

Prints

Reading Preview

Key Concepts

- What kinds of prints do investigators look for at crime scenes?
- How are prints preserved, and how is print evidence used?
- Why do investigators need search warrants?

Key Terms

- print
- imprint
- impression
- skid mark
- cast
- search warrant

Target Reading Skill

Previewing Visuals When you preview, you look ahead. Look at Figure 7. Write two questions you have about the figure in a graphic organizer like the one below. As you read, answer your questions.

Impressions and Casts

Q. What is an impression?
A.
Q.

Discover Activity

What's the Difference?

Look carefully at the two photographs. Use what you observe to answer these questions.

1. What type of object made the marks shown in the photographs?
2. Was each mark made by the same object? Why or why not?
3. What do you think is the key difference between the marks?

Think It Over

Forming Operational Definitions The mark in photo B is an impression. The mark in photo A is not. Based on these examples, how would you define an *impression*?



The “Shadow Wolves” are a Native American unit of the U.S. Customs Service. The unit hunts smugglers who bring drugs into Arizona from Mexico. The officers often use footprints as clues. They know, for example, that a person carrying a heavy load leaves deep footprints. They can tell where a smuggler stopped to rest and where he turned around to look back.

Most detectives are less likely to use footprints to track a person. But they do use footprints and other marks to show that a person, a car, or a tool was present at a crime scene.

Marks left when an object is pressed against the surface of another object are **prints**. In forensic science, flat prints with only two dimensions are called **imprints**. Prints that have three dimensions—length, width, and depth—are called impressions. An **impression** is the pattern left when an object is pressed into a surface. An object can make an impression when a surface is soft or the object is pressed hard enough against the surface. Your teeth, for example, make an impression when you bite into an apple.

Types of Prints

Some prints found at crime scenes are extremely useful. **Investigators look for imprints and impressions made by objects that leave a distinctive pattern.** Some patterns are so distinctive that they can be used to identify a suspect. This is true for fingerprints, which you will study in Chapter 3. Prints left by other objects can be used to narrow a list of possible suspects. These objects include shoes, tires, tools, and gloves.

Shoe Prints There are many ways one shoe can differ from another. One shoe might be white and the other red. One shoe might be made of leather and the other made of cloth. These differences are important when you buy shoes, but are not important when a CSI finds a shoe print at a crime scene. The features that interest investigators most are shoe size—both length and width—and the pattern on the sole of a shoe. These are features that can be detected in an imprint or impression.

Figure 1 shows a pair of shoes with a distinctive pattern on the soles. But shoe stores may have sold thousands of pairs of shoes with this same pattern. Other than size, would there be any way to tell one pair from the others?

The soles on the boots in Figure 2 are worn down. But they are not all worn down in exactly the same way. The way a person walks affects how a sole wears down. Look at the bottom of a shoe you've worn for a while. Is it worn down more on one edge than on the other? Can you see places where the sole has been cut or scratched? Sometimes print examiners can use such differences to connect a particular shoe to a print.



Reading Checkpoint

What are two things you can tell about a shoe from a shoe print?

FIGURE 1 Shoe Soles

The pattern on these shoe soles is distinctive, but it is not unique. Many pairs of shoes with the same pattern may have been sold.



FIGURE 2 Worn Soles

As people walk, they wear down the soles of their shoes.

Comparing and Contrasting How could you tell prints made by these cowboy boots apart?



FIGURE 3

Tire Treads

Tire treads have a distinctive pattern of ribs and grooves.



Tire Treads The part of a tire that touches the road is called the tread. It can leave an impression in soft earth, sand, or snow. Figure 3 shows how a tread is made up of alternating ribs and grooves. Wide ribs help the tire grip the road on a dry day. Wide, deep grooves help the tire grip the road on a wet day. The pattern of ribs and grooves is distinctive for each brand and model of tire.

Tires gradually wear down from the constant contact with hard road surfaces. Just as with shoe soles, tire treads do not wear down evenly. There may also be marks on a tire tread, such as a cut or a missing chunk of rubber. A print examiner may be able to use these marks and wear patterns to connect a specific tire to an impression.

