FINGERPRINT EXAMINER

Examination Study Guide

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Study Guide for Fingerprint Examiner

As you will need to study in order to learn the job, it is necessary to test your ability to learn and retain information. This study guide is meant to prepare you for the written exam for Fingerprint Examiner. It is vital that you study this document and become familiar with all the information presented here. This study guide also serves as a realistic job preview to give you a better idea of the work involved in and the skills needed for a Fingerprint Examiner.

Fingerprint Examination

Most people probably think of shows like “CSI Miami” when they think of fingerprint examination. On the surface, fingerprint examination may seem simple and straightforward; however, the process is actually very involved and requires a specific skill set and knowledge base. To really understand what a fingerprint examiner does, it is first necessary to understand fingerprints. The definition of a fingerprint is, an impression of the friction ridges of all or any part of the finger. In order to break this down and truly understand it, we have to define what we mean when we say “impression” and “friction ridge.”

Impression: Whenever a person’s skin comes in contact with a substrate, oil and sweat is transferred to that substrate. Human skin is not smooth so the oil and sweat creates an impression, or a mark, on that substrate in a pattern. A substrate is the surface on which the friction ridge impression is deposited. The visibility of a print depends on the type of substrate that is touched. Impressions made on smooth, non-porous surfaces such as metal or glass or soft substrates such as putty, wax, or mud may be visible to the naked eye. Impressions made on porous or flexible substrates such as plastic bags, paper, or fabrics are generally invisible to the naked eye and can only be detected using special equipment and chemical processes. Fingerprints are recorded by photography or by ‘lifting’ the impression with adhesive tape.

Friction Ridge: the raised portion of the epidermis (i.e. ridges) on the inside surfaces of hands and fingers and on the bottom surfaces of feet and toes that are developed by the pores through which oil and sweat are secreted creating a pattern. One pore creates a single friction ridge unit. Many friction ridge units line up to create a friction ridge.

Friction Ridge skin is the only skin on the body without hairs. The only skin appendage of the
Friction ridge skin is the eccrine sweat gland. Although sweat glands are distributed over almost the entire skin surface, the friction ridge skin has the highest concentration of eccrine glands. The sweat glands of the friction ridge skin are also the largest on the body. The secretions that sweat glands release allow for impressions to be made when friction skin comes in contact with a substrate.

The function of friction ridge skin is to reduce slippage by increasing friction between the skin and a surface to enhance grip or traction. Friction ridge skin is useful to fingerprint examiners because it is unique and permanent which helps in identifying individuals. Since the patterns that friction ridge skin create are unique and never repeated from person to person or finger to finger, no two fingerprints have ever been found to be identical in over a century of fingerprinting. Even with identical twins, each twin may have a similar pattern as the other; however, the prints are unique in their details. In addition, the friction ridge patterns from fingers are permanent meaning once fully developed, they do not naturally change overtime. Changes in fingerprints after development can occur from permanent scarring, but the scarred tissue developed is also unique. Ultimately, the uniqueness and permanence allows fingerprint examiners to identify individuals based upon examination of fingerprints.

In fact, all skin is actually unique, even ear, lip, nose, and elbow prints are unique from person to person. Since fingerprints are made up of friction ridge skin, understanding skin in general will build a foundation to aid in the understanding of fingerprints. Skin is considered an organ and is the largest organ by weight. Skin consists of three layers: epidermis, dermis, and hypodermis. The epidermis is the outermost layer of the skin composed primarily of cells called keratinocytes. Keratinocytes make up 90-95% of epidermal cells and contain keratin filaments that provide the cells with strength. Keratin reinforces the skin cells so that they do not break when subjected to physical stress. The epidermis also includes melanocytes cells that synthesize vitamin D and produce the pigment melanin which give keratinocytes their color. The pigment melanin protects the DNA within the keratinocytes from ultra-violet damage (i.e. sun’s rays). The dermis is the middle layer of the skin that supports the epidermis. It is a network of cells, fibers, blood vessels, and gelatinous material that provides structural support and nourishment for the epidermis as well as serves as a blood reserve, participates in sensory reception, and aids in temperature regulation.

