Jonathan Quang   
Period 1  
Ms.Protass

He wakes up, startled. Dazed, Mr. Cheung looks around for the source of the sound that disturbed his nap. The sound seems to be getting closer. Mr. Cheung tries to cup his head around his hear to increase his hearing, but he realizes something. Mr. Cheung is wearing headphones and he is still at work at a remote radar station at a military airbase.  
 Its two hours past midnight, and the snow is more like corrosive wind than a gentle blanket.   
 'Wait a minute, there shouldn't be any aircraft coming in right now,' thought Mr. Cheung, 'Could it be the enemy broke the truce and started an attack?'  
 The radar spews some information on screen. It reports that its angle of elevation at the time of detection was 70 degrees and the reported distance it took the radar pulse to make its round trip was about 1.000985089\*10-4 seconds. The compass sensor on the radar reports that the radar sensor is facing 15 degrees north. Mr. Cheung finds that the distance between the source of the radar blip and the radar sensor to be 15 kilometers after halving the round trip time and multiplying it by the speed of light at sea level. In his drowsiness, Mr. Cheung reports to the command center the radar blip and the distance he calculated.  
 "Are you an idiot? I need more information than that. Hurry up and report the right information so we can do a search with our aircraft!" says your boss.  
 "Will do, sir," Mr.Cheung apologizes.  
 'Dang, what information did I forget to give him?' He thought as he slams his fast on the paper containing his calculations.   
 Mr. Cheung looks down and his cheeks turn sanguine in embarrassment. He forgot to report to his boss the altitude.   
 'If this is how I serve my country, I am doing a pretty bad job at it,' thought Mr. Cheung.  
 'Let's see, the elevation of the sensor at that time was 70 degrees. If I were to form a right triangle using this information, the angle of elevation would be 70 degrees and the hypotenuse would be 15 kilometers. Sin(70)=h/15km. h=15km(sin(70)). This puts the height at 14.095389 km. Add this to the 0.015 kilometers the radar sensor is above the ground, and the plane was flying at 14.11038931 kilometers above the ground,' Mr. Cheung reasons out.  
 He picks up the phone and has a minor epiphany. Mr. Cheung's mind flashes back to when he was being trained to work at this job. He has to report the speed the unidentified plane is traveling. The detection radius of the radar sensor is 40 kilometers. Mr. Cheung can feel his palms sweating.   
 He slams the button requesting the radar module for another update on the radar blip.   
'What luck!' thought Mr. Cheung, 'The radar reported the radar blip at the same angle of elevation and time it took the light to make its round trip, only the compass sensor changed to 70 degrees north.'  
 He wipes the sweat of his palms and grasps his pencil. Mr. Cheung reasons out that if the angle of elevation and the time it took for the light to make its round trip to be the same, then the plane must be flying at the same altitude. Mr. Cheung imagines in his head a circle where the two radar blips lie on the perimeter of the circle and the radar station's position on the earth surface is at the center. Altitude is irrelevant if he manages to find the base of the right triangle that he drew earlier. Mr. Cheung chooses to use the Pythagoras's theorem to find the missing side, and it comes out to 5.1303 kilometers.  
 On this circle, Mr. Cheung imagines a triangle drawn between the two radar blips and the center. This forms an isosceles triangles where the two equal sides are the radius (5.1303 kilometers) and the third side is the distance between the two radar blips. Mr. Cheung uses the law of cosines, c2=a2 + b2 - 2ab(cos(C)). Mr. Cheung knows that C is the difference in the two angle measurements provided by the compass, which comes out to 70-15= 55 degrees. Solving for c, Mr. Cheung obtains the distance travelled by the plane was 4.73 kilometers.   
 He checks that that the time that has passed was about 1.3 minutes between the two radar measurements. This means the plane is travelling at about 3.63 kilometers a minute.  
 Mr. Cheung reports the altitude and the speed to his boss. The boss thanks him for his work, and Mr. Cheung slumps in his chair.  
 The hum of airplane engines fills the airbase, and Mr. Cheung gives a long sigh. His mind feels tired, and once again, he naps.