Skid Marks Sometimes a driver has to make a sudden, unplanned stop. The driver may be trying to avoid hitting a person, an animal, or another vehicle. When the driver presses hard on the brake pedal, the wheels on the car may lock, so that the wheels can no longer turn.

When the wheels lock, rubber from the tires can make a skid mark like the ones in Figure 4. A **skid mark** is the mark left when a vehicle with locked wheels slides along a road surface. A tire may also leave a skid mark when a driver takes a sharp turn at high speed. Investigators can use skid marks to figure out a car's direction and speed.



FIGURE 4

Skid Marks

A fire engine rolled over after turning a corner.

Relating Cause and Effect *What do you think caused the fire engine to roll over?*

Tool Marks A burglar could use one of the tools shown below. If the burglar presses the tool against the window frame, the tool leaves a mark. Each type of tool leaves a different mark. A forensic scientist can often infer what tool was used just by looking at the mark.

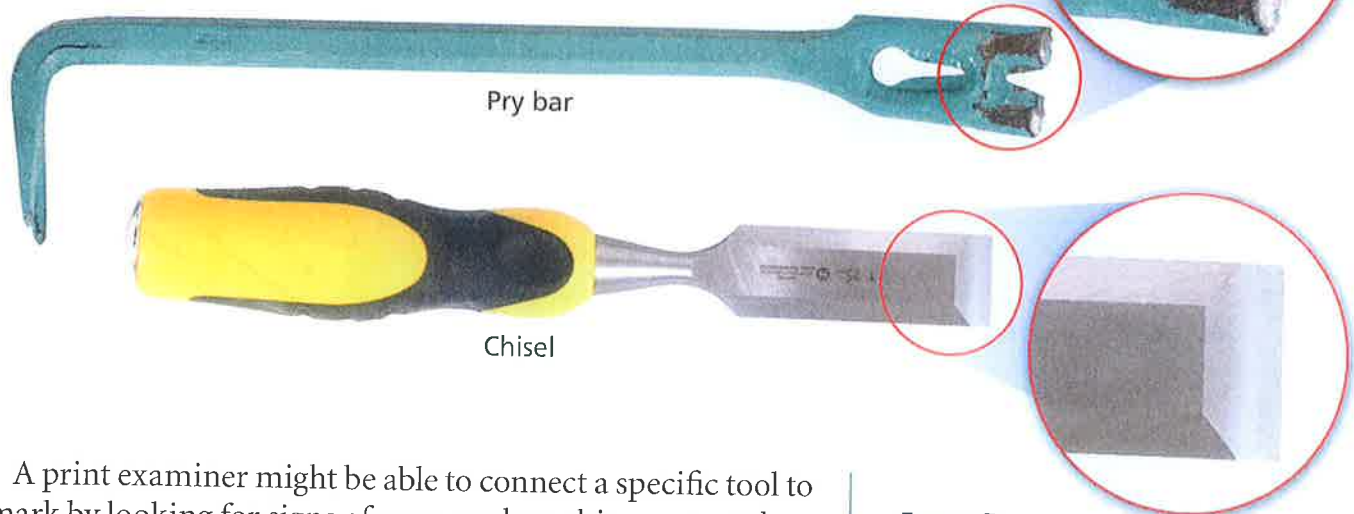


FIGURE 5

Tools

These tools leave different marks on a hard surface.

Inferring How would marks left by a chisel differ from those left by a pry bar?

A print examiner might be able to connect a specific tool to a mark by looking for signs of wear, such as chips or scratches. These flaws appear on the working edge, or blade, of the tool. Flaws on a tool are like nicks on a shoe sole or tire tread. Tool marks are generally less useful as evidence than are shoe prints. Here are three reasons why.

- ▶ New tools from the same factory are likely to leave the same mark unless the tools have been sharpened.
- ▶ If a tool used in a crime remains in use, nicks and scratches may be added to the blade. So investigators need to find the tool quickly in order to compare it to a tool mark.
- ▶ Criminals may steal or borrow a tool. Or they may use a tool they find at the crime scene. Thus, tool marks may lead investigators to a tool's owner—but not necessarily to the person who did the crime.