The hypodermis lies under the dermis and is a loose connective tissue that contains a pad of adipose cells (fat) that insulate and cushion the body and serve as an energy reserve. Fibers link the epidermis to the dermis and the dermis to the hypodermis. Friction ridge skin has ridges and furrows rather than a smooth surface. **Furrows** are valleys or depressions between friction ridges that do not contain sweat ducts. The ridges and furrows on the surface of the friction ridge skin are firmly rooted in the dermis by primary ridges (under-the-surface ridges) and secondary ridges (under the valleys). The basal layer of keratinocytes provides the template for the surface ridges and furrows.
How are fingerprints permanent?

The friction ridge skin persists because of the physical attachments throughout the skin and the regulation of the replacement of cells lost at the surface of the skin. Despite its durability, the friction ridge skin is subject to injury and aging. The friction ridge skin undergoes subtle changes as a person ages; however, the arrangement of the friction ridges does not change (i.e. the ridges and furrows maintain their position in the skin). Advancing age has two effects on the friction ridge skin: the surface ridges tend to flatten, making them appear “less sharp” and loss of elasticity in the dermis causes the skin to become flaccid and to wrinkle. Though changes to skin do occur, these changes are not reflected in the configuration of the surface ridges and furrows (i.e. fingerprint patterns).

Skin is self-regenerating and repairs itself. After a superficial injury or disease, the skin regenerates, forms a temporary scar, the skin heals, and friction ridges and furrows appear as they did prior to the incident. Some of the more common illnesses and injuries that temporarily affect friction ridge skin include minor frostbite, warts, eczema or dermatitis, plant allergies (i.e. poison ivy), other allergies, first-degree burns, and occupational conditions such as manual labor that causes callus skin. A permanent change can occur when an injury or disease penetrates the basal layer of the epidermis; the skin heals, leaving behind a permanent scar. The scar replaces the friction ridge skin at the wounded area and results in a new, unique feature of the friction ridge skin that remains persistent throughout life. The unique and persistent nature of scars allows for their use during the examination of friction ridge impressions.

How are fingerprints unique?

Numerous genetic and physical variances during friction ridge development lead to uniqueness of ridge units. In addition, the number of ridge units in a friction ridge is random and differential growth affects where a ridge starts and ends (ridge length). Furthermore, friction ridges do not run evenly and unbroken across our fingers, hands, toes and feet; instead, they display a number of characteristics known as minutiae. **Minutiae** are the features of the friction ridge skin patterns that make the overall pattern individual. The average fingerprint has approximately 150 ridge characteristics, so the different combinations of these characteristics is limitless. Fingertips can be compared to each other by examining the minutiae to determine whether the same minutiae are present and occupy the same relative positions to each other.

The most common categories of minutiae are ridge ending and bifurcation. **Ridge endings** are friction ridges that terminate. **Bifurcations** are the points at which one friction ridge divides into two friction ridges. Other categories of minutiae that are considered sub-categories of bifurcation and ridge endings are spur, enclosure, short ridge, ridge dot, incipient ridge, and bridge. A **spur** is a bifurcation with one short friction ridge branching off a longer friction ridge. An **enclosure** is a single friction ridge that bifurcates and rejoins after a short course and continues as a single friction ridge. A **short ridge** is a single friction ridge beginning, traveling a short distance, and then ending.
A **ridge dot** is an independent ridge with approximately equal length and width. An **incipient ridge** is a friction ridge not fully developed that may appear shorter and thinner than fully developed friction ridges. A **bridge** is a short, connecting friction ridge that runs between two parallel ridges. Often times, examiners use the core or delta to aid in identification. A **delta** is the point on a friction ridge at or nearest to the point of divergence of two type lines and located at or directly in front of the point of divergence. The **core** is the approximate center of a fingerprint pattern.

**Ridge Characteristics**

![Diagram of ridge characteristics](image)

Trifurcations and ridge crossings are categories of minutiae that are rarer than most other friction ridge characteristics. A **trifurcation** is the point at which one friction ridge divides into three friction ridges. A **ridge crossing or crossover** is a short ridge that crosses over another ridge.

