

SI Forensics - Full Discipline Demo

Firearms

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Forensics - Full Discipline Demo
Course	SI Forensics - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

Label the appropriate parts of the angle of impact equation.

⋮
Minor
Axis

⋮ θ

⋮
Major
Axis

▶

1

$= \sin^{-1} \left(\frac{\text{2}}{\text{3}} \right)$

Correct answers:

1 θ 2 Minor Axis 3 Major Axis

Match each term with the best description.

■ Rifling

■ Lands

■ Grooves

The depressed areas in the barrel of a gun.

The spiral cuts in the inner surface of the gun barrel that give the bullet rotation for a more precise trajectory.

The raised areas in the barrel of a gun.

1

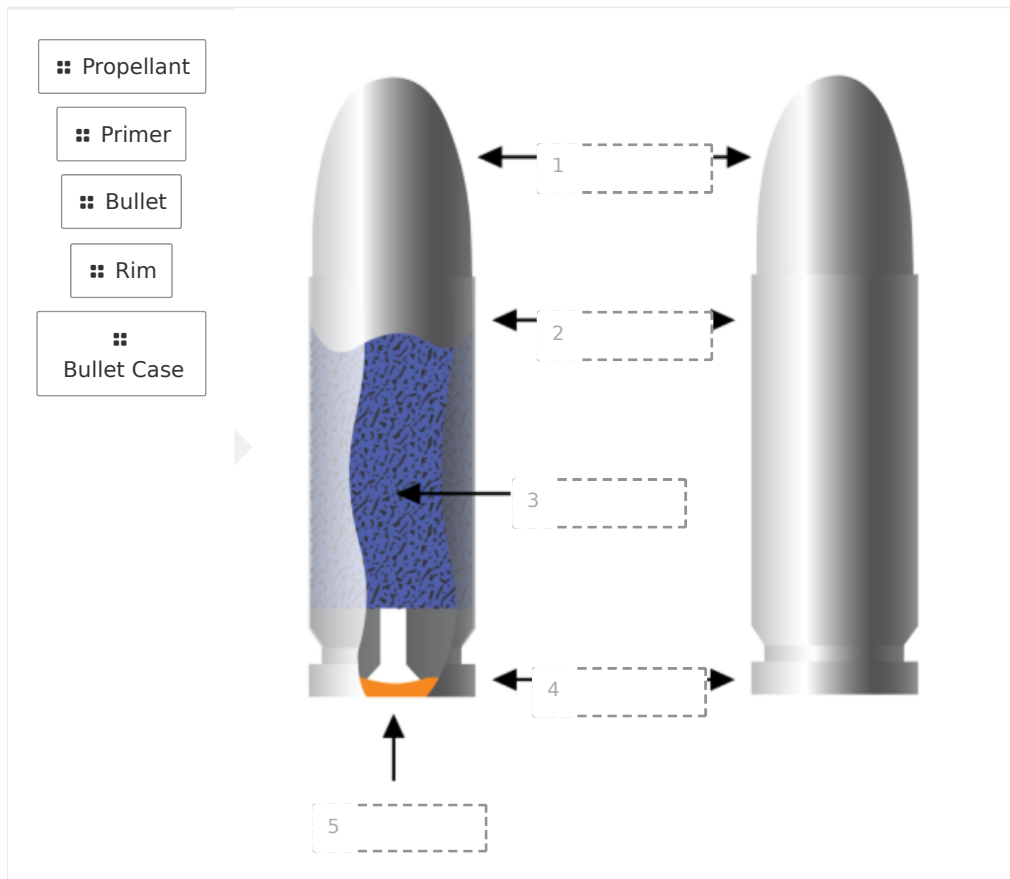
2

3

Correct answers:

1 Grooves 2 Rifling 3 Lands

Label the parts of the cartridge in the image below.



Correct answers:

1 Bullet 2 Bullet Case 3 Propellant 4 Rim 5 Primer

Exploration

_____ can be determined by measuring the diameter of a cartridge or bullet hole.

- ☒ Caliber
- ☐ Ballistics
- ☐ Cartridges
- ☐ Firearms



Bullet trajectory can be approximated based on the angle of impact.

☐ True



☐ False

If a bullet exhibits rifling spiraling to the left, it can be concluded that _____.

☐ the bullet was fired from a handgun

☐ the bullet was fired from a shotgun

☐ the bullet was fired from a gun with right-spiraling rifling

☐ the bullet was fired from a gun with left-spiraling rifling



Exercise 1

Crime scene investigators do not always physically measure out bullet trajectory and shooter height as you did in this exercise. How could an investigator use trigonometry alone to determine shooter shoulder height after calculating the angle of impact?

