

Navigating the print program

Unit & Sub-Unit Resources

Each unit includes a range of resources designed to support teachers in thinking through the progression of mathematics that students will engage with over the course of the unit. These resources can support teachers in their unit planning, as well as choices they make in response to students' thinking, strengths, and needs that arise over the course of the unit.

Unit at a Glance

Students use devices for most lessons as indicated with .

Student Notes sheets in the Student Edition are available for these lessons.

Unit Synthesis and Reflection: Invite students to complete 1–2 tasks to synthesize and reflect on what they learned in the unit.

Pacing: 16 days (+1 optional day) | Short on time? See pacing considerations below.

All instructional and assessment days are ~45 minutes each.

- 12 Lessons
- 2 Practice Days
- Pre-Unit Check (optional)
- Sub-Unit Quiz
- End-of-Unit Assessment

Start of the Year		Assess and Respond		Sub-Unit 1				Sub-Unit 2	
S Meet & Greet (Optional) Begin the year with this lesson designed for you and your students to get to know one another through mathematical conversations. <small>MP1 MP4</small>	A Pre-Unit Check (Optional) Learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit. S.F.B.5 S.G.A.1 S.G.A.3 HSF.IF.A.2 HSF.BF.B.3 HSF.BF.B.4 ★ HSF.BF.B.5 ★ HSG.CO.A.2 HSG.CO.A.2 <small>MP2 MP6 MP7</small>	1 Splashing Into Functions Diving Deeper into Function Stories Describe situations about swimming and diving, both verbally and graphically. HSF.IF.A.1 HSF.IF.A.2 HSF.IF.B.4 ★ HSF.IF.C. HSN.Q.A.2 ★ <small>MP1 MP4 MP6</small>	2 Flower Frames Domain and Range Determine the domains and ranges of functions by describing videos of blooming flowers. HSF.IF.A.1 HSF.IF.B.5 ★ <small>MP1 MP3</small>	3 A Family Function Function Families and Features Build on Lessons 1–2 to describe functions based on their key features (increasing, minimum, etc.). HSF.IF.B.4 ★ HSF.IF.C.7 ★ <small>MP3 MP7</small>	4 Alphabet Soup Functions Defined By Other Functions Explore functions defined in terms of other functions. HSF.IF.A.2 HSF.IF.C <small>MP1 MP6 MP7</small>	5 Transformation Station Transformations of Functions Describe and sketch transformations of graphs of functions. HSF.BF.B.3 HSF.IF.B.4 ★ <small>MP6</small>	6 Shifting Gears Vertical and Horizontal Translations Explore vertical and horizontal translations of functions using tables and graphs. HSF.BF.B.3 HSF.IF.C <small>MP3 MP6</small>		
7 Mirror, Mirror Reflecting Functions Explore reflections of functions using tables and graphs. HSF.BF.B.3 HSF.IF.C <small>MP6 MP8</small>	8 Symmetry Studio Exploring Even and Odd Functions Explore even and odd functions using tables and graphs. HSF.BF.B.3 HSF.IF.C <small>MP3 MP6 MP8</small>	P Practice Day 1 Practice the concepts and skills developed during Lessons 1–8. Consider using this time to prepare for the upcoming quiz. HSF.BF.B.3 HSF.IF.A.1 HSF.BF.B.5 ★ <small>MP1 MP3</small>	A Sub-Unit Quiz Learn about your students' understanding of the concepts and skills so far in this unit. HSF.BF.B.3 HSF.IF.A.1 HSF.IF.A.2 HSF.IF.B.5 ★ HSF.IF.C <small>MP1 MP3 MP6</small>	9 Ferris Functions Scaling Functions Vertically Explore scaling vertically by changing the size of a Ferris wheel. HSF.BF.B.3 HSF.IF.C <small>MP1 MP6 MP6 MP8</small>	10 Coastin' Through Transformations Scaling Functions Horizontally Explore the effects of scaling horizontally by analyzing the graph of a Ferris wheel cabin's height as its speed changes. HSF.BF.B.3 HSF.IF.C <small>MP3 MP6 MP7</small>	11 B(ring) It On All of the Transformations Together Use function notation to write equations that represent multiple transformations of a function. HSF.BF.B.3 HSF.IF.C <small>MP3 MP6 MP7</small>	12 Mental Models Modeling Mental Health Data by Age Group Make sense of mental illness data across three different age groups and make predictions about what shape of function would model the data well. HSF.BF.B.3 HSF.IF.B.4 ★ HSF.IE.B.5 ★ HSN.Q.A.2 ★ HSS.ID.B.6.A ★ <small>MP4</small>		
Practice Day P Practice Day 2 Practice the concepts and skills developed during Lessons 1–12. Consider using this time to prepare for the upcoming assessment. HSF.BF.B.3 HSF.IF.A.1 HSF.IF.C <small>MP6</small>		Assess and Respond A End-of-Unit Assessment Learn about your students' understanding of the concepts and skills in this unit. HSF.BF.B.3 HSF.IF.B.5 ★ HSF.IF.C HSS.ID.B.6.A ★ <small>MP1 MP3 MP6</small>							

Concept Development

By the following points, students will have had multiple opportunities to practice the key skills in this unit:

- After Lesson 2: Describing behaviors of functions, including domain and range
- After Lesson 4: Evaluating functions in function notation.
- After Lesson 6: Translating functions.
- After Lesson 8: Reflecting functions.
- After Lesson 11: Scaling functions and sequences of transformations.

Pacing Considerations

Lessons 1–2: These lessons are intended to revisit properties of functions from Algebra 1, including the definition of a function, evaluating functions written in function notation, and writing the domain and range of a function. If students show a strong understanding of Problems 1–3 on the Pre-Unit Check, consider combining these lessons.

Lessons 9–10: These lessons support students in making sense of equations that represent scaling functions vertically and horizontally. If time runs short, these lessons can be consolidated into one by omitting Activity 3 from Lesson 9 and the Warm-Up from Lesson 10.

Unit 1
IB
Unit at a Glance
Unit 1
IC
Unit at a Glance

Every unit has a **Unit at a Glance** page that shows teachers everything they need to know to get started planning out their upcoming unit.

Student Notes sheets support student recall and retention when engaging in digital lessons.

This overview of **concept development** supports teachers in making decisions about potential intervention points during the unit. It indicates at which point students have had multiple opportunities to focus on each key concept or skill. It does not necessarily mean there are no further opportunities to strengthen and develop these skills.

Teachers are provided with thoughtful **pacing considerations** for how they can adjust the pacing of the unit as needed without compromising unit learning goals.

