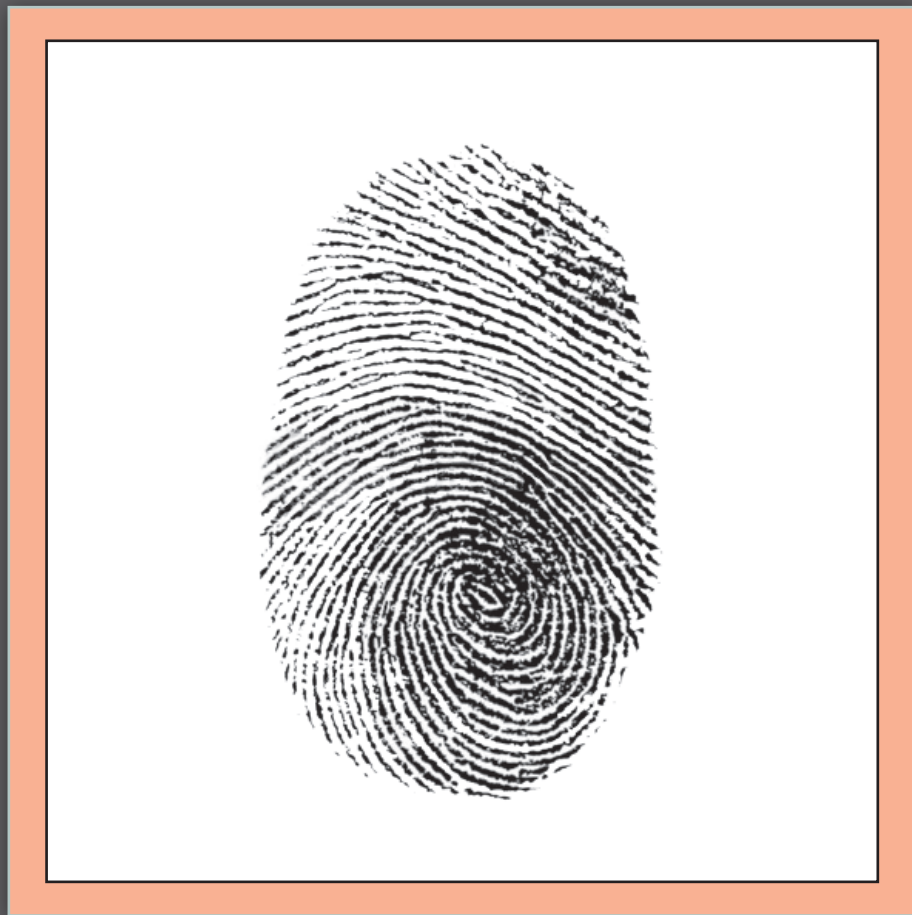


Fingerprinting



Fingerprinting

**Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.**

Start right now learning about how law enforcement agencies use fingerprints to help solve crimes. Take the following brief quiz to see how much you already know about the process of fingerprint identification. See the bottom of page 4 to check your answers.

1. All of the following are major patterns of fingerprints *except*:
 - a. arches
 - b. loops
 - c. islands
 - d. whorls
2. Which major fingerprint pattern is most common?
 - a. arches
 - b. loops
 - c. islands
 - d. whorls
3. What is the study of fingerprints called?
 - a. dactyloscopy
 - b. digitoscopy
 - c. phalangoscopy
 - d. tarsaloscopy
4. Which animal has fingerprint patterns most similar to humans?
 - a. chimpanzee
 - b. koala
 - c. orangutan
 - d. squirrel monkey
5. Identical twins have identical fingerprints.
 - a. true
 - b. false

11-23-63 84018
NAME LEE HARVEY OSWALD

SEX	RACE	DPD #	FBI #	DPS #

AGE _____ HT _____ WT _____ HAIR _____ EYES _____ COMP _____ OCC _____

DATE AND PLACE OF BIRTH _____

PRESENT ADDRESS _____

SCARS AND MARKS _____

DATE OF ARREST _____ CHARGE _____

ARRESTED BY _____ ARREST # _____

PRINTED BY _____ CLASSIFIED BY _____ SEARCHED BY _____

NEAREST RELATIVE _____ ADDRESS _____

POLICE DEPARTMENT, DALLAS, TEXAS BUREAU OF IDENTIFICATION

Making an Impression

In this activity, you'll make and classify your fingerprints into one of the eight categories shown on page 4.

