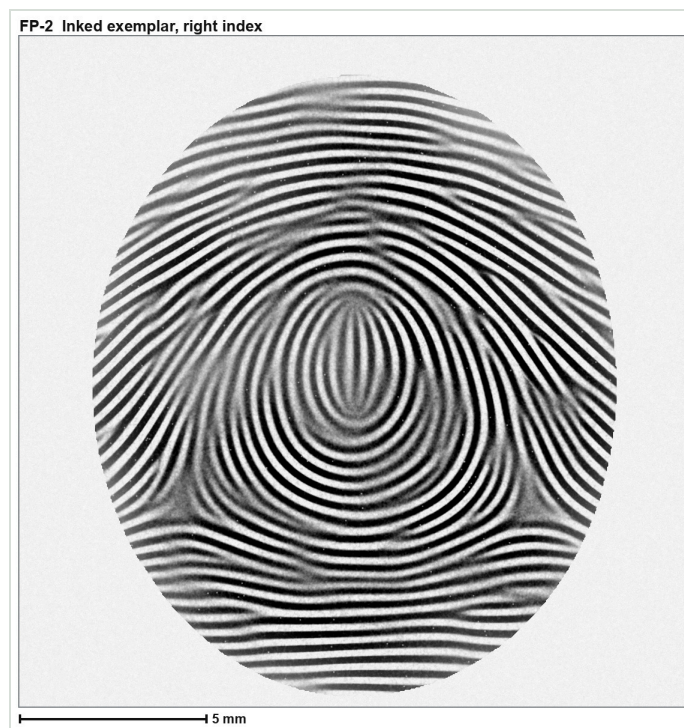


Method card: comparing a latent print to a known print

Keep this card next to you while you work.

CLAIM CEILING. READ THIS FIRST.

- **Polygraph.** It records breathing and heart rate. A change in either one is a physiological response. It is not a measurement of lying, and nothing in this unit produces a deception call.
- **Hair.** Microscopic similarity can support consistency or support exclusion. It cannot identify one person.
- **Fingerprint.** Pattern class can narrow a field or exclude a person. By itself it cannot name a source, and it never says when or why a finger touched something.
- **Timeline.** A scheduled event is not proof the person was there. Time of death is not established in the early case evidence.



A clear inked exemplar. Every feature named on this card is visible in an image like this one.

Anna Garcia Forensic Methods Unit. Supports exercises FP-1 through FP-4.

These are the standard examiner words, and they are the words your key is written in, so use them in your notes. Every one is defined below, so you do not need any other manual to start.

- **Print types.** latent print (needs powder or chemicals to be seen), patent print (visible, made by a hand carrying blood, oil, or grease), plastic print (pressed into putty, dust, or butter).

The seven ridge features, in plain English

You are asked to find and count these. Here is what each one looks like. Every definition below is about a **ridge**, which is one of the raised lines that leaves the ink or the powder mark.

Feature	What you are looking at
Ending ridge	A ridge that simply stops. Follow it with your eye and it runs out.
Bifurcation	One ridge splits into two, like a Y. Both branches keep going.
Enclosure	A ridge splits and then joins back together a short way along, leaving a closed island with a hole in the middle. Sometimes called a lake.
Ridge dot	A single mark about as wide as a ridge and no longer, sitting on its own between two ridges.
Short ridge	A ridge that starts and stops within a few ridge widths. Longer than a dot, shorter than a ridge that crosses the print.
Core	The centre of the pattern, where the innermost ridge curves back on itself. A loop has one. An arch has none.
Delta	The point where three different ridge flows meet and make a rough triangle. Count them: an arch has none, a loop has one, a whorl has two.

Two that get mixed up

A **dot** is a single mark no longer than it is wide. A **short ridge** is clearly longer than it is wide but still ends quickly. If you cannot decide which one you are looking at, write down that you could not decide. That is a real observation and it belongs in your notes.

The eight pattern classes

Count the deltas first. That one number sends you to the right family.

