glow

see math in a new light

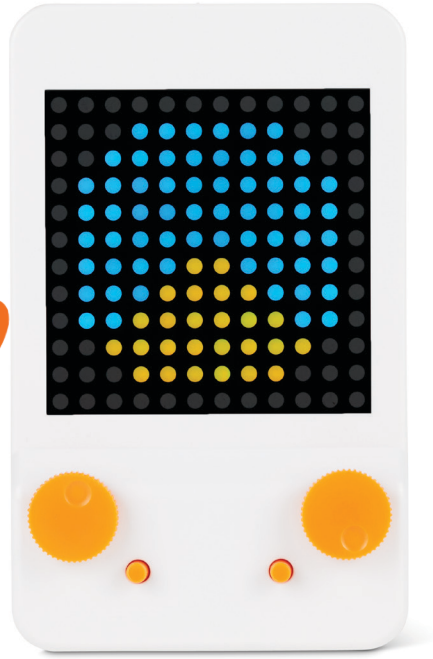
TEACHER GUIDE

OWLET® MATH TOOLS

BY BIRDBRAIN TECHNOLOGIES LLC®

MEET GLOW

Glow is part LED display, part etch-a-sketch, and all about making math make sense! Its friendly dials and buttons provide a way to illustrate operations, write math equations, and model fractions.



Glow supports K-5 math instruction, developing students' knowledge of addition, subtraction, multiplication, division, and fractions. Glow communicates to a range of apps, reflecting students' work in real-time.

OWLET MATH TOOLS

GLOW TEACHER GUIDE

This guide is designed to help teachers understand how to use Glow and how to integrate the tool in the classroom. You'll learn the basics of setup, as well as how to customize math problem sets to differentiate for students at all levels. When you're ready to introduce Glow in the classroom, you'll have this guide on hand to refer to sample introduction scripts, student prompts, and discussion questions.

Glow is an incredibly flexible tool with so many possibilities for instruction. Before you dive in, imagine how Glow might be used in your classroom. Will you use practice time with Glow as a time for one-on-ones with a few students who need support? Will you use Glow as a tool to introduce a new math standard or revisit a skill learned earlier in the year? No matter how you put Glow to use, we hope you see the breakthroughs in students' understanding that were witnessed in the classroom testing of this tool. Glow was designed for and with teachers, and we're thrilled that you'll be putting it to work.

OWLET® MATH TOOLS

TABLE OF CONTENTS

GLOW SETUP

APPS OVERVIEW

CLASSROOM INTEGRATION

OWLET MATH TOOLS

SETUP: CHARGING

When you turn Glow on or off, it will display the battery status.

Fully charged	
Mostly charged	
Charge Glow soon	
Charge Glow immediately	

Use a micro USB cable (included) to charge Glow.

You will see a small orange light by the plug when Glow is charging. The light turns green when finished.

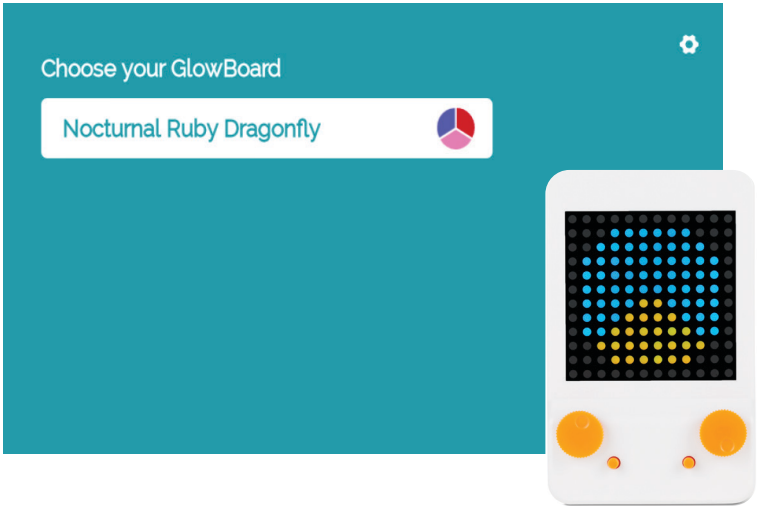
OWLET MATH TOOLS

SETUP: CONNECTING TO A DEVICE

Download an app. Start with GlowGrid.

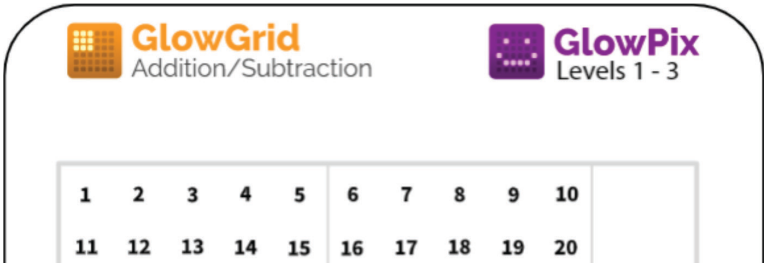
Scan to download apps >>

Press the black button on the side to turn on Glow. Open the app and select the name with the symbol that matches the one on Glow's LED array.



SETUP: ACCESSORIES

Glow includes five reusable sticker overlays to help students visualize number grids with the lights. The overlays are optional. When you're ready to use an overlay, peel it from its backing page and align it carefully to the LED board.



- Two overlays for Addition and Subtraction: both use a 1-120 number grid.
- Two overlays for Multiplication and Division: both use a 12 x 12 grid. The overlay with a blank interior is for Division with Remainders.
- Two overlays for GlowPix: a 1-120 number grid shared with Addition and Subtraction, and a 1-144 number grid for creating pictures.

SETUP: TROUBLESHOOTING

If you run into any issues during setup or while using Glow, please go to our Help Desk to browse FAQs. If you don't find what you're looking for, please don't hesitate to contact us.

Help Desk

support.birdbraintechnologies.com

Contact Us

birdbraintechnologies.com/about-us/contact-us

OWLET MATH TOOLS

APPS OVERVIEW

GLOWGRID

Model arithmetic operations with lights

- 5 categories: Addition, Subtraction, Multiplication, Division, Division with Remainders
- 4 activity modes: Explore, Make, Solve, and Find
- 5 levels of difficulty in Addition and Subtraction categories

GLOWPIX

Write math equations to create pictures

- 5 levels of difficulty

FRACTIONS

Turn dials to model fractions

- 3 categories: Foundations, Intro, Equivalence
- 4 activity modes in Intro: Explore, Make, Build, and Compare
- 2 levels of difficulty in Intro

OWLET MATH TOOLS

APPS OVERVIEW: CUSTOMIZE LEARNING

In each app you'll have options that change the level of difficulty. For example, with addition you can limit students to adding to 10 (Level 1) or adding to 120 with regrouping (Level 5). These options often align to a math standard for a specific grade level.