Unit Overview pages

Teachers will find a comprehensive set of resources for each unit, including an overview of the math of the unit, a visual summary of the Unit at a Glance, materials, a preview of each of the unit assessments, and guidance about differentiation, supporting math identity and community, accessibility, language development, technology, and connections to future learning. Each Unit Overview also includes a professional development activity and a formative Pre-Unit Check that teachers can use to learn more about students' understanding of foundational concepts and skills that will support them in the upcoming unit.

Skill

Example

Write an equation for $g(x)$ in terms of $f(x)$.

$$g(x) = -f(x - 4) + 1$$

Sub-Unit 3

The lessons within each unit are grouped into sub-units that address a related group of concepts. All lessons in each sub-unit include lesson practice and Show What You Know formative assessments, and targeted sub-units include a practice day and assessment.

Lesson Supports

Throughout this Teacher Edition, lesson guidance for teachers is organized clearly and consistently so that they have all of the information they need at their fingertips.

In the **Focus and Coherence** section, teachers will find the goals and language goals for the lesson. There is also information on prior learning that has built to the math in this lesson, as well as future learning that this lesson is helping build to.

Lesson modality shows teachers how they should plan to have students engage in the lesson.

Unit 1
Lesson
9

Digital Lesson

This lesson uses digital student screens. Student Notes are also available.

Ferris Functions

Scaling Functions Vertically

Let's transform a Ferris wheel using vertical scales.

Focus and Coherence

Today's Goals

1. Goal: Write an equation in function notation of a function that has been scaled vertically.

2. Goal: Calculate the factor, k , needed to transform the graph of one function onto another function.

3. Language Goal: Describe the effects of replacing the function $f(x)$ by $kf(x)$. (Reading and Writing)

Students explore scaling vertically by changing the size of a Ferris wheel. They write equations in function notation that represent a function being scaled vertically so that it goes through specific points.

Prior Learning

In Lessons 7 and 8, students explored the effects of replacing $f(x)$ with $-f(x)$ and $f(-x)$. In Algebra 1, Unit 7, Lesson 15, students described the effects of vertical stretches on the graph of a quadratic function.

Future Learning

In Lesson 10, students will expand their understanding of scaling to include horizontal scales.

Standards Addressing

HSF.BF.B.3

Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

Also Addressing: HSF.IF.C

Mathematical Practices: MP1, MP2, MP6, MP8

Building On

8.G.A.3

Building Toward

HSF.BF.B.3
HSF.TF.B.5 ★

Rigor and Balance

Students build **conceptual understanding** of the effects of replacing $f(x)$ with $kf(x)$ in the context of a Ferris wheel.

Students develop **adaptive reasoning** by using responsive feedback to support their intuition and adjust their strategy.

Unit 1 Lesson 9

53A

Ferris Functions

The **Rigor and Balance** section explains how students develop conceptual understanding, procedural fluency, application, strategic competence, adaptive reasoning, and productive disposition in this lesson.

Where applicable, the **Standards** section will list all standards addressed in this lesson, including standards the lesson builds on and standards the lesson builds toward. The **bolded** words indicate which parts of each standard described are covered in the lesson.

Lesson Overview

This introductory page orients teachers to the topic, standards, and key learning goals of the lesson, including any new vocabulary terms that will be introduced.

The **Key Takeaways** and **Lesson Takeaway** summarize the most important ideas in the lesson.

The **time frame** and suggested **student grouping** is listed for each part of the lesson.

The screen icon is used to show which **Presentation Screens** or **Digital Student Screens** align to each instructional moment.

Lesson at a Glance

~ 45 min

Why digital?

Repeated Challenges offer Responsive Feedback™ to support developing fluency with writing equations of functions that have been scaled vertically.

Standards: HSF.BF.B.3, HSF.IF.C

Warm-Up

Independent | 5 min

Pacing: Screens 1-2

Students design a Ferris wheel and explore a graph representing the height of a Ferris wheel cabin from its boarding platform over time.

Routine: Notice and Wonder (MPI)

Activity 1

Pairs Sharing a Device | 10 min

Pacing: Screens 3-5

Students build an understanding of vertical scaling using graphs and equations.

Routine: Think-Pair-Share

Key Takeaway (Screen 5): You can scale the graph of a function vertically by multiplying its outputs by a factor, as in $h(x)$. If k is between 0 and 1, the function compresses toward the x -axis. If k is greater than 1, the function stretches away from the x -axis.

Activity 2

Pairs Sharing a Device | 7 min

Pacing: Screens 6-8

Students write and compare equations with both positive and negative factors.

Key Takeaway (Screen 8): A negative factor, k , reflects the graph over the x -axis in addition to scaling the function vertically.

Activity 3

Independent | 13 min

Pacing: Screen 9, Screen 10

Students develop fluency writing equations that transform graphs so that they pass through certain points.

Synthesis

Whole Class | 5 min

Pacing: Screen 11

Students synthesize their understanding of the effect that multiplying a function by a factor, k , has on the graph of that function.

Lesson Takeaway: The graph of a function is scaled vertically when the outputs of the function are all multiplied by the same number. The equation of the transformed function can be represented as $g(x) = kf(x)$.

Show What You Know

Independent | 5 min

Pacing: Screens 12-13

Students demonstrate their understanding by writing an equation to represent a function that has been scaled vertically.

Prep Checklist

Assign the digital student screens. Student Notes are also available.

This lesson includes:

Student Screens

Lesson Practice

Show What You Know (optional)

Student Notes sheet in Student Edition: Consider providing the Student Notes to support take discussion and student thinking.

The **Prep Checklist** displays all materials students will need for the lesson.

Independent | 5 min | Pacing: Screens 1-2

Warm-Up

Purpose: Students design a Ferris wheel and explore a graph representing the height of a Ferris wheel cabin from its boarding platform over time.

1 Launch

Invite students to select the color and style of their Ferris wheel cabin.

Multilingual/English Learners

Create a list of words about Ferris wheels that students might not know, along with visuals or translations of each word in languages spoken by your students. (Reading and Listening)

Look for interesting quantities that students would choose to graph, then highlight them during the Connect.

2 Connect

Use the Notice and Wonder routine to promote curiosity and help students make sense of the Ferris wheel's graph. (MPI)

Accessibility: Memory and Attention

Invite students to record their ideas on their notes sheet in the left column.

Create a record of the things students noticed and wondered, along with the names of the students who shared them.

Consider asking:

Did anyone notice how the graph is above and below the x -axis? Does this make you wonder about what the graph would look like for a Ferris wheel that loads at ground level?

Does this graph represent a function? How do you know?

Note: If it doesn't come up naturally, consider asking, "Why is the graph not a circle?"

Math Identity and Community

Consider celebrating variety and creativity in what students notice and wonder, including things that surprised you or that you think other students may not have noticed.

Students using digital

Warm-Up

Design a Ferris wheel for your community's first amusement park!

Select a color and style for the Ferris wheel cabin.

What would you measure about your Ferris wheel and how many rotations?

