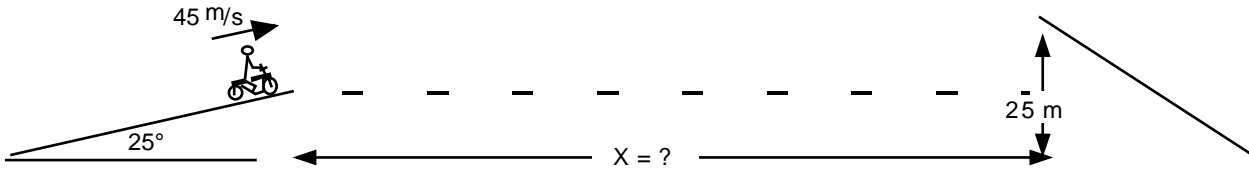Projectile Motion – Partial and extended Trajectories

For these types of problems, V_o is at an angle and x & x_o (Ending and beginning heights) are not equal

1.

45 m/s

25°

25 m

X = ?

A stunt rider is making a motorcycle jump. Through a planning error the landing ramp's end does not match the take-off height. The landing ramp is 25 m high . The take off ramp is 10 meters high at the end.
    a.   Where should the ramp be placed (x)?
   b.   How long is the rider in the air?

2.

A skier was traveling 20 m/s when they hit a hill and launched themselves up into the air at a 30° angle. They hit a tree when they were at the highest part of the motion.
    a   How long was the skier in the air?
    b   How high did the skier travel?
    c   How far along the ground did the skier travel?

#@*%
&$!
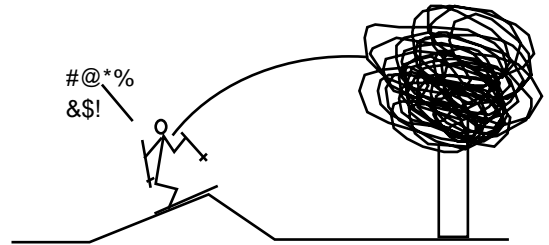
3.   . A rock is thrown off a tall building at 45 m/s at an angle of 30° below the horizontal.
    a. How long is the rock in air?
    b. How far from the building did the rock land?
    c. What is rock's velocity (magnitude and direction)
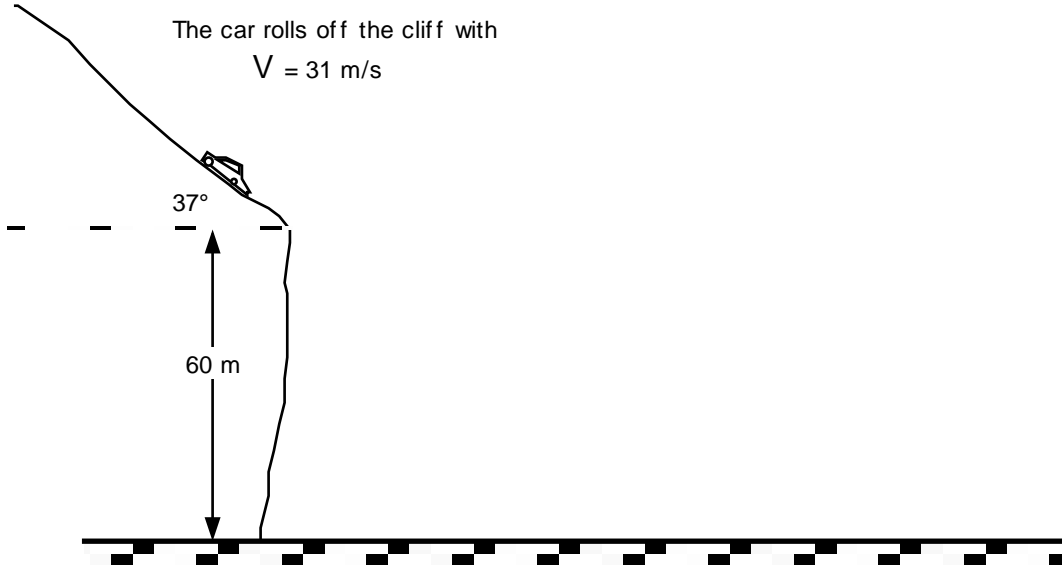   at impact?

30 deg

45 m/s

42 m
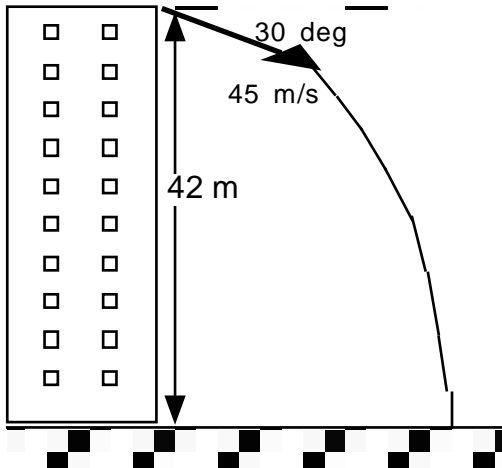
Projectile Motion – Partial and extended Trajectories

4. A rock is thrown off a tall building at 45 m/s at an angle of 60.0° above the horizontal.
    a. How high did the rock travel?
    b. How long is the rock in air?
    c. How far from the building did the rock land?
    •d. What is rock's velocity (magnitude and direction) at impact?

