

Dot Card Number Talk

Setting up a productive class culture of multidimensional mathematics and equitable group work

#2

Introduction

A dot card number talk is a fantastic number sense activity for people of all ages to engage with and enjoy. It is a short but powerful learning activity that shows students:

- creativity in math
- the visual nature of math
- that there are many different ways people see math

Connection to CCSS

- MP 2
- MP 3
- MP 6
- MP 7

It also helps to develop an important part of the brain called the Approximate Number System (ANS).

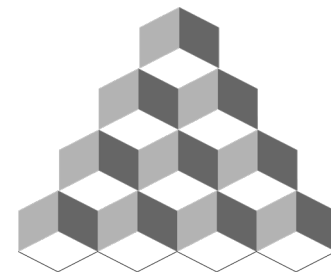
Agenda

Activity	Time	Description/Prompt
Launch	5 min	<ul style="list-style-type: none"> • Introduce students to the purpose of the dot card number talk. • Explain to students that first they will briefly see a collection of dots, and then they will be asked to say how many dots they saw and to describe how they saw the pattern of dots multiple ways. Tell students you will show the dots only for a short time because you don't want them to count them. Instead they should group dots to find the total number.
Explore	1 min	Use the projector to show the dots for about one second. (Not long enough for anyone to count them)
Discuss	15 min	<ul style="list-style-type: none"> • Students share their thinking. • Carefully represent your students' thinking by drawing their described patterns on the board. Make sure to continually checking in with the student who is sharing to ensure you are accurately capturing their thinking.

To the Teacher

We give dot card number talks to all groups we work with: students, teachers, Stanford undergraduates, administrators, superintendents, and more. We use them to celebrate the fact that we all see maths differently, even a set of dots.

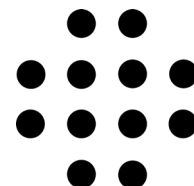
Dot card number talks are a really nice way to start a new class and value the many ways we see mathematics. A dot card focuses students on a visual pattern with no paper or pencil for written calculation. The pattern is shown only for a brief time so students cannot count the individual dots. As various visualizations are shared, students will be amazed at how differently their peers see the pattern. We encourage you to use different dot card number talks throughout the school year.



We have an example of Jo giving a dot talk number talk during youcubed summer camp. To see ways to record strategies watch this video: <https://vimeo.com/265491957>.

Launch

Start the activity explaining to students that you are going to show them a collection of dots for a short period of time. The time is short because you do not want them to count the individual dots. Next, let the students know that you will be asking them to explain the number of dots and how they visualized the dots to know how many were in the image.



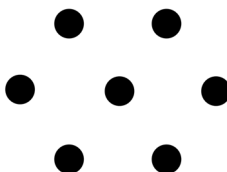
Show the dot card for about one second on the screen and then remove it. Ask students, "How many dots did you see?" and record their numerical answers on the board. For now, you are only asking for the number of dots, not the ways of visualizing the pattern. If students get different answers write all of them on the board without identifying whether any answer is right or wrong. Often students will get different answers, which is great because it makes space for more conversation about numbers and visual representations. Different answers also provide a great time for you to discuss mistakes and explain their importance and that it means they are learning.

Discuss

Put the dot card back on the screen so that students can refer to the picture to describe their thinking. Invite students to share by saying something like, "Who would like to tell us how they saw the dots?"

Ask students to share their visual representations. (Note: This is not the time to ask students to come to the board.) Carefully draw what each student describes and label their picture with their name. Including the student's name is important because it gives them ownership over their mathematical thinking. Make sure you ask each student to explain their thinking and ask them clarifying questions to ensure that you are accurately representing their strategy. This process helps students focus on communicating clearly. At times it is challenging to illustrate what a student is describing. These moments are great because they allow students to see you, the teacher, struggle to understand. Here are some examples of recorded student strategies for the dot pattern.

To make sure you are accurately representing students' thinking with your representations, continually





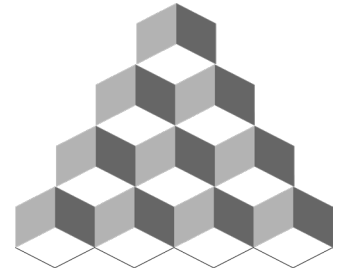
$$2+1+2+1$$



$$3+3+1$$



$$2+3+2$$



check with the student and ask them questions like:

- Is it like this? (Referring to a part of your representation)
- Is this what you saw?
- Is it a little bit like this other one? What was different about it?
- What did you do after that?
- Maybe we could draw this one out because that would be helpful. Does this look like what you did?
- Do you feel like this represents your thinking?

Look-Fors:

- How are students engaging with mistakes? Multiple answers in dot card number talks are an opportunity to honor and discuss mistakes.
- How are students organizing dots when counting? Dot card number talks are all about visualizing and having an appreciation for different ways of seeing. Take notice of the different strategies students are using and think about their connection to other mathematical ideas like reflection, grouping, subitizing, etc.
- Which students are sharing their ways of seeing? Encourage many different students to share their ways of seeing. Dot card number talks are a great opportunity to highlight the work of a variety of students.
- How many different ways of seeing are shared? This activity is visual and generally you can expect about 10 or more different ways. When you ask students to share take note of how many hands go up. Are there students who share strategies who did not have their hand up at the start?

Reflect

Tell students why dot card number talks are important by saying something like, “The reason I wanted you to see this is because math is an open and visual subject. There are so many different ways that people saw just this collection of dots. Some people think that maths is all about the same method or procedure but even a collection of dots can be seen many different ways. In this class we will be sharing all our different ways of seeing maths.”

Ask students to reflect on their experience with the class with a prompt like, “What did you learn from this dot card number talk?”

