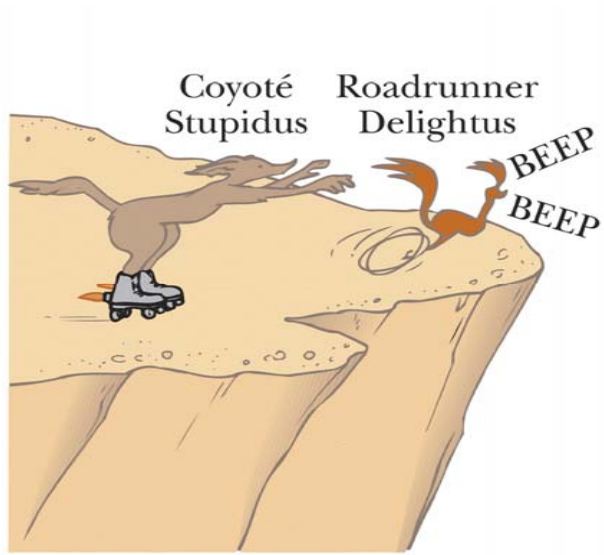
The determined coyote is out once more to try to capture the elusive roadrunner. The coyote wears a pair of Acme™ jet-powered roller skates, which provide a constant horizontal acceleration of 15 m/s^2. The coyote starts off at rest 70m from the edge of a cliff at the instant the roadrunner zips past him in the direction of the cliff.

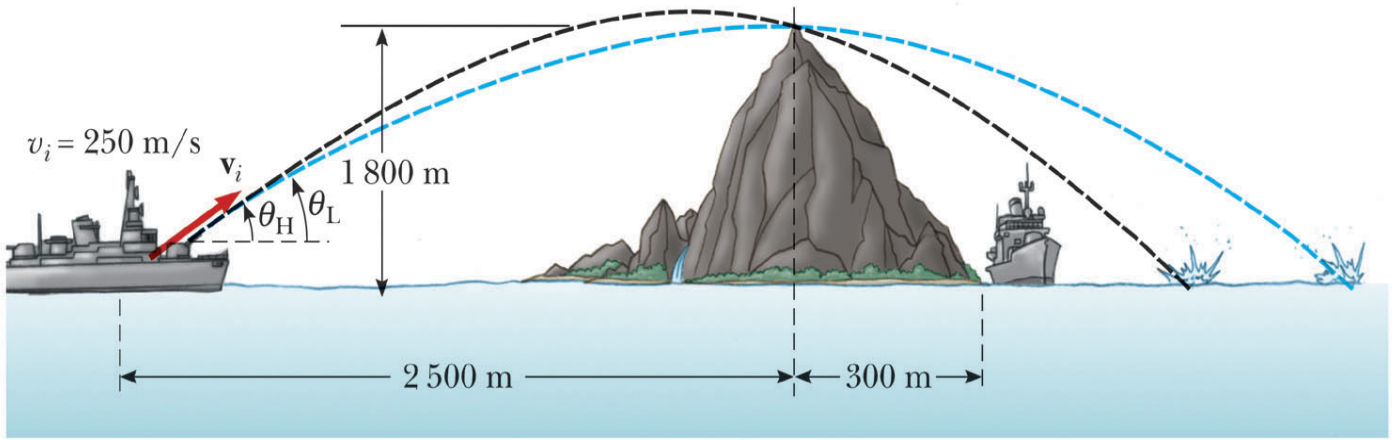
a. If the roadrunner moves with constant speed, determine the minimum speed he must have to reach the cliff before the coyote.

b. At the brink of the cliff the roadrunner escapes by making a sudden turn, while the coyote continues straight off of the cliff. If the cliff is 100m above the floor of a canyon, where does the coyote land, assuming that his skates remain horizontal and continue to work while in flight?

c. What are the components of the coyote's impact velocity?



An enemy ship is on the western side of a mountain island. The enemy ship can maneuver to within 2500 m of the 1800 m high mountain peak and can shoot projectiles with an initial speed of 250m/s. If the eastern shore line is horizontally 300m from the peak, what are the distances from the eastern shore at which a ship can be safe from the bombardment of the enemy ship?



A quarter is thrown off of a large building at an upward angle of 30^o with respect to the horizontal, with an initial speed of 10 m/s.

a. How long does it take the quarter to hit the ground if the building is 45m tall?

b. What is the velocity of the quarter before it strikes the ground?

c. How long does it take the quarter to reach its maximum height above the building and what is that height?

d. How long does it take the quarter to come back to the same height from which it was thrown?

e. What is the vertical component of the velocity when the quarter passes this point in part c?

f. How long does it take the quarter to fall through the remaining 45 m if it's vertical component of velocity is that in part d?

g. Suppose that it the quarter were just dropped straight down from the building top, how long would it be in flight?

h. What would the velocity of the quarter be in the case of part e?

A movie stunt requires a person to run at 4.5 m/s across and directly off of a rooftop and land on the roof of the next building.

a. From the information in the diagram, how long is the person in flight if he is to land on the roof?

b. How long does it take the stuntman to fall 4.8m, the distance below him to the rooftop? In this time, what is his horizontal displacement?

c. Does the person make it safely to the next building's rooftop or not?

d. If he doesn't make it, what initial speed would the stuntman need in order to make it safely from one rooftop to the other?