABC, tan300 = AB/AC 1/3 = AB/72 AB = 72/3 = 243mAgain in ABC, sin300 = AB/AC 1/2 = 243/BC BC = 483mHence the length of the tree = AB + BC = 243+483 = 723 = 124.7m Example 8: Two aero planes flying in opposite directions are at points A and B, 3000 m high from the ground. When the pilots look at a point P on the ground, the angles of depression made by them are 300 and 600 respectively. Find the distance between the two aero planes. Sol: The planes are at point A & B.In ADP, AD/DP =tan 300 3000/DP =1/3 DP = 30003mAgain in BPC, tan 600=3000/PC 3 = 3000/PC PC = 3000/3The distance between the planes = 30003 + 3000/3 = 12000/3 =6928.4 m Example 9: When a man looks from the foot and the top of a tower at the roof of a building, the angles of elevation and depression are of 270 and 630 respectively. If the height of the building is 40m, find the height of the tower. (tan 630=2) Sol: Let AB is the tower and CD is the building of height 40m.In ACD, AC/DC = cot270 = cot(90-63) AC/40 = tan630 = 2 AC=80mNow DE=AC=80mIn BED, tan 630= BE/DE2=BE/80 BE=160m Height of the tower = AE + EB = 40 + 160 = 200m Example 10: There is a cliff 80 m high on the bank of a lake. A man is sitting on the cliff. He looks at a bird in the sky and the angle of elevation is formed to be of 300. When he looks at the shadow of the bird in the lake, the angle of depression is 600. Find the height of the bird from the lake surface. Sol: Let AB is the cliff and the man is sitting at B. Let C is the position of the bird and D is its shadow.In ADB, tan 600 = AB/AD 3 = 80/AD AD=80/3 mNow BE = AD = 80/3 mIn BEC, tan 300= CE/BE 1/3 = CE/(80/3) CE=80/3 m The height of the bird = DC = DE +CE = 80 + 80/3 m = 320/3 m The topic of height and distance in physics holds tremendous importance. This topic is significant in competitive examinations. You can understand it better with the help of solved problems on height and distance. The problems of this topic usually revolve around the measurement of a buildings height. They could also involve finding the height of another building when one buildings height and angles of elevation or depression are shown. Another form could be finding the distance between these two buildings. Keep on reading to benefit from such solved problems on height and distance.Solved Problems on Height and Distance: Associated TermsBefore we delve into solved problems on height and distance, you must first become familiar with some associated terms:Angle of Elevation: Suppose an individual is standing on the ground. This individuals sight is on an object at the top of a building. Here, the line of sight would be the line that joins the individuals eyes with the buildings top. Most importantly, the elevation angle would be the angle produced by the line of sight with the horizontal line.The angle of Depression: Suppose an individual is standing at some height of an object that can be viewed. Here, the line of sight would be the line that joins the individuals eyes with the buildings bottom. Most importantly, the angle of depression would be the angle produced by the line of sight with the horizontal line.These terms would become clearer to you by studying solved problems on height and distance.Solved Problems on Height and Distance: Examples:Lets look at the solved problems on height and distance examples below:1. From a lighthouses top that is 80m high, someone observes two ships. The angles of elevation of these ships that are observed from this lighthouses top come out to be 45and 30, respectively. Now, measure the distance between the two ships that are being observed?Solution: Here, let us consider AB or h is 80 m, which is the lighthouse.Moreover, consider the ships to be at points P and Q.In BAP, tan 45= BA/BPAs such, 1 = 80/BPTherefore, BP or x = 80mTherefore, BQ = 80 + PQIn BAQ, tan30= BA/BQAs such, 1/3 = 80/(80+PQ)Furthermore, (80+PQ) = 803Finally, we have PQ = 80(3-1) = 80 x 0.732 = 58.56mTherefore, the distance between the ships as observed from the lighthouses top is 58.56m.2. The angle of elevation of the buildings top is found to be 60. This building is located at a distance of 50 m when measured from its foot on a horizontal plane. Now, calculate the buildings height? Here, the buildings height is represented by AC.Moreover, BC