Changes to level of difficulty are device-specific, meaning you can adjust the difficulty on each tablet/computer to differentiate for pairs of students.

You'll find more app-specific information later in this guide:

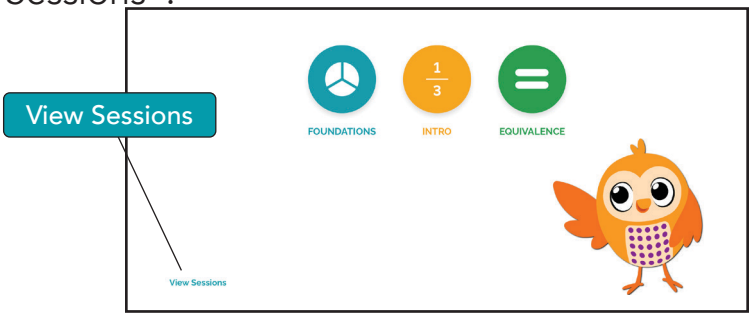
GlowGrid Levels - page 19

GlowPix Levels - page 38

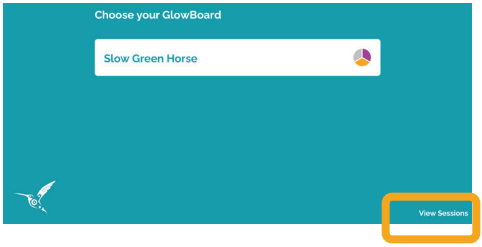
Fractions Levels - page 66

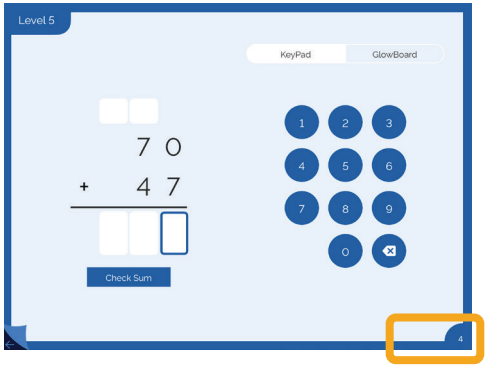
APPS OVERVIEW: TRACKING STUDENT WORK

The app automatically saves a summary of student work within a session. When a work period ends, teachers can check student work by clicking “View Sessions”.



The “View Sessions” option can also be accessed during a work period via the number at the bottom right corner or from the app’s homescreen while disconnected from Glow.



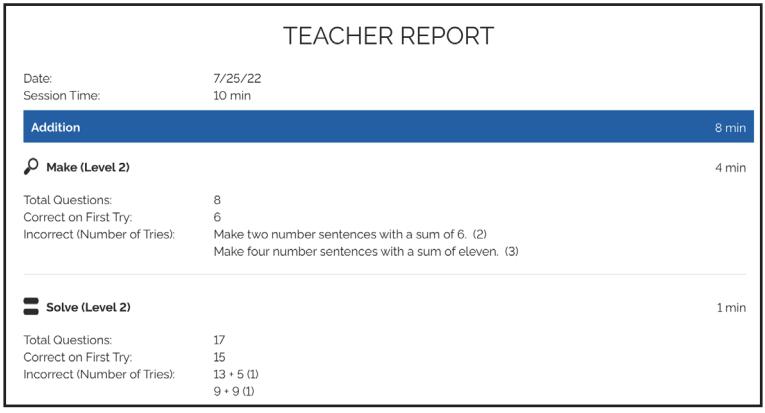


OWLET MATH TOOLS

APPS OVERVIEW: TRACKING STUDENT WORK

The summary of students' work in each session includes how many problems they completed and how long they spent in each section. It also records how many incorrect attempts were made for each problem, and which problems were missed. Easily document student progress using one of our **free Student Performance Trackers (two versions)!**

NOTE:
Find these printables on our website!



TEACHER REPORT

Date:	7/25/22
Session Time:	10 min

Addition — 8 min

Make (Level 2) — 4 min

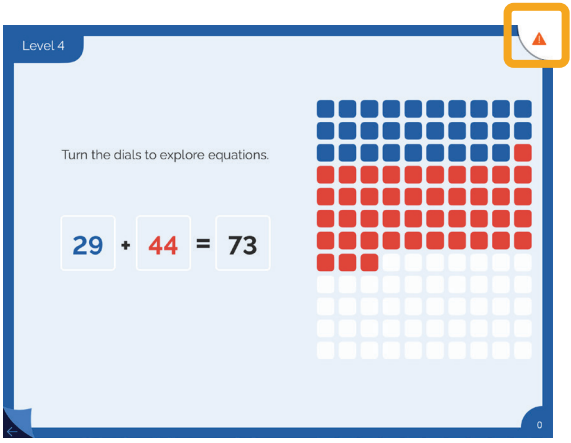
Total Questions:	8
Correct on First Try:	6
Incorrect (Number of Tries):	Make two number sentences with a sum of 6. (2) Make four number sentences with a sum of eleven. (3)

Solve (Level 2) — 1 min

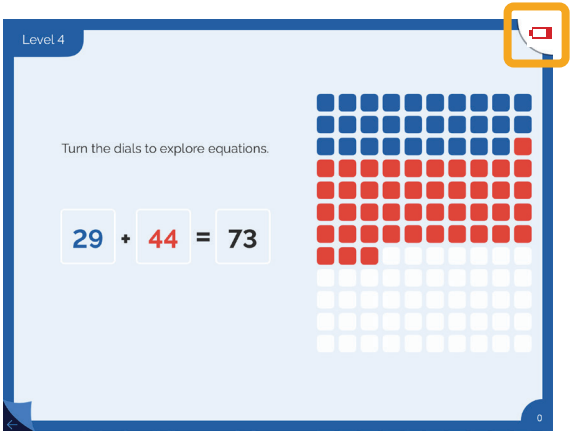
Total Questions:	17
Correct on First Try:	15
Incorrect (Number of Tries):	13 + 5 (1) 9 + 9 (1)

APPS OVERVIEW: ALERTS

If Glow becomes disconnected from the tablet, the app will show an alert. Click on the alert to bring up the 'scan for device' screen and reconnect.