Class	Deltas	What it looks like
Plain arch	0	Ridges enter one side, rise in a gentle hill, and leave the other side. No core.
Tented arch	0	Same as a plain arch, but one ridge in the middle thrusts up sharply, like a tent pole.
Radial loop	1	Ridges enter and leave on the same side, and that side is the thumb side of the hand.
Ulnar loop	1	The same shape, but opening toward the little finger side. Most loops are ulnar.
Plain whorl	2	Ridges make at least one complete circle or spiral in the middle.
Central pocket loop whorl	2	Mostly a loop, but with a small circle or spiral tucked inside it.
Double loop whorl	2	Two separate loop shapes wrapped around each other, often an S or a yin-yang shape.
Accidental whorl	2 or more	Does not match any of the above, or combines two of them. This is the honest answer when nothing else fits.

<div class="warn"> Radial or ulnar depends on the hand <p style="margin-bottom:0">A loop opening to the left is ulnar on a right hand and radial on a left hand. If you do not know which hand a print came from, you cannot call it radial or ulnar. Write loop and say why you stopped there.</p></div>

Exercise	What you use this card for
FP-1	Steps 3 and 7. One finger, three impressions. Learn what a real difference looks like.
FP-2	Steps 4 and 5. Name eight features, the core, and the delta on a clean exemplar.
FP-3	All nine steps, ten times. Your rule is locked before you open pair one.
FP-4	All nine steps, once per suspect exemplar. Several suspects will share the pattern class.

What this test can and cannot tell you

- **It can exclude, and it can exclude fast.** If the pattern class disagrees, or one clear feature disagrees and you cannot explain why, that exemplar is out.
- **It can narrow a group.** The kit manual reports roughly 5 percent of people with arches, 65 percent with loops, and 30 percent with whorls. Saying "ulnar loop" removes a lot of people and still leaves millions.
- **It cannot name a person by itself.** A person makes this call by eye. No machine hands you the answer. In one study of latent print examiners, false positives ran about 0.1 percent of decisions and false negatives about 7.5 percent (Ulery-2011). Those numbers belong to that study, with those images and those examiners, and they do not transfer to your desk.
- **It cannot tell you when or why a finger touched something.** Ridge detail carries no date, no room, and no reason. A print on a bottle does not say who carried the bottle, or when.

Before you start: what you need

- The latent print and the known print (the exemplar), printed at the same size.
- One clear transparency sheet or acetate per print, plus tape.
- A fine-tip permanent pen. A regular ballpoint will not write on acetate.
- A ruler marked in millimetres.
- A magnifier, or a phone camera zoomed in and held steady.
- Two sticky notes or an index card, big enough to cover a print completely.
- A pencil and your tally sheet.
- Your locked rule, already written down, from before you saw any of the images.

The steps

Real examiners work in four stages, in this order. They analyze the unknown print on its own. They compare it to the known print. They evaluate what the agreement is worth. Then a second person verifies it. Examiners shorten those four stage names to ACE-V. The nine steps below are those four stages, cut into pieces you can finish at a desk.

1. Cover the known print first

Before you look at anything, put a sticky note over the exemplar so no part of it shows. Tape the note down if your desk is crowded. Slide the exemplar to the far edge of your workspace and pull the latent in front of you. Keep any note, name, or case detail that came with the pair face down.

You are done with this step when: you can see the latent and zero square centimetres of the exemplar.

2. Grade the latent for detail

Put the magnifier on the latent. Pick one friction ridge and try to trace it with your eye across at least ten ridge widths without losing it. Now count how many features you can point to and name out loud using kit words: ending ridge, bifurcation, enclosure, ridge dot, short ridge. Most of what you find will be ending ridges and bifurcations. The other three are much rarer, and plenty of prints contain none of them at all, so finding zero of a type is a real observation and not a failure. Write that count on your tally sheet and compare it to the minimum in your locked rule. If the count is below your minimum, write "insufficient ridge detail" and stop the comparison here.

You are done with this step when: a number is written on your sheet, and you have either written "insufficient ridge detail" and stopped, or written "sufficient, continue."