shows us the distance between the building and the point of observation.Now, consider the right triangle ACB:Here, side AC is the side that lies opposite to the angle of elevation, 60.Also, the hypotenuse side AB is the side that lies opposite to 90. Furthermore, the adjacent side BC is the remaining side.Now, given the above parameters, we need to calculate the length of the side AB.Tan = opposite side/adjacent side. This gives us tan60 = AC/BCFurthermore, 3 = AC/50Also, 3 x 50 = ABAC = 503Approximate value of 3 comes out to be 1.732So, we have AC = 50 (1.732)Finally, we have AC = 86.6 mSo, the buildings height comes out to be 86.6 m.Solved Problems on Height and Distance QuestionsLets take a look at the solved problems on height and distance questions below:1. On level ground, a 30 angle of elevation is formed with the top of a tower. Now, on moving towards the tower by 20 metres, a 45 angle of elevation would form. What is the towers height out of the four options?Correct Answer: AExplanation: Consider the height of the tower to be hIn such a situation, we have 20 = h (cot30 cot60)Furthermore, 20 = h (3 1/3)Also, 203 = h (3-1)Finally, we have h = 1032. There are two ships that are sailing on the two sides of a particular lighthouse. The angles of elevation, as observed from the ships and from the top of the lighthouse, are 30 and 45, respectively. Now, suppose the height of the lighthouse is 100 m. What is the distance between the two ships out of the four options given below?A. 173 mB. 200 mC. 300 mD. 273 mCorrect Answer: DExplanation: Consider the lighthouse to be represented by AB.Also, let us assume the ships positions to be C and D.In such a situation, we shall have the following:AB = 100 mACB = 30ADB = 45AB/AC = tan 30 = 1/3 This would give us AC = AB x 3 = 100/3Now, we will haveAB/AD = tan 45 = 1This would give usAD = AB = 100mTherefore, we have CD = AC + ADSo, AC + AD = 100/3 + 100mFinally, we have, CD = 273 m.ConclusionThe topic of height and distance is an important constituent of physics. Study any Physics chapter, and there are chances that you would be dealing with height and distance in some way or another. The solved problems on height and distance are a must for mastering this topic. The angle of elevation and the angle of depression are two associated terms with this topic. Finally, study the solved problems on height and distance examples and questions for a thorough understanding. 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 Solutions Problem 1 An 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 2 A 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 2 Problem 3 A 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 3 Problem 4 A 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 4 Problem 5 A ball kicked from ground level at an initial velocity of 60 m/s and an angle with ground reaches a horizontal distance of 200 meters. a) What is the size of angle ? b) What is time of flight of the ball? Solution to Problem 5 Problem 6 A 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 6 Problem 7 A 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 ? b) At what initial velocity was the projectile launched? Solution to Problem 7 Problem 8 The 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 8 Problem 9 Two 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 9 More References and Links Solving height and distance questions requires a strong knowledge of trigonometric principles. These types of problems come up frequently on various competitive examinations, like the SSC, Bank PO, and other government job exams, and are an integral part of Quantitative Aptitude. Prerequisite: Height and Distance - FundamentalsAptitude Questions on Height and DistancesQ1: From the top of a lighthouse, the angles of depression of two ships are 30 and 45 degrees. The two ships, as it was observed from the top of the lighthouse, were 100 m apart. Find the height of the lighthouse.Solution:Here, we can apply the formula Height = Distance/[cot(original angle) cot(final angle)] Height of the lighthouse = 100 / (cot 30 cot 45) = 100 / (3 1) = 50 3 + 50 mQ2: An 80 m long ladder is leaning on a wall. If the ladder makes an angle of 45 degrees with the ground, find the distance of the ladder