Forensics

Lesson: Friday, April 10th

Learning Target:

Students will be able to determine the position of a shooter based on bullet trajectory.

Let's Get Started:

1. What term is used to describe the flight path a bullet takes as it travels toward its target?

   2. Which of the following best describes the trajectory of a projectile?
   a) the height of the shooter
   b) the path of the flight of a bullet
   c) the housing for the bullet's gunpowder
   d) the pattern of lands and grooves on the projectile

Let's Get Started: KEY

1. What term is used to describe the flight path a bullet takes as it travels toward its target? Trajectory

   2. Which of the following best describes the trajectory of a projectile?
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Lesson Activity Part 1:Trajectory

- Watch the following video on bullet trajectory:
  - [Trajectory](#)

Lesson Activity Part 2:Trajectory

- Trajectory – the path of the propelled bullet
- Helps determine where the shooter was located.
- If trajectory angle is downward, the shooter was positioned above the target.
- Two reference points along the flight path are needed to define the trajectory.
- Investigators can figure the shooter discharged the firearm somewhere along that line.
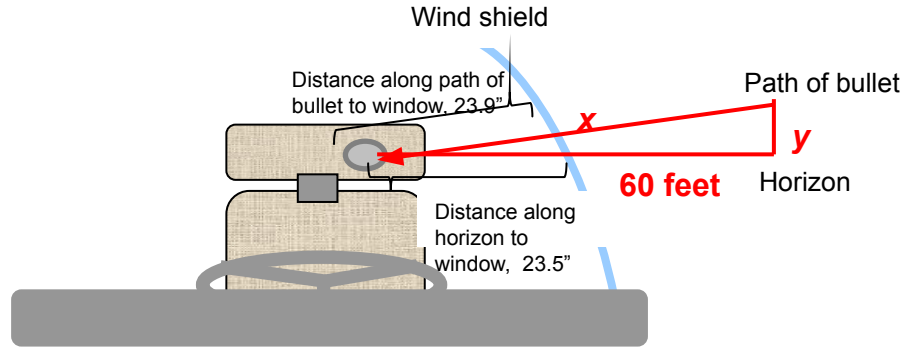
Trajectory

- Reference points can be bullet holes in objects or victims.

- An entry point and exit point on a victim can be used.

- Gunshot residue or spent cartridge casings can be less specific reference points.

- Investigators can use lasers to trace a straight-line path to help determine the position of the shooter.

Trajectory

- Can be difficult to determine
- Bullet can ricochet, become damaged, or does not provide a direct path for measurement.
- Targeting needs to be adjusted for very distant objects due to gravity.

Trajectory

Distance to the window   =   Distance to the shooter (x)

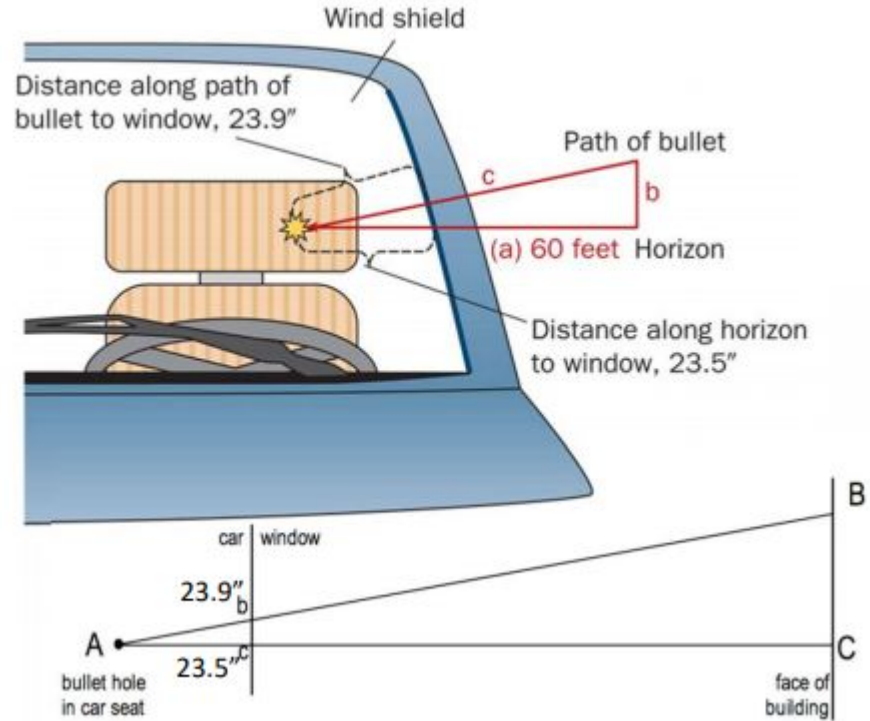Distance along horizon to window   Distance to the building

- With the distance to the building and the distance to the shooter along the trajectory of the bullet, the Pythagorean theorem can be used to determine the height of the shooter above the horizon (not the ground)

Practice

Practice Questions

Building is 60 feet away along the horizon line; Bullet hole is 4 feet above the ground.

1. Calculate the distance to the shooter.

2. Where is the shooter located?

3. Why is it important to determine the height of the shooter?

Wind shield

Distance along path of bullet to window, 23.9"

Path of bullet

c

b

(a) 60 feet Horizon

Distance along horizon to window, 23.5"

car | window

23.9"
b

A •

23.5" c

bullet hole in car seat

B

C

face of building

$$\frac{\text{Distance to window (Ab)}}{\text{Distance along horizon (Ac)}} = \frac{\text{distance to shooter (AB)}}{\text{distance to side of building (AC)}}$$

Practice Questions Answers

Building is 60 feet away along the horizon line; Bullet hole is 4 feet above the ground.

1. Calculate the distance to the shooter.

$$\frac{23.9 \text{ in}}{23.5 \text{ in}} = \frac{\text{distance to shooter}}{720 \text{ inches}}$$

AC = 60 ft * 12 in/ft = 720 inches

distance to shooter = 732.3 inches

Practice Question Answers Continued..

2. Where is the shooter located?

Use Pythagorean's theorem

$$AB^2 = AC^2 + BC^2$$

$(732.3 \text{ in})^2 = (720 \text{ in})^2 + BC^2$

$BC^2 = (732.3 \text{ in})^2 - (720 \text{ in})^2$

$BC = \sqrt{(536{,}263 \text{ in}^2 - 518{,}400 \text{ in}^2)}$ (square root)

$BC = 133.1$ inches

$BC = 11.1$ feet

AB = distance to shooter
AC = distance to building
BC = height of the shooter from the horizon

Shooter is 11.1 feet higher than the bullet hole, which is 4 ft. Shooter was 15.1 feet about the ground (on a second floor)

3. Why is it important to determine the height of the shooter?

Identification

Additional Practice

Click on the following links for additional practice.

[Bullet Trajectory](#) '

[Firearms and Trajectory](#)