3. Describe the latent alone

The exemplar stays covered. On your sheet write three lines: about what fraction of a fingertip you can see, where the clear area sits, and where the smeared, faint, or blank areas sit. Then list every feature you counted in step 2 with its type. This order protects you. The moment you see the exemplar, your eyes start hunting for what is in it, and you will find things in a smudge that were never there. Writing the latent's description first freezes what you actually saw. Later you can check whether you added anything.

You are done with this step when: your written description of the latent is finished and the exemplar has still never been uncovered.

4. Name the pattern class

Count the deltas. Plain arches have none. Tented arches and loops have one. Whorls have two. Find the core, the point where the ridges curve tightest near the center. Circle the core with your pen and draw a small triangle over each delta. Then name the class from the eight kit types. Radial versus ulnar depends on which side the ridges enter and leave, so you need to know the hand and the finger. If the card does not tell you, write "loop, side not determinable" and move on. If the latent is a partial and no delta falls inside it, write "delta not present in this area" instead of guessing.

You are done with this step when: a class name, or an honest "not determinable," is written on your sheet with the core and any delta marked on the image.

5. Mark and number your targets

Lay acetate over the latent and tape one edge so it cannot slide. With the fine pen, put a numbered dot on each feature and write its letter beside it: E for ending ridge, B for bifurcation, N for enclosure, D for ridge dot, S for short ridge. Spread your targets across the print instead of clustering them in one corner. Then count the friction ridges you cross on a straight line from feature 1 to feature 2, from 1 to 3, and from 1 to 4, and write those three numbers on the acetate. Ridge counts survive stretched skin much better than millimetres do, which is why you record them.

You are done with this step when: every target has a number and a type letter, and at least three ridge counts are written on the acetate.

6. Hunt those features on the exemplar

Uncover the exemplar. Find its core and its delta first, then turn the page so its ridge flow runs the same direction as the latent's. Start with whichever latent feature was easiest to see, and look for the same feature type in the same neighbourhood of the exemplar. Check it with a ridge count, not with a ruler. Do not drop the acetate on top and expect the dots to land perfectly, because skin stretches under pressure and a perfect overlay almost never happens.

You are done with this step when: every numbered feature from the latent has been searched for on the exemplar and has a result written next to its number.

7. Count agreements, then hunt differences

Tally each feature as one of three things. **Agreement** means the same feature type sits in the same relative position, with the ridge count inside your tolerance. **Not found** means that patch of the exemplar is smeared, over-inked, or missing, so you could not check. **Difference** means clear detail in both prints that disagrees. Not found is never a difference. Now spend one full minute doing only the opposite job and try to break your own comparison, hunting for a feature that is clean in both prints and disagrees. For every difference you find, ask whether pressure, smearing, or partial contact could have made it, and write the physical reason on your sheet if you can point to one.

You are done with this step when: every feature carries one of the three labels, you have a count of agreements, and each difference is written down as either explained (with the reason) or unexplained.

8. Apply your locked rule

Read your rule off the page where you wrote it before the images were opened. Do not edit it now. Your kit's practice is that at least 10 to 12 points of comparison should be in common before you call two prints a match. Most locked rules use a number in that range. Then circle one of three calls: correspondence, non-correspondence, or inconclusive. Your kit names the same three outcomes as a match, not a match, or a print without enough ridge detail to reach a conclusion. If you are working FP-4 with five suspect exemplars, run steps 5 through 7 separately against each one and expect more than one to survive the pattern class check.

You are done with this step when: one of the three calls is circled, and the numbers on your sheet by themselves justify that call without any extra explaining.

9. Get a blind second look

Fold your conclusion under or turn it face down. Hand your partner the latent, the exemplar, a clean sheet of acetate, and a blank tally sheet. Say nothing about what you found, which features you liked, or which way you are leaning. Let them run steps 1 through 8 themselves, then compare. If your calls disagree, write both calls down

along with what each of you saw, and hand the disagreement to your teacher instead of arguing your partner into your answer.

You are done with this step when: your partner's independent call is written next to yours, and any disagreement is recorded rather than resolved by talking.