from the wall.Solution:Here, cos = Base / Hypotenuse cos 45 = Base / 80 Base = 80 cos 45 = 80 / 2= 40 2Thus, Distance of the ladder from the wall = 40 2 mQ3: There are two poles, one on each side of the road. The higher pole is 54 m high. From the top of this pole, the angle of depression of the top and bottom of the shorter pole is 30 and 60 degrees respectively. Find the height of the shorter pole.Solution:Let AB and CD be the two poles.Let AC = x m and CD = h mNow, in triangle ABC,tan 60 = AB / AC 3 = 54 / AC AC = 18 3 mClearly, AC = DE = 18 3 mIn triangle BED,tan 30 = BE / DE BE = DE tan 30 BE = 18 3 / 3 m BE = 18 m CD = AE = AB BE CD = 54 18 = 36 mTherefore, the height of the shorter pole = 36 mQ4: From the top of a tower 100m high, a person observes that the angle of elevation of the top of another tower is 60 and the angle of depression of the bottom of the tower is 30. Then the height (in meters) of the second tower is.Solution:Let AB be the first tower and CD be the second tower.From figure, Tan(30)= BC/AB AB=BC/3Tan(60)=CD/AB CD=AB3 = BC/3 * 3 = BCTotal height of the second tower = CD + BDBD = AB - AD BD= BC/3 - 100 Height of second tower = BC + BC/3 - 100 = BC (1+ 1/3) - 100= BC (1+ 3/3) - 100From the right-angled triangle,BC = AB cot 30 = AB/3 = BC/3Hence, Height of second tower = BC (1+ 3/3) - 100= BC (4+ 3)/3 - 100= BC (4+ 3)/3 - 300/3 = BC (4+3)/3 - 100= BC (4+ 3)/3 - 100= 75 m (approx)Q5: The angle of elevation of the top of a tower from point A on the ground is 45. On moving 20 meters toward the tower, the angle of elevation of the top of the tower becomes 60. Find the height of the tower (in meters).Solution:Let h be the height of the tower and x be the distance between the initial position and the foot of the tower.From the right-angled triangle AOB, where O is the foot of the tower, we have:tan(45) = h / x h = xFrom the right-angled triangle COB, where C is the new position of the observer, we have:tan(60) = h / (x - 20) h = (x - 20) 3Equating both expressions for h, we get:x = (x - 20) 3Simplifying, we get:x = 20 (3 + 1)Therefore, the height of the tower is:h = x = 20 (3 + 1) meters, which is approximately 45.72 meters (rounded to two decimal places).Q6: If the length of a pole is 12m and the angle of elevation from the top of the pole to point A on the ground is 45, then find the distance of the pole from point A?Solution:Here AB = 12mAccording to given trick, p, b, h is 1 : 1 : 2Here p = 12mAnd, p/b = BC/AC = 1/1 12/AC = 1/1So, AC = 12 mSo, the required value is 12m.CASE 3, When angle is 60 :-We know that tan 60 = p/b = 3/1So, h = (3 + 1) = 2Then, if an angle of elevation/depression is given as 60, then the ratio of p, b, h is 3 : 1 : 2Question 7:A pole is broken at some height and makes 60 to the ground and the distance between the bottom point of the pole and the point it touches the ground is 10m. What is the length of the pole?Solution:Let the pole is broken from point B and it touches point A on the ground.Since angle of elevation is 60 so p, b, h is 3 : 1 : 2Then, tan 60 = p/b = 3/1 BC/AC = 3/1 BC/10 = 3/1 BC = 103 m = 17.3And, AB = (BC2 + AC2) = (300 + 100)m = 20m (Approx)Since the pole is broken from the point B so the length of pole = BC + AB = (17.3 + 20)m = 37.3m = 37 m (approximately)The required length is 37m.Question 8: The shadow of a tree decreases by 15m when the suns altitude changes from 45 to 60. Find the length of the tree.Solution:Let AB be the length of the tree and the length of shadow be x when the angle of elevation is 45.Then, the length of shadow when the angle of elevation is 60 = x 15mFor angle 45 in triangle ABD, we haveAB/BD = 1/1 = AB/xSo, AB = xNow, for angle 60 in triangle ABC, we haveAB/BC = 3/1 = x/(x 15) x = 3x 153 (3 1)x = 153 x = 153/(3 1)mThe length of the tree is 153/(3 1)m.Question 9: A pole stands upright on the ground with the help of two wires to its top and affix to the ground on opposite sides. If the angle of elevation for both wires are 30 and 60 respectively and the length of the first wire is 8m, then find the length of another wire.Solution:Let AD be the length of the pole and AB and AC be the length of the first and second wires respectively.In triangle ABD, we haveB = 30So, AB : AD = h : p = 2 : 1 8/AD = 2/1 AD = 4mNow, in triangle