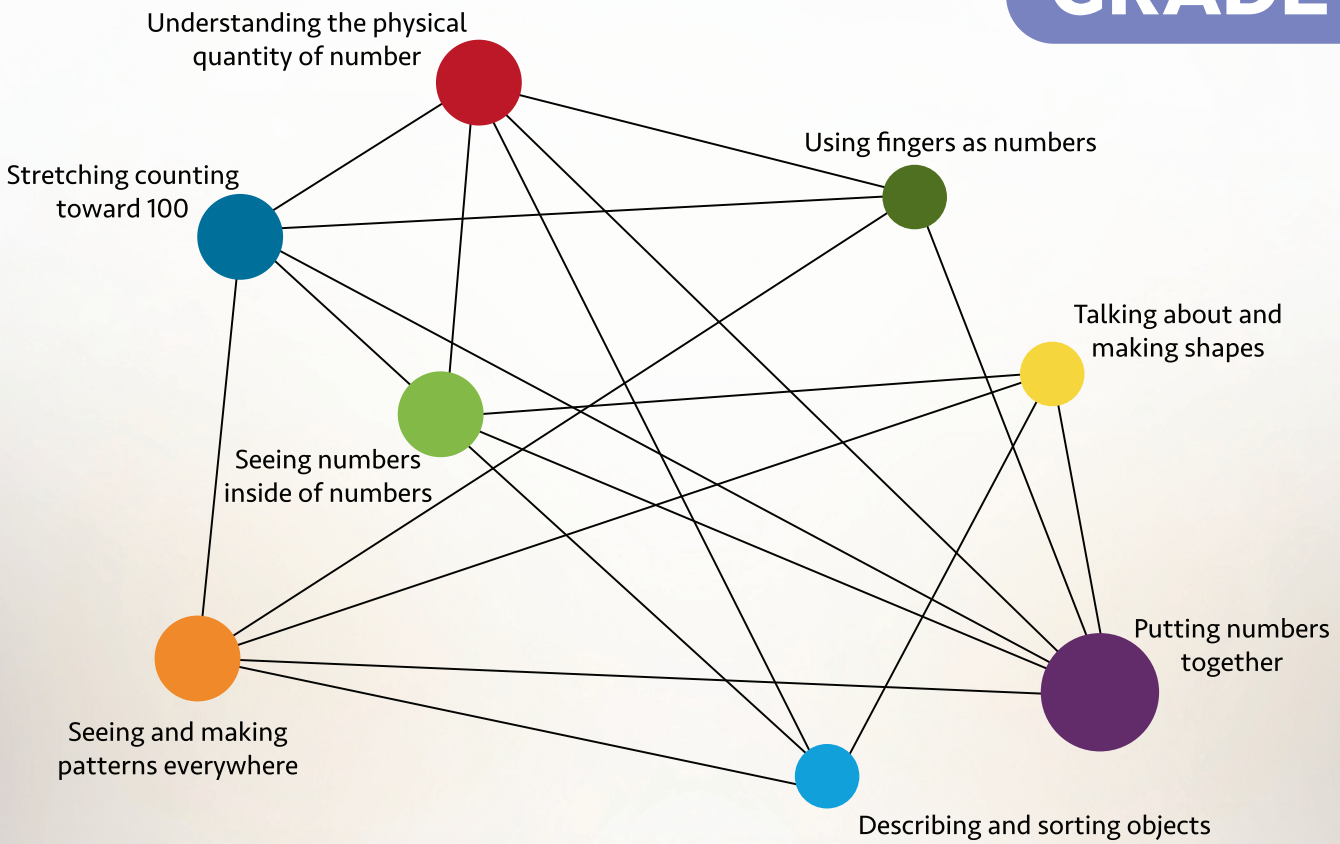
Visualizing and Investigating Big Ideas

mindset mathematics

GRADE K



JO BOALER JEN MUNSON CATHY WILLIAMS

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Jo Boaler
Jen Munson
Cathy Williams

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Sorting Buttons

Snapshot

Students investigate the many attributes of buttons and create groups to sort diverse button collections.