Responses vary.

The height of the cabin above the ground

The time spent on the Ferris wheel for one rotation

The speed at which the Ferris wheel spins

The number of people that the wheel can carry in an hour

Sample student responses to the Warm-Up prompt are provided to help teachers prepare to facilitate the conversation.

Lesson at a Glance

The Lesson at a Glance page describes the purpose of the Warm-Up, Activities, Synthesis, and Show What You Know. Teachers will find suggested timing for each part of the lesson, as well as guidance on whether students should work individually, in pairs, in small groups, or with the whole class.

The page also lists which pages, Presentation Screens, or Digital Student Screens can be used with each part of the

Warm-Up

Every Amplify Desmos Math lesson begins with a Warm-Up to help draw students into the lesson. It might elicit information from their personal experience or intuition, remind them of a context they have seen before, invite them to think about the previous lesson, or preview a calculation that will appear in the current lesson.

Each lesson notes the corresponding **Teacher Presentation Screens** or related **Student Edition** pages also available to support the lesson.

Country	Year	Population (millions)	Urban population (millions)	Urban population (%)
Algeria	2000	24.1	12.1	50.2
Algeria	2005	26.1	13.1	50.2
Algeria	2010	28.1	14.1	50.2
Algeria	2015	30.1	15.1	50.2
Algeria	2020	32.1	16.1	50.2
Algeria	2025	34.1	17.1	50.2
Algeria	2030	36.1	18.1	50.2
Algeria	2035	38.1	19.1	50.2
Algeria	2040	40.1	20.1	50.2
Algeria	2045	42.1	21.1	50.2
Algeria	2050	44.1	22.1	50.2
Algeria	2055	46.1	23.1	50.2
Algeria	2060	48.1	24.1	50.2
Algeria	2065	50.1	25.1	50.2
Algeria	2070	52.1	26.1	50.2
Algeria	2075	54.1	27.1	50.2
Algeria	2080	56.1	28.1	50.2
Algeria	2085	58.1	29.1	50.2
Algeria	2090	60.1	30.1	50.2
Algeria	2095	62.1	31.1	50.2
Algeria	2100	64.1	32.1	50.2
Algeria	2105	66.1	33.1	50.2
Algeria	2110	68.1	34.1	50.2
Algeria	2115	70.1	35.1	50.2
Algeria	2120	72.1	36.1	50.2
Algeria	2125	74.1	37.1	50.2
Algeria	2130	76.1	38.1	50.2
Algeria	2135	78.1	39.1	50.2
Algeria	2140	80.1	40.1	50.2
Algeria	2145	82.1	41.1	50.2
Algeria	2150	84.1	42.1	50.2
Algeria	2155	86.1	43.1	50.2
Algeria	2160	88.1	44.1	50.2
Algeria	2165	90.1	45.1	50.2
Algeria	2170	92.1	46.1	50.2
Algeria	2175	94.1	47.1	50.2
Algeria	2180	96.1	48.1	50.2
Algeria	2185	98.1	49.1	50.2
Algeria	2190	100.1	50.1	50.2
Algeria	2195	102.1	51.1	50.2
Algeria	2200	104.1	52.1	50.2
Algeria	2205	106.1	53.1	50.2
Algeria	2210	108.1	54.1	50.2
Algeria	2215	110.1	55.1	50.2
Algeria	2220	112.1	56.1	50.2
Algeria	2225	114.1	57.1	50.2
Algeria	2230	116.1	58.1	50.2
Algeria	2235	118.1	59.1	50.2
Algeria	2240	120.1	60.1	50.2
Algeria	2245	122.1	61.1	50.2
Algeria	2250	124.1	62.1	50.2
Algeria	2255	126.1	63.1	50.2
Algeria	2260	128.1	64.1	50.2
Algeria	2265	130.1	65.1	50.2
Algeria	2270	132.1	66.1	50.2
Algeria	2275	134.1	67.1	50.2
Algeria	2280	136.1	68.1	50.2
Algeria	2285	138.1	69.1	50.2
Algeria	2290	140.1	70.1	50.2
Algeria	2295	142.1	71.1	50.2
Algeria	2300	144.1	72.1	50.2
Algeria	2305	146.1	73.1	50.2
Algeria	2310	148.1	74.1	50.2
Algeria	2315	150.1	75.1	50.2
Algeria	2320	152.1	76.1	50.2
Algeria	2325	154.1	77.1	50.2
Algeria	2330	156.1	78.1	50.2
Algeria	2335	158.1	79.1	50.2
Algeria	2340	160.1	80.1	50.2
Algeria	2345	162.1	81.1	50.2
Algeria	2350	164.1	82.1	50.2
Algeria	2355			

In the **Launch, Monitor, Connect** guidance, teachers will find ways to help students get started, suggested facilitation moves, and discussion questions.

The **Key Takeaway** is called out to highlight the learning goal of the activity and provide teachers with an example of how to frame the big idea of the activity for students.

Each lesson includes one, two, or three activities. These activities are the heart of each lesson. Students notice, wonder, explore, calculate, predict, measure, explain their thinking, settle disputes, create challenges for their classmates, and more.

AmplifyDesmos Math

Lessons conclude with the **Show What You Know**, which presents an opportunity for students to reflect on the main learning goals of the lesson. This is a great way for both students and teachers to access a formative check for understanding.

Each **Lesson Practice** includes a **Summary** and **Try This** problem. Students can highlight big ideas of the lesson in the summary or share it with a caregiver or classmate. They can also engage with the Try This to further apply the lesson content.

Whole Class | 5 min | Pacing: Screen 11

Synthesis

Encourage students to change the factor of $f(x)$ to support their thinking. Invite students to respond independently, then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Multiplying the outputs by a factor.
- Stretching or compressing corresponding points.
- Reflecting the function over the y -axis if the factor is negative.

Math Identity and Connections
to share strategies they've calculated the students use.
Note: If time allows, invite students to share their previous thinking based on the synthesis.

Students using digital

Students using print

Show What You Know

Purpose: Students demonstrate their understanding by writing an equation to represent a function that has been scaled vertically.

Today's Goals

1. **Goal:** Write an equation in function notation of a function that has been scaled vertically.
2. **Goal:** Calculate the scale factor k , needed to transform the graph of one function onto another function.
3. **Language Goal:** Describe the effects of replacing the function $f(x)$ by $kf(x)$. (Reading and Writing)

Students using digital

D Differentiation Beyond the Lesson

Here are options for responding to student work on the Show What You Know and throughout the lesson.

Support
Provide targeted intervention.
If student work shows **partial understanding** of writing equations of functions that are scaled vertically:
• You may choose not to intervene now. Students will have more opportunities to write equations of transformed functions in Lessons 10–11.