ADC, we haveC = 60So, AD : AC = 3/2 4/AC = 3/2 AC = 8/3 = 83/3 mThe required length of wire is 83/3 m.Question 10: Angle of depression from a kite flying into the sky to a point on the ground is 45 and it changes to 60 when the kite flies 10m higher. Find the initial height of the kite.Solution:Let the kite was flying at a height of AB initially.According to the question, in triangle ABC, we have C = 45So, AB = BC = 1/1Then, AB = BCNow, in triangle ADC, we have C = 60So, AD/BC = 3/1 (AB + 10)/AB = 3 AB + 10 = AB3 AB(3 1) = 10 m AB = 10/(3 1) = 5(3 + 1) mThe required length is 5(3 + 1)m.Read More,Practice Questions on Height and Distances1. From the top of a 75 m high lighthouse, the angle of depression of a ship is observed to be 30. What is the distance of the ship from the base of the lighthouse?2. A person observes the angle of elevation of the top of a tower to be 30 when standing 100 meters away from its base. What is the height of the tower?3. The angle of elevation of the top of a building from a point on the ground is 45. If the height of the building is 50 m, how far is the point from the foot of the building?4. A ladder 10 m long reaches a window 8 m above the ground. Find the distance of the foot of the ladder from the wall.5. From the top of a cliff 100 m high, the angles of depression of two ships are observed to be 30 and 45. If both ships are on the same side of the cliff, find the distance between the ships.6. A man on the top of a vertical tower observes a car moving at a uniform speed coming directly towards it. If it takes 12 minutes for the angle of depression to change from 30 to 60, how soon after this will the car reach the base of the tower?7. The angle of elevation of the top of a tower from a point A on the ground is 30. On moving 20 m towards the foot of the tower to a point B, the angle of elevation becomes 60. Find the height of the tower.8. A kite is flying at a height of 75 m above the ground. The string attached to the kite is temporarily tied on the ground. The inclination of the string with the ground is 60. Find the length of the string.9. The angle of elevation of the top of a tower from a point on the ground is 45. On moving 30 m closer to the tower, the angle of elevation becomes 60. Find the height of the tower.10. From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower fixed at the top of a 20 m high building are 45 and 60 respectively. Find the height of the tower. Application of Trigonometry to Height and Distance Problems Trigonometry, in ancient times, was often used in the measurement of heights and distances of objects which could not be otherwise measured. For example, trigonometry was used to find the distance of stars from the Earth. Even today, in spite of more accurate methods being available, trigonometry is often used for making quick and simple calculations regarding heights and distances of far-off objects. For this, the value of various trigonometric functions is needed. A simple example is given below to demonstrate how trigonometry can help find the height or distance of an object. If the distance of a person from a tower is 100 m and the angle subtended by the top of the tower with the ground is 30o, what is the height of the tower in meters? Steps: Draw a simple diagram to represent the problem. Label it carefully and clearly mark out the quantities that are given and those which have to be calculated. Denote the unknown dimension by say h if you are calculating height or by x if you are calculating distance. Identify which trigonometric function represents a ratio of the side about which information is given and the side whose dimensions we have to find out. Set up a trigonometric equation. Substitute the value of the trigonometric function and solve the equation for the unknown variable. Solution: AB = distance of the man from the tower = 100 m BC = height of the tower = h (to be calculated) The trigonometric function that uses AB and BC is tan A , where A = 30o. So tan 30o = BC / AB = h / 100 Therefore height of the tower h = 100 tan 30o = (100) 1/3 = 57.74 m. Most of the simple word problems in trigonometry can be solved by the method illustrated in the example above. Many questions on Heights and Distances in Trigonometry along with their