A low battery alert will appear when Glow should be charged immediately.



OWLET MATH TOOLS

GLOWGRID

GLOWGRID: APP OVERVIEW

GlowGrid is one of 3 apps for Glow. Students turn the dials to model arithmetic operations with the colored lights. The GlowGrid app communicates in real-time, reflecting students' work, and the app will save students' work and generate teacher reports.

Scan to download apps >>

The GlowGrid app has 5 categories:

Addition, **Subtraction**, **Multiplication**, **Division**, and **Division with Remainders**.

OWLET MATH TOOLS

GLOWGRID: APP OVERVIEW

Each operation has four different activity modes:

Explore: Turn dials to see how the equation changes in the app

Make: Make a target number

Available only for Addition Levels 1-2, Subtraction Levels 1-2, and Multiplication

Solve: Solve arithmetic problems

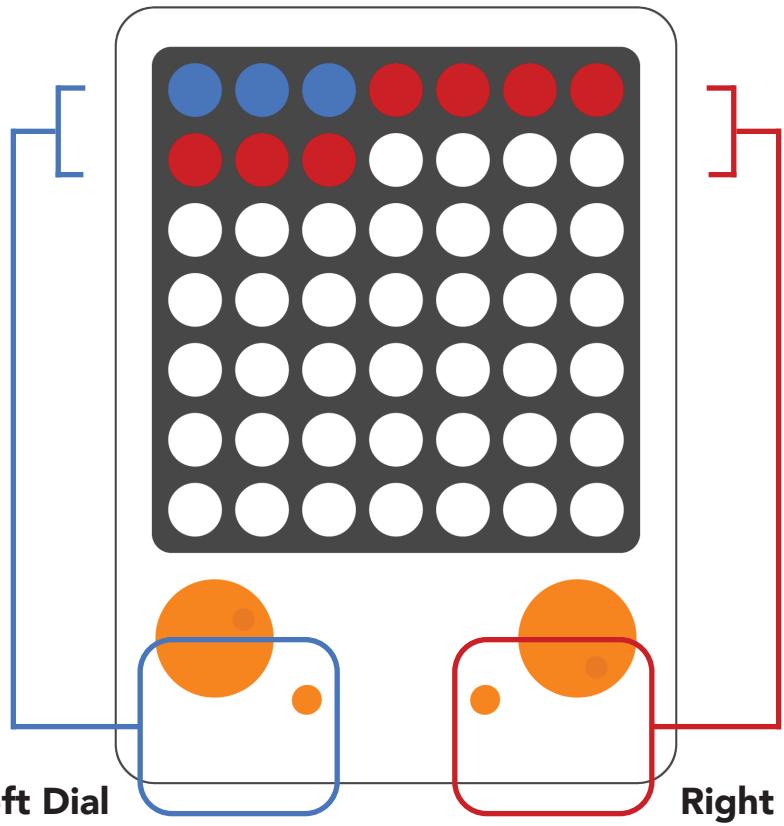
Find: Solve missing number problems

Make, **Solve**, and **Find** randomly generate problems for students, while **Explore** is open-ended. Because problems are randomly generated, pairs of students will be given different problems.

GLOWGRID: HOW IT WORKS

NOTE:
Find these printables on our website!

ADDITION

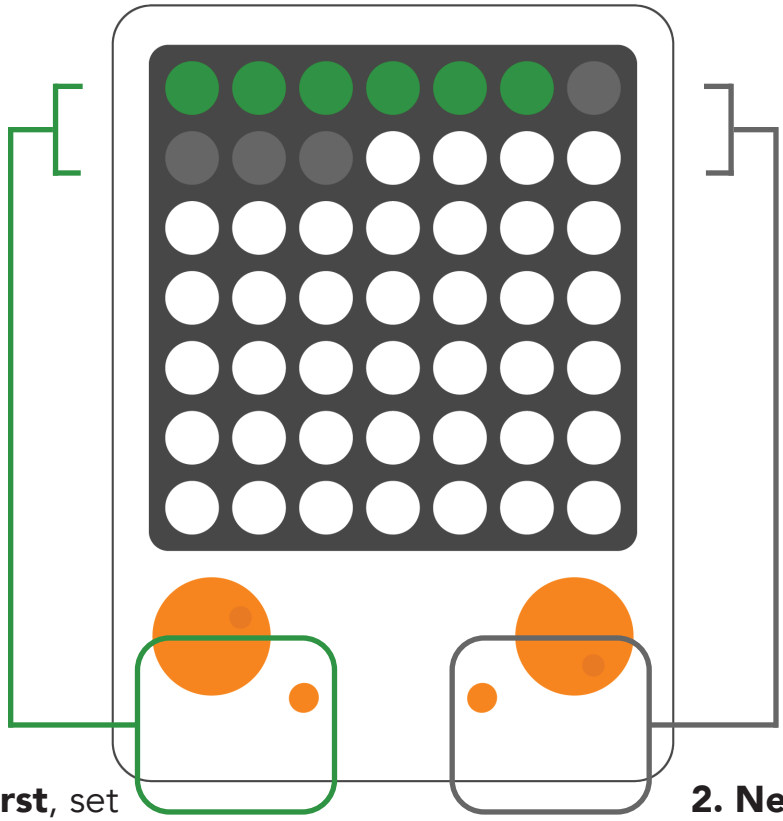


Left Dial
sets the number of blue lights.

Hold **Button** while turning dial to move by 10.

Right Dial
sets the number of red lights.