Strengthen
Reinforce students' understanding.
If student work shows **conceptual understanding**, consider:
• Assigning the **Lesson Practice**.
• Inviting students to review the **Summary** and complete the **Try This** problem.
• Revisiting the **Repeated Challenges** in Activity 3.

Stretch
Challenge students and extend their learning.
If students would enjoy an **additional challenge**, consider:
• Encouraging them to complete the **DOK3 Practice Problem**.

Professional Learning
Consider the next several lessons you will teach. How will students' work today in writing equations and calculating unknown factors prepare them for this work in Lessons 10–12? What are ways that you might call back to students' strategies from this lesson?

Unit 1 Lesson 9 56A Show What You Know (Differentiation)

Each Show What You Know is accompanied by a table with suggestions in three categories: students who need **support**, would benefit from more practice to **strengthen** their understanding, or are interested in a **stretch** to deepen or extend their thinking.

Lesson Practice Independent

Students continue developing their conceptual understanding, fluency, and application of topics from this lesson and previous lessons/units (spiral review). Invite students to refer to the **Lesson Summary** to support them with this practice and their learning throughout the year.

Students using digital

Lesson Summary

You can scale a function vertically by multiplying the outputs by a factor. When the factor is greater than 1, the graph stretches vertically. When the factor is between 0 and 1, the graph compresses vertically.

The function $g(x)$ is a vertical stretch of the function $f(x)$ by a factor of 2. The equation is $g(x) = 2f(x)$.

The function $h(x)$ is a vertical compression of the function $f(x)$ by a factor of $\frac{1}{2}$. The equation is $h(x) = \frac{1}{2}f(x)$.

The function $k(x)$ is a vertical reflection of the function $f(x)$ across the x -axis. The equation is $k(x) = -f(x)$.

Try This
Here are the graphs of the functions $f(x)$ and $g(x)$. Write an equation for $g(x)$ as a transformation of $f(x)$.
 $g(x) = 2f(x)$

Lesson Practice A2.1.09

2. Is the statement always, sometimes, or never true?
The y -coordinate of a function remains the same when you scale the function vertically.

Always Sometimes Never

Explain your thinking.

3. The function $g(x)$ is a vertical stretch of the function $f(x)$ by a factor of 2. The equation is $g(x) = 2f(x)$. The function $h(x)$ is a vertical compression of the function $f(x)$ by a factor of $\frac{1}{2}$. The equation is $h(x) = \frac{1}{2}f(x)$. The function $k(x)$ is a vertical reflection of the function $f(x)$ across the x -axis. The equation is $k(x) = -f(x)$.

Spiral Review
Problems 9–10: Change one number in each equation so the outputs of the function are closer to the x -axis. **Response only.**
9. $g(x) = 3x + 12$ $h(x) = 3x + 18$
10. $g(x) = 3x + 12$ $h(x) = 3x + 18$

Challenge
1. Put a number next to a question you were stuck on and then figured it out.
2. Use this space to ask a question or share something you're proud of.

Lesson Practice Item Analysis

Problem(s)	DOK	Standard(s)
On-Lesson		
1–2	1	HSF.BF.B.3
3–6	2	HSF.BF.B.3
Test Practice		
7	2	HSF.BF.B.3
8	3	HSF.BF.B.3
Spiral Review		
Fluency	9–10	1 HSA.SSE.B.3 ★

Need More Practice?
Additional Practice resources coming soon.

Unit 1 Lesson 9 55–56 Lesson Practice

A **Lesson Practice Item Analysis** table breaks down the problems by type, Depth of Knowledge (DOK), and corresponding standards.

Synthesis

The Synthesis is an opportunity for students to put the key ideas from the lesson into their own words. There is typically an open-ended prompt followed by a discussion for students to consolidate and refine their ideas about the learning goals. If time allows, it is also an opportunity for students to revise their responses after the discussion.

Lesson Practice

Daily practice problems for each lesson are included both online and in the Student Edition, including Fluency, Test Practice, and Spiral Review.

Practice Days are always **print-based** and may involve **materials** like Problem Cards.

Unit 1 | Lessons 1–8

Practice Day 1

45 min

Purpose: Students practice the concepts, skills, and strategies developed in Lessons 1–8. Consider using this Practice Day as preparation for the upcoming Sub-Unit Quiz.

Preparation

Materials

Option 1: Stations

- Student Edition
- Task Cards, one per station

Option 2: Group Problems

- Student Edition
- Task Cards, one set per group

Accessibility: Affective Functioning Consider intentionally pairing students with different strengths (e.g., group work, organization, understanding of the task) to support collaboration.

Standards

Addressing

HSF.A.1.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $f(x)$, $f(x) + k$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

Also Addressing: HSF.A.1.1, HSF.B.5.5*

Mathematical Practices: MP1, MP3

Facilitation Options

Option 1: Stations

This structure promotes student opportunities to move around and supports students with extended time on a task into smaller, more manageable chunks.

Pair or Small Group

Distribute the task cards around the room. Consider creating a rotation schedule to prevent crowding.

Consider sharing that there are different ways to approach the task and invite students to discuss their solutions and to each record their own.

Other considerations:

- What/who will rotate?
- Encourage groups to rotate their stations.
- Rotate the task cards while.
- When will rotation occur?
- Set a specific amount of time.
- Invite groups to rotate as they finish.

SE Practice Day 1

Practice Day 1

Task A: Total Transformation

Task B: Point the Point

Practice Day 1 (continued)

Task C: Odd or Even?

Task D: Total Transformation

Task Cards (online)

Task A: Total Transformation

The Teacher Guide typically provides **two different approaches for facilitating** Practice Day activities.

Practice Day

Practice Days are included before each Sub-Unit Quiz and End-of-Unit Assessment. These lessons provide an opportunity for students to consolidate and apply their knowledge and skills from the preceding lessons. Practice Days often incorporate student movement and collaboration.

