

In the following lesson, students shall have the opportunity to represent real-life situations mathematically. Using number sense, they will use part-to-whole concepts to describe window panes. This is a great math lesson for intermediate grades that allows students to relate what they are learning to their own lives.

Concept: Part-to-whole relationships

Method adapted from "Fractions and Panes" by Douglas Edge, University of Western Ontario, London, ON N6C 1G7

Grade Level: 5-6

Objectives: Students will use part-to-whole concepts to describe windowpanes.

Prior Knowledge: The children may or may not have used the "multiplication windows" method of learning multiplication; if they have, it may benefit them. The lesson does not work up to the point of explaining equivalent fractions, though the window pane idea is an excellent tool for explaining this later.

Materials:

Photos or magazine clippings of many styles of window panes, *at least* one per student

Overhead transparency of *The Window Pane Song* by Heather Hanson

A solid sheet of paper to reveal the verses one by one

Procedures: *Introduction*

Tell children, "Rather than telling you right away what we will use to help us learn math today, I'd like you to guess. I'm going to read a riddle, and when you think you know the answer, raise your hand. I'll keep going till most of your hands are raised. Here goes: *You can see through me. I am made from sand pressed together for a long time. I am in almost every building. My shape can be a circle, triangle, square, octagon—almost any shape. I am covered with frost on cold, winter mornings. I am even in your car. Your grown-up has to scrape me off if I am snowy or icy, or they won't be able to see to drive. What am I, class?*"

The children will offer, "Windows!" Say, "That's right. Today we're going to use windows to help us learn math."

"Let me tell you a little joke, a homonym joke. What do you say when a window is hurting?" Pause for responses. Answer, "A pain in the pane."

Learning Activities

"Now, let's go on to our lesson. You may wonder,

"What's mathematical about windows?" Well, let me tell you a little story."

Once there was a small town beside a lake, and all the people who lived there were getting ready for a winter holiday. Some were window shopping, some were buying sparkly window clings, and some were spraying spray-snow on their windows to make them look frosty. The children in school were all painting pictures of favorite winter activities on their windows. All the preschoolers had made snowflakes to hang in front of their windows. Soon it was evening, and everyone was preparing for bed. They all shut their shades or closed their curtains, and settled down for a good night's sleep. But what would they find in the morning but that a *strange window disease* had attacked all the windows in town! Exactly one pane, or one part, of each window was broken. The people were all worried and sad, because they loved their pretty windows, and also because the windows helped to keep the cold *out* and the warm *in*. Now the chilly winter wind was

blowing their curtains aside and making their oatmeal cold and clammy before they could even eat it. There were real ice crystals on the snowflakes the preschoolers had hung. They knew they had to do something fast, before the dreaded window disease struck again. But the problem was, when they called the window doctors, how could they tell them what kind of window needed to be replaced? Some windows were square, with no panes inside, like this [teacher displays one such window from a magazine picture], so there was only the one big window to replace. But they couldn't just tell them they had a square window, because their neighbors had square windows that were divided into four parts, like this [teacher displays a magazine picture where a window is divided by its panes into four parts]. The window doctors wouldn't know which square windows to bring. Added to that, some people had circular windows, some half-circles, some octagons, some triangles, and more! They had to think fast. *What could they do?* [Sing and reveal verse 3 and the chorus of *The Window Pane Song.*]

"What they did was to come up with a way of explaining which kind of windows they had. They started with the shape of the window: square, circle, half-circle, et cetera. Then, they counted the number of parts that made up their window. One family that had a square window with no panes told the window doctors that she had a square, and they needed to replace one part out of one [hold up picture again]. There was one part broken, and one part total, and that's what one part out of one means. The neighbors told the doctors they had square windows, too. They needed to replace one part out of four [hold up picture again]. One part was broken, and there were four parts total, so they needed him to bring one part out of four.

"You, students, will help the people of this town conquer the dreaded window disease. Your task is to help them figure out how to explain their windows to the window doctors. Working in your table groups, you will be given pictures of the windows of this town *before* the disease struck. First, you'll choose one picture and call it number one. If there are many windows in that picture, you'll choose just one of them. You'll write down the shape of that window. Then you'll find out how many total parts there are to that window. Your sheet should look like this so far:

<i>Shape</i>	<i>Total</i>
<i>Parts</i>	
1. Square	4

Then, it will be your mission to write down exactly what the family who lives in that house should tell the window doctors. You'll all take turns being the recorder. Let's do one all together."

Display one magazine picture on the chalkboard. Write the following categories next to it: *Shape*, *Total Parts*, and *What to tell Window Doctors*. Ask students, "What is the shape of this

window?" and write it under the shape category. Then, ask, "Let's count together how many total parts there are to this window." Write the sum in the total parts category. Think aloud: "Now, I know that this window is a [square], and it has [four] total parts. I know that the window disease broke one. Therefore, I'd better tell the window doctors to bring one out of four square windows." Write this in the appropriate category. "Do this for every picture your group gets. Remember, if you get a picture of a house with many windows, choose just one window from the picture to describe. "

Ask if there are any questions before the students work on their picture logs. Pass out at least one picture for each person in the table group, preferably six for a group of four students. Walk around the classroom while they work, answering questions and providing suggestions as necessary.

Conclusion and Evaluation

Come together as a large group. Ask students what problems they encountered while carrying out their mission. Introduce the following game to students "to share what we learned in our table groups." Each group chooses one of their window descriptions to tell verbally to the group on its left. They should not show them the picture. All members of this group must come to the board and draw the total window that fits the description. Play continues until each group has had a turn drawing.

If it comes out that there are multiple ways to represent 1 out of 4, for example, gain students' interest by asking, "Why could that be?" Assure them that they will investigate this later in school. (This concept is equivalent fractions.)

Extension

Each student is given a window picture and must find a partner whose window description is the same, as in 1 out of 3. The shape of the window does not need to match. The teacher provides a time limit to make it lively, but allows enough time so the students do not need to be *too* lively. Variations may be played if extra time still remains; students could find matching shapes of windows, mismatching shapes, matching shapes and descriptions, etc.