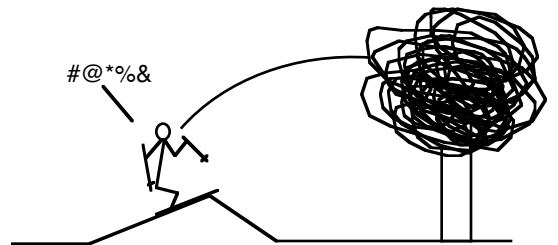


# Projectile Motion Review

HONORS

The problem numbers are weird. Just go with it. **TEST NEXT CLASS ON PROJECTILE MOTION.**  
Correct numerical answers will be posted to the blog before the test.

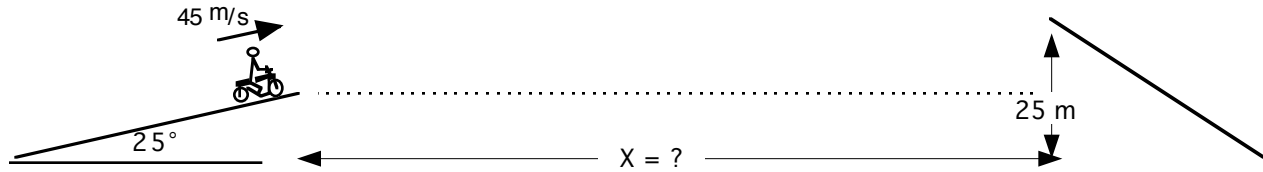
- In a football game, a quarterback throws a ball to a receiver. The quarterback takes the hike from the center. 3.0 seconds later he passes the ball with a velocity of  $20 \text{ m/s}$  at a  $30^\circ$  angle with the ground.
  - How high did the ball travel? (5.10 m)
  - How long was the ball in the air? 2.04 s
  - How far down the field did the ball travel? 35.35 m
  - What speed will the ball hit the ground with and at what angle? ( $20 \text{ m/s}$ ,  $30^\circ$  with the ground)
  - With what average velocity will the receiver have to run with in order to catch the ball the moment it gets to the ground? ( $7.01 \text{ m/s}$ )
- While traveling down the road, a driver loses control of his car the bounces off a curb at a  $5^\circ$  angle with the ground. The car was traveling  $40 \text{ m/s}$  when it bounced at  $5^\circ$ . It lands on ground the same height it left from.
  - How long was the car in the air? (0.71 s)
  - How far did the car travel? (28.35 m)
  - What velocity did the car impact the ground with? (magnitude AND direction) ( $40 \text{ m/s}$ ,  $5^\circ$  with the ground)
- A skier was traveling  $20 \text{ m/s}$  when they hit a hill and launched themselves up into the air at a  $30^\circ$  angle. They hit a tree when they were at the highest part of the motion.
  - How long was the skier in the air? (1.02 s)
  - How high did the skier travel? (5.10m)
  - How far along the ground did the skier travel? (17.67 m)
- The Charlottesville parking garage on Market Street is 6 stories high, 19.8 m. A car travels horizontally off the top of the garage at  $2.2 \text{ m/s}$ , 5 mph.
  - How far from the edge of the building did the car land? (4.42 m)
  - How long was the car in the air? (2.01 s)
  - What velocity did the car impact the ground? (magnitude AND direction) ( $19.70 \text{ m/s}$ ,  $83.63^\circ$  with the ground)
- A student is at a quarry and attempting to run off the edge of a cliff. They run off the cliff at horizontally at  $10 \text{ m/s}$ . The edge of the cliff is 5 m above the water.
  - How far from the edge of the quarry wall did the student land? (10.10 m)
  - How long was the student in the air? (1.01 s)
  - What velocity did the student impact the water? (magnitude AND direction) ( $14.07 \text{ m/s}$ ,  $44.71^\circ$  with the ground)
- The motorcycle dare-devil Evil Kinevil is about to make a world record distance jump. He leaves the jump ramp at  $45 \text{ m/s}$ . The ramp is at a  $22^\circ$  angle with the ground. He lands at the same height he took off from.
  - How high does he travel? (14.50 m)
  - How long is he in the air? (3.44 s)
  - What is the distance of his jump? (??? m)
  - what is his velocity when he lands? ( $45 \text{ m/s}$ ,  $22^\circ$  with the ground)
- Evil Kinevil is about to make another world record distance jump. He leaves the jump ramp at  $45 \text{ m/s}$ . The ramp is at a  $68^\circ$  ( $90^\circ - 22^\circ$ ) angle with the ground. He lands at the same height he took off from.
  - How high does he travel? (88.82 m)
  - How long is he in the air? (8.51 s)
  - What is the distance of his jump? (??? m)
  - what is his velocity when he lands? ( $45 \text{ m/s}$ ,  $68^\circ$  with the ground)
  - Can you see a cool relationship between the problem (9) and this one?
- A penny is kicked horizontally off the roof of a 10 story building (33.3 m high). It is kicked at  $22 \text{ m/s}$ .
  - How much time does the penny spend in the air? (2.61 s)
  - How far away from the building did the penny land? (57.35 m)
  - What is the penny's SPEED when it hits the ground? ( $33.71 \text{ m/s}$ )
  - What is the penny's VELOCITY (magnitude and direction) when it hits the ground? ( $33.71 \text{ m/s}$ ,  $49.27^\circ$ )



