PATIENCE LEARNING · FREE 1-DAY CASE

The Shadow Witness

A free single-session case from the world of **The Crime Scene**, the 13-day forensic geometry simulation.

GRADES 9–10 · GEOMETRY (DISTANCE FORMULA & SIMILAR TRIANGLES) · ~45 MIN · 1 CLASS PERIOD

An eyewitness swears the suspect was six-foot-two. A shadow on the pavement says otherwise. Your students are forensic geometry analysts for the Grayfield Police Department — and the math, not the loudest voice, decides what happens next.

TEACHER QUICK-START

Objective: Students use the distance formula and similar triangles to compute a suspect's height from a shadow, then weigh quiet physical evidence against confident eyewitness testimony.

Standards tie-in: CCSS G-SRT.B.5 (use similarity criteria for triangles to solve problems) and the distance formula in the coordinate plane (G-GPE.B.7, building on 8.G.B.8); construct an argument from evidence (MP.2, MP.3).

What you need: Just this packet. Print the student pages (works individually or in pairs). Calculators optional. No prep.

1. Set the scene (5 min). “A jewelry store was hit last night. One witness. One shadow. Your job: test the testimony with geometry.”

2. Hand out the evidence (8 min). Students read the case file and the witness statement.

3. Compute & decide (20 min). Distance formula → similar triangles → suspect height → written recommendation.

4. The reveal (8 min). Walk the answer key. The point: confident testimony is not evidence — and math can rule out without ruling in.

5. Reflection (4 min). Each student answers the reflection question.

STUDENT PAGE 1

The Case File

You are a forensic geometry analyst contracted by the Grayfield Police Department. At 11:42 last night, someone smashed the side window of Hollis Jewelers and was gone in under two minutes. The security camera was aimed at the door — it never saw the suspect. But it saw something better: the suspect's **shadow**, thrown across the parking lot by the streetlight, at the exact moment they stood still at the window.

THE WITNESS STATEMENT

> “I saw him run. Big guy — six-foot-two, easy, maybe taller. I was across the street and I know what I saw.” — Witness, interviewed at the scene (very confident)

THE PHYSICAL EVIDENCE

Evidence	Measurement
Streetlight height (city records)	18 ft, mounted at the lot's origin point (0, 0)
Suspect's footprints (where they stood still)	Coordinate (20, 15) on the scene grid — units in feet
Shadow on the pavement	11 ft long, stretching in a straight line directly away from the streetlight

The Rule: A shadow from a light pole makes two similar triangles — the big one from the top of the light to the shadow's tip, and the small one from the top of the suspect's head to the same tip. Matching sides of similar triangles keep the same ratio. The math doesn't care how confident the witness is.

STUDENT PAGE 2

Your Call (Decision Sheet)

Name: _____ Period: _____

Step 1. How far from the base of the streetlight (0, 0) did the suspect stand? Use the distance formula on the footprint coordinate (20, 15).

d = √((20 – 0)² + (15 – 0)²) = √(_____ + _____) = √_____ = _____ ft

Step 2. The shadow starts at the suspect's feet and runs 11 ft farther from the light. How far is the shadow's *tip* from the base of the streetlight? _____ + 11 = _____ ft

Step 3. Similar triangles. The big triangle: 18 ft tall, base = your Step 2 answer. The small triangle: the suspect's height h, base = the 11 ft shadow. Set up the proportion and solve.

h / 18 = 11 / _____ → h = _____ ft = _____ ft _____ in

Step 4. Compare your h to the witness's “six-foot-two, easy.” Does the physical evidence support the testimony? _____

Step 5 — Your recommendation to detectives. Write your decision and the reason behind it. Be precise about what your math proves, and what it does NOT prove:

_____

_____

_____

ANSWER KEY (for the reveal)

Step 1 — Distance:

d = √(20² + 15²) = √(400 + 225) = √625 = **25 ft** from the base of the light.

Step 2 — Shadow tip:

25 + 11 = **36 ft** from the base of the light.

Step 3 — Similar triangles:

h / 18 = 11 / 36 → h = 18 × 11 ÷ 36 = **5.5 ft = 5'6"**.

Step 4 — The test:

For a 6'2" suspect (≈6.17 ft) standing in the same spot, the shadow would need to be about **13 ft** long — roughly 2 ft longer than what's on the pavement. The testimony and the shadow cannot both be right, and the shadow was measured, not remembered. The witness is confidently wrong.

Step 5 — What a strong recommendation says:

The math **rules out** the tall-suspect theory (≈5'6", not 6'2") — so stop filtering for tall suspects and re-interview the witness. But be careful: the shadow does **not identify anyone**. A student who says "the math proves it was [some specific short person]" has overreached — that's the same mistake the witness made, with better tools.

The big idea:

The loudest evidence in the case was a confident human. The quietest evidence was 11 feet of shadow. Confidence is not accuracy — and good analysis knows exactly how far the numbers go, and no farther.

REFLECTION (graded on thinking, not the "right" answer)

"The witness was certain. The math was quiet. Which did you trust, and what specifically in your calculations earned that trust?"

SCORING THE THINKING

	3 — Strong	2 — Developing	1 — Beginning
Geometric work	Distance and proportion both correct, steps shown	One correct	Not computed
Evidence over confidence	Rejects the 6'2" claim using the computed height	Mentions the mismatch	Sides with the witness
Knows the limit	States what the math cannot prove (no ID)	Hints at it	Overreaches to an ID
Explains clearly	A reader can follow the reasoning	Partly clear	Unclear

READY FOR THE FULL INVESTIGATION?

This was one shadow. The Crime Scene is ten days of evidence.

In the full 13-day simulation, every student becomes the analyst on a museum break-in: daily evidence drops — rope lengths, broken glass, camera blind spots, footprints, alarm zones — where some evidence is reliable, some is misleading, and geometric proof is how you tell them apart. Then Day 8 delivers a contradiction that breaks every easy theory. Graded on the reasoning, never on guessing right.

THE CRIME SCENE · GRADES 9–10 GEOMETRY · $44 · patiencelearning.com/the-crime-scene