ACTIVITY 4

BLOOD-SPATTER IMPACT ANGLE

Objectives: *By the end of this activity, you will be able to:*

1. Create blood-spatter patterns from different angles of impact.
2. Examine the relationship between angle of impact and blood-spatter patterns.
3. Calculate the angle of impact from blood-spatter patterns.

Scenario:

Two police officers walk into a neighborhood convenience store. They soon realize that no one is inside the store. They discover a series of blood spatter patterns on the walls and ceiling. “What happened here?” says one officer as she walks around the store. The officers call in the situation, and a forensics team is dispatched to the scene. Forensic scientists will investigate the crime scene and seek answers for the questions listed below:

• Whose blood is this?
• Does it belong to just one or several people?
• How many people were injured?
• If more than one person was injured, is it possible to tell who was injured first?
• What type of injury caused the blood loss?
• What type of weapon caused the injury?
• If the weapon was a gun, from which direction was the bullet fired? Did the shooter point the gun upward, downward, or straight ahead?
• In what direction(s) did the injured person move?

Materials:

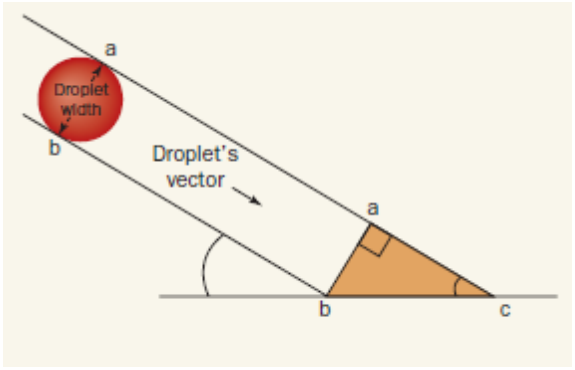
(per group of four students)
1 dropper bottle of simulated blood
4 five-by-eight-inch index cards
1 meter sticks
newspapers
2 clipboards
1 protractor
1 roll masking or drafting tape

Safety Precautions:

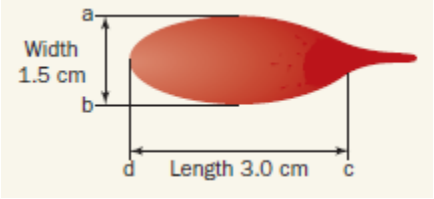
Cover the floor in the work area with newspaper.
Simulated blood may stain clothing and furniture, so care should be taken to avoid spilling blood.

Background:

Blood-spatter analysis is a powerful forensic tool. Spatter patterns allow investigators to reconstruct what happened at a crime scene. The blood spatter patterns “tell a story” of the crime and help the investigators determine if eyewitness accounts are consistent with the evidence.



By accurately measuring the length and width of a bloodstain, you can calculate the impact angle.



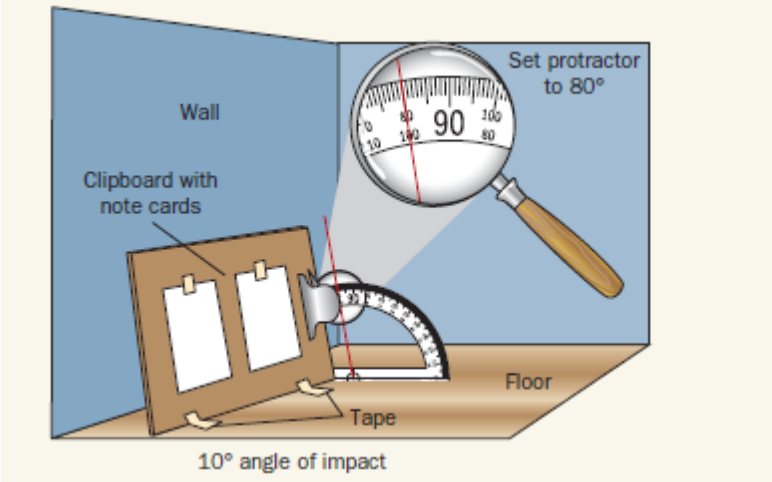
Procedure:

Creating blood spatter from different angles of impact

In this activity, you will drop blood onto 5 × 8 index cards set at various angles. You will drop the blood from 30 cm from the point of impact on the 5 × 8 card. You will observe how the angle of impact affects the size and shape of the blood spatter.

