

BRaille

OBJECTIVE:

You will understand and demonstrate how the Braille system of raised dots is used to produce print that enables visually impaired people to read.

INTRODUCTION:

The written word enables us to record our ideas, thoughts, and feelings and to communicate with others. Unfortunately, people who have no or little sight cannot read conventional writing. What they can do, however, is “read” with their fingertips, using a system developed in the nineteenth century by a French teacher named Louis Braille (1809–1852).

Braille lost his sight at the age of 3 as the result of an accident. In 1824, while a pupil at the National Institute for Blind Children in Paris, he began to develop a system for reading by touch, using patterns of raised dots on paper. The Braille alphabet, as it came to be known, was based on the dot patterns found on dominoes; it is said that Braille was inspired by a code of dots punched into cardboard used by an army captain to signal to his soldiers at night. A complete version of his language, using one to six dots arranged in a six-dot pattern, was published in 1837.

Braille writing is touch-read by running the tips of one or two fingers over the raised text. There are 63 possible combinations of dot patterns, some of which are shown in figure 1.

Figure 1

A · B : C ·· D ·· E ·· F ·· G ··
 H ·· I · J ·· K : L : M ·· N ··
 O ·· P ·· Q ·· R ·· S : T ·· U ··
 V ·· W ·· X ·· Y ·· Z ··

In 1932 Braille was adopted as the standard language for the blind in the English-speaking world. Braille systems are now used in mathematics, science, music, and shorthand, and many other languages have now been “translated” into Braille.

TIME NEEDED:

1 hour

MATERIALS:

Note: You will need a partner for this experiment.

2 pencils, one with a sharp point and one with a blunt point	metric ruler
awl, with point approximately 1 mm across	piece of lightweight cardboard, about 10 cm x 14 cm
X-acto® knife	2 pieces of good-quality construction paper, approximately 15 cm x 21 cm
cutting board	roll of paper towels
metal straight edge	

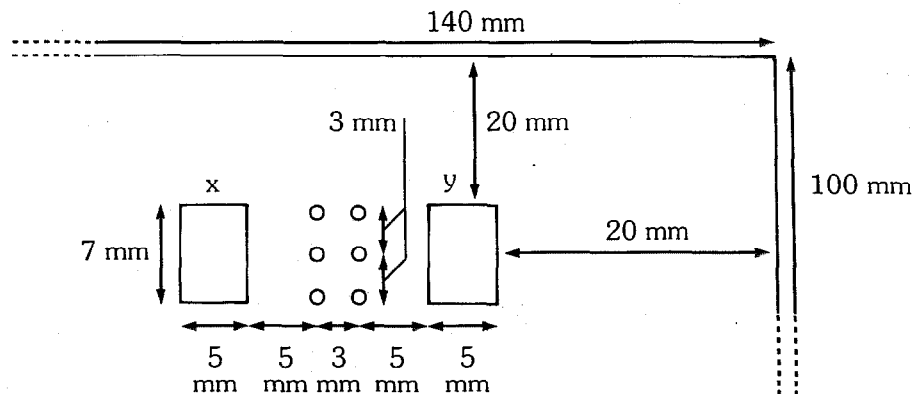
Safety Precautions

Please read and copy the safety precautions at the beginning of this book. Be careful when using the knife.

PROCEDURE:

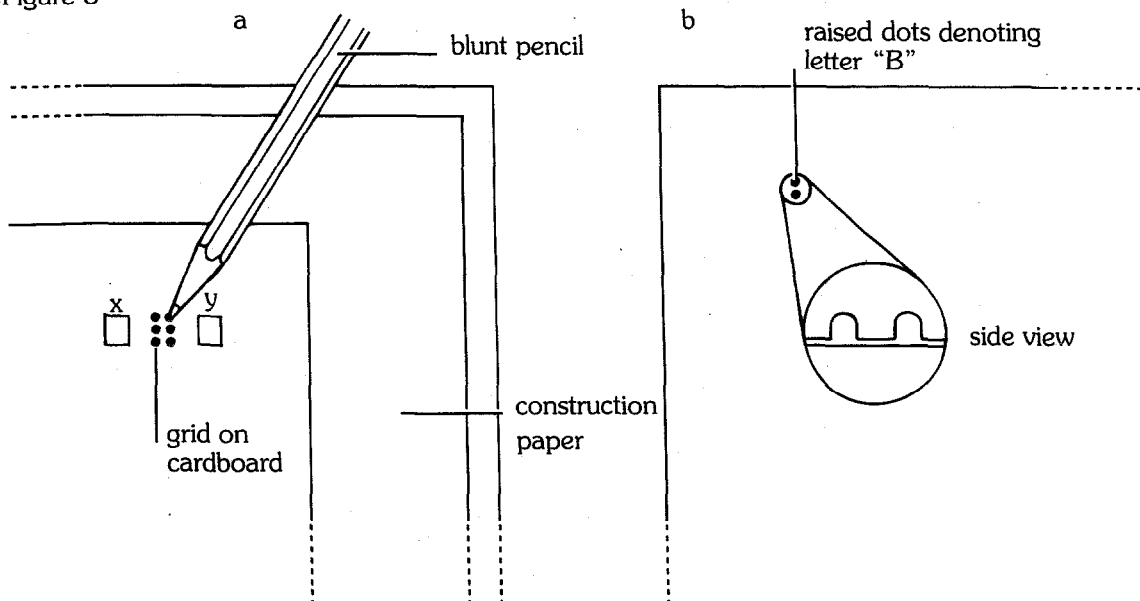
1. Take the ruler, sharp pencil, and piece of cardboard. Mark out on the cardboard a grid of six dots, 3 mm apart, bordered by two 5 mm x 7 mm rectangles, as shown in figure 2.