45 m/s

60°

50 m
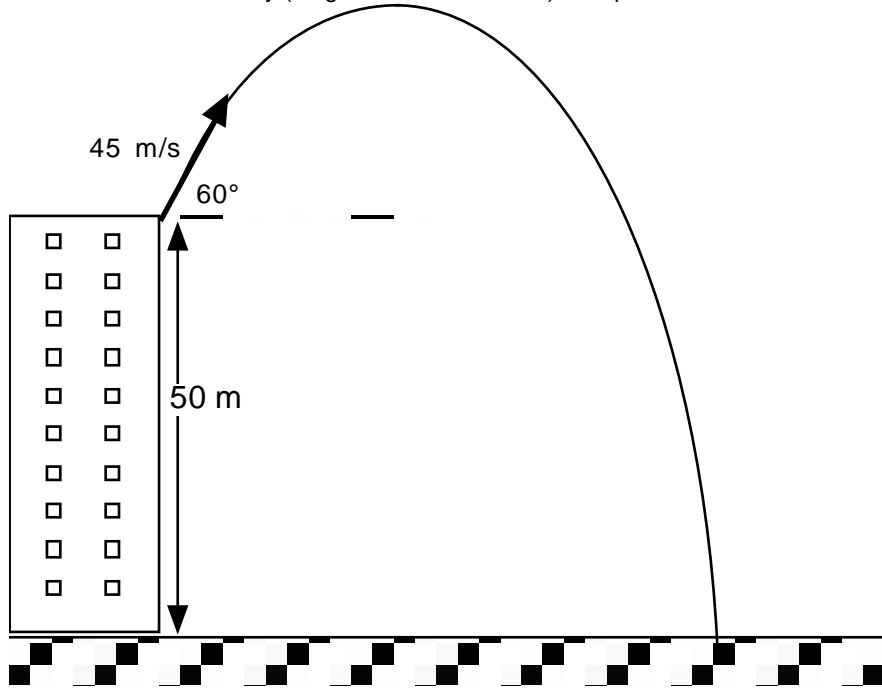
5.

The car rolls off the cliff with
V = 31 m/s

37°

60 m

How long is the car in the air?
How far from the cliff's edge will the car land?
How fast and at what angle will the car impact the ground?

Projectile Motion – Partial and extended Trajectories

6. A snow ball is thrown out a second story window (7 m high) with a speed of 32 m/s. It is thrown at an angle of 57° beneath the horizontal.
   - a. What is the ball's initial horizontal velocity?
   - b. What is the ball's initial vertical velocity?
   - c. How long is the ball in the air?
   - d. How far away from the building did the ball land?
   - •e. How fast, vertically, is the ball traveling when it hits the ground?
   - •f. How fast, horizontally, is the ball traveling when it hits the ground?
   - •g. What is the ball's VELOCITY (magnitude and direction) when it hits the ground?

7. A Penny is thrown out off the Eifel Tower (303 m high) with a speed of 43 m/s. It is thrown at an angle of 83° beneath the horizontal.
   - a. What is the penny's initial horizontal velocity?
   - b. What is the penny's initial vertical velocity?
   - c. How long is the penny in the air?
   - d. How far away from the building did the penny land?
   - •e. How fast, horizontally, is the penny traveling when it hits the ground?
   - •f. How fast, vertically, is the penny traveling when it hits the ground?
   - •g. What is the penny's VELOCITY (magnitude and direction) when it hits the ground?

8. While sitting in a tree, Tarzan tried to get a trapper's attention by throwing a banana with a velocity of 20.0 m/s at a 30.0 degree angle beneath the horizontal.
   - a) How high was Tarzan if the banana took 2 seconds to hit the ground?
   - b) With what speed did the banana hit the ground?
   - •c) With what angle did the banana hit the ground?

9. •Tina, the golfer, tees off the tip-top of a tall turf laden hill. Her golf ball is in the air for 6.00 seconds before coming to a rest 5.00 meters below the tee's height.
   - a) If the golf is hit with a velocity of 60.00 m/s then what angle was the ball hit with?
   - b) How far horizontally did the ball travel before coming to a rest?

10. •Tarzan was swinging on a vine when is snapped. At the moment it snapped the vine was 30° from the VERTICAL in an upwards direction. Tarzan was traveling 25 m/s. Tarzan landed 16 meters along the ground from where the vine broke.
    - a. How long was Tarzan in the air?
    - b. How fast was Tarzan traveling when he hit the ground, (<u>MAGNITUDE and DIRECTION</u>)?

11. •A rock is thrown at a house with a speed of 30 m/s at an angle of 39 degrees with the ground. If the house is 83 meters away, will the rock hit the house?

12. •In a backyard baseball game Billy Bats bats a ball beyond the bases. The ball is hit at a 58 degree angle with the ground with some yet unknown initial speed. The ball travels 235 meters along the ground.
    - a) With what speed does the ball hit the ground?
    - b) How long is the ball in the air?
    - c) How high did the ball travel?

13. At <u>THE</u> bodacious mud-bog of the year, a car makes a jump at an angle of 22 degrees with the ground. The truck travels up as high as 5.0 meters.
    - a) What is the trucks initial speed when it leaves the ramp?
    - b) How long was the truck in the air?
    - c) How far across the ground did the truck travel?

14. Young Billy Joe Bobby Brucey shoots a rock out of a sling shot at an angle of 41 degrees with the ground. The rock travels 78 meters before hitting the ground.
    - a) What is the rock's initial speed?
    - b) How long is the rock in the air?
    - c) How high did the rock travel?

15. •A canon ball is fired from a cannon that it titled at a 33° angle with the ground. The cannon ball travels 568 m down range. It also has a vertical velocity component of 60.12 m/s.
    - a. How high did the cannon ball travel?
    - b. What was the cannon ball's initial velocity?
    - c. How long was it in the air?