PC1221 Fundamentals of Physics 1

Semester-1, AY10/11

Tutorial 2

Week-5: T6, T7, T8, T9, T10.
Week-6: T1, T2, T3, T4, T5.

All the tutorial classes for PC1221 are conducted at S11-03-01 for all the groups.

_____

1.   A neurologist holds a ruler of 1 m vertically with 0-m below his fingers, while his patient suspected of having partial brain damage waits with her fingers poised at 50-cm mark on the ruler. The ruler will be dropped unexpectedly and the patient will try to catch it as quickly as possible. If the ruler is caught at 90-cm, what is the reaction time of his patient? Do this test with your friend to check your own reaction time (and whether you have brain damage or not!).

2.   A string is tied with weights at regular increasing heights above ground. We drop the string and listen to the sound as each weight strikes a board at the bottom. What type of time interval will be heard for each hit?

3.   Setting a new world record in a 100-m race, Maggie and Judy cross the finish line in a dead heat, both taking 10.2 s. Accelerating uniformly, Maggie took 2.00 s and Judy 3.00 s to attain maximum speed, which they maintained for the rest of the race. (a) What was the acceleration of each sprinter? (b) What were their respective maximum speeds? (c) Which sprinter was ahead at the 6.00-s mark, and by how much?

4.   A rock is dropped from rest into a well. (a) The sound of the splash is heard 2.40 s after the rock is released from rest. How far below the top of the well is the surface of the water? The speed of sound in air (at the ambient temperature) is 336 m/s. (b) **What If?** If the travel time for the sound is neglected, what percentage error is introduced when the depth of the well is calculated?

5.   A man pushing a mop across a floor causes it to undergo two displacements. The first has a magnitude of 150 cm and makes an angle of 120° with the positive x axis. The resultant displacement has a magnitude of 140 cm and is directed at an angle of 35.0° to the positive x axis. Find the magnitude and direction of the second displacement.

6.   A small car with a cannon which is positioned vertically upward on the car runs down a tilted track so that it is constantly accelerating. When the car has accelerated a short distance of the tilted track it will fire a ball straight out of the cannon. After the ball is fired, will it land ahead of, on top of, or behind the car? Why? Assume that the tilted track is long enough to receive the ball.
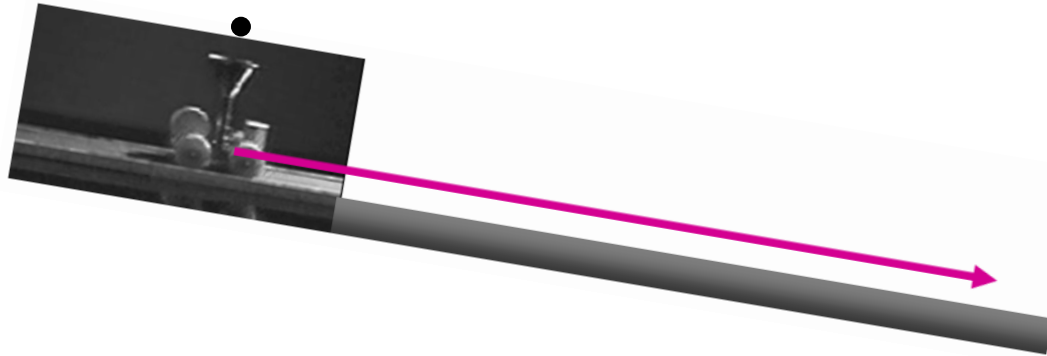
7.   An enemy ship is on the left side of a mountain island, as shown in the figure.   The enemy ship has maneuvered to 2500 m of the 1800-m-high mountain peak and can shoot projectiles with an initial speed of 250 m/s.
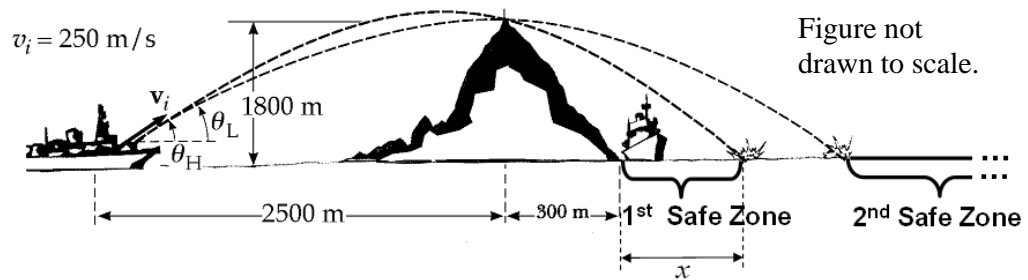
Θ_H: Highest firing angle from which the projectile will clear the mountain peak

Θ_L: Lowest firing angle from which the projectile will clear the mountain peak

There are two safe zones as shown in the figure. If the right shoreline is horizontally 300 m from the peak, what is the distance x from the right shoreline at which a ship in the 1st Safe Zone can be protected from the bombardment of the enemy ship? Assume the height of both warships is negligible as compared to the height of the mountain. You need not solve for the distance to the 2nd safe zone.