# Projectile Motion Review

HONORS

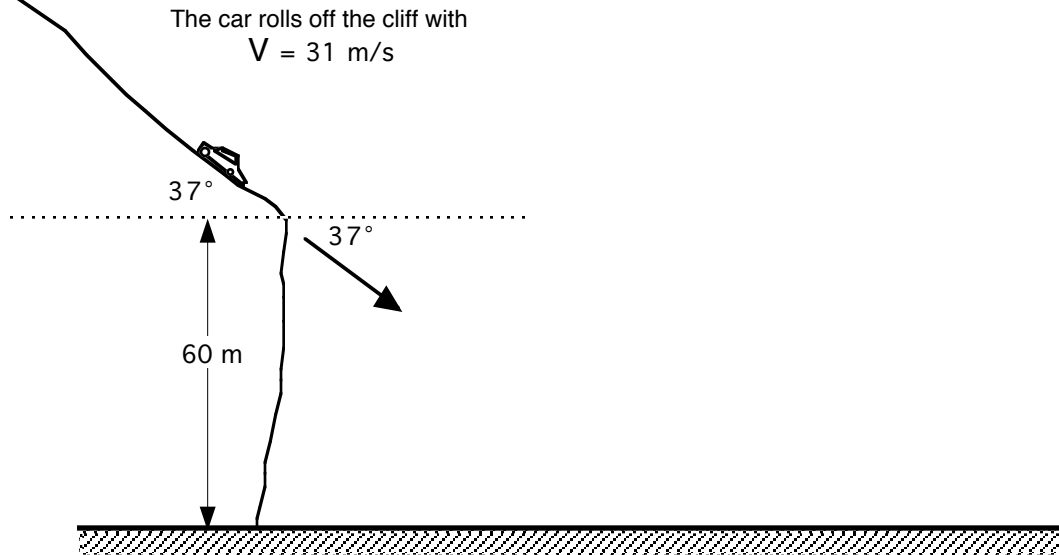
25



A stunt rider is making a motorcycle jump. Through a planning error the landing ramp's end does not match the take-off ramp's height. The landing ramp is 25 m high. The take off ramp is 10 meters high at the end.

- Where should the ramp be placed (x)? (113.38 m)
- How long is the rider in the air? (2.78 s)

29



- How long is the car in the air? (2.07 s)  
How far from the cliff's edge will the car land? (51.49 m)  
How fast and at what angle will the car impact the ground? (46.22 m/s,  $57.62^\circ$  with the ground)

**The, "Do you really get it?" question.** The solution to this will appear on web before the test.

- 200) A baseball is thrown from the outfield to home with a speed of  $32 \text{ m/s}$  at an angle of  $43^\circ$  with the ground.
- What is the ball's velocity (magnitude and direction) 1.90 seconds after being thrown? ( $23.62 \text{ m/s}$ ,  $7.79^\circ$  with the horizontal)
  - Is the ball on the way up or down? (Up)