youcubed®

Number Visual Pennies

Grades 9-12

Introduction

This activity allows students to explore a visual pattern. Students use visuals to think about numbers and find a total. This problem allows students to solve it in a variety of different ways. This activity connects to solving systems of equations. Students can share their different strategies for approaching the problem with each other.

Video

Speed is not Important, https://youcubed.org/weeks/week-3-grade-9-12/

Agenda for the activity

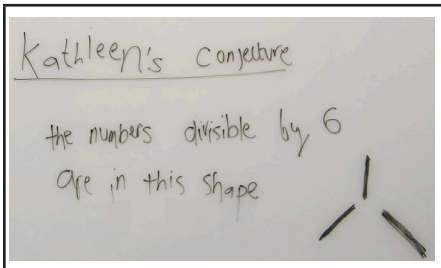
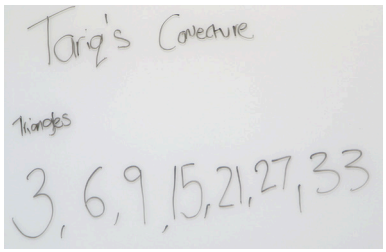
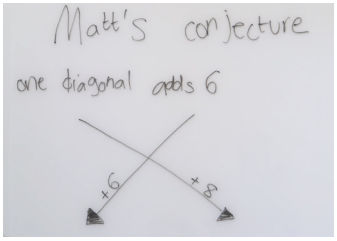
Activity	Time	Description	Materials
Mindset Message	5 min	Play the mindset video, ***Speed is not Important***, https://youcubed.org/weeks/week-3-grade-6-8/	• Mindset Video day 2, ***Speed is not Important***
Work Time	35 min	Give students a copy of the Number Visual Handout and ask them to write the number each visual represents next to its representation. Ask students to study the number visual page and look for patterns. Ask students to share their conjectures. You can record their conjectures and name each conjecture with the student's name. Give students the Task Handout. Students should work in groups of 2 – 4. Ask students to prepare a poster showing their solution(s). During the work time you may want to pause and have different groups present where they are. The purpose of this time is to share ideas, not solutions. If you choose to do this ask student to share their thinking and where they are in solving the problem.	• Number Visual Handout • Number Visual Pennies Task Handout • 100 pennies per group (could use counters instead)

youcubed®

Debrief	10 min	Invite students to share their strategies and process for working on this problem. You can either have some students share their thinking from the front or allow students to do a gallery walk around the different work areas so they can see how different groups organized their work and communicated their solutions.	
Debrief Mindset Message	5 min	Ask students to reflect on the belief discussed in the video that math is NOT about speed. What is important in math is to think carefully, deeply, and to make connections.	

Activity

If your students have not explored Number Visuals from WiM 1 you might want to give them some time to do that first. Give each student a copy of the Number Visuals Handout. First ask them to write the number for each visual representation next to the visual on the page. Ask students to study the number visual page and look for patterns and record any observations they can make. When they have had enough time ask them to share their findings. We record their findings as conjectures and we write each on the board with their name. Below are a few examples from our summer camp class.

		
Kathleen's conjecture states the numbers divisible by 6 are in this shape	Tariq's conjecture states that these numbers are in the shape of a triangle	Matt's conjecture states the numbers increase by 8 on the diagonal and the numbers increase by 6 on the opposite diagonal

Give students the Number Visual Pennies Task Handout and ask them to work on this in groups of 2 – 4. Give each group a poster paper to record their process and findings. Each group will need 100 pennies or counters. When we introduce this task, we don't have any discussion or introduction. We let students make sense of the task in their groups. Students will find their own way with this task and their solutions will be visual and creative. Our role during this time is to walk around and answer questions. We never answer a question or confirm a process or answer. We always answer a question with another question. For example, Students: "Can one of the numbers have zero pennies?", Response: "What do you think? What information was given in the task?".

The task:
Imagine you have pennies stacked in the patterns of the number visuals for 3, 5, 6, 7 and 9.

- Each number visual has stacks of pennies, no number visual has zero pennies
- The stacks of pennies within each unique number visual are equal
- Each unique number visual can have a different size stacks of pennies than the other number visuals

What would be the size of each stack of pennies for each number visual if the sum of the pennies is $1.00? Is there more than one solution?

In this example students have 2 pennies in each column for #3, 1 in each column for #5, 4 for #6, 3 for #7 and 3 for #9. They still have leftover pennies to place since they started with 100 pennies.

Invite students to share their strategies and process for working on this problem. You can either have some students share their thinking from the front or allow students to do a gallery walk around table to see different groups approach and strategy for organizing what they have tried. We love the gallery walk. Students have an opportunity to see how others organized their work. We celebrate when all of the work looks different!