Worked example, done all the way through

Jaylen is working PRACTICE-2, a practice pair that is not part of the graded FP-3 set. Before opening any envelope, Jaylen wrote this rule on the top of the tally sheet:

Minimum to compare: 8 nameable features in the latent.
Correspondence: 10 or more agreements and 0 unexplained differences.
Non-correspondence: 1 or more unexplained differences.
Inconclusive: anything else.
Ridge count tolerance: within 1 ridge.

Jaylen covers PRACTICE-2K with an index card and pulls out PRACTICE-2L. The latent is black powder on glass and covers maybe a third of a fingertip. Under the magnifier, one friction ridge traces cleanly across fourteen ridge widths, so the image resolves real detail. Jaylen counts eleven nameable features. Eleven clears the minimum of eight, so the comparison continues.

Working on the latent alone, Jaylen writes: clear area is the lower left two thirds, unusable area is a diagonal smear across the upper right corner, one delta sits at the lower left, core is visible near the top center. One delta means a loop. The evidence card says right hand, index finger, and the ridges enter and leave on the little-finger side, so Jaylen writes "ulnar loop."

On the acetate, Jaylen numbers eleven targets: four bifurcations at 1, 4, 7, and 10, four ending ridges at 2, 3, 8, and 11, an enclosure at 5, a ridge dot at 6, and a short ridge at 9. Ridge counts go on the acetate: 1 to 2 is 6 ridges, 1 to 3 is 9 ridges, 1 to 4 is 4 ridges.

Now the card comes off PRACTICE-2K, a full rolled inked print. One delta, core visible, ridges entering and leaving the little-finger side. Ulnar loop. The class agrees, so the comparison keeps going.

The hunt takes about twelve minutes. Features 1, 2, 3, 4, 5, 6, 8, 10, and 11 all turn up as the same feature type in the same neighbourhood. The ridge counts on the exemplar come out 6, 10, and 4 against the latent's 6, 9, and 4. The 1 to 3 count is off by one ridge, which sits exactly at the edge of the locked tolerance, so it counts. Feature 9, the short ridge, lands in a patch of the exemplar that is over-inked and filled solid. Jaylen writes "not found" and does not count it as a difference.

Then feature 7 stops everything. In the latent it is clearly a bifurcation. In the exemplar, the same spot is clearly an ending ridge. Jaylen's first reaction is that this is an unexplained difference, which under the locked rule means non-correspondence, and the pair is finished.

Before writing it down, Jaylen goes back to the latent with the magnifier at higher zoom. Within about three ridges of feature 7, the latent's ridges are thick and two of them are touching each other. The same neighbourhood on the exemplar shows clean, separated ridges with normal spacing. The latent has extra powder in that patch. FP-1 showed this exact thing happen: press the same finger harder and features appear that were not on the finger. A

bridge of extra deposit between an ending ridge and its neighbour reads as a fork. Jaylen writes: "Feature 7. Difference explained. Heavy deposit in latent, two neighbouring ridges touching within 3 ridges of the point. A bridged ridge can read as a bifurcation. Not counted as an agreement and not counted as an unexplained difference."

The final tally is 9 agreements, 1 explained difference, 1 not found, and 0 unexplained differences.

Jaylen wants to count feature 7 as agreement number 10, because 10 is the number the rule needs. The rule was locked before pair one, and feature 7 was never a clean agreement, because the latent detail there is degraded. It goes in neither column. Nine is less than ten, so the call is inconclusive.

The written conclusion:

Latent PRACTICE-2L and exemplar PRACTICE-2K agree in 9 corresponding friction ridge features, three bifurcations, four ending ridges, one enclosure, and one ridge dot, in the same relative positions with ridge counts within 1 ridge. I found 0 unexplained differences, 1 explained difference at feature 7, and 1 feature I could not check. My locked rule required 10 agreements to report correspondence, so I report this comparison as inconclusive. This does not mean the prints came from the same finger, and it does not mean they came from different fingers.

