

TRAINING LAB - FIREARMS AND BALLISTICS: USING BULLET TRAJECTORY TO DETERMINE THE POSITION OF A CLOSE RANGE SHOOTER

NAME _____

Background: The last Training Lab taught you how to determine a bullet's trajectory from bullet holes, however, you also discovered that it is difficult to determine the exact location of a shooter based on the trajectory of a single bullet. Where along a single bullet's trajectory line was the shooter's location when they pulled the gun's trigger? In this Training Lab you will discover that it is much easier to determine the exact location of a shooter if they fired more than one bullet at a crime scene.

1. You will be trained to determine the position of a shooter when bullets were fired at close range.

Procedures:

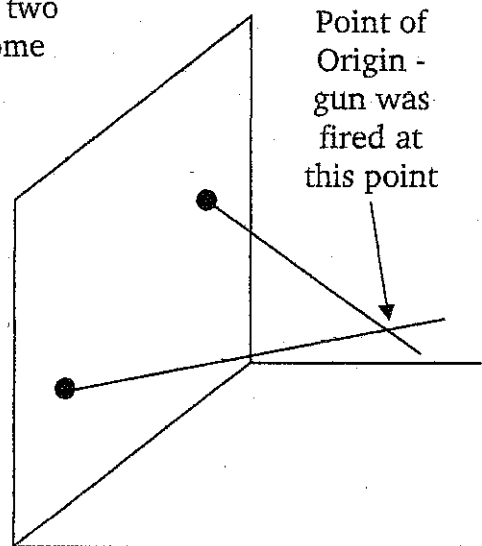
Part 1 - Stringing A Crime Scene To Determine A Shooter's Position

1. Pick up a "Bullet Trajectory Kit", meter stick/measuring device, and TWO bullet holes of your choosing. You are going to create a crime scene for another group to analyze!
2. Find a wall space where you can create your crime scene. Assume a shooter was standing about 6 feet from this wall space and fired TWO shots in the direction of the wall - producing two bullet holes at different locations in the wall. To determine where the shooter was standing you would complete the following steps:

Step #1 - Place Trajectory Rods in the two bullet holes to determine the trajectory of each bullet.

Step #2 - Extend strings from each Trajectory Rod to extend the trajectory path of each bullet away from the wall. This is called STRINGING the crime scene.

Step #3 - As long as the shooter was standing still, these two trajectory paths (strings) should intersect at some point. This point of intersection is the exact location where the gun was being held when it was fired (see the diagram at right). This point is called the POINT OF ORIGIN (the same as blood spatter Point of Origin). The strings may not perfectly intersect due to "stringing" errors on your part. You may need to adjust the strings until you find the perfect Point of Origin.



3. Time to create your crime scene! You will place TWO bullet holes on the wall. Decide approximately where you want your Point of Origin to be in your crime scene (the location where the gun was fired). Choose a Point of Origin that is somewhere between 5 feet to 8 feet from your wall. The Point of Origin should also be less than 6 feet high.

4. Work quickly to set up your crime – you will only have 25 minutes to construct your crime scene and take all necessary measurements!

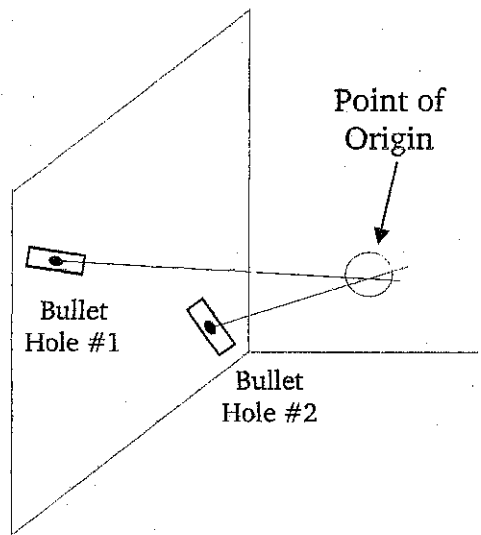
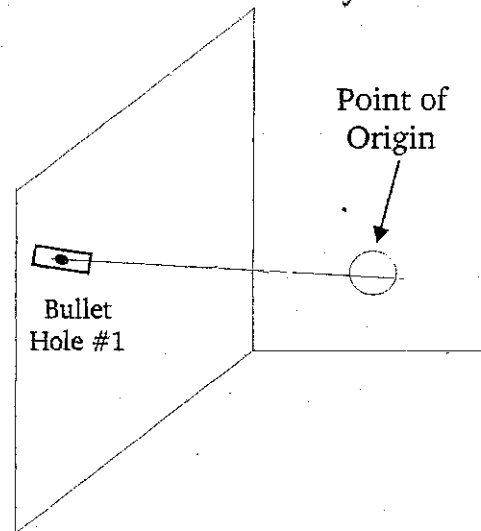
5. Tape your first bullet hole somewhere on the wall (numbered side against the wall) oriented so the bullet hole's angle is pointing toward your Point of Origin (see the diagram at right).