Connection to CCSS
K.MD.3, K.MD.1, K.MD.2, K.G.1, K.CC.6

Agenda

Activity	Time	Description/Prompt	Materials
Launch	5–10 min	Give each pair of students one button and ask them to make observations about it together. As a class, discuss some of the features that students noticed and make connections between the different buttons students examined. Highlight some of the attributes of buttons.	• Buttons, one per partnership • Optional: chart and markers
Explore	20–30 min	Partners examine a collection of buttons and discuss groups they could make. Together they sort the buttons into multiple groups based on their attributes.	• Collections of several dozen buttons, per partnership • Muffin tins, cups, bowls, or containers, for organizing sorted buttons
Discuss	10–15 min	Discuss the different ways students developed to sort the buttons, highlighting sorting rules that used multiple attributes. Make a chart of attributes for sorting buttons.	Chart and markers

Activity	Time	Description/Prompt	Materials
Extend	Ongoing (sorting station), or 15 min (small group)	Two possible extensions: make a sorting station with a large collection of buttons for the class to sort collectively over the day or week; alternatively, do a small-group activity in which students try to figure out how a collection of sorted buttons was grouped.	• Large collection of buttons • Muffin tin, cups, bowls, or containers, for organizing sorted buttons • Labeling tools, such as sticky notes or masking tape • Chart of button attributes from the discussion on display

To the Teacher

In this investigation, we explore another new item that can be sorted in a variety of ways, buttons. We love buttons for sorting because they have a large number of attributes for sorting, and large quantities can be purchased from craft stores or websites inexpensively. Once you have a collection of buttons, they can be used repeatedly for years. In a large, diverse collection of buttons, you will find buttons that vary by color, size, shape, number of holes, texture, material, and decoration. Students may also notice that some buttons have a raised ridge around the edge or words imprinted on the surface, while others do not. Some may be shiny or have a pearl finish, while others are matte. Some have a loop on the back where they are sewn on, while others have holes. Some may be transparent, with or without color. The number of attributes is simply huge, and each button can be sorted along multiple dimensions.

A collection of buttons has many different attributes for creative sorting.
Source: Shutterstock.com/Viktor Gladkov.

For each partnership, you will need to prepare a collection of buttons to sort. Each collection should have a large number of diverse buttons, at least several dozen, so that students have many ways to sort. It is important to note that students do not need to sort the entire collection for this activity, unlike with the school supplies and emojis in the earlier activities. They can simply use the buttons as a pool to draw from in creating groups with particular attributes. This is a time to encourage using multiple attributes. Take, for example, the button sort one kindergartener made here. Some of the categories focus on a single attribute, such as "Big buttons," while one intersects two attributes, "Buttons that are little and green." You'll notice that these are not comprehensive categories, which is to say that not every button in the collection could go into one of these categories. Students are likely to create groups by exploring the buttons available, noticing features, and then looking for others that share that feature. Encourage students to develop as many categories as they want as they explore.

These descriptions were provided by the student who sorted the collection:

1. Big buttons
2. Red buttons
3. Buttons that are little and green
4. Blue buttons
5. Transparent buttons
6. Buttons that are not flat

A sorted button collection

You'll notice in this image that a muffin tin was used to sort buttons. We think these are a handy way to organize multiple groups if you have some pans available. They encourage thinking about more groups, are about the right size, and are tough to knock over. If you don't have access to muffin tins, you can use cups, bowls, or other containers.

Activity

Launch

Launch the activity by giving each pair of students one button and asking them to look closely at it. Ask, What do you notice about your button? Give students a chance to talk with their partner about their button.

Invite students to share what they noticed about their buttons. As students make observations, such as "It has two holes," ask the class, "Who else has a button with two holes?" Support students in making connections between the attributes of their different buttons. Be sure students notice more than just the color or number of holes of the buttons. You may want to make a chart that shows different attributes of buttons by sketching some of the buttons students have and pointing to and labeling their features. You may need to provide students some language for attributes they notice.

Explore

Provide each partnership with a collection of buttons and a muffin tin or several cups for sorting.