You may want to pose the following questions for discussion or journaling. We have found our students come up with interesting questions and areas to explore.

- What does working on this problem make you wonder?
- What would you want to explore next?

Extensions

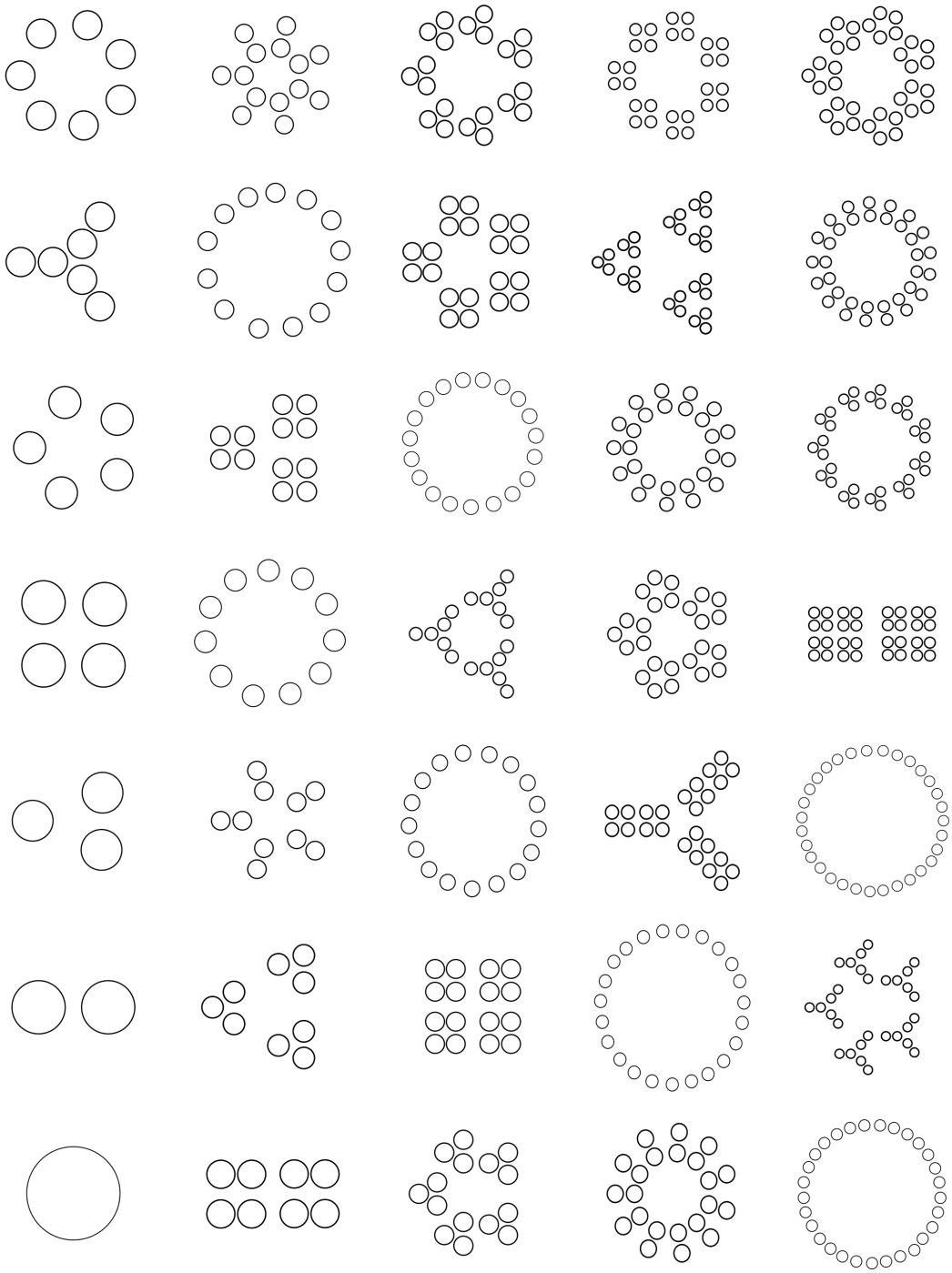
- What if the total were changed?
- What if you used different numbers than 3, 5, 6, 7, and 9?

Materials

- Number Visual Handout
- Number Visual Pennies Task Handout
- 100 pennies per group (could use counters instead)

youcubed®

Number Visual
Handout



youcubed®

Number Visual Pennies

Task Handout

Imagine you have pennies stacked in the patterns of the number visuals for 3, 5, 6, 7 and 9.

- Each number visual has stacks of pennies, no number visual has zero pennies
- The stacks of pennies within each unique number visual are equal
- Each unique number visual can have a different size stacks of pennies than the other number visuals

What would be the size of each stack of pennies for each number visual if the sum of the pennies is $1.00? Is there more than one solution?