![Trifurcation and Ridge Crossing](image)

Even though ridge characteristics vary immensely, they can be grouped into pattern type categories in order to facilitate the classification, filing, and accessing of fingerprint records. The **pattern type** is the fundamental pattern of the ridge flow. The **ridge flow** is the direction of one or more friction ridges. The three overall ridge patterns that are used to classify prints are loop, whorl, and arch.

![Loop, Whorl, Arch](image)
How are fingerprints examined?

In order to ensure fairness and consistency and help to eliminate potential errors, fingerprint examiners use a process that follows the scientific method.

**Scientific Method:**
1. Make an observation
2. State the problem or question
3. Develop the hypotheses, the null, and the alternative
4. Test the hypothesis with experiments
5. Form a conclusion based on the data
6. Confirm the process and conclusion through repetition by others
7. Record and/or present the conclusions

The specific scientific method that most fingerprint examiners use is the **ACE-V** process. This process involves four phases, which are Analysis, Comparison, Evaluation, and Verification (**ACE-V**).

**Analysis** is the first step of the **ACE-V** method that consists of assessing an impression to determine suitability for comparison. This includes the first three steps of the scientific method. First, the examiner analyzes an unknown friction ridge impression from the evidence gathered at a crime scene to determine if the print can be claimed. **Claiming prints** involves gathering information in a print in order to decide if the print has enough quantity and quality of information to be used for comparison. (Value/No Value decision). **Quality** is the clarity of information contained within a friction ridge impression and **quantity** is the amount of information contained within a friction ridge impression. When a print is determined to be "of value", it is claimed. Second, the examiner states the question, “what is the source of the unknown friction ridge impression?” Third, the examiner develops the hypotheses, the null, and the alternative. A hypothesis is a statement that explains or makes generalizations about a set of facts or principles, usually forming a basis for possible experiments to confirm its viability. A **null hypothesis** is a hypothesis that says there is no statistical significance between the two variables. An **alternative hypothesis** is one that states there is a statistically significant relationship between two variables; therefore, the alternative hypothesis is the opposite of the null hypothesis. In the case of fingerprint examination, the null hypothesis may be that the unknown friction ridge impressions do not come from the same source as those of the exemplar (known) print and the alternative hypothesis may be that the unknown friction ridge impressions do come from the same source as those of the exemplar print. In this case, the **source** is an area of friction ridge skin from an individual from which an impression originated and **exemplars** (known prints) are the prints of an individual, associated with a known or claimed identity, and deliberately recorded electronically, by ink, or by another medium and used for comparison to unknown prints.
Comparison is the second step of the ACE-V method that follows the fourth step of the scientific method by having the examiner test the hypothesis. The examiner tests the hypothesis by comparing the unknown and known fingerprint using the observation of two or more areas of friction ridge impressions to determine the existence of discrepancies, dissimilarities, or similarities. The prints in question are compared to determine if they match. When assessing a print, an examiner usually picks a focal point within the unknown print to help with comparison. A focal point is a small region containing distinguishing features within a print such as the core, delta, creases, scars, or unusual ridge events. The examiner may upload the fingerprint into an Automated Fingerprint Identification System (AFIS). AFIS is an online database used for matching, storage, and retrieval of fingerprints. AFIS operates by using an algorithm that anchors the position of the fingerprint and searches the database using two types of minutiae: bifurcations and ridge endings. Before uploading the fingerprint image into AFIS, the examiner visually locates the minutiae and notes its location, the orientation of the ridge on which it resides, and the minutiae type. After uploading the image of the unknown print into AFIS, the examiner inputs information about the print such as indicating the location of the core, the pattern type, and the target group (i.e. special ridge characteristics) in order to help narrow the potential matches. A target group is a distinctive group of ridge features (and their relationships) that can be recognized. The database queries prints to find ones with the same number of ridges in the same relative positions. The most likely matches are displayed and the fingerprint examiner will manually compare these with the unknown print to determine if there is a true match.