AmplifyDesmos Math

Unit 1 | Sub-Unit Quiz

Assess and Respond

Additional data on student thinking can be found in Teacher Reporting

Sub-Unit Quiz

Independent | 45 min

Facilitation: Assign the Sub-Unit Quiz to learn about your students' understanding of the concepts and skills so far in this unit. Text to speech is available in the digital version. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis

Problem(s)	Concept or Skill	Addressed in	DOK	Standard(s)
1a	Determine the domain, range, and key features from a graph	Lesson 2	1	HS.F.B.5 • HS.F.F.2
1b	Justify whether a function is linear			HS.F.B.5 • HS.F.F.2
2a	Determine output from a graph			
2b	Graph translate			
3	Recognize properties of functions			
4a	Describe transformations of functions			
4b	Write equations of functions			
5	Write equations of transformations			

Assessment Resources

Student Assessments

Assessment Rubrics with Answer Keys

Show What You Know and How

Differentiation (Sub-Unit Quiz)

Note: To strengthen and stretch students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	To respond to student thinking, consider:
Interpret functions using graphs and function notation. (Lessons 1-5)	1, 2	<div>Support</div> <ul style="list-style-type: none">Reviewing the Lesson 1 Summary and inviting students to color code the inputs and outputs on the graph and equation.Reviewing the Lesson 2 Summary and inviting students to summarize it in their own words.Reviewing Lesson 3, Activity 1 and creating an anchor chart for the key features of functions.Reviewing Algebra 1, Unit 4, Lesson 9 (Elevator Stories).Reviewing Algebra 1, Unit 4, Lesson 5 (Craft-a-Graph).
Describe translations or reflections that move one function onto another. (Lessons 4, 6-7)	4a, 5	<div>Support</div> <ul style="list-style-type: none">Reviewing the Lesson 6 and Lesson 7 Summaries and creating an anchor chart about the effect of each type of transformation on equations to refer to throughout the unit and course.Reviewing the Repeated Challenges in Lesson 6, Activity 3.Reviewing the Repeated Challenges in Lesson 7, Activity 3.
Write equations that represent translations and reflections of functions. (Lessons 6-7)	3, 4b	<div>Support</div> <ul style="list-style-type: none">Reviewing the Lesson 8 Summary and inviting students to draw multiple even and odd functions based on their definitions.Reviewing Lesson 8, Activity 3 and inviting students to highlight the symmetry they see in the graphs and tables.Selecting a few related practice problems from Lesson 8 and giving individualized feedback.

Unit 1

SSC

Assess and Respond

An **Item Analysis** is provided to show what concepts and skills are assessed in each problem.

A **Differentiation** table suggests specific materials from the unit to **Support**, **Strengthen**, or **Stretch** students' understanding based on their responses to different assessment problems.

Assess and Respond

Each unit typically includes one or two Sub-Unit Quizzes. Quizzes are designed for students to show what they know and can do based on what they have learned so far in the unit. Each unit includes Assess and Respond guidance for the Pre-Unit Check, Sub-Unit Quizzes, and End-of-Unit Assessment.

Navigating the digital program

Unit Landing Page

A

Home

Library

Bookmarks

Analytics

Calendar

Users

Settings

Amplify Desmos Math / ... / Unit 1: Constructions and Rigid Tr... / Geo.1 Unit Overview

Q Search

Geo.1 Unit Overview

Pre-Unit

Meet & Greet

Geo.1 Pre-Unit Check

Sub-Unit 1: Constructions

1. Circles and Segments

2. Compass Constructions

3. Constructing Digitally

4. Right in the Middle

5. Lines of Construction

6. Square Up

7. Community Constructions

Geo.1 Practice Day 1

1

Geo.1 Unit Overview

Students use a variety of tools to construct geometric figures. Students then extend what they learned about rigid transformations in Grade 8 by constructing the transformations precisely.

Let us know what you thought about this lesson by filling out [this survey](#).

Sub-Unit 1: Constructions (Lessons 1–7 + Practice Day + Quiz)

Use a variety of construction tools (e.g., compass, straightedge, and dynamic geometry software) to construct precise geometric figures.

Write and analyze descriptions of constructions.

Sub-Unit 2: Rigid Transformations (Lessons 8–13 + Practice Day)

Perform and describe a sequence of rigid transformations that moves a figure onto another.

Describe the relationships between an image and a pre-image when a figure is transformed.

Vocabulary

compass (optional), construction, equidistant, equilateral triangle, image, inscribe, line of reflection, midpoint, parallel lines, perpendicular bisector, perpendicular lines, pre-image, prime notion, regular polygon, straightedge (optional), Voronoi diagram

Standards

Addressing

MP1MP3MP4MP5MP6MP7MP8HSG.CO.AHSG.CO.A.1HSG.CO.A.2HSG.CO.A.4HSG.CO.A.5HSG.CO.D.12HSG.CO.D.13HSG.MG.A.2HSG.MG.A.3

PD Library

Standards and Routines

On the Unit Landing Page for each unit, you'll find Unit-at-a-Glance information, including sub-unit descriptions and learning goals, vocabulary found in the unit, and standards addressed in the unit (where applicable).

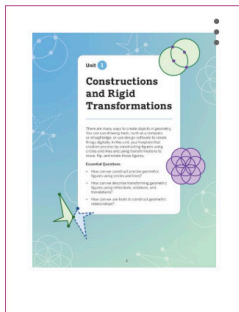
AmplifyDesmos Math

Paper Resources

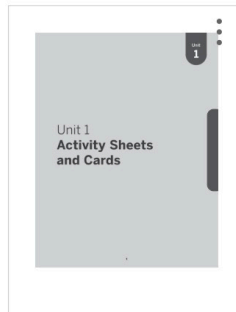
Unit Teacher Edition



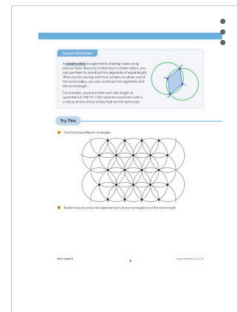
Unit Student Edition



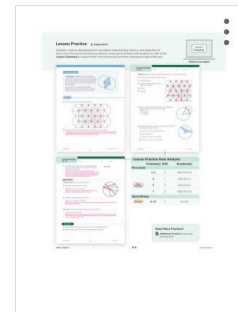
Unit Activity Sheets and Cards



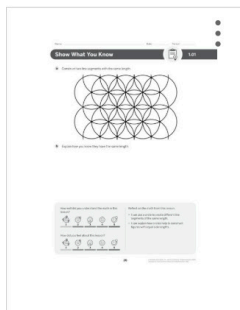
Unit Lesson Practice



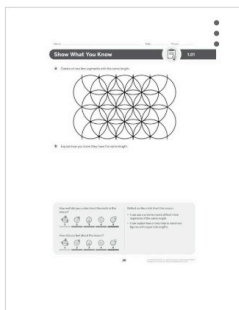
Unit Lesson Practice (Answers)



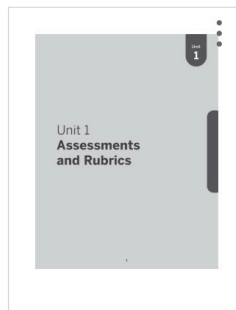
Unit Show What You Knows



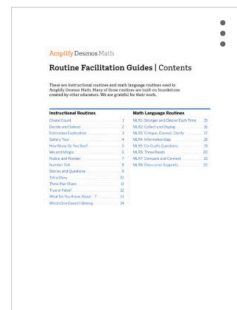
Unit Show What You Knows (Answers)