SUBTRACTION

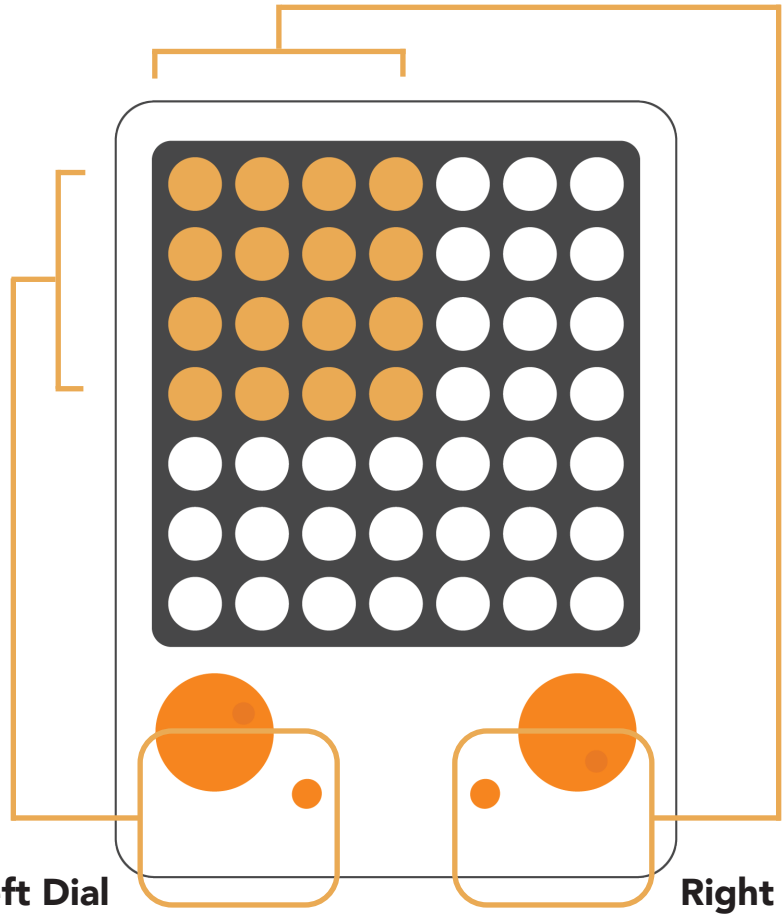


1. First, set the total number of lights with the **Left Dial**.

Hold **Button** while turning dial to move by 10.

2. Next, subtract lights from the total with the **Right Dial**.

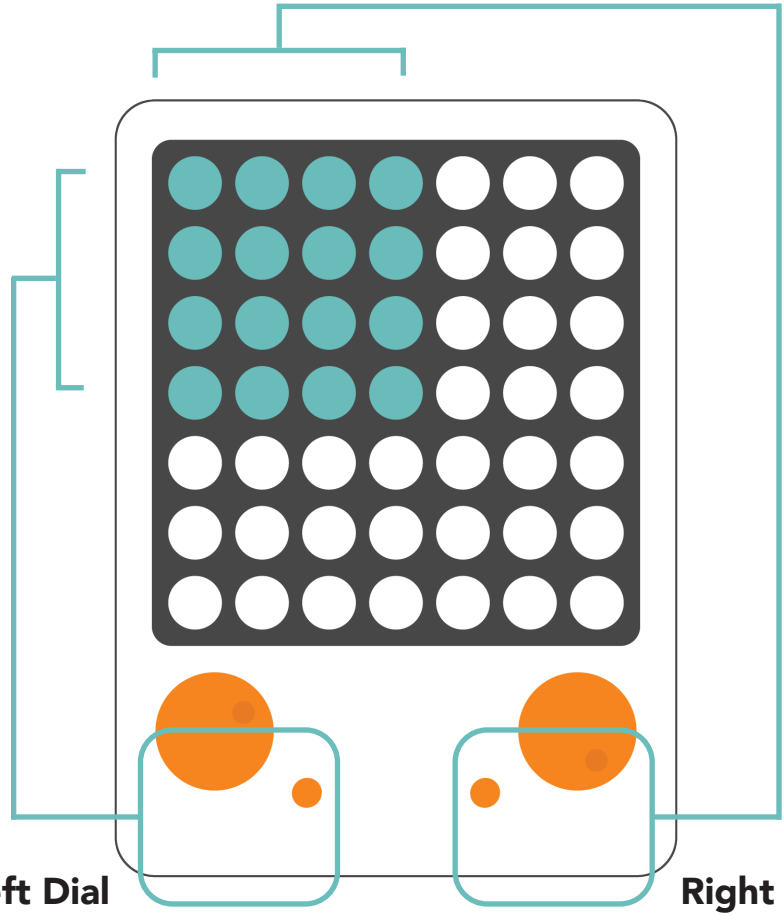
MULTIPLICATION



Left Dial sets the number of rows.

Right Dial sets the number of lights in each row.

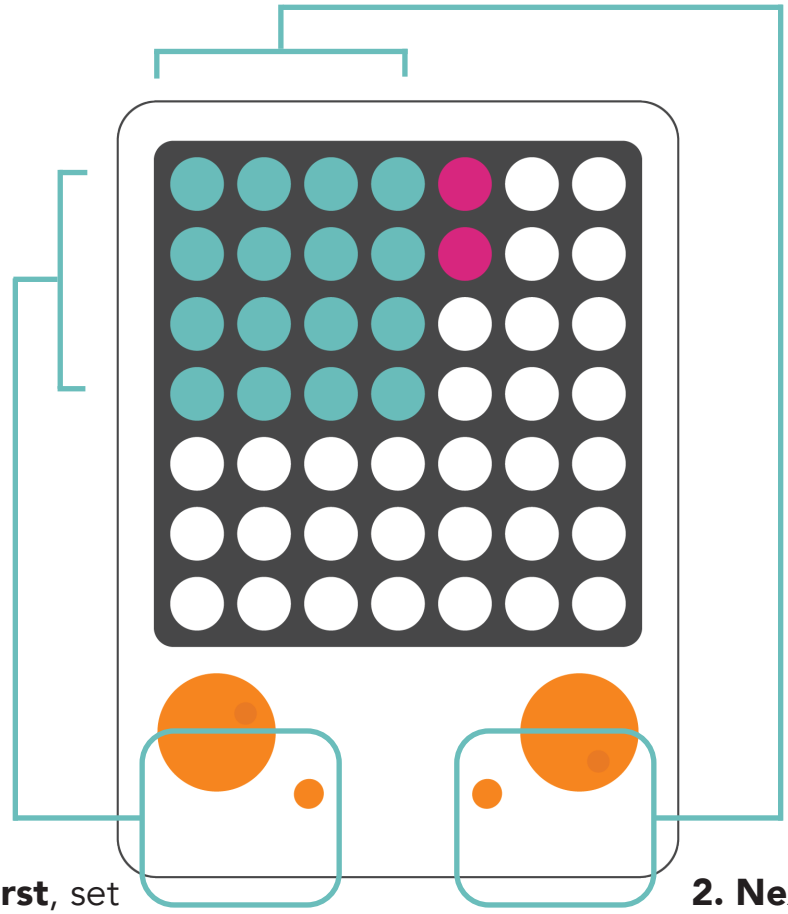
DIVISION



Left Dial
sets the number of rows.