Evaluation is the third step of the ACE-V method that follows the fifth step in the scientific method where the examiner forms a conclusion based on data gathered in the comparison step. Evaluation has two basic parts: agreement and sufficiency. This means determining if the prints agree in all of their details and if there is enough information to form a conclusion. In this case, the examiner sets the tolerance or threshold for making a decision concerning agreement. Tolerance is the amount of variation in appearance of friction ridge features to be allowed during a comparison. The examiner assesses the value of the details observed during the analysis and the comparison steps using the tolerance that he/she has set and arrives at one of three possible conclusions: individualization, exclusion, or inconclusive. Individualization (identification) is the determination by an examiner that there is sufficient quality and quantity of detail in agreement to conclude that two friction ridge impressions originated from the same source (i.e. there is a fingerprint match between the unknown print and known print). Exclusion is the determination by an examiner that there is
sufficient quality and quantity of detail in disagreement to conclude that two areas of friction ridge impressions did not originate from the same source (i.e. there is not a fingerprint match between the unknown print and known print). Inconclusive is the determination by an examiner that there is neither sufficient agreement to individualize, nor sufficient disagreement to exclude. Distortions such as the prints being smudged, not sufficiently complete, overlaid one over another, or dirt and/or other materials on the finger at the time the impression was made and other factors may lead to an inconclusive print. Distortions are the variances in the reproduction of friction skin caused by factors such as pressure, movement, force, and contact surface.

Verification is the last step in the ACE-V process that includes the sixth and seventh steps of the scientific method that are confirming the process and conclusion through repetition by others and recording and/or presenting the conclusion. This consists of another examiner independently repeating the comparison and evaluation steps to verify the original conclusion. Upon secondary verification, the fingerprint examiner writes a report of his/her findings detailing the process followed and the conclusions reached and may testify to these findings in court when requested. The courts heavily rely on the knowledge and expertise of the examiner when being presented with fingerprint evidence so thorough documentation and the ability to present the findings is a key element in fingerprint examination.

Is fingerprint examination foolproof?

While following a standard scientific method helps to ensure fairness and consistency of the process, errors can still occur in fingerprint examination. Two potential errors that can occur are erroneous individualization (false positive) and erroneous exclusion (false negative). Erroneous individualization is the incorrect determination that two areas of friction ridge impressions originated from the same source (i.e. incorrectly concluding a match between two prints). Erroneous exclusion is the incorrect determination that two areas of friction ridge impressions did not originate from the same source (i.e. missed identification).

Fingerprint examination is a true science that contains both objective and subjective elements. The objectivity of science lies in the recording of observations. The subjectivity of science lies in the interpretation of those observations (i.e. what the examiner focuses on or how he/she interprets and records the data). This subjectivity can lead to human errors such as biases because each person interprets things differently based upon their own biases. These biases can form based upon many different factors such as education level, race, gender, religion, national origin, socioeconomic background, previous experience, etc. There are several different potential biases that can exist in fingerprint examination. Cognitive bias is the effect of perceptual or mental processes on the reliability and validity of one’s observations and conclusions. Cognitive contamination where interpretations and judgments are affected can occur from many different sources such as contextual cues, irrelevant details of the case, prior experiences, information processing shortcuts, motivational factors, or expectations and institutional pressures. Several types of cognitive biases may exist in fingerprint examination such as confirmation or contextual bias. Confirmation bias is the tendency to search for data or interpret information in a manner that supports one’s preconceptions. For example, an examiner may assign more weight to evidence that confirms his/her hypothesis, and ignore or undervalue evidence that could contradict his/her hypothesis. Contextual bias is the effect of information or outside influences on the evaluation and
interpretation of data. For example, an examiner may be presented with contextual information about the case such as being informed of the identity of the person suspected of the crime based on other evidence and this information could influence the examiner’s decision-making. Most of these biases often occur without awareness or conscious control of the fingerprint examiner.

Though it is not possible to completely eliminate the potential of biases, several things are put in place to help prevent and/or protect against these potential biases. One method used to help overcome bias when examining fingerprints is to examine the fingerprint characteristics in sequence following a systematic process, such as the ACE-V method. In addition, some agencies use blind verification to help combat potential biases. **Blind verification** is the independent examination of a friction ridge impression by another examiner, who does not know the conclusion of the original examiner. This can help prevent an examiner from being “set” before evaluating the prints. **Set** is a state of psychological preparedness to perceive or respond to an anticipated stimulus or situation. In fingerprint examination, it is seeing what you expect to see. Having no prior exposure or information regarding the fingerprints in question allows the secondary examiner to evaluate the prints without any preconceived notions or expectations.