solutions are available in the practice exercise. Practice Exercise for Trigonometry Module 3: Word Problems on Heights and Distances - -5 more pages in TrigonometryApril 4, 2012— -- intro: Height has been linked to a range of health problems, from Alzheimer's and heart disease to multiple cancers. How stature stacks the odds of getting sick is unclear, but experts say the link between height and health offers new hope for understanding puzzling diseases.Here are five common conditions linked to height.quicklist: 1category: Health Problems Linked to Heighttitle: Cancerurl:text: A new study suggests taller women have heightened risk for ovarian cancer, a disease that kills nearly 15,000 American women each year, according to the U.S. Centers for Disease Control and Prevention.British researchers reviewed data from 47 studies involving more than 100,000 women. For every 5-centimeter (2-inch) increase in height above the average 5 feet 3, the risk of ovarian cancer rose 7 percent, according to the study published Tuesday in the journal PLoS Medicine.In July 2011, a study published in the Lancet Oncology found taller women had an increased risk of 10 different cancers, including breast and skin cancer. And taller men have an increased risk of prostate cancer, according to a 2008 study published in the journal Cancer Epidemiology, Biomarkers & Prevention."One of the big surprises in cancer has been the potential impact of early life nutritional factors on long-term cancer risk," said Dr. Tim Byers, a professor of preventive medicine and biometrics at the University of Colorado Cancer Center in Denver. "I think height is an indicator of some risk factor, but we don't know what the mechanism is."The findings offer little comfort for tall men and women, whose height -- guided by genes, nutrition and other environmental influences -- was established in their 20s. But Byers said taller people should not worry any more, nor should shorter people worry any less, about their cancer risk."Whether you're tall or short, staying away from tobacco, being physically active, eating a balanced diet and maintaining a healthy are beneficial behaviors for everyone," he said. "And get the recommended cancer screening tests, regardless of height."quicklist: 2category: Health Problems Linked to Heighttitle: Heart Diseaseurl:text: Heart disease is the leading cause of death in the U.S., killing 616,000 people per year, according to the CDC. And unlike cancer, it seems to affect shorter people more than their taller counterparts.A recent review of 52 studies involving more than 3 million men and women found shorter people have a 50 percent higher risk of having deadly heart disease than tall people."It would be interesting to explore the possibility that short stature is connected with the risk of [coronary heart disease] and [heart attack] through the effect of smaller coronary artery diameter, and that smaller coronary arteries may be occluded earlier in life under similar risk conditions," the authors wrote in their 2010 report published in the European Heart Journal.A 2006 study published in the American Journal of Epidemiology found identical twins who died from coronary heart disease tended to be shorter than their co-twins, suggesting the height-heart disease link stems from environmental factors that affect both height and heart disease risk rather than genetics."If there is some environmental factor acting early in life that both affects adult height and somehow programs us for certain diseases, we need to look early in life for those factors. It's not impossible, but it's hard," said Byers, explaining the difficulty of asking adults to accurately recall what they ate as children. "It would be nice if everyone kept a diary, wouldn't it?"quicklist: 3category: Health Problems Linked to Heighttitle: Strokeurl:text: Like heart disease, serious strokes are also more common among shorter people.An Israeli study of more than 10,000 men, 364 of whom died from stroke, linked each 5-centimeter (2-inch) increase in height with a 13 percent increase in fatal stroke risk. Men who were in the shortest quartile had a 54 percent higher risk of fatal stroke than men in the tallest quartile, according to the 2002 study published in the journal