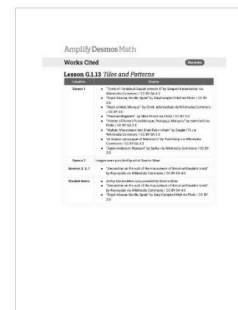
Unit Assessments and Rubrics



Routine Facilitation Guide



G.1 Works Cited



The Unit Landing Page also includes a variety of paper resources available for that unit. Those resources include:

- A printable PDF of the Teacher Edition and Student Edition pages for the entire unit (the Teacher Edition pages include assessment answer keys)
- Unit lesson practice, Show What You Know, and assessments
- Routine Facilitation Guides for the routines found in the unit
- Activity Sheets and Cards for lessons in the unit that call for additional resources not included in the Student Edition

A
Amplify Desmos Math / ... / Unit 1: Transformations of Functions / Lesson 1: Splashing Into Functions
Q Search

A2.1 Unit Overview

Meet & Greet

Pre-Unit

- A2.1 Pre-Unit Check

Sub-Unit 1: Analyzing Functions

- Splashing Into Functions**
- Flower Frames
- A Family Function
- Alphabet Soup

Sub-Unit 2: Translating and Reflecting Functions

- Transformation Station
- Shifting Gears
- Mirror, Mirror
- Symmetry Studio
- Practice Day 1

A2.1 Sub-Unit Quiz

Sub-Unit 3: Scaling Functions and Modeling

- Ferris Functions
- Coastin' Through Transformations
- B(ring) It On
- Mental Models
- Practice Day 2

End-Unit

- A2.1 End-of-Unit Assessment
- Unit Synthesis and Reflection

Resources

- A2.1 Lesson Practice
- A2.1 Digital Companions

Splashing Into Fun(ctions)

Lesson 1: Diving Deeper Into Function Stories

Students describe situations about swimming and diving, both verbally and graphically.

Let us know what you thought about this lesson by filling out [this survey](#).

This lesson uses **digital student screens**. Print Student Notes pages are also available.

Why digital? Teachers can use the dashboard's Teacher View to quickly access student sketches that connect to situations.

Instruction

Differentiation Beyond the Lesson

Today's Goals

- Sketch a graph of a function to match a situation.
- Justify whether a graph represents a function.
- Interpret graphs in context. (*Reading and Writing*)

Standards

Building On 8.F.A.1 8.F.B.5

Addressing MP1 MP4 MP6 HSF.IF.A.1 HSF.IF.A.2 HSF.IF.B.4 HSF.IF.C HSN.QA.2

Building Toward HSF.IF.A.1

B At a Glance

Lesson Practice C

Your Assignments

@ Assign ▼

Assign this activity to one of your classes or create a single session code

Screens

Preview

Warm-Up (5 min)		Activity 1 (15 min)			
1 Warm-Up Sketch or describe an activity you enjoy.	2 Tell a Story Remy dives for a local...	3 Diving Right In Height Above Water (m) Time (sec)	4 Anyiah's Sketch Anyiah sketched this graph on the previous screen.	5 Function or Fake? Here is the graph of $h(t)$.	
Activity 2 (15 min)					
6 Funky Functions Student graphs: a. Here are several different quantities from the	7 Swim It to Win It The Mighty Morays are	8 A Tale of Three Swimmers The functions $a(t)$, $b(t)$, Time (sec)	9 The Plot Thickens Distance From Start (m) Time (sec)	10 The Winning Swimmer The function $s(t)$	
Synthesis (5 min)		Show What You Know... (5 min)			
11 Explore More Create your own situation	12 Synthesis Here is a snapshot of	13 Show What You Know This graph represents Height Above Water (m) Time (sec)	14 Reflect on the math from this lesson.		

Paper Resources

Teacher Edition

Student Edition

Show What You Know

Show What You Know (Answers)

E

F

A Differentiation Beyond the Lesson

The Differentiation Beyond the Lesson tab provides guidance and differentiation resources after each lesson for students in three categories: Support, Strengthen, and Stretch.

B At a Glance

The At a Glance button will pull up a preview of the lesson Warm-Up, lesson activities, Synthesis, and Show What You Know. You'll find suggested timing for each part of the lesson, as well as guidance on whether students should work individually, in pairs, or with the whole class. The Focus and Coherence and Rigor and Balance information for the lesson is also found here.

C Practice Problems

Every Amplify Desmos Math lesson includes a digital Practice Problems set, which you and students can access via the Lesson Landing Page.

D Lesson prep

In the gray box on the Lesson Landing Page, you'll find the goals for that lesson, any materials needed for the lesson, vocabulary found in that lesson, and standards addressed in the lesson.

E Lesson Thumbnails

Teacher Presentation Screens enhance lessons and are for the teacher to project. Lessons where student devices are suggested have Student Activity Screens.

F Paper resources

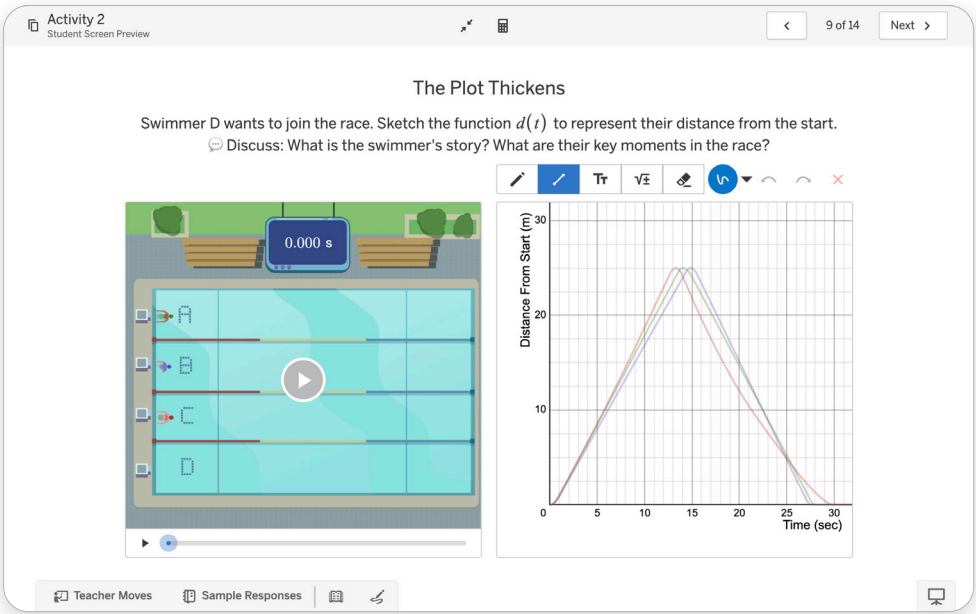
Paper resources for each lesson include print Teacher Edition pages, print Student Edition pages, and the lesson Show What You Know printable PDF.

Student Screens

Student Screens make the lesson highly interactive for students working on devices individually or in pairs or small groups. You can preview by clicking Activity Screens from the lesson landing page.

