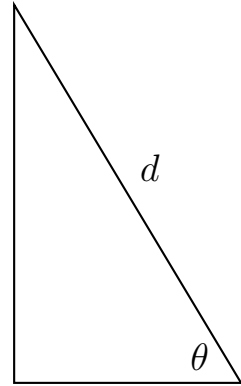


Lecture 6: Projectile Motion I

Warm-Up Activity

- You slide down the ramp shown, starting from rest. Consider the special case where the ramp is made horizontal.
 - How long would it take you to reach the end of the ramp in this case?
- (A) No time at all.
- (B) The same amount of time as when tilted.
- (C) An infinite amount of time.
- (D) Not enough information.

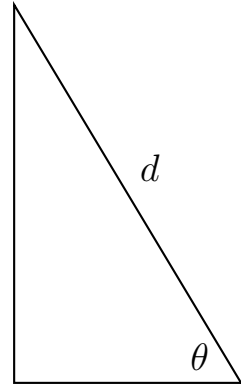


L6-1: Ramp Slide Sensemaking

- You slide down the ramp shown, starting from rest. Consider the special case where the ramp is made horizontal.
- Does the equation below agree with your prediction?

$$t = \sqrt{\frac{2d}{g \sin \theta}}$$

- Can you make sense of how t depends on d and g as well?



L6-2: Long Distance Archer – Analyze & Represent

You are a long-distance archer who releases an arrow that hits a target 200 m away. Your arrow makes an initial angle with the horizontal of 17° . Following the steps for solving an A*R*C*S problem, find the initial speed of the arrow.

- **Analyze and Represent**
 - Choose appropriate symbols for the quantities you **know** and **don't know**.
 - What assumptions are you making and why are you making them?
 - Sketch a diagram showing the known and unknown quantities.

L6-2: Long Distance Archer – Calculate

You are a long-distance archer who releases an arrow that hits a target 200 m away. Your arrow makes an initial angle with the horizontal of 17° . Following the steps for solving an A*R*C*S problem, find the initial speed of the arrow.

- **Calculate:** Find a **symbolic expression** for the initial speed of the arrow.
 - *Hint 1:* **Use the symbols you defined before** to help you choose which kinematics equations to use for the x - and y -directions.
 - *Hint 2:* Think about which quantity is the same for the x - and y -directions.
 - Wait until the end to plug in numbers!

L6-2: Long Distance Archer – Sensemake

You are a long-distance archer who releases an arrow that hits a target 200 m away. Your arrow makes an initial angle with the horizontal of 17° . Following the steps for solving an A*R*C*S problem, find the initial speed of the arrow.

- Sensemake
 - Check the units of your answer.
 - Does your number make sense?
 - Give a physical explanation for how the initial speed of the arrow would change if you increased each variable that your answer depends on.

Main Ideas

- We can use the kinematics equations to solve for any quantity of interest when the acceleration is constant.
- Motion in 2 dimensions can be broken down into independent motion in each dimension.