Materials (for each group)

- 3" x 5" index card
- nontoxic ink stamp pad
- magnifying glass

Procedure

1. Open the ink stamp pad, press and roll your thumb on the pad.
2. Place and roll your inked thumbprint on the index card. Be careful not to smudge the ink.
3. Let the thumbprint dry for a couple of minutes.
4. Use the magnifying glass and the information on page 4 of this brochure to categorize your thumb print into one of the eight patterns.
5. Classify your thumbprint into one of the three major print patterns: arches, loops, or whorls.
6. Survey your classmates and record the number of each type of print in Table 1 (Type 1 = arches, Type 2 = loops, and Type 3 = whorls). Calculate the percentage of each type of print.

	Type 1	Type 2	Type 3	Total Number of Students
Number of students with this type				
Percentage of students with this type				100%

Questions for You

1. Compare your class results with the expected percentages shown at the bottom of page 4. Discuss whether your class results matched the expected results.
2. Did any fingerprint not fit into one of the eight categories shown on page 4?

Look, No Hand...Prints!

Fingerprints are created by the raised surfaces on the tips of fingers. When a person touches a surface, oils from their skin make a fingerprint as the fingertip ridges leave an oil impression on the surface. Fingertips that are too dry or too wet reduce the quality of fingerprints left on a surface. Fingerprints can be classified into three major categories: arches, loops, or whorls.

As people age, some of their skin wears away and reduces the depth of the ridges. For this reason, their fingerprints cannot be used to identify some people since not enough of a ridge remains to create the print. Certain diseases, such as leprosy, can also change a person's fingerprints.









An even more unusual case is the rare medical condition called adermatoglyphia. People with this disorder do not have fingerprints, but have no other side effects other than the lack of fingerprints. There are only four families in the entire world that exhibit this disorder. Scientists discovered that individuals with this disorder have a genetic mutation that affects a protein found in skin.

Fingerprinting

Expanding the Major Patterns

Although there are three major patterns of human fingerprints, forensic scientists have created more classifications to better categorize prints. The eight patterns and classifications are shown below.

FINGERPRINT PATTERNS AND CLASSIFICATIONS

 <p>Plain Arch</p> <p>In plain arches the ridges enter on one side of the impression and flow or tend to flow out the other side with a rise or wave in the center.</p>	 <p>Tented Arch</p> <p>Tented arches are similar to plain arches with the exception that the ridges in the center form a definite angle; or one or more ridges at the center form an upthrust, or they approach the loop type of pattern, possessing two of the basic characteristics of the loop, but lacking the third.</p>	 <p>Ulnar Loop</p> <p>Ulnar loops are those types of pattern in which the loops flow in the direction of the little fingers.</p> <p>The above pattern would be an ulnar pattern if on the right hand, and a radial pattern if on the left hand. The above pattern is also sometimes called a right slant loop, regardless of which hand it appears on.</p>	 <p>Radial Loop</p> <p>Radial loops are those types of pattern in which the loops flow in the direction of the thumbs.</p> <p>The above pattern would be a radial pattern if on the right hand, and an ulnar pattern if on the left hand.</p> <p>The above pattern is also sometimes called a left slant loop, regardless of which hand it appears on.</p>
 <p>Double Loop Whorl</p> <p>The double loop whorl consists of two separate loop formations, with two separate and distinct sets of shoulders and two deltas.</p>	 <p>Plain Whorl</p> <p>A plain whorl has two deltas and at least one ridge making a complete circuit, which may be spiral, oval, or any variant of the circle. An imaginary line drawn between the two deltas must touch or cross at least one of the recurring ridges within the pattern area.</p>	 <p>Central Pocket Loop Whorl</p> <p>The central pocket loop whorl consists of one or more recurring ridges, or an obstruction at a right angle to the inner line of flow, with two deltas between which an imaginary line would cut or touch no recurring ridge within the pattern area. The inner line of flow of a central pocket loop whorl is determined by drawing an imaginary line between the inner delta and the center of the innermost recurve or looping ridge.</p>	 <p>Accidental Whorl</p> <p>The accidental whorl is a pattern with two or more deltas, and a combination of two or more different types of patterns exclusive of the plain arch. This classification also includes those exceedingly unusual patterns which may not be placed by definition into any other classes.</p>

Above fingerprint images from *The Science of Fingerprints - Classification and Uses*, by the FBI Identification Division, 1957.

Please visit our site for more helpful information:
STEMsims.com

Answers: Page 2 Answers: (1) c. (2) b. (3) a. (4) b. (5) b. They are very similar, but not identical. Page 3 Making an Impression Answer: Expected frequency of fingerprints = 5% arches, 30% whorls, and 65% loops.

The Science Fair Kits project was funded in part under the Department of Homeland Security Science and Technology Directorate grant contract #N10PC20003. Its contents are solely the responsibilities of the authors and do not necessarily represent the official views of the Department of Homeland Security.

© 2015 STEM Sims. All rights reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable, and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent or other industrial or intellectual property rights.