Figure 2



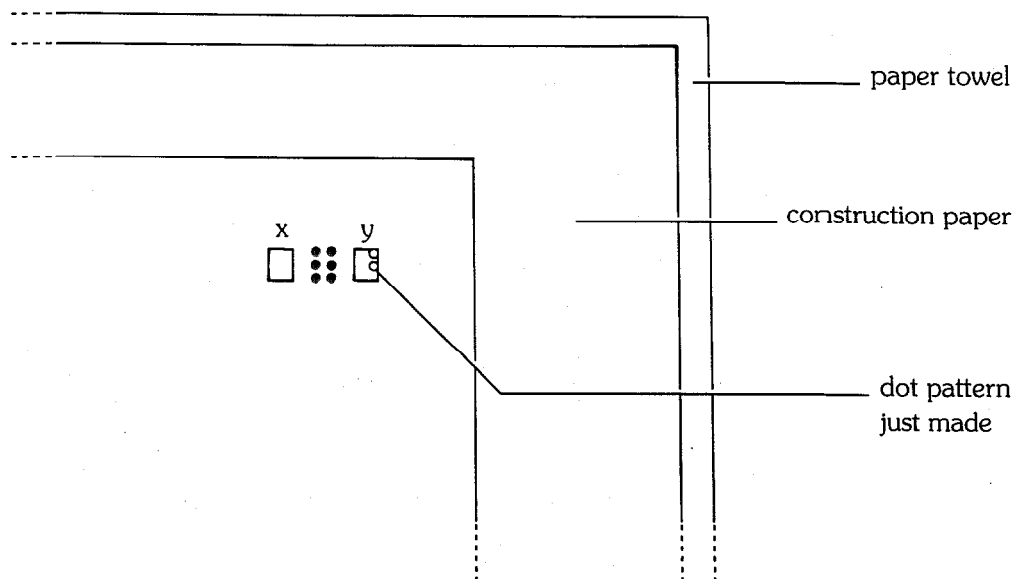
2. Put the cardboard on the cutting board. Use the awl to make six holes about 1 mm in diameter through the pencil dots on the marked grid. You will use this grid to produce your Braille letters.
3. Now take the knife and straight edge. Still working on the cutting board, cut out the marked rectangles to form two slots, X and Y. You will use these to give proper spacing between letters and words.
4. You will now write the word "Braille" in Braille using your grid. To do this, put four paper towels, one on top of the other, onto a table. Place a piece of construction paper on top of the layers of paper towel. Put the grid on top of the construction paper, at its top right-hand corner, with slot Y to the right. (Note: You will be writing the Braille letters back to front and from right to left, so that when you turn the construction paper over you will be able to read it from left to right, as you would with conventional writing.)
5. Find the Braille dot combination for the letter "B" in figure 1. Now produce this Braille letter on the construction paper using the grid. Push the blunt pencil point through the holes into the grid so that you form "B" back to front (see figure 3a). Push hard enough to produce raised dots on the other side of the construction paper, but not so hard that the paper is pierced or torn.

Figure 3



6. Turn the construction paper over to check that you have formed the letter “B” correctly in Braille (see figure 3b).
7. Put the construction paper back on top of the paper towels. Position the grid so that the dot pattern you have just made appears in the right-hand side of slot Y (see figure 4).

Figure 4



8. Push the blunt point of the pencil through the grid to make the letter “R” (remember to make the dot pattern back to front). Move the grid to the left so that slot Y surrounds the dot pattern you have just made. Use the top and bottom edges of both slots to make sure you are writing in a straight line.
9. Repeat step 8 with each letter until you have spelled out the word “BRAILLE.” Turn over the construction paper and check that you wrote the word correctly.
10. Now invent a two-word message that uses some letters of the alphabet shown in figure 1. Write it in Braille on the second piece of construction paper, as described in steps 5 to 9. Leave two spaces between letters to indicate the beginning of a new word. To do this, mark a line down the left-hand edge of slot X as you finish the last letter of the first word. Then move the grid so that the left-hand edge of slot Y rests on this line, and make the first letter of the second word.
11. Give your partner the Braille message. Get him or her to read the message by feeling the dots, from left to right, with the tip of her or his first finger while at the same time looking at the key in figure 1. Do not let your partner simply read the message by looking at the dot pattern on the construction paper and comparing it with figure 1. Make a note of how easy or difficult it was to read the message.