6. Place a Trajectory Rod in the bullet hole and extend the string to see if the bullet's trajectory is where you want it to be (near your Point of Origin). If you are not happy with the bullet's trajectory you should remove the bullet hole from the wall, adjust its placement and re-tape it to the wall.

7. Tape your second bullet hole somewhere on the wall and orient this bullet hole toward your Point of Origin. Remember, bullet holes with different bullet hole angles are available for you to use.

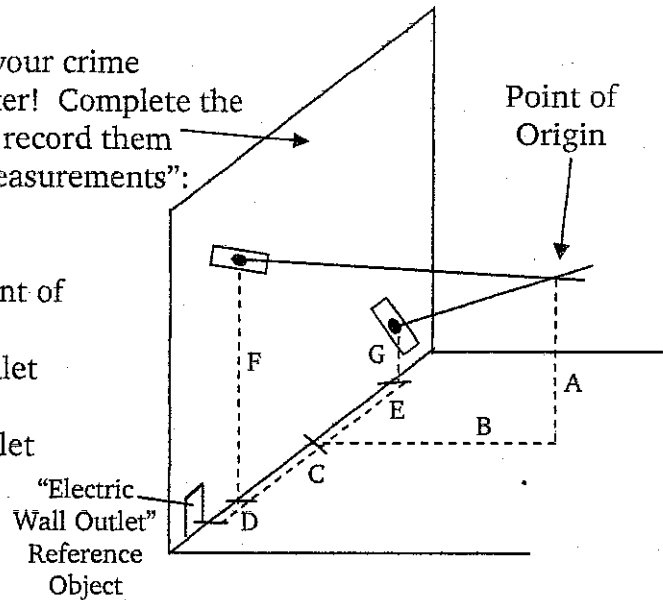
8. Place a Trajectory Rod in the second bullet hole and extend the string. This second bullet's trajectory MUST intersect with the first bullet's trajectory. If it is too high or too low remove the bullet hole, adjust its placement, and re-tape it to the wall. It works best if one person holds the string at the Point of Origin and eyes down the string to make sure it is lined up with the Trajectory Rod, while a second person adjusts the bullet hole's position until it is lined up perfectly.

9. Place a clip on the two strings to hold them together at the Point of Origin.



10. Time to take accurate measurements of your crime scene so it can be accurately sketched later! Complete the following measurements (in inches) and record them in Table 1 –“KEY To The Crime Scene Measurements”:

- A. Height of Point of Origin
- B. Distance from Point of Origin to Wall
- C. Distance from Reference Object to Point of Origin's Position Along the Wall
- D. Distance from Reference Object to Bullet Hole #1's Position Along the Wall
- E. Distance from Reference Object to Bullet Hole #2's Position Along the Wall
- F. Height of Bullet Hole #1
- G. Height of Bullet Hole #2



- 11. When you have finished your measurements you should make sure your bullet holes are SECURELY taped to the wall. Remove your Trajectory Rods/strings from the bullet holes. DO NOT remove the bullet holes or “wall outlet” Reference Object.
- 12. Your supervisor will assign you an unknown crime scene to analyze. You will have 20 minutes to string the crime scene, determine the Point of Origin, and complete all measurements that you will need to accurately sketch the crime scene. Complete the same measurements you completed in Step #10 of the Training Lab (measurements A – G). Record your measurements in Table 2 – “Unknown Crime Scene Measurements”.
- 13. When you have finished analyzing the unknown crime scene you should remove the bullet holes, tape, and wall outlet reference object from the wall, organize your Bullet Trajectory Kit (make sure you return the adhesive putty – wrap the trajectory string around the trajectory rod and clip it), and return everything to your supervisor.