When the practice key opened, PRACTICE-2 was a mated pair. Under this unit's rules, inconclusive is never scored as a miss. Nine clean agreements is what the image actually carried, and that is what Jaylen reported. Moving the rule from ten down to nine after seeing the answer would have made the rule worthless for pairs seven through ten, which had not been opened yet.

How to write your conclusion

Fill in one of these three. Every blank has to be a number, a feature type, or a position off your own tally sheet.

Correspondence.

Latent _____ and exemplar _____ agree in _____ corresponding friction ridge features (_____ bifurcations, _____ ending ridges, _____ other), in the same relative positions with ridge counts within _____ ridge(s). I found _____ unexplained differences. My locked rule required _____ agreements and _____ unexplained differences, so I report correspondence. This says the ridge detail in these two prints agrees closely enough that they could share one source. It does not identify a person, and it says nothing about when or why a finger touched the object.

Non-correspondence.

Latent _____ and exemplar _____ disagree at feature _____, where the latent shows _____ and the exemplar shows _____. Both prints are clear in that area and I could not account for the difference by pressure, smearing, or partial contact. My locked rule treats _____ unexplained difference(s) as sufficient, so I report non-correspondence and exclude this exemplar as the source of this latent. This says nothing about any other finger or any other exemplar.

Inconclusive.

Latent _____ and exemplar _____ agree in _____ corresponding features with _____ unexplained differences and _____ features I could not check because the area was _____. My locked rule required _____ agreements, so I report inconclusive. This comparison does not support a source conclusion in either direction. More ridge detail, or a clearer impression, would be needed.

Two bad conclusions

Bad. "The latent print proves Suspect 3 was in the kitchen that night."

Three separate overreaches sit in one short sentence. "Proves" is heavier than a human eye comparison can carry, and even a strong correspondence is a judgment about two images. The sentence jumps from a finger to a whole person standing in a room, and a print is compared to ridge detail rather than to a human being. And no part of a friction ridge carries a date or an address. The comparison was asked which finger, and the sentence answers when and where.

Bad. "The two prints look different in one spot, so they are not a match."

A single difference does not settle anything until you check it. FP-1 exists to show that one finger printed three ways produces features that appear and vanish. So the first job is to ask whether pressure, smearing, or partial contact made that spot look different. The sentence also names no feature and no position, so nobody can check the work. And "not a match" reaches past the evidence to a claim about people, when the honest sentence excludes one exemplar as the source of one latent.

The three mistakes that cost people most

Looking at the suspect print first. Once you have seen the exemplar, your eyes carry a picture of what agreement is supposed to look like, and a smudge starts to resolve into exactly that. You will spend your time hunting for agreement and almost none of it hunting for difference. The damage is invisible from the inside, because finding what you expected feels like careful work. Steps 1 through 5 exist for this one reason, and they only work if the exemplar stays covered the entire time. The same trap catches a partner who already knows your answer, which is why step 9 hands them nothing but the two prints.

Reading distortion as a different finger. Skin stretches. Powder loads unevenly. A finger that slides a millimetre while it touches glass smears a whole region. FP-1 puts one finger down three ways on purpose, and features move, thicken, split, and disappear between the three. So before you call any difference unexplained, look at the ridges immediately around it. Ask what the rest of that patch is doing. Thick, touching ridges nearby mean heavy deposit.

A directional streak means the finger moved. In one study of AFIS-search comparisons, erroneous exclusions on mated pairs ran about 4.2 percent of decisions (Hicklin-2025). That figure is study-specific, and it still shows that calling a real same-source pair an exclusion is a mistake trained people make.

Counting points and skipping the hunt for differences. Your kit's practice of 10 to 12 points of comparison is a floor to clear, and clearing it settles nothing on its own. One clear feature that disagrees in two clear prints, with no physical reason behind it, outweighs any number of agreements above it. Fifteen agreements plus one unexplained difference still comes out as a non-correspondence, with a large and distracting tally sitting next to it. Step 7 asks for a full minute of trying to break your own comparison, and that minute is the part students skip when the count already looks good.