Biases are not the only errors that can occur. Procedural errors or system errors may exist in the examination process. Procedural errors refer to departures from a prescribed procedure. A departure from the protocol, a mistake in one of the steps, or failure of a technician to calibrate an instrument are all examples of procedural errors. A system error can occur when an instrument or tool malfunctions or fails. The best way to safeguard against these types of errors is to implement a comprehensive quality control and assurance system that measures and tracks error rates. Random audits of casework can help with identifying and tracking errors. Furthermore, providing timely, constructive feedback to the examiners can help in error reduction. Numerous studies have found that without quick and accurate feedback, experience does not enhance expertise. Consequently, if an examiner is not made aware of his/her mistake and given ways to correct or prevent the error, then the examiner cannot improve and the same errors may be repeated. Another way to decrease potential human error is to ensure examiners are well trained and have the necessary knowledge, skills, and abilities to make the required judgements.

In conclusion, fingerprints are unique and permanent which helps in identifying individuals. Fingerprint examination is a science that requires great skill and knowledge. Fingerprint examination is a complicated process and it follows a specific scientific method. Though it is not perfect, there are many procedures and standards implemented to help eliminate errors.
Fingerprint Examiner Outline

The outline below provides a brief overview of important information that was presented in the narrative. In order to demonstrate your ability to acquire job-related knowledge, please study and memorize the following information before taking the test.

1. Two basic factors are stressed concerning the use of fingerprints as a means of identification:
   a. Uniqueness - patterns differ from individual to individual and from digit to digit.
   b. Permanence or persistence - friction ridges are persistent throughout life except for permanent scaring.

2. Types of substrates
   a. Smooth non-porous substrates
      • Metal or glass
   b. Flexible substrates
      • Plastic bags, paper, fabrics
   c. Soft Substrates
      • Putty, wax, mud

3. Friction ridge skin is located on the
   a. inside surfaces of hands and fingers
   b. bottom surfaces of feet and toes

4. Friction ridge configuration
   a. Friction ridges are made up of ridge units.
   b. The number of ridge units is random.
   c. Differential growth affects where a friction ridge starts and ends (ridge length).
   d. Numerous genetic and physical variances during friction ridge development leads to uniqueness of ridge units.

5. Friction ridge skin is the only skin on the body without hairs.

6. The only skin appendage of the friction ridge skin is the eccrine sweat gland.

7. The sweat glands of the friction ridge skin are the largest on the body.

8. The function of friction ridge skin is to reduce slippage by increasing friction between the skin and a surface to enhance grip or traction.

9. In identical twins, each twin may have a similar pattern as the other; however, the prints are unique in their details.

10. All skin is unique.
11. Ear, lip, nose, and elbow prints are unique from person to person.

12. Skin is considered an organ.

13. Skin is the largest organ by weight.

14. The skin is made up of three layers:
   a. The epidermis
      • The outermost layer of the skin typically separated into five layers composed primarily of cells called keratinocytes
      • Keratinocytes make up 90-95% of epidermal cells, and contain keratin filaments which provide the cells with strength.
      • Melanoocytes are cells that produce the pigment that give keratinocytes their color.
      • The pigment melanin protects the DNA within the keratinocytes from ultraviolet damage.
   
   b. The dermis
      • The middle layer of the skin that supports the epidermis
      • Provides structural support and nourishment for the epidermis
      • Serves as a blood reserve
      • Participates in sensory reception
      • Aids in temperature regulation
   
   c. The hypodermis
      • The innermost layer of the skin composed of adipose tissue made up of primarily of fat cells called adipocytes
      • Insulates the body
      • Serves as an energy reserve
      • Cushions and protects the body

15. Advancing age has two effects on the friction ridge skin
   a. The surface ridges tend to flatten, making them appear “less sharp.”
   b. The loss of elasticity in the dermis causes the skin to become flaccid and to wrinkle.