Right Dial
sets the number of lights in each row.

DIVISION WITH REMAINDERS



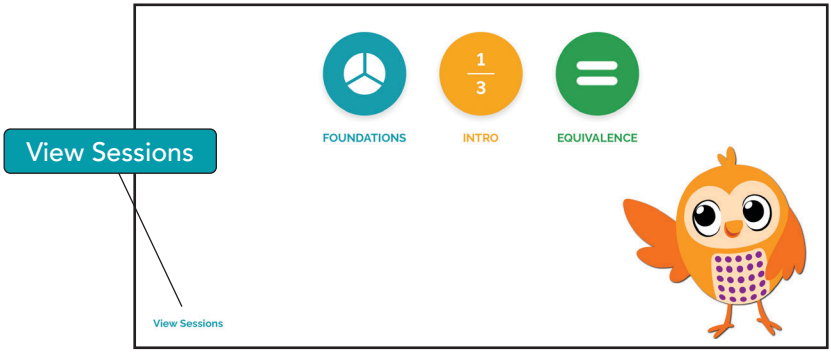
1. First, set the divisor with the **Left Dial**.

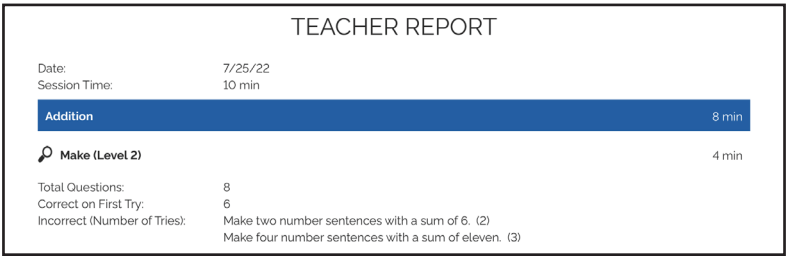
2. Next, set the dividend, the total number of lights, with the **Right Dial**.

GLOWGRID: HOW IT WORKS

Tracking Student Work

GlowGrid automatically saves a summary of student work within a session. When a work period ends click “View Sessions”. The summary includes how many problems students completed and how long they spent in each section. It also records how many incorrect attempts were made for each problem, and which problems were missed.





TEACHER REPORT

Date:	7/25/22
Session Time:	10 min

Addition 8 min

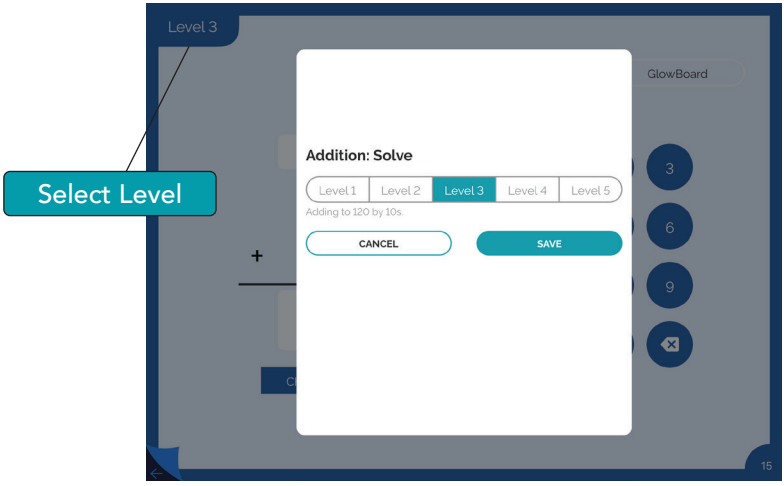
Make (Level 2) 4 min

Total Questions:	8
Correct on First Try:	6
Incorrect (Number of Tries):	Make two number sentences with a sum of 6. (2) Make four number sentences with a sum of eleven. (3)

Levels

Once in a category (such as Solve), click **Level** in the top left corner to specify the difficulty of math problems. This is device-specific, meaning it's a choice made on each tablet/computer which allows for differentiation among pairs of students.

The image below shows the Addition levels within Solve Mode. Browse the other operations and modes to find the best fit for your and math standards.

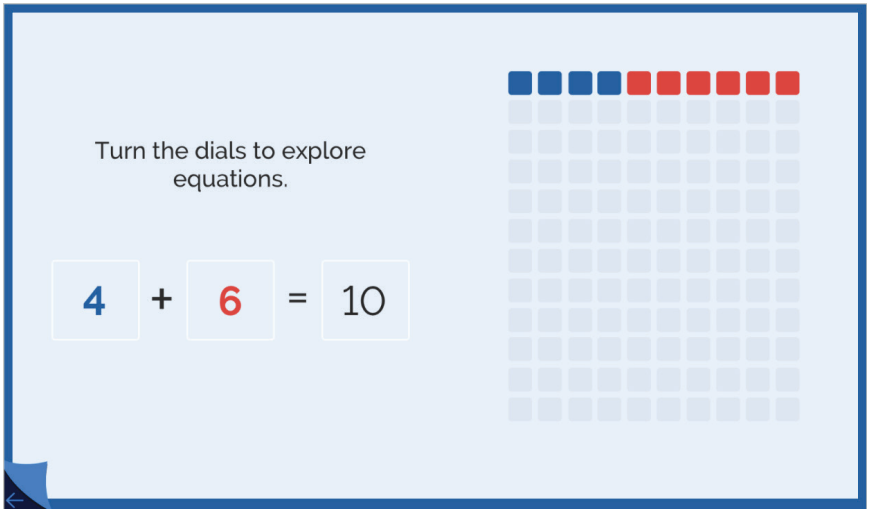


EXPLORE

Choose your operation. 

Tap the compass symbol  for Explore mode.

Turn the dials and see what happens on the LED board. Keep turning and see how the equation changes in the app.