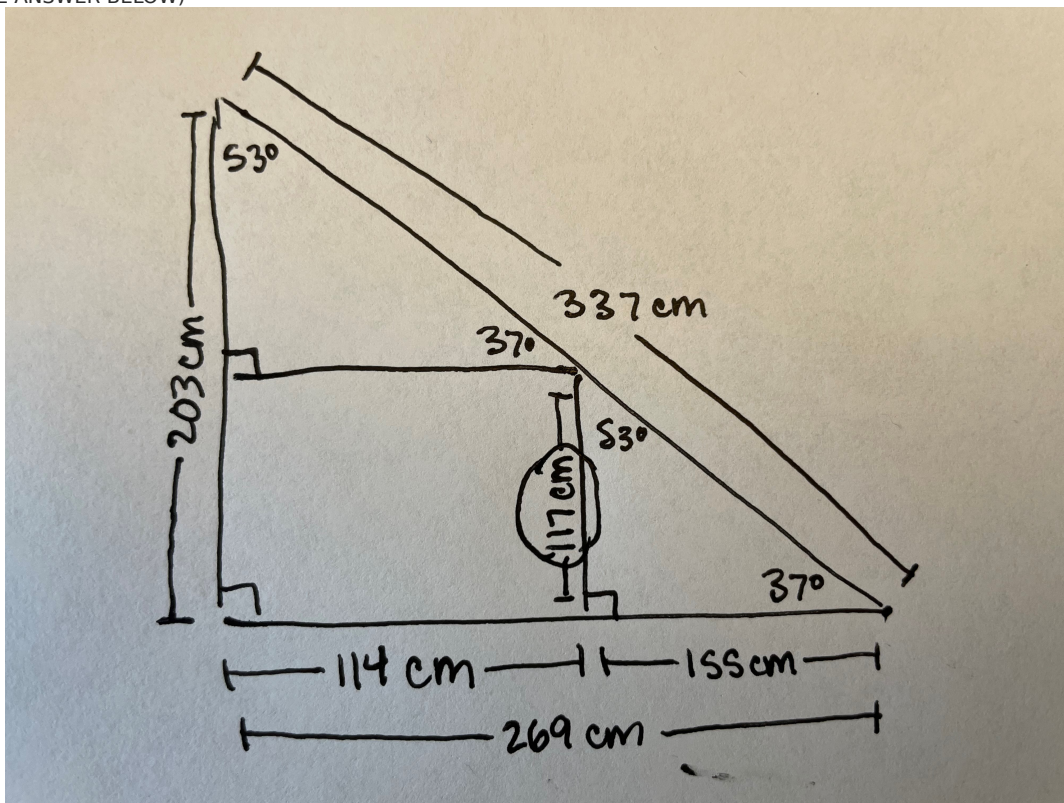
How would your use of the bullet trajectory analysis differ if you were to encounter this same scenario, but without the latent footprints? Would there still be any benefit to this analysis?

Why were you able to determine the angle of the string in relation to the ground by subtracting the angle of impact from 90° ? Explain your answer using trigonometry.

Data Table 1: Bullet Trajectory Data
(SAMPLE ANSWER BELOW)

Bullet Hole Minor Axis (mm)	8
Bullet Hole Major Axis (mm)	10
Angle of Bullet Impact ($^\circ$)	53
Shoulder Height (cm)	117
Shooter's Height (cm)	137

Photo 1:
(SAMPLE ANSWER BELOW)



Exercise 2

What evidence did you use to determine that the bullet came from the gun you selected for Photo 2 and not the other two?

Would you be able to perform this same sort of analysis for a shell fired from a shotgun? Explain your answer.

Once a gun is found that produces the same rifling patterns as those found on a bullet at a crime scene, what is the likelihood that bullet was fired by a different gun?

Photo 2: Rifling Pattern Match
(SAMPLE ANSWER BELOW)

Crime Scene Bullet



2



Competency Review

What is the angle of impact of a bullet with a minor axis of 10 mm and a major axis of 13 mm?

- ☐ 25°
- ☐ 33°
- ☒ 50°
- ☐ 60°

Ballistics is the study of bullet rifling patterns.

- ☐ True
- ☒ False

The combination of lands and grooves inside a gun barrel is called _____.

- ☐ shot
- ☒ rifling
- ☐ angle of impact
- ☐ ballistics

The trajectory of a bullet can be calculated using the _____ function.

- ☐ inverse sine
- ☐ sine
- ☐ inverse cosine
- ☒ cosine

The height of the string directly above the location of the footprints in Exercise 1 is the approximated height of the shooter's head.

- ☐ True
- ☒ False

The angle of impact is used to determine bullet trajectory.

- ☒ True ✓
- ☐ False

The bullet recovered from the crime scene displayed rifling spiraling to the right.

- ☒ True ✓
- ☐ False

The width of the lands and grooves on a bullet cannot be used to determine the gun that fired the bullet.

- ☐ True
- ☒ False ✓

Extension Questions

Would a handgun or shotgun be more difficult to trace and determine class characteristics? Explain your answer. (SAMPLE ANSWER BELOW)

A shotgun would be more difficult to trace for two reasons. Instead of one, solid bullet like a handgun, a shotgun cartridge contains many small pellets that are more difficult to find and collect. Furthermore, if the pellets are collected, they do not have markings from the barrel of the gun. As a result, the barrel of shotguns do not contain rifling.