16. Aging does not affect the arrangement of the friction ridges so the ridges and furrows maintain their position in the skin.

17. Skin is self-regenerating and repairs itself.

18. A permanent change can occur when an injury or disease penetrates the basal layer of the epidermis; the skin heals, leaving behind a permanent scar.
19. Common illnesses and injuries that temporarily affect friction ridge skin
   a. minor frostbite
   b. warts
   c. eczema or dermatitis
   d. plant allergies (i.e. poison ivy)
   e. other allergies
   f. first-degree burns
   g. occupational conditions such as manual labor that causes callus skin

20. The average fingerprint has approximately 150 ridge characteristics.

21. Fingerprints can be compared to each other by examining the minutiae to determine:
   a. if the same minutiae are present (i.e. a bifurcation).
   b. if the minutiae occupy the same relative positions to each other.

22. The most common categories of minutiae are ridge ending and bifurcation.

23. Trifurcations and ridge crossings are rarer than most other friction ridge characteristics.

24. The three overall ridge patterns that are used to classify prints are loop, whorl, and arch.

25. Steps of the Scientific Method
   a. Make an observation
   b. State the problem or question
   c. Develop the hypotheses, the null, and the alternative
   d. Test the hypothesis with experiments
   e. Form a conclusion based on the data
   f. Confirm the process and conclusion through repetition by others
   g. Record and/or present the conclusions

26. Steps of the Scientific Method applied to Fingerprint Examination using ACE-V
   a. Analysis
      - Make an observation
      - State the problem or question
      - Develop the hypotheses, the null, and the alternative
   b. Comparison
      - Test the hypothesis with experiments
   c. Evaluation
      - Form a conclusion based on the data
   d. Verification
      - Confirm the process and conclusion through repetition by others
      - Record and/or present the conclusions
27. AFIS compares fingerprints using two types of minutiae
   a. bifurcations
   b. ridge endings

28. Evaluation has two basic parts
   a. Agreement: do the prints agree in all of their details?
   b. Sufficiency: is there enough information to individualize?

29. The practice of science contains both objective and subjective elements.
   a. The objectivity of science lies in the recording of observations.
   b. The subjectivity of science lies in the interpretation of those observations.

30. Types of errors
   a. Human error
   b. Procedural error
   c. System error

31. Ways to prevent errors
   a. use blind verification
   b. examine the fingerprint characteristics in sequence
   c. use quality control and assurance
   d. provide feedback
   e. ensure examiners are well trained and have the necessary knowledge, skills, and abilities to make the required judgements
Terminology for Fingerprint Examiner

The following are common terminology used in fingerprint examinations. In order to demonstrate your ability to acquire job-related knowledge, please study and memorize the following terms and definitions before taking the test.

ACE-V: The acronym for a scientific method; Analysis, Comparison, Evaluation, and Verification.

AFIS: The acronym for Automated Fingerprint Identification System, a generic term for an electronic fingerprint matching, storage, and retrieval system.

Alternative Hypothesis: States there is a statistically significant relationship between two variables; therefore, the alternative hypothesis is the opposite of the null hypothesis.

Analysis: The first step of the ACE-V method. The assessment of an impression to determine suitability for comparison.

Bifurcation: The point at which one friction ridge divides into two friction ridges.

Blind verification: The independent examination of a friction ridge impression by another qualified fingerprint examiner, who does not know the conclusion of the original examiner.

Bridge: A connecting friction ridge between, and generally at right angles to parallel running friction ridges.

Claiming prints: Involves gathering information in a print in order to decide if the print has enough quantity and quality of information to be used for comparison. (Value/No Value decision).

Cognitive bias: The effect of perceptual or mental processes on the reliability and validity of one’s observations and conclusions.

Comparison: The second step of the ACE-V method. The observation of two or more areas of friction ridge impressions to determine the existence of discrepancies, dissimilarities, or similarities. The prints in question are compared to determine if they match.

Confirmation bias: The tendency to search for data or interpret information in a manner that supports one’s preconceptions. One may assign more weight to evidence that confirms his/her hypothesis, and ignore or undervalue evidence that could contradict his/her hypothesis.

