Real-Life Applications of Inverse Trigonometry: A Student Worksheet

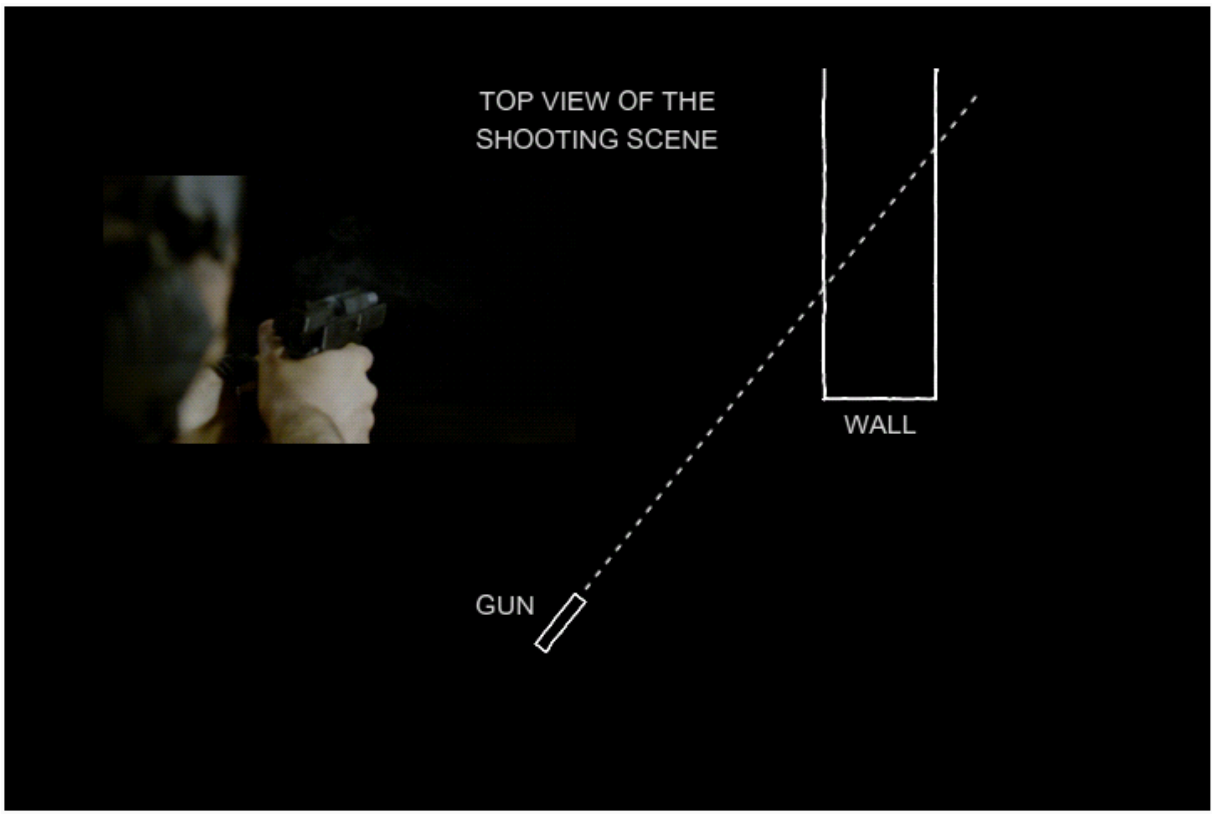
Arctan (Inverse Tangent): Example from Forensics

1. Crime Scene Reconstruction

Criminalists, also known as forensic scientists, reconstruct crime scenes to understand how crimes were performed. For example, in the investigation of shooting scenes, they often need to determine the shooting angle and the suspected path of the bullet. Criminalists may use plastic strings or laser beams to determine bullet trajectories. However, this is not always possible, for example, if some objects like trees or bushes occlude the crime scene. This is where inverse trigonometric functions, particularly inverse tangent (arctan), come to the rescue.

2. Calculating shooting angle:

Consider a shooting scene where the bullet has entered and exited the wall, as shown in the picture below.

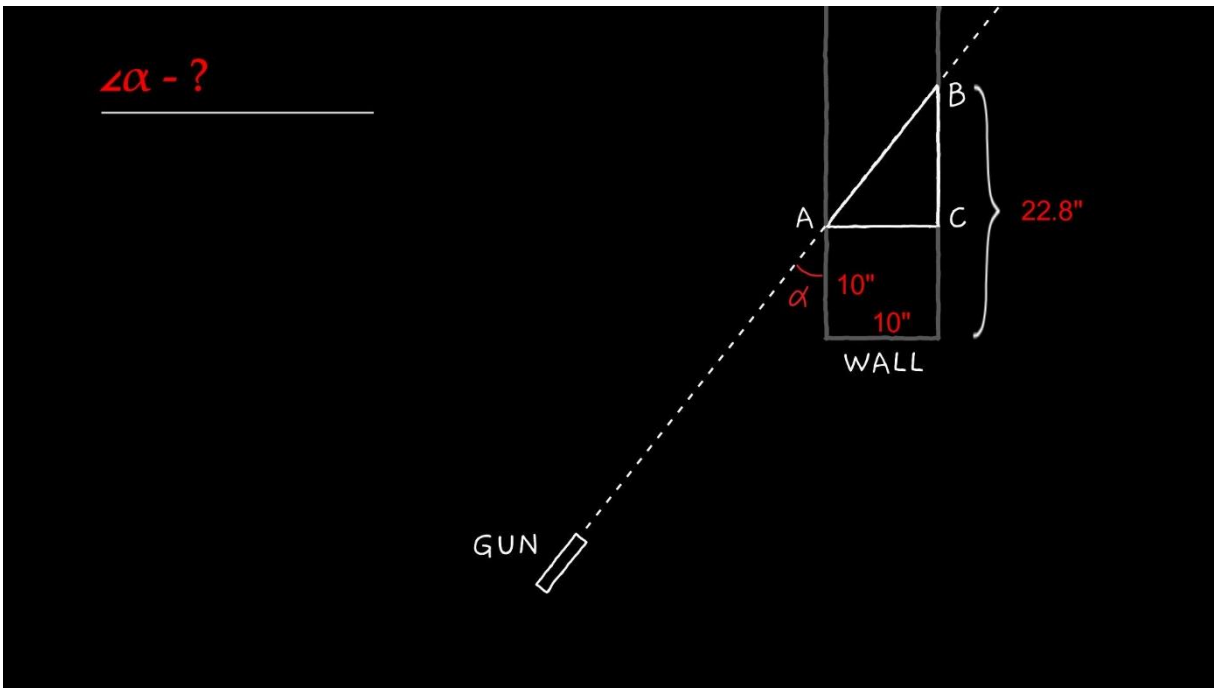


3. **Model of the shooting scene:**

This scene can be modeled with the right triangle model (ABC), where:

- AB is the hypotenuse, formed by the flight of the bullet through the wall;
- Leg AC is a 'horizontal' leg (if the shooting scene is viewed from above);
- Leg BC is the 'vertical' leg.
- **<u>The angle α, formed between the path of the bullet and the wall, is the shooting angle forensic scientist want to find.</u>**

The model, along with dimensions, is illustrated in the schematic below.



Angles α and ABC are corresponding angles, and therefore equal. Find shooting angle α.

Answer: shooting angle α equals _____