Gloves Criminals may wear gloves to keep from leaving fingerprints at a crime scene. But gloves can leave prints, too. Suppose a person wearing a pair of gloves leaves an imprint on a dusty mirror. Print examiners match the pattern on the print to the pattern on a specific brand of gloves. If a pair of those gloves are found in a suspect's house, the print can be used as evidence.



Where would a print examiner look for flaws on a tool?

Skills Activity

Drawing Conclusions

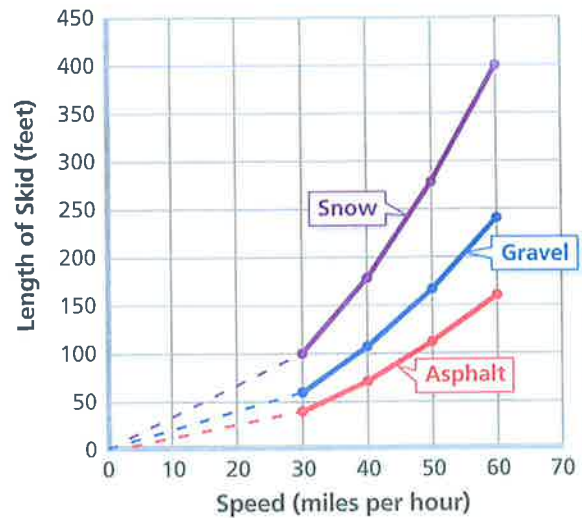
1. Examine the tool marks your teacher has displayed. The marks are labeled "A," "B," and so on.
2. Then examine the tools. Don't put a tool into a tool mark to find a match.
3. In your notebook, record which tool you think made each mark, and why.

Estimating Speed From Skid Marks

Investigators measure the length of skid marks. Then they use the data to estimate the speed of a vehicle when the driver applied the brakes. The graph has data for skid marks on three surfaces.

- Interpreting Graphs** If a car's speed on asphalt is 40 miles per hour, about how far will it skid?
- Estimating** A car skids 125 feet on gravel. About how fast was the car traveling?
- Comparing and Contrasting** Based on the data, which surface is most slippery? Which is least slippery?
- Drawing Conclusions** How does the speed of a vehicle affect the length of a skid?

Length of Skid vs. Initial Speed



Preserving Prints

Some prints are easy to destroy. A neighbor rushing into a house to help a victim may walk over a shoe print. Rain can wash muddy prints from a sidewalk. So what can investigators do to make sure they don't lose the evidence from prints? **Investigators can preserve prints by taking photographs, making casts, or removing objects from a crime scene.** They can also "lift" some types of prints, as you will learn in Chapter 3.

Taking Photographs It can be a challenge to take good photos of impressions. Photographers need to capture every possible detail of the impressions. If not, the people who look at the photos later won't be able to see those details.

Figure 6 shows how to photograph an impression. The camera is attached to a stand directly above the impression. A ruler is placed next to the impression to show scale.

A photographer would need a series of photos to record a trail of shoe prints in a muddy yard. The photographer would first take long-range and medium-range photos. Then he would place a number beside each impression. Finally, he would take close-ups of each impression. A photographer would use the same approach for long tire tracks or skid marks.

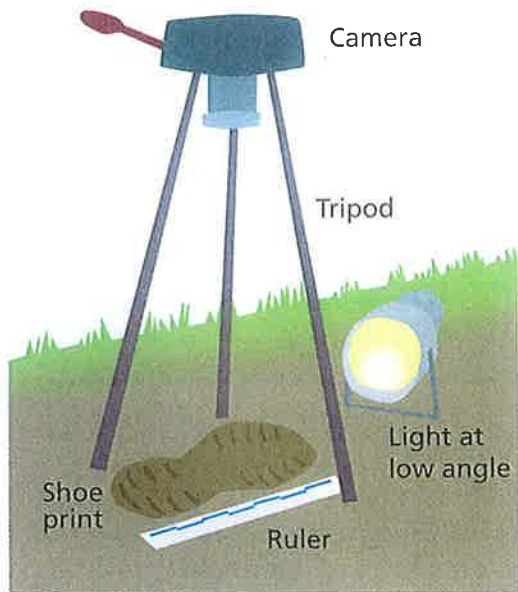


FIGURE 6

Photographing Impressions

A light held close to the ground creates shadows that highlight details in the impression. For each shot, the photographer moves the light to a new spot.