Contextual bias: The effect of information or outside influences on the evaluation and interpretation of data.

Core: The approximate center of a fingerprint pattern.
**Delta:** The point on a friction ridge at or nearest to the point of divergence of two type lines and located at or directly in front of the point of divergence.

**Deviation:** A change in friction ridge path.

**Dissociated ridges:** Disrupted, rather than continuous, friction ridges.

**Distortion:** Variances in the reproduction of friction skin caused by factors such as pressure, movement, force, and contact surface.

**Enclosure:** A single friction ridge that bifurcates and rejoins after a short course and continues as a single friction ridge.

**Erroneous exclusion:** The incorrect determination that two areas of friction ridge impressions did not originate from the same source.

**Erroneous individualization:** The incorrect determination that two areas of friction ridge impressions originated from the same source.

**Evaluation:** The third step of the ACE-V method wherein an examiner assesses the value of the details observed during the analysis and the comparison steps and arrives at one of three possible conclusions: individualization, exclusion, or inconclusive.

**Exclusion:** The determination by an examiner that there is sufficient quality and quantity of detail in disagreement to conclude that two areas of friction ridge impressions did not originate from the same source. (Determination that there is not a fingerprint match).

**Exemplars:** The prints of an individual, associated with a known or claimed identity, and deliberately recorded electronically, by ink, or by another medium (also called known prints).

**Fingerprint:** An impression of the friction ridges of all or any part of the finger.

**Focal point:** A small region containing distinguishing features within a print such as core, creases, delta, scars, or unusual ridge events.

**Friction ridge:** A raised portion of the epidermis on the palmar or plantar skin, consisting of one or more connected ridge units.

**Friction ridge unit:** A single section of ridge containing one pore.

**Furrows:** Valleys or depressions between friction ridges.

**Impression:** Friction ridge detail deposited on a substrate.

**Individualization:** The determination by an examiner that there is sufficient quality and quantity of detail in agreement to conclude that two friction ridge impressions originated from the same source. (Determination that there is a fingerprint match).
**Inconclusive:** The determination by an examiner that there is neither sufficient agreement to individualize, nor sufficient disagreement to exclude.

**Incipient ridge:** A friction ridge not fully developed that may appear shorter and thinner than fully developed friction ridges.

**Lift:** An adhesive or other medium used to transfer a friction ridge impression from a substrate.

**Minutiae:** Events along a ridge path that make the overall pattern individual such as bifurcations, ridge endings, and dots.

**Null Hypothesis:** A hypothesis that says there is no statistical significance between the two variables. It is usually the hypothesis a researcher or experimenter will try to disprove or discredit.

**Pattern type:** Fundamental pattern of the ridge flow: arch, loop, whorl.

**Quality:** The clarity of information contained within a friction ridge impression.

**Quantity:** The amount of information contained within a friction ridge impression.

**Ridge ending:** A single friction ridge that terminates within the friction ridge structure.

**Ridge flow:** The direction of one or more friction ridges.

**Scientific Method:** The systematic collection and classification of data and, usually, the formulation and testing of hypotheses based on data.

**Set:** A state of psychological preparedness to perceive or respond to an anticipated stimulus or situation. In fingerprint examination, it is seeing what you expect to see.

**Short ridge:** A single friction ridge beginning, traveling a short distance, and then ending.

**Source:** An area of friction ridge skin from an individual from which an impression originated.

**Spur:** A bifurcation with one short friction ridge branching off a longer friction ridge.

**Substrate:** The surface upon which a friction ridge impression is deposited.

**Target group:** A distinctive group of ridge features (and their relationships) that can be recognized.

**Tolerance:** The amount of variation in appearance of friction ridge features to be allowed during a comparison.

**Trifurcation:** The point at which one friction ridge divides into three friction ridges.
**Verification:** The independent application of the ACE-V process as utilized by a subsequent examiner to either support or refute the conclusions of the original examiner.

This study guide is meant to prepare you for the written examination for Fingerprint Examiner. After studying this guide, you should be able to answer questions regarding the information contained within this study guide, including defining any of the terms or identifying the term given its definition or a description of the term.