Part 2 – Creating An Accurate Sketch Of Your Crime Scene

- 1. Use your measurements from Table 1 – “KEY To The Crime Scene Measurements” to accurately sketch the position of the bullet holes and Point of Origin in Figure 1 – “KEY To The Crime Scene Sketch”. The Scale in this sketch is 1 mm = 1 inch.
HINT: It is easiest to begin by measuring out the distance of each object (bullet holes and Point of Origin) from the Reference Object and marking their locations along the wall/floor border.
- 2. Draw in the trajectories of the two bullets. Give your completed Figure 1 sketch (KEY To The Crime Scene Sketch) to your supervisor when you have finished.
- 3. Use your measurements from Table 2 – “UNKNOWN Crime Scene Measurements” to accurately sketch the position of the bullet holes and Point of Origin in Figure 2 – “UNKNOWN Crime Scene Sketch”. The Scale in this sketch is 1 mm = 1 inch. Draw in the trajectories of the two bullets.
- 4. Go to your supervisor and ask for the “KEY To The Crime Scene” that matches your “UNKNOWN Crime Scene” number so you can see how close your analysis of the crime scene matches the key.
- 5. Answer the Training Lab Questions.

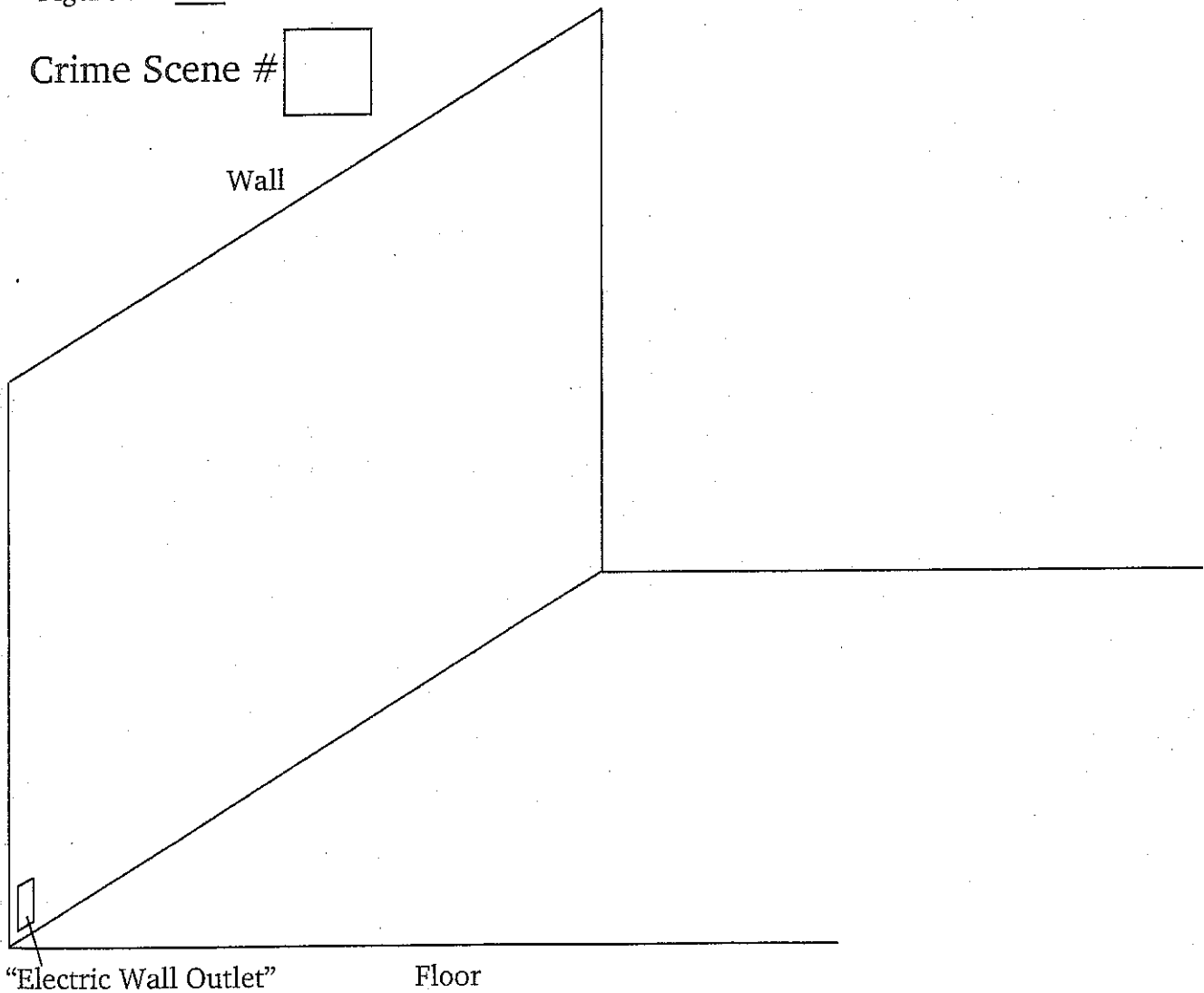
Shooter Location Data Page - KEY To The Crime Scene