To make planning and teaching seamless, tips for instruction are available in both the print Teacher Edition and digitally at point of use. At the bottom of Activity Screens, the teacher will see suggestions for facilitation to support great classroom conversations:

- **Teacher moves:** Suggestions for pacing, facilitation moves, discussion questions, examples of early student thinking, and ideas for early finishers, as well as opportunities to build and develop the math community in your classroom.
- **Sample responses:** One or more examples of a possible student response to the problem.
- **Student supports:** Facilitation suggestions to support students with disabilities and multilingual students.



Assign

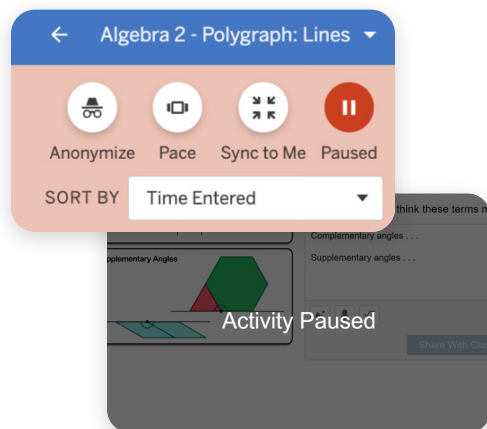
Getting your students started with a digital lesson is a breeze. To have your students try one of these program preview lessons, simply generate and share a single-session code by clicking the arrow next to @Assign. If you have individual classes set up, getting students online is even quicker!

Your Assignments

@ Assign

CLASS	STUDENTS ⓘ	SCHEDULED FOR	DUE ON
Grade 7	0 of 0	Jul 28, 2025 at 4:21 pm	-

Teach



Pause allows you to stop the lesson and gather student attention—whether for a brief announcement or a class discussion.

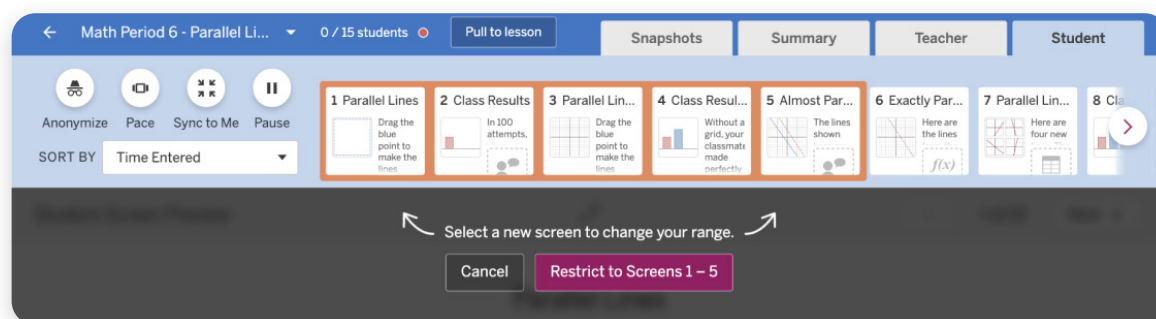
Keep an activity paused for as long (or as briefly) as you want. When you're ready for students to continue, press the Pause button again to resume the activity.

With Pause activated, students can see their current screen but cannot interact with the activity at all.

Pacing

Pacing allows you to lead students through part of an activity one screen or one section at a time. To activate, click the Pacing icon. Then select the screen (or screens) you'd like to gather your students on. They'll automatically go to that location in the activity, and the navigation outside of that range will temporarily be disabled.

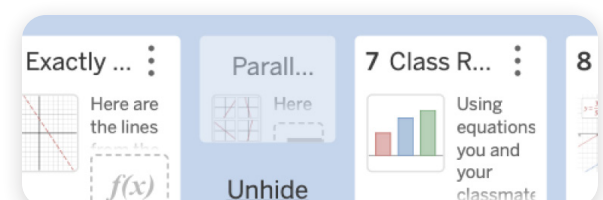
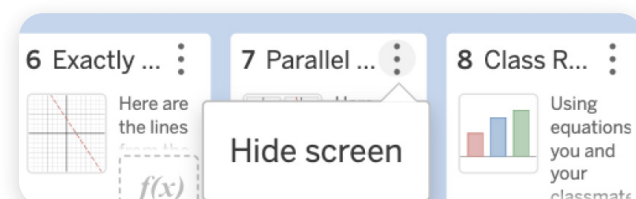
Once Pacing is activated, you'll see clear indicators for what screens your students may access. You can edit or extend that range, or even disable pacing, with a single click.



Hide screens

Are you running out of time in class? Or do you want to refine an activity to better suit your students' needs? You can hide screens from students by clicking the Menu (three vertical dots) on the screen's thumbnail. This allows for non-sequential teacher pacing.

Notice that the screens automatically renumber themselves when one is hidden. Change your mind? Simply click Unhide and students will be able to access the screen again.



Teacher supports and facilitation tools

Teacher Dashboard

The powerful Teacher Dashboard helps teachers play an active role as discussion facilitators, monitoring student work in real time, choosing moments to share and discuss, and synthesizing learning. Teachers get insight into student thinking in real time, meaning they can select student work to display and discuss quickly and easily, and ask better questions to guide more productive discussions.

To teach a lesson with students on devices, click the Dashboard link next to your single-session code or class name to launch your Teacher Dashboard with facilitation tools.

Activity Sessions				
CLASS		STUDENTS	DATE	
E5YPM2	New students can join until Jan 2, 2025	0	Jan 3, 2024 at 10:50 am	Dashboard
YMMVC5	New students can join until Jul 17, 2024	0	Nov 17, 2023 at 3:18 pm	Dashboard

The Teacher Dashboard has four tabs at the top. In addition to these views, the Teacher Dashboard also has facilitation tools, including the Class Conversation Toolkit and Written Feedback.

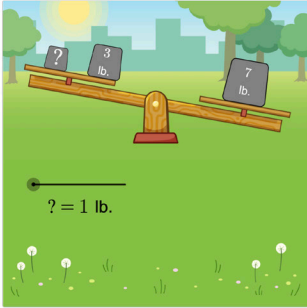
Weight for It [SAMPLE]9 students

SnapshotsSummaryTeacherStudent

1 Warm-Up...2 Weight...3 "d" is f...4 What...5 Equati...6 Weigh...7 Group...8 Squirrel...9 Class...10 Less...11 Cool...12

Student Screen Preview

Warm-Up



Here are some weights on a see-saw.