Stroke."Height might represent a strong indicator of nutritional status, especially in a study such as ours, which included many subjects who had lived as persecuted minorities in their childhood," the authors wrote. "It could also be associated with environmental conditions in childhood and adolescence."While nutrition is known to influence height, Byers height may also influence hormones to dictate disease risk."I suspect that height is probably an indicator of early life nutritional factors that somehow play out 50, 60 years later. But the other possibility is that taller people have slightly different hormone profiles than shorter people," he said. "This definitely needs more attention."quicklist: 4category: Health Problems Linked to Heighttitle: Alzheimer's Diseaseurl:text: Alzheimer's disease is the most common cause of dementia in older people, affecting 5.4 million Americans, according to the Alzheimer's Association. The risk increases with age and a family history of Alzheimer's, highlighting the disease's genetic roots. And according to a 2007 study, the risk is also higher for shorter people.The study, which compared 239 Alzheimer's patients with 341 healthy controls, found men who were taller than 5 feet 10 inches had a 59 percent lower risk of developing the disease than men who were shorter than 5 feet 6 inches. The study was published in the Journal of Alzheimer's Disease.Cardiovascular disease, which is more common among shorter people, is also linked to an increased risk of Alzheimer's disease. It's unclear whether all three are linked.quicklist: 5category: Health Problems Linked to Heighttitle: Diabetesurl:text:While type 2 diabetes is linked to weight, type 1 diabetes -- also called juvenile diabetes -- may be linked to height."Taller children generally seem to experience increased risk for development of diabetes mellitus type 1, except perhaps during infancy or early adolescence," according to a 2002 study published in the journal Pediatrics.The cause of type 1 diabetes is unknown, but it's thought result from an autoimmune attack on the insulin-producing cells of the pancreas. Although it can occur at any age, it's usually diagnosed in children, teens or young adults.There is debate surrounding the link between height and diabetes, however, as other studies have suggested children with diabetes are similar in stature or even shorter than their non-diabetic peers.While diabetes, Alzheimer's, cardiovascular disease and cancer are distinctly different health problems, their relationship to height could signal some common underlying mechanism."It's possible, but we just don't know," said Byers. "It's a kick in the head to us researchers to remind us to answer some of these fundamental questions." To know how to solve height and distance problems in trigonometry, we must be knowing the following basic stuff in trigonometry.Angle of Elevation and Angle of DepressionTrigonometric Ratiosopp ----> opposite sidehyp ----> hypotenuseadj ----> adjacent sideTrigonometric ratios of angles0, 30, 45, 60 and 90.Practice ProblemsProblem 1 :The angle of elevation of the top of the building at a distance of 50 m from its foot on a horizontal plane is found to be 60. Find the height of the building.Solution :Draw a sketch.Here, AB represents height of the building, BC represents distance of the building from the point of observation.In the right triangle ABC, the side which is opposite to the angle 60is known as opposite side (AB), the side which is opposite to 90is called hypotenuse side (AC) and the remaining side is called adjacent side (BC).Now we need to find the length of the side AB.Multiply both sides by 50.503 = ABApproximate value of 3 is 1.732.AB50(1.732) AB 86.6So, the height of the building is about 86.6 m.Problem 2 :A ladder placed against a wall such that it reaches the top of the wall of height 6 m and the ladder is inclined at an angle of 60. Find how far the ladder is from the foot of the wall.Solution :Draw a sketch.Here AB represents height of the wall, BC represents the distance between the wall and the foot of the ladder and AC represents the length of the ladder.In the right triangle ABC, the side which is opposite to angle 60is known as opposite side (AB), the side which is opposite to