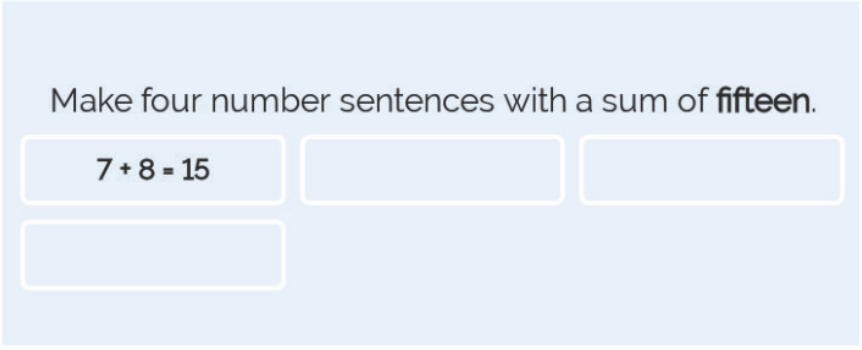
GLOWGRID: ACTIVITY MODES

MAKE

Choose your operation. 

Tap the magnifying glass symbol  for Make mode.

Turn the dials to make the target number. Tap the Check button. If you are correct, you will see the equation show up in one of the boxes. Your goal is to find different combinations to fill up all of the boxes.



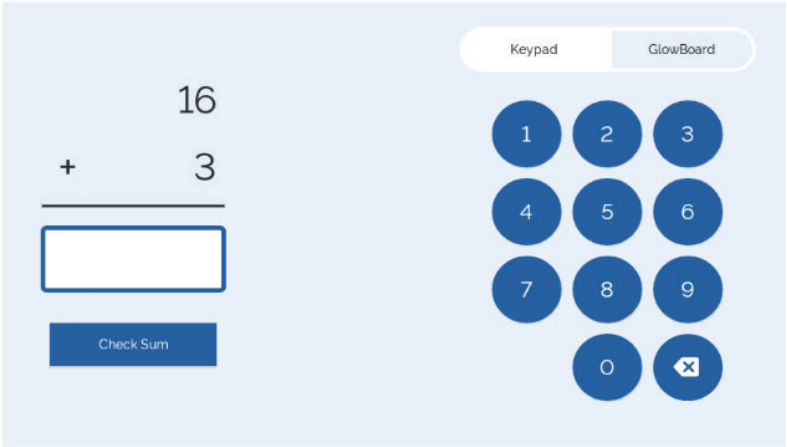
OWLET MATH TOOLS

SOLVE

Choose your operation. 

Tap the equals symbol  for Solve mode.

Turn the dials to model the problem shown in the app.. Enter an answer with the number buttons, then tap the Check button. If you are correct, you will see a "That's Correct!" message.

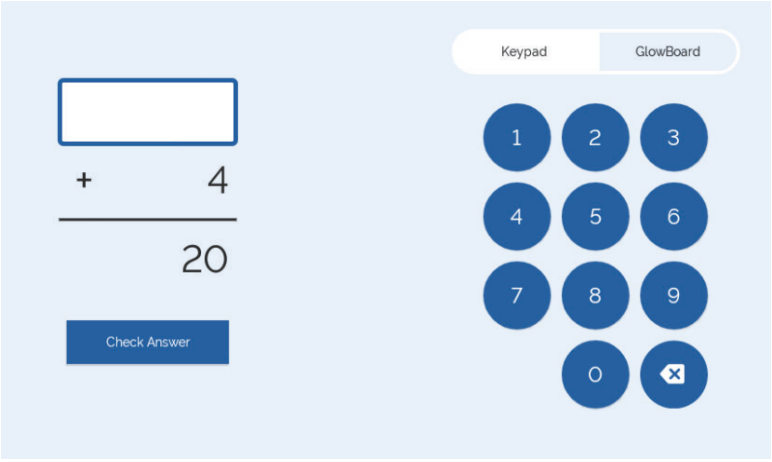


FIND

Choose your operation. 

Tap the question mark ? for Find mode.

Turn the dials to model the problem shown in the app. Enter an answer with the number buttons, then tap the Check button. If you are correct, you will see a "That's Correct!" message.



EXPLORE ACTIVITY MODE

Learning Goal: Students will understand how to use the Explore activity mode

Key Terms: dials, equation

Time: 5-20 min

Today we will be exploring (addition/subtraction/ multiplication/division). In the GlowGrid app, tap the symbol for this operation. Then tap the compass symbol for Explore mode.

Give it a try! What do you notice about the **equation** in the app as you turn the **dials**? *You may want to refer to the printable dial card as you demonstrate.*

Who can make an equation where the answer is _____? Let's make 3 equations as a class where the answer is _____.

MAKE ACTIVITY MODE

Learning Goal: Students will understand how to use the Make activity mode

Key Terms: target number, dials, equation

Time: 5-20 min

Open with a number talk: How can you (add /subtract/multiply/divide) two numbers to get the number ___? *Highlight that there are different solutions.*

Today you will be doing similar problems with Glow. In the GlowGrid app, tap the symbol for ___. Then tap the magnifying glass symbol for Make.

The app will show you a **target number** and ask you to make it different ways.

MAKE ACTIVITY MODE

In this case, the target number is ____ and I need to make it ____ ways. First, I need to turn the **dials** to find a combination of lights to make my target number ____.

Each time you have a combination of lights that makes your target number, check it by tapping the "Check" button. If you are correct, you will see the **equation** show up in one of the boxes. Your goal is to find different combinations to fill up all the boxes.

SOLVE ACTIVITY MODE

Learning Goal: Students will understand how to use the Solve activity mode

Key Terms: dials, number buttons

Time: 5-20 min

Today you will be solving (addition/subtraction/multiplication/division) problems with Glow. Open the app and tap the symbol for that operation. Then tap the equals sign for the Solve activity mode.

The app will show you a problem, like _____. *Turn the **dials** to model this problem. Talk through strategies on how to solve the problem.* Now that we think we have the answer, I'll use the **number buttons** in the app to enter our answer and tap the Check/Sum/Difference/Product/Quotient button. You will see a "That's Correct!" message when you've solved it correctly.

? FIND ACTIVITY MODE

Learning Goal: Students will understand how to use the Find activity mode

Key Terms: missing number problems

Time: 5-20 min

Today you are going to use Glow to come up with a strategy for solving **missing number problems**. Tap the addition/subtraction/multiplication/division sign. Then tap the question mark for the Find activity mode.