1. Drag the movable point to adjust one of the weights.

2. Discuss what you notice and wonder.

Teacher MovesSample ResponsesStudent Supports

Snapshots

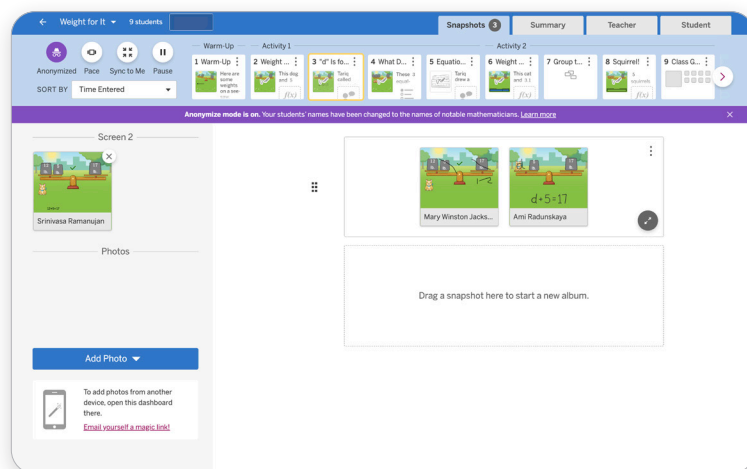
Peg Smith and Mary Kay Stein's *5 Practices for Orchestrating Productive Mathematics Discussions* offers a clear and useful framework for facilitating class discussions around student thinking. We added a Snapshot tool to make it even easier to select and sequence student work for those discussions. Try your hand at selecting and sequencing student work for discussion during your next Amplify Desmos Math lesson.

Snapshot student screens

To select a response for discussion, simply click the camera icon.



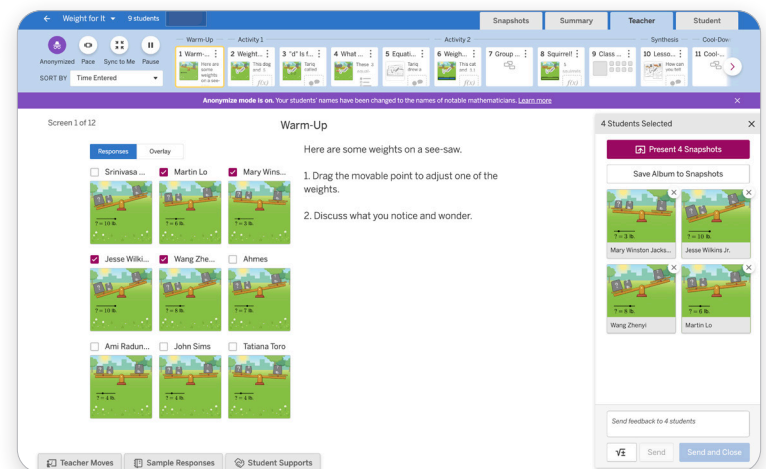
Then, in the Snapshots View, you can organize your snapshots into albums. Each album can hold up to four snapshots.



Present your albums to facilitate class discussions. Consider entering a title or question, or simply share your discussion prompt aloud! (**Note:** The teacher must present the album of snapshots to students in order for the album to show on student devices.)

Snapshot in Teacher View

To select a response for discussion in the Teacher View, click the response's checkbox to bring up the snapshots and the Feedback sidebar.



You can select up to four pieces of work and present them to students right from the Teacher View, or save them as an album in Snapshots.

Dashboard summary view

When you open a dashboard, you will first see the Summary View. Here you will see a row for each student in the activity session, along with a quick overview of where they are in the activity, a symbol to let you know more about their work on that screen, and a triangle indicator in the corner if you've sent the student feedback on that screen.

You can click on any of these boxes to see the current state of the student's screen. You might use a student screen as a jumping-off point for a class discussion and modify the screen together with the class. Any changes you make will not change the work for the student.

← Prob-bear-bilities 15 students

Snapshots 2

Summary

Teacher

Student

👤

 Anonymize

📺

 Pace

🔄

 Sync to Me

⏸

 Pause

— Warm-Up —

— Activity 1 —

— Activity 2 —

1 Warm-Up

2 What Is...

3 Probabi...

4 Prob-b...

5 Sample...

6 Prob-b...

7 How M...

8

SORT BY

Time Entered

Rishi	⋮	●	●	✓	●	●	●	●	
Victor	⋮	●	●	✓	●	●	●		✓
Juana	⋮	●	●	✓	●	●	●	●	✓
Deven	⋮	●	●	✓	●	●	●	●	✓
Remy	⋮	●	●	✓	●	●	●	●	✓
Yolanda	⋮	●	●	✓					
Anushka	⋮	●	●	✓	●		●	●	✓

Here is what the symbols on this page mean:

- Dash:** There is no required input for this screen, but students still need to look at it.
- ✓

Check: Everything on this screen is correct.
- ✗

Cross: Something on this screen is incorrect.
- ⚠

Warning: Something on this screen isn't merely incorrect but indicates the student may have misunderstood the question itself—intervene ASAP!
- **Dot:** This screen requires teacher interpretation.

You might also see a triangle indicator in the corner. Here's what they mean:

- Teal triangle:** You sent feedback to the student on that screen, but the student has not yet seen the feedback.
- Gray triangle:** You sent feedback to the student on that screen and the student has seen the feedback.

Teacher View

In the dashboard, you can use the Teacher View to answer questions like:

- How did all my students answer this question?
- What answers were most common?

If the screen has some components that can be correct or incorrect, you can check the Show Correctness checkbox in the upper-right corner of the screen. This will add icons to pieces of work showing if they're correct or incorrect.

You can also leave written feedback and create and present albums of snapshots from the Teacher View by selecting the student response checkboxes.

The screenshot shows the Teacher View interface for a probability activity titled "Prob-bear-bilities". The interface includes a top navigation bar with tabs for "Snapshots", "Summary", "Teacher", and "Student". Below the navigation bar are controls for "Anonymize", "Pace", "Sync to Me", and "Pause". A "SORT BY" dropdown is set to "Time Entered". The main content area displays a sequence of activity cards: "1 Warm-Up", "2 What Is...", "3 Probabi...", "4 Prob-b..." (highlighted), "5 Sample...", "6 Prob-b...", and "7 How M...". The "4 Prob-b..." card is selected, showing a probability problem: "1. Here is a randomizer. Press 'Spin' to get a random creature. 2. Drag the point to show how likely you think it is to get a bear on one spin." Below the problem, there are two columns of student responses. Each response card includes a checkbox for the student's name, a visual representation of the randomizer (a spinner with four colored sections: red, green, blue, and yellow), and a horizontal probability scale from 0 to 1. The scale is labeled with "Impossible", "Unlikely", "Equally likely as not", "Likely", and "Certain". The scale has a point marked at $\frac{1}{2}$. The students listed are Rishi, Victor, Juana, Deven, Remy, Yolanda, Deven, Remy, and Anushka. At the bottom, there are buttons for "Teacher Moves" and "Sample Responses".