You will be working in groups. Each group will prepare blood spatter from different angles of impact. Divide the work as follows:

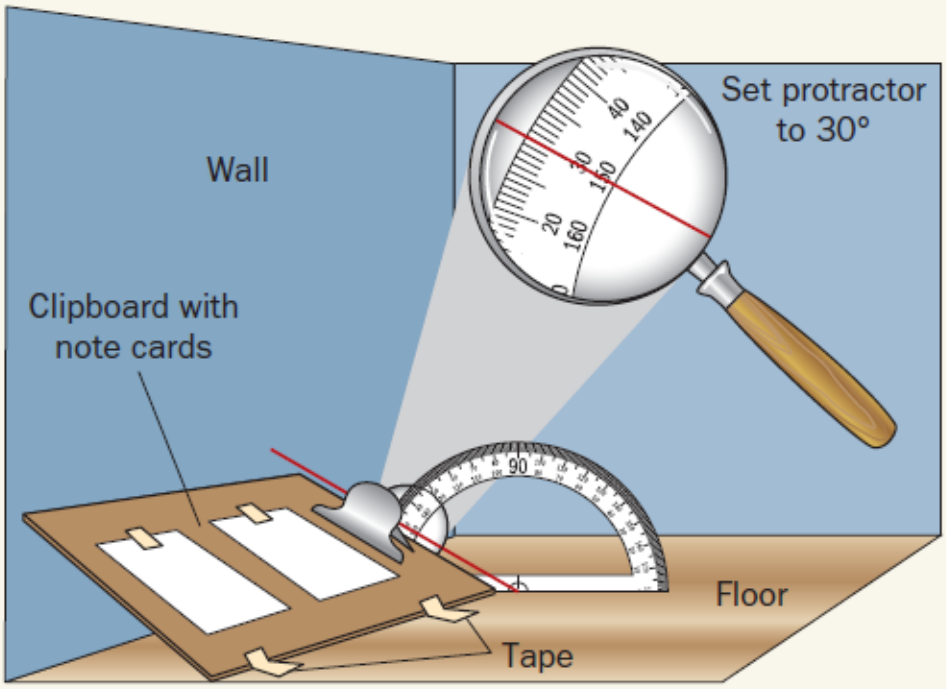
Group 1: 10 degrees, 50 degrees and 80 degrees
Group 2: 20 degrees, 40 degrees and 60 degrees
Group 3: 30 degrees, 70 degrees and 15 degrees
Group 4: 55 degrees, 85 degrees and 25 degrees
Group 5: 45 degrees and 65 degrees
Group 6: 35 degrees and 75 degrees



To simulate blood being cast off during bleeding, the following process is used.

