FIGURE 3.13
A child organizes repurposed paint chips by sorting them into groups by color.

Here are some open-ended explorations I have found particularly productive for young children's mathematical thinking. As you think about which ones you might try out, consider what mathematical ideas might come out of children's work. How will you highlight and build upon their ideas through noticing and wondering alongside your students?

PAPER SCULPTURES

Suggested Materials: long strips of colorful construction paper cut into various widths, a large piece of cardboard for the base, glue sticks, scissors

What's the Math? Describe measurable attributes of objects; directly compare two objects with a measurable attribute in common; describe objects in the environment using names of shapes; and describe the relative positions of these objects.

Teacher Tips: Provide the strips of paper in a large basket in the middle of your working area. Invite interested children to choose a large piece of cardboard to serve as a base for their sculpture. Encourage children to mentally plan and talk about what types of lines they might like to include in their paper structure (e.g., straight, curved, zigzag, twisted). Model how one end of the paper can be glued to the cardboard base. Carefully manipulate the paper strip. If you are twisting it, for example, show how one hand can hold down the glued end to keep it from lifting off the cardboard while the other hand can gently twist the strip. Once you are satisfied with the appearance of the strip, glue the other end to the cardboard base (see Figure 3.12). As children work, encourage them to discuss the shapes and lines they see emerging in their work, the length of the paper strips they are using, and the location of the strips in relation to one another. For instance, you might say, "I see that you needed to place the zigzag strip under the curved strip to get it to stick to the cardboard base and not fall off." Children can also work on one large, collaborative paper sculpture that can be displayed in the classroom.

TEXTURED PRINTS

Suggested Materials: repurposed materials, including textured fabric swatches and bubble wrap, paint, rubber bands, paper, rolling pins, brushes

What's the Math? Describe and name shapes regardless of their orientation or overall size; identify and describe patterns.

Teacher Tips: Demonstrate to children that the repurposed materials (e.g., fabrics with different textures, bubble wrap) can be attached to a rolling pin with rubber bands so the material covers much of the pin's surface. Lightly brush the covered pin with paint. Encourage the children to roll the pin over their paper and observe the interesting shapes and patterns that emerge in the prints. Repeat with different materials covering the rolling pins. As children notice the patterns and designs emerge, engage them in a discussion about what they are noticing and wondering.

FIGURE 3.14
A child creates prints by first wrapping a rolling pin with rubber bands and then covering it in paint.

TAPE RESIST PAINTING

Suggested Materials: heavy paper (e.g., card stock, cardboard), painter's tape, paint, thick brushes

What's the Math? Describe and name shapes regardless of their orientation or overall size; describe measurable attributes of objects; directly compare two objects with a measurable attribute in common.

Teacher Tips: Encourage children to place tape on the paper in different ways (shapes, lines, patterns). Invite children to paint all over the paper, covering as much of the area as they can. While the paint is still wet, gently peel the tape off the paper, revealing the unpainted designs underneath. Encourage children to discuss their creations, paying careful attention to the surprising lines and shapes that are revealed and using math language to describe what they see. Children can compare the results of their tape paintings with one another or share them with the class during a sharing circle, inviting observation and feedback from their peers.

FROZEN CREATIONS

Suggested Materials: various sizes and shapes of containers (e.g., repurposed plastic tubs, muffin tins, small cake pans), water in a large tub, a variety of natural loose parts (e.g., acorns, seeds, dried corn or beans), measuring cups and spoons, freezer space

What's the Math? Estimate and count; describe and name shapes regardless of their orientation or overall size; describe measurable attributes of objects; build an early understanding of capacity, time, and temperature.

Teacher Tips: Although this activity can happen any place and time, doing it in colder climates will extend its duration. Children select a container and estimate, then count, how many cups or spoonfuls of water it takes to fill. Encourage children to select, count, and place a variety of loose parts into the water. Listen to students' ideas and make your own noticings and wonderings about how the materials are responding to the water, For example, you might say, "I am noticing most of the pebbles are sinking and filling the bottom of your container" or "You filled the entire container with ten large and five small pine cones" or "I wonder how much water has spilled over the top of your tray as you've added more and more seeds." Place the containers in a freezer or outside on a cold day. When the creations are frozen, pop them out of the containers and place them in different locations in your play area or outside your classroom windows. Encourage children to make predictions about how quickly the ice will melt, and record observations over time. Ask students how they might measure the ice melt. Possible suggestions include measuring the size of the ice block over time or measuring the water as the ice melts.

FIGURE 3.15
A child holds a piece of ice formed into a heart.

SPLATTER PAINTING

Suggested Materials: small plastic bins, large rubber bands, paint, brushes, thick card stock, scissors, goggles

What's the Math? Describe measurable attributes of objects; directly compare two objects with a measurable attribute in common.

Teacher Tips: Explain to children that they are going to use the rubber bands to splatter paint. (Goggles are recommended so that splattered paint does not end up in children's eyes.) Children should first select a paper that is the correct size to fit inside their bin or cut the paper to the right size. Next, the bin must be fitted with rubber bands that wrap around the opened side. Once five or six rubber bands are in place, the children can gently brush each rubber band with a light coat of paint. When the rubber bands are coated, the children can gently pluck and snap them, causing the paint to splatter and leave interesting speckled designs on the paper. Encourage the children to apply various levels of force to the rubber band and observe what happens. What kind of splatter does a rubber band pulled lightly produce? What about rubber bands plucked more forcefully? Does the length or width of the rubber band have an impact on what type of art is produced? Do the colors of paint mix on the paper into new shades? Encourage children to discuss their predictions, observations, and explorations as they manipulate the materials. Change the size of the bin and see what effect this has on the art produced.

FIGURE 3.16
A child plucks rubber bands covered with paint to create splatter designs on the paper.

Building on Children's Explorations with Teacher Invitations

ONE WAY to build on ideas that emerge through children's play is to highlight them in class meetings and invite other children to explore the ideas discovered by their classmates. At times, I purposely design an ongoing art project that extends specific math ideas. For example,