What shoe made this impression?

Impression



Liquid is poured into the impression. After the liquid sets, the cast is removed.

Cast



Investigators search for a shoe to compare to the cast.

Shoe



Making Casts Investigators can also make a cast of an impression. A **cast** is an object made by filling a mold with a liquid that takes the shape of the mold as it changes to a solid. Because an impression can be filled with a liquid, it can act as a mold. Figure 7 shows an impression, a cast, and the shoe that made the impression.

Casts of impressions are usually made from “dental stone.” If you wear braces, a dentist may have used dental stone to make a cast from an impression of your teeth. When dental stone is mixed with the right amount of water, it forms a liquid with a thickness similar to pancake batter.

Removing Objects Investigators prefer to send some prints back to the lab for analysis. Suppose someone used a tool to force open a door. At the crime scene, a CSI could take photos as a record of the evidence. Then she could carefully remove and pack up all or part of the door.

If it is not practical to remove an object with a tool mark, a CSI makes a cast of the tool mark. To preserve tool marks, the CSI uses a casting material that can be spread, poured, or sprayed onto the tool mark.

Investigators may find a tool at the crime scene that they think made a tool mark. Even so, they should not try to fit the tool into the mark. Touching the tool to the mark could alter the mark and destroy its value as evidence. The tool mark and the tool need to be packaged separately and sent to the lab.

FIGURE 7

Impressions and Casts

A cast of an impression should have the same pattern as the object that made the impression.

Interpreting Photographs Would it be easier to compare a shoe to an impression or a shoe to a cast, and why?



Reading
Checkpoint

Why can an impression act as a mold?

Comparing Prints

What do forensic scientists do with the photos, casts, and tool marks that are sent to a crime lab? Forensic scientists **use computer databases to identify and compare prints**. They also compare prints found at a crime scene to objects that belong to a suspect.

Searching a Database A print examiner wants to know what shoe made a print found at a crime scene. Luckily, there are databases that the examiner can use to identify the shoe. Most databases are organized sets of computer records. They are designed to make it easy to search for records.

The examiner starts by adding a record and a scanned image of the shoe print to a database of crime scene prints. Then she can search for similar records in the database. The computer displays any likely matches on the screen. She could also look for a match in two other databases. One has data about makes and models of shoes from companies that manufacture shoes. The other has records of shoe prints from suspects.

To compare tire prints, examiners use data supplied by companies that make tires. The data may be part of an online database. Or it may be in a reference book or on a CD-ROM.

Comparing Prints to Objects If the crime lab has a suspect's shoes, a technician can make a print of the shoe sole. Then he can compare the print to a print from the crime scene. If the lab has a suspect's car, someone can compare a tire from the car to a cast of a tire impression, as shown in Figure 8.



Reading Checkpoint

What kinds of shoe prints are stored in online databases?