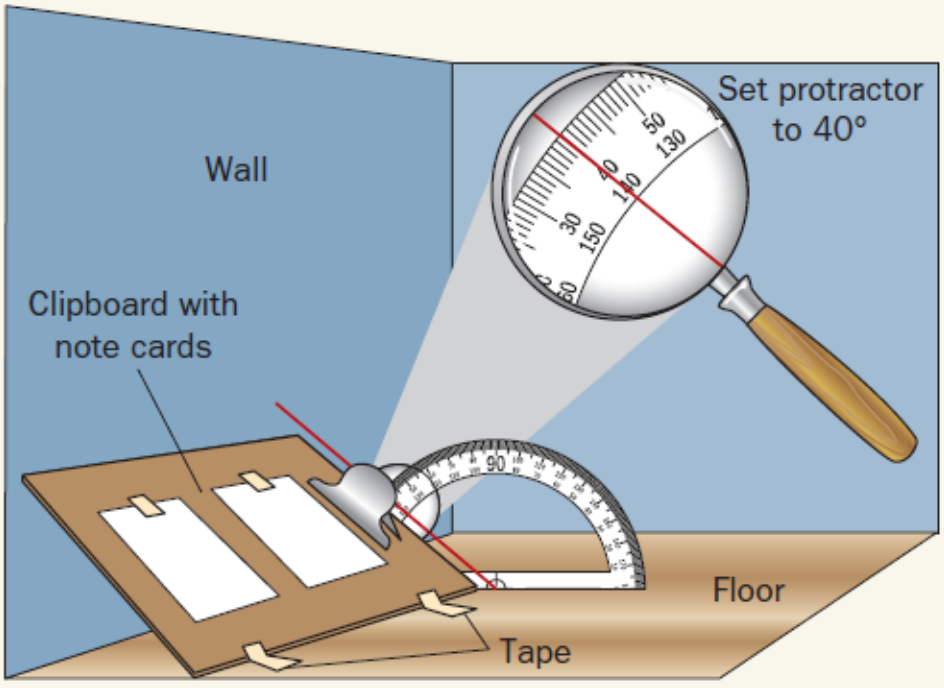
1. Turn a 5 × 8 index card over so that no lines are visible.
2. Tape two 5 × 8 index cards on the clipboard as shown.

60 degree angle of impact and set protractor for 30 degrees



60° angle of impact

50 degree angle of impact and set protractor for 40 degrees



50° angle of impact

3. Label the cards with your initials on the top-right corner, along with the angle of impact that you will be using.

4. Working with your partners and a roll of masking tape, locate an area along a wall and set up the clipboard as pictured.

    a. Place the clipboard on the floor. Turn the clipboard so that the metal clasp of the clipboard is on its side. You will move the clipboard up against the wall as indicated in the following diagrams.

    b. Set your protractor at the zero mark at the end of the clipboard in contact with the floor. (See other examples on the next page.)

    c. Note: To calculate the desired impact angle, set the protractor reading for 90 degrees minus the desired angle ($90 - 10 = 80$). Tape the end of the clipboard to the floor to keep it at this position.

5. Start with the first angle assigned. Calculate the protractor setting.

6. From a height of 30 cm drop two drops of blood onto each index card.

7. While the first card is drying, prepare the second clipboard and card and repeat steps 1 to 6 for the second angle you were assigned.

8. Allow cards to dry completely. Do not move or pick up the cards for at least 30 minutes!

9. Measure the length and width of each droplet in millimeters. Disregard elongated tails of blood.

    Measure the main football-shaped or Q-tip rounded area only. If more than one group is assigned the same angle of impact, average your readings for length and width of the drops for the same angle of impact.

10. Record all of your information in Data Table 1

11. Determine the R value by dividing the length and width of your blood droplets. Using a calculator and the Law of Sines determine the actual angle of impact based on your blood-spatter marks.

12. Record all information in the Data Table

Name _____

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Data Table 1: Blood Spatter Angle

Expected Impact Angle	Length (mm)			Width (mm)			R = W/L	Actual Impact Angle
	1st Trial	2nd Trial	Avg. Length	1st Trial	2nd Trial	Avg. Width	Avg. W/L	
10°								
15˚								
20°								
25°								
30°								
35°								
40°								
45°								
50°								
55°								
60°								
65°								
70°								
75°								
80°								
85°								

Questions:

1. How accurate were you in obtaining the desired angles of impact?

2. How would you account for any differences between your actual angle of impact as determined by measuring the length and width of the blood-spatter droplets and your expected angle of impact as determined by your clipboard setup?

3. Provide an example of how knowing the actual angle of impact could help investigators solve crimes.

4. What would the length and width averages be if you measured an angle of 90˚?