The app will show you a problem, like ____, and you'll work with a partner to find the missing number. How do you think we can use Glow to do this? Give it a try with your partner. You will see a "That's Correct!" message when you've solved correctly. *After exploring in pairs, ask students to share strategies aloud.*

GLOWGRID: PROMPTS

EXPLORE ACTIVITY MODE

1. **The maker and the guesser**: The maker turns the dials to make an equation in the app. The guesser guesses the equation by looking at the LED board. Then swap!

2. **The writer and the modeler**: The writer writes an equation on paper or a small whiteboard, then the modeler turns the dials to create that equation with Glow. Then swap!

3. **The writer and the modeler**: The writer writes a word problem on paper or a small whiteboard, then the modeler turns the dials to create an equation with Glow that solves the word problem. Then swap!

EXPLORE ACTIVITY MODE

4. **Roll a number**: Roll two dice and add the values to get a number between 4 and 5.
   - Addition/Subtraction: How many ways can you make that number with Glow? Record your equations on paper.
   - Multiplication: Record all the multiples of that number.
   - Division: Record all the equations with that number as the divisor.
5. **The writer and the modeler**: The writer creates a number riddle. Then the modeler turns the dials to find a number that solves the riddle. Then swap! Two examples:
   - When 7 is added to me, you will get 15. What number am I?
   - When you subtract 6 from me, you will get 12. What number am I?

GLOWGRID: PROMPTS

MAKE ACTIVITY MODE

Race to solve: Work with a partner to find out how many problems you can solve in one minute. One student will be the timer, and one student will be the player. The player should solve as many problems as they can in one minute. The timer should keep track of the time and how many problems are solved. Switch roles and see who can solve more problems!

NOTE:
Prepare for this activity by distributing timers to students.

GLOWGRID: DISCUSSION QUESTIONS

ADDITION AND SUBTRACTION

- How many different ways can you make __?
- Can you think of a number that you can't make with the Glow?
- How can you (add/subtract) more than two numbers to get the number ___?
- How can you use a different arithmetic operation to get the number ___?
- Have each pair of students pick two (even/odd) numbers and (add/subtract) them. Have the class share their equations. What do you notice about all the (sums/differences)?
    - Extension: What happens with one odd and one even?
- Lead students in a discussion of their strategies for solving missing number problems.

GLOWGRID: DISCUSSION QUESTIONS

MULTIPLICATION AND DIVISION

- What do 4, 9, and 16 have in common?
- How many different ways can you make __?
- Can you think of a number that you can't make with Glow?
- Give the students word problems to solve with Explore.
- Lead students in a discussion of their strategies for solving missing number problems.

DIVISION WITH REMAINDERS

- What is the largest remainder you can get if the divisor is __?
- Is __ a factor of __?
- What strategies can we use to find all the factors of ___?

TIPS FOR ALL MODES AND LEVELS

- Use Explore to incorporate word problems from your curriculum.

- Students can write down some of the problems that they solve to reinforce their learning. Students can also write a number story to go with their number sentence.

- Leave time at the end of class for students to share their work and their strategies.

- Emphasize that students can use Glow to skip count.

- In Levels 3-5 of Addition and Subtraction, students can count by tens for rows that are entirely one color and then count by ones for partial rows.

- In Multiplication and Division, students can set the number of rows and then count by that number as they add columns.

NOTES

GLOWPIX

GLOWPIX: APP OVERVIEW

GlowPix is one of 3 apps for Glow. Students write math equations in the GlowPix app to create pictures on Glow's LED array. Each correct equation lights up one light. The GlowPix app communicates in real-time, reflecting students' work.

Scan to download apps >>

OWLET MATH TOOLS

GLOWPIX: APP OVERVIEW

GlowPix has five levels to support students across grades K-5.

Level 1: Add and subtract 1 and 10 to move from one number to another

Level 2: Add and subtract to move from one number to another

Level 3: Add and subtract to select numbers from 1-120

Level 4: Use all four operations to select numbers from 1-144

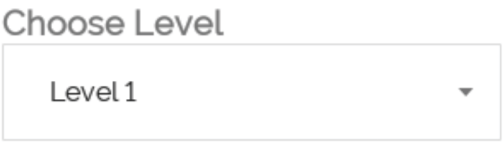
Level 5: Use parentheses to create more complex equations

GLOWPIX: HOW IT WORKS

Open the GlowPix app.

Tap **NEW PICTURE**

Choose your level.

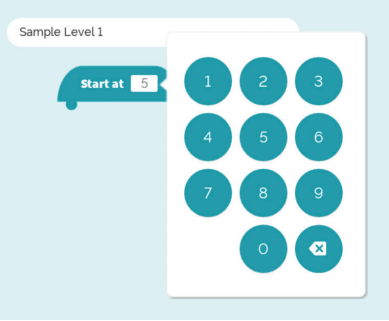


Tap **CREATE**

Give your picture a name.

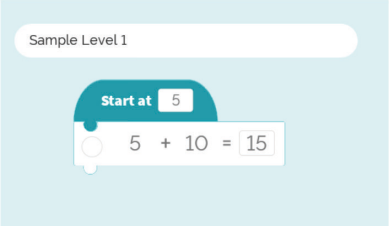
GLOWPIX: HOW IT WORKS

1. Tap the white boxes to enter numbers.



2. Drag a block from the left bar and connect it to the start block.

3. Answer a problem correctly to light up a number on Glow.

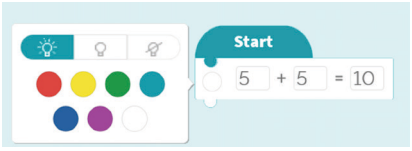


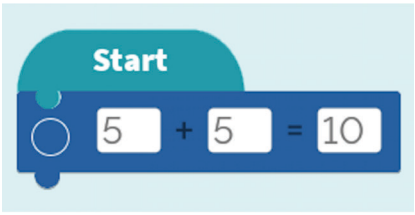
4. Keep adding blocks to create a picture!