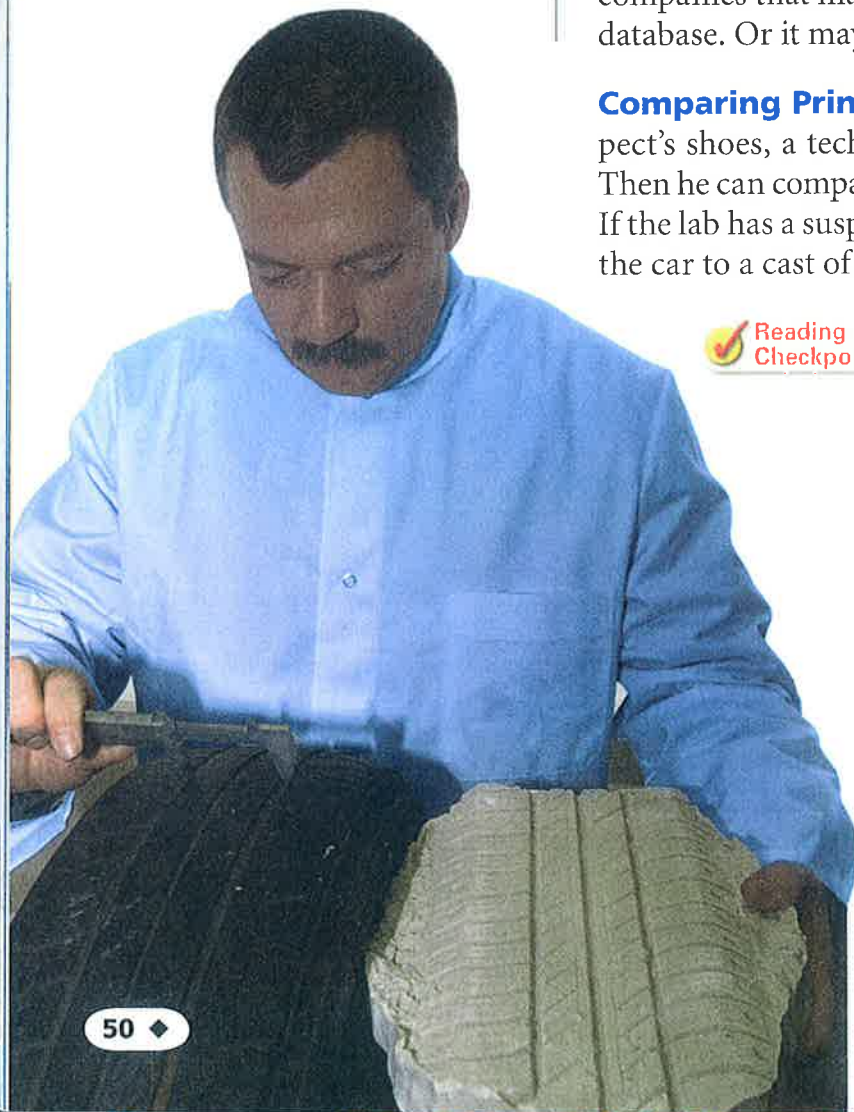


FIGURE 8

Comparing a Tire to a Cast

This print examiner is comparing a tire from a suspect's car to a cast of an impression from a crime scene.

Interpreting Photographs *What is the examiner measuring?*

Search Warrants

How does a crime lab get a suspect's shoe to compare it to a print? Maybe a police officer caught the suspect at the crime scene. More likely, investigators searched the suspect's home. Before doing the search, they had to get a search warrant. A **search warrant** is a written court order that allows police to search for specific objects at a given place and time. The warrant allows police to seize property as evidence. But they can only take items listed on the warrant.


Why do police need a search warrant? A **search warrant protects a suspect's rights and ensures that a search is legal.** The U.S. Constitution states that a person must be protected from "unreasonable searches and seizures." So, to obtain a search warrant, police have to show that their planned search is reasonable. They must explain why they expect to find evidence of a crime during the search.

Why is it important to make a legal search? Suppose police find a key for a locker at a YMCA when they arrest a suspect. They use the key to open the locker and find a gun that was used in a crime. If the police don't have a search warrant for the locker, the gun may be thrown out as evidence in court.

FIGURE 9 Seizing Evidence
An officer can remove objects from a crime scene if the objects were listed on a search warrant.



Lesson 1 Assessment

 **Target Reading Skill Previewing Visuals** Refer to your graphic organizer about Figure 7 to help you answer Question 2.

Reviewing Key Concepts

- Summarizing** How are prints made by shoes, tires, tools, and gloves useful to investigators?
 - Explaining** Explain why it can be difficult to connect a tool to a suspect.
 - Making Judgments** An examiner has a print made by a new shoe and a print made by a shoe that was worn only for a few months. Which print do you think will be more helpful, and why?
- Identifying** What is the preferred method for collecting tool marks?
 - Comparing and Contrasting** How are taking photographs and making casts similar? How are they different?

- Making Generalizations** How do databases make it easier to identify shoe prints or tire tracks?
- Listing** What are two reasons why police officers need a search warrant before they enter a suspect's home?
 - Applying Concepts** Is it reasonable for police officers to search every house on a street to look for a tool used in a burglary? Explain your answer.

Writing in Science

Wanted Poster Design a wanted poster for a pair of your shoes. Assume that you don't have a photo of the shoes to use on the poster. Write a description of the shoes. Include details that could help someone recognize your specific pair of shoes.