ANALYSIS:

1. What problems did your partner have when reading the Braille message? Why do you think these occurred?
2. How could you improve the method used for making the Braille writing?
3. In figure 1, only 26 out of the possible 63 dot combinations are shown. Suggest what some of the other dot combinations are likely to represent. (Hint: Look at a page of text from any textbook. What extra information does Braille need to provide?)
4. Do some research. How is Braille writing usually produced?

OUR FINDINGS:

Click on above link to see what we found.

SPECIAL SAFETY NOTE TO INVESTIGATORS

Each invention includes any special safety precautions that are relevant to that particular project. These do not include all of the basic safety precautions that are necessary whenever you are working on a scientific investigation. For this reason, it is absolutely necessary that you read, copy, and remain mindful of the General Safety Precautions that follow this note.

Experimental science can be dangerous, and good laboratory procedure always includes carefully following basic safety rules. Things can happen very quickly when you are constructing or demonstrating a model invention. Things can spill, break, even catch fire. There will be no time after the fact to protect yourself. Always prepare for unexpected dangers by following basic safety guidelines the *entire* time you are carrying out the project, whether or not something seems dangerous to you at a given moment.

We have been quite sparing in prescribing safety precautions for the individual projects. We made this choice for one reason: We want you to take very seriously every safety precaution that is printed in this book. If you see it written here, you can be sure that it is here because it is absolutely critical to your safety.

One further note: The book assumes that you will read the safety precautions that follow, as well as those in the box within each project you are preparing to perform, and that you will *remember* them. Except in rare instances, these precautions will not be repeated in the procedure itself. It is up to you to use your good judgment and pay attention when performing potentially dangerous parts of the procedure. Just because the book does not say **BE CAREFUL WITH HOT LIQUIDS** or **DON'T CUT YOURSELF WITH THE KNIFE** does not mean that you should be careless when simmering water or stripping an electrical wire. It does mean that when you see a special note to be careful, it is extremely important that you pay attention to it.

If you ever have a question about whether a procedure or material is dangerous, wait to perform it until you find out for sure that it is safe.

GENERAL SAFETY PRECAUTIONS

Accidents caused by carelessness, haste, insufficient knowledge, or taking unnecessary risks can be avoided by practicing safety procedures and being alert while carrying out these projects. Be sure to check the individual projects in this book for additional safety regulations and adult supervision requirements. If you will be working in a lab, do not work alone.

PREPARING:

- Clear all surfaces before beginning projects
- Read the instructions before you start
- Know the hazards of the procedures and anticipate dangers

PROTECTING YOURSELF:

- Follow the directions step-by-step; do only one project at a time
- Locate exits, fire blanket and extinguisher, master gas and electricity shut-offs, eye wash, and first-aid kit
- Make sure there is adequate ventilation
- Do not horseplay
- Wear an apron and goggles
- Do not wear contact lenses, open shoes, loose clothing, or loose hair
- Keep floor and work space neat, clean, and dry
- Clean up spills immediately
- Never eat, drink, or smoke in laboratory or work space
- Do not eat or drink any substances tested unless expressly permitted to do so by a knowledgeable adult

USING EQUIPMENT WITH CARE:

- Set up apparatus far from the edge of the desk or bench
- Use knives and other sharp or pointed instruments with caution
- Pull plugs, not cords, when removing electrical plugs
- Clean glassware before and after use
- Check glassware for scratches, cracks, and sharp edges
- Clean up broken glassware immediately
- Do not touch metal conductors
- Use only low voltage and current materials such as lantern batteries
- Be careful when using stepstools, chairs, and ladders
- Never look directly at the sun with your observation devices

USING CHEMICALS:

- Never taste or inhale chemicals
- Label all bottles and apparatus containing chemicals
- Read labels carefully
- Avoid chemical contact with skin and eyes (wear goggles, apron, and gloves)
- Do not touch chemical solutions
- Wash hands before and after using solutions
- Wipe up spills thoroughly

HEATING SUBSTANCES:

- Use goggles, apron, and gloves when boiling water
- Keep your face away from test tubes and beakers
- Never leave apparatus unattended
- Use safety tongs and heat-resistant mittens
- Turn off hot plates, bunsen burners, and gas when you are done
- Keep flammable substances away from heat
- Have fire extinguisher on hand

FINISHING UP:

- Thoroughly clean your work area and glassware
- Be careful not to return chemicals or contaminated reagents to the wrong containers
- Don't dispose of materials in the sink unless instructed to do so
- Wash your hands
- Clean up all residue and put in proper containers for disposal
- Dispose of all chemicals according to all local, state, and federal laws

BE SAFETY CONSCIOUS AT ALL TIMES