Name _____

Table 1 - KEY To The Crime Scene Measurements

Height of Point of Origin (inches)	
Distance from Point of Origin to Wall (inches)	
Distance from Reference Object to Point of Origin Position Along The Wall (inches)	
Distance from Reference Object to Bullet Hole #1 Position Along The Wall (inches)	
Distance from Reference Object to Bullet Hole #2 Position Along The Wall (inches)	
Height of Bullet Hole #1 (inches)	
Height of Bullet Hole #2 (inches)	

Figure 1 - KEY To The Crime Scene Sketch Scale: 1 mm = 1 inch in this drawing



Shooter Location Data Page - UNKNOWN Crime Scene

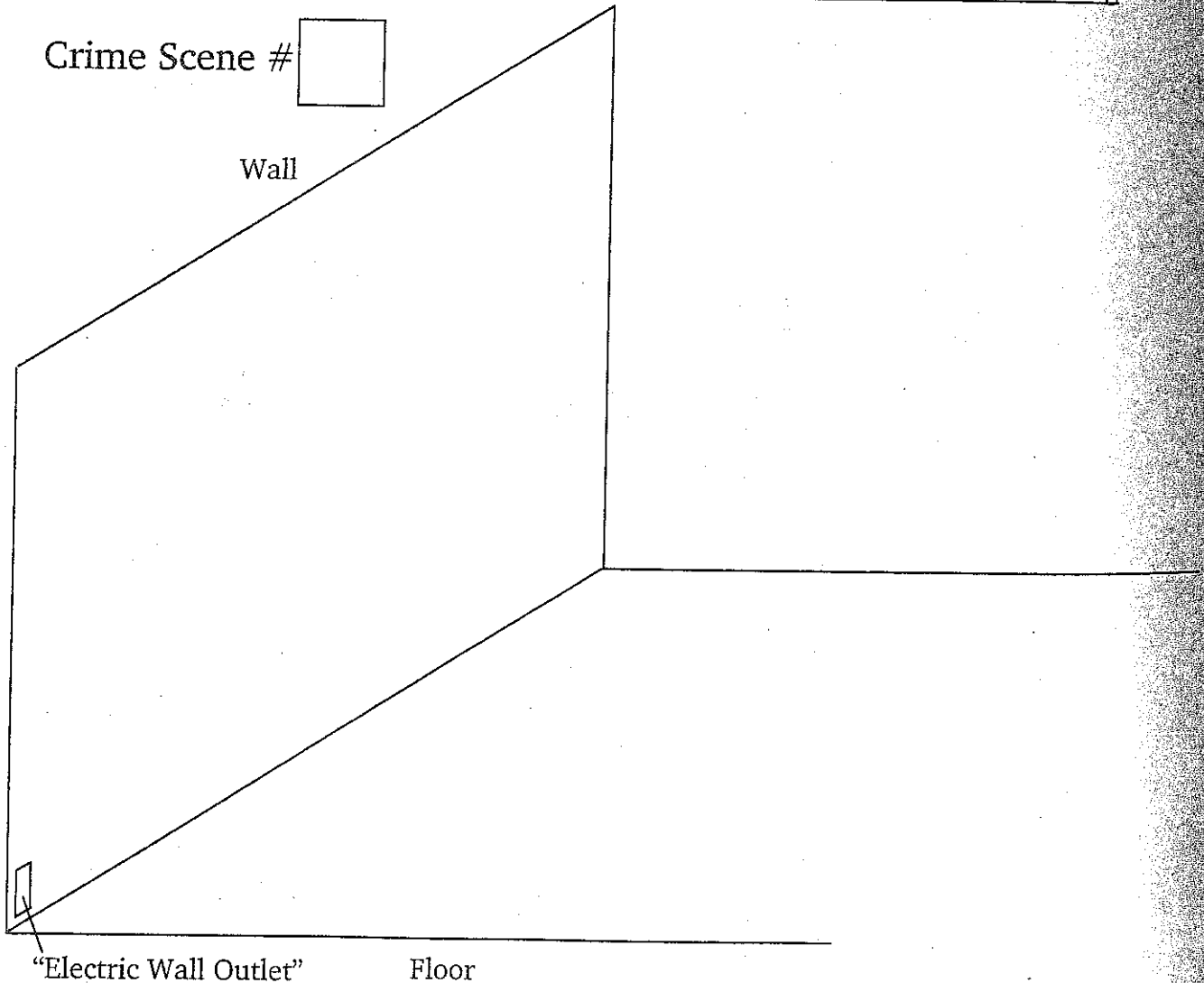
Name _____

Table 2 – Unknown Crime Scene Measurements

Height of Point of Origin (inches)	
Distance from Point of Origin to Wall (inches)	
Distance from Reference Object to Point of Origin Position Along The Wall (inches)	
Distance from Reference Object to Bullet Hole #1 Position Along The Wall (inches)	
Distance from Reference Object to Bullet Hole #2 Position Along The Wall (inches)	
Height of Bullet Hole #1 (inches)	
Height of Bullet Hole #2 (inches)	

Figure 2 – UNKNOWN Crime Scene Sketch Scale: 1 mm = 1 inch in this drawing

Crime Scene #



QUESTIONS - FIREARMS AND BALLISTICS: USING BULLET TRAJECTORY TO DETERMINE THE POSITION OF A CLOSE RANGE SHOOTER

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Answer the questions below based on the UNKNOWN Crime Scene you analyzed.

1. Based on your analysis, how far from the wall was the shooter (in inches)? _____
2. Based on your analysis, at what height was the gun fired (in inches)? _____
3. In what position do you think the shooter was in when the gun was fired? (circle one)
 - A. lying on the floor
 - B. sitting on the floor
 - C. on their knees
 - D. standing
4. Based on your analysis, was Bullet #1 fired to the: left, right, or directly in front of the gun/shooter?

5. Based on your analysis, was Bullet #1 fired: downward, upward, or level? _____
6. Based on your analysis, was Bullet #2 fired to the: left, right, or directly in front of the gun/shooter?

7. Based on your analysis, was Bullet #2 fired: downward, upward, or level? _____
8. My analysis of the unknown crime scene was (circle one)
 - A. exactly like the key to the crime scene – my point of origin was right on.
 - B. similar to the key to the crime scene – my point of origin was slightly off.
 - C. different than the key to the crime scene – my point of origin was not very close.
9. Why does a Reference Object help when sketching a crime scene?
10. You are preparing to “string” bullet holes at a crime scene to determine trajectories and find the Point of Origin. You can choose to use string or lasers. Which method would you choose to use. Explain your choice.