Partners talk about ways they can sort the buttons in their collection. Encourage partners to take time to just look at the buttons before they begin. Then partners use the tools provided to organize the buttons into groups. Keep in mind that they may not sort all the buttons.

As you circulate to talk to students about their work, ask students to name the groups they have created. You might ask, How do you know what buttons go in this group? Can you find another button that could go in this group? Alternatively, you might ask students to find a button that doesn't go in any of their groups and talk about why. Use this time to circulate and observe as an opportunity to discuss with students attributes that they may not have considered.

Discuss

Gather students together and discuss the following questions:

- How did you sort your buttons? (Talk about the rules students used to sort them. Make, or add on to, a chart of different attributes for sorting buttons.)
- What other ways could we have sorted the buttons? (Highlight sorting rules that students used or could use that intersect multiple attributes, such as white buttons with two holes and white buttons with four holes.)

As students are explaining the ways they sorted their buttons, you may find it useful to have students bring their collections over to the carpet to show. This may be particularly useful when students have sorting rules that involve multiple attributes.

Extend

We offer two possibilities for extending this activity. In either, we suggest that you post the chart you made with the class during the discussion of button attributes for students to use for reference.

First, you can turn this activity into a station or center with a very large, diverse collection of buttons for students to sort. The collection should have hundreds of buttons to expand the ways that students might sort. Provide access to containers for the sorted groups. If you'd like students to build on one another's groups, encourage

students to label their groups with a sticky note or masking tape and leave their groups behind when they leave the station, so that others can add on to the groups they have started. At the end of the day or week, you could discuss the different groups that emerged from this collective sorting process.

Second, you can build on the deductive work we began in the Play activity, by setting up a small-group activity with a presorted set of buttons and asking students to figure out how the buttons were sorted. Working in a small group, students can discuss what they notice about the buttons in each group and come up with a label they can apply to each group they figure out. You can facilitate by asking students what ideas they have about what each group has in common and exploring the buttons in that group to test their ideas.

Look-Fors

- **Are students using a variety of attributes to sort?** If students decide to use a single attribute to sort all the buttons, they have the opportunity to sort all the buttons following a single strategy. For instance, if students decide to sort their buttons by color, creating groups for red, orange, yellow, and so on, all buttons can be sorted using this scheme. However, once students have explored this way, encourage them to try new ways of sorting so that they attend to different kinds of attributes. You might do this by asking students to mix up their buttons and start again, or by asking them if they could separate one of their groups into some smaller groups, such as "red buttons with two holes" and "red buttons with four holes." Be sure to let the ways of sorting come from students. Students may find it easier to consider this process if you put all the buttons currently in one group back on the table so that the buttons can be physically sorted in different ways.
- **Are students able to describe the rules used for each group they create?** As you talk with students about their sorts, you'll want to ask them to describe each group they are creating. Listen carefully for how students describe these groups. You may hear hesitant or imprecise language that you can support with words that students may not have had the need for in the past. For instance, students might tell you that a group of buttons "has this bump" or "isn't flat" as ways of indicating the raised ridge or ring that runs around the circumference of the button. You may want to offer students the word *ridge* or *edge* to help them describe and define the group. In other cases, students may have descriptions, but they may be ambiguous in ways that are worthy of

discussion. For instance, students may have groups of "big" or "little" buttons, but how big or little does a button need to be to belong in the category? Ask students about these fuzzy boundaries to invite them to think more about what these words mean to them in relationship to the buttons.

- **Are students using multiple attributes to construct groups?** As with the previous activities in this big idea, thinking about how attributes intersect is a goal of this investigation. Look for instances of students defining groups with multiple attributes to share with the class during the discussion. If you notice these, you may want to press students about what other groups they might need in relationship to the group they defined. For instance, in the sort shown in the To the Teacher section, the student created a group of "buttons that are little and green," which might point toward the need for a group of "buttons that are big and green" or "buttons that are little and black." By contrast, if students are using a simple rule for sorting that creates a small number of groups with a large number of buttons in each (e.g., "blue buttons" and "buttons that are not blue"), then use this opportunity to press students to find groups inside these larger groups, as discussed earlier.

Reflect

What other objects in the world could be sorted? How might you sort them?