GLOWPIX: HOW IT WORKS

Changing Colors

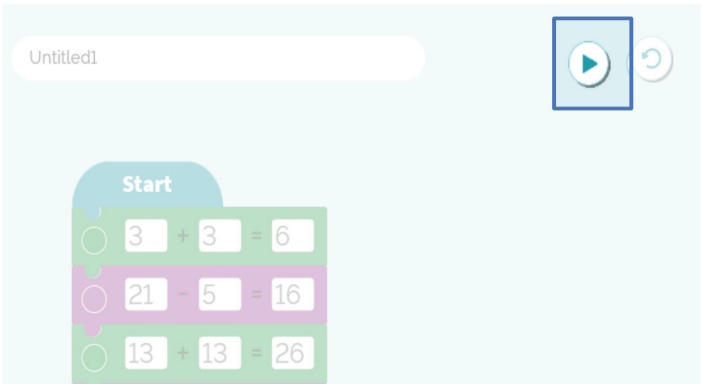
Once a problem is correct, you can change the color of the light. Tap the white circle on the left side of the block. Choose a color and a brightness level. When you pick a color, the block and the light will turn that color.





Animating

Press the play button to see your picture light up one light at a time.

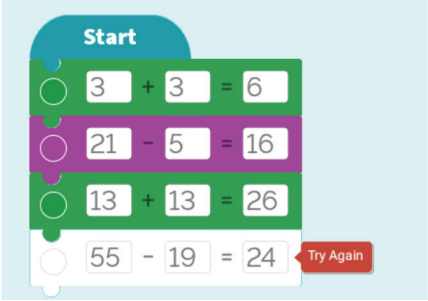


OWLET MATH TOOLS

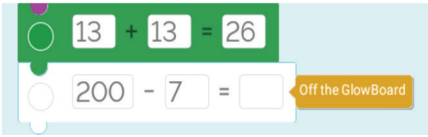
GLOWPIX: HOW IT WORKS

Errors

If your answer is incorrect you will see a red "Try Again" message.

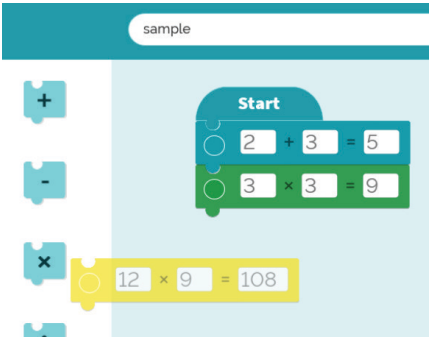


If the answer is not a number on the LED Board (1-144), you will see a yellow "Off the GlowBoard" message.



Deleting a Block

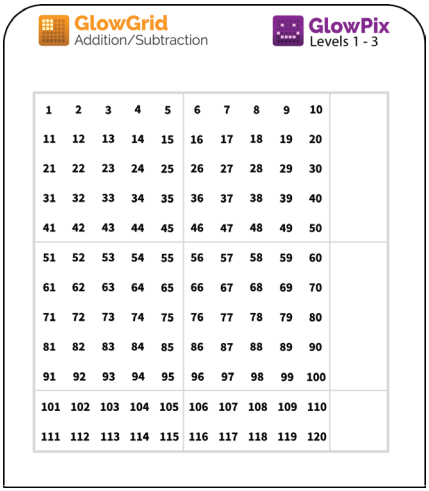
To delete a block, drag it back to the menu on the left.



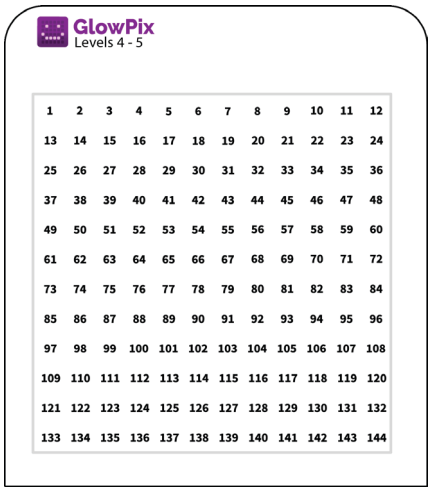
GLOWPIX: HOW IT WORKS

Overlays

Overlay stickers are included to help students identify which numbers they need to create their picture. When you're ready to use an overlay, peel it from its backing page and align it carefully to the LED board.



Levels 1, 2, & 3



Levels 4 & 5

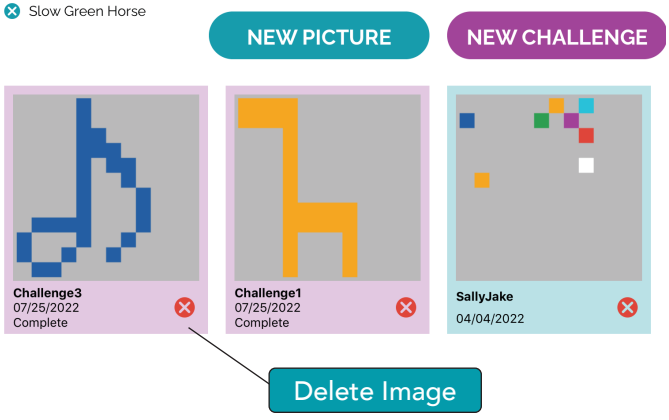
GLOWPIX: HOW IT WORKS

New Picture vs Challenge

Selecting New Picture allows students to solve for math problems that will create an LED image of their own design. Selecting Challenge allows students to solve problems for a surprise image! They'll discover the design as they solve.

Viewing/Deleting Student Work

On the homescreen click an image to open up the students' work and see the math behind the picture. Pictures/Challenges can be deleted by clicking the red X.



GLOWPIX: SAMPLE CLASSROOM INTRO

LEVEL 1

Learning Goal: Students will understand how to use GlowPix Level 1

Key Terms: equation

Time: 5-20 min

Today we will be working with the GlowPix app, where you can write math **equations** to make pictures with Glow. Open the GlowPix app. Tap "New Picture" and choose Level 1 in the drop-down menu. Then tap "Start Creating."

Give your picture a name. *You may want to have students add their names or initials to the file name so they can identify it later.*

Tap the white box to choose where to start. For now, let's all start at 5. Once you choose a number, you will see that number light up on Glow.

LEVEL 1

Next, let's all drag in a +10 block. You just drag the block from the bar on the left and connect it to your start block. You will see a white "ghost block" when it is close enough to snap into place.

Now we have a math problem to answer. What is 5 + 10? We tap the white box to enter the answer. When the problem is correct, you will see the answer light up on Glow.

Now you can add more blocks to make a picture. Choose a new block to add and drag it out. What other numbers can you reach from 15?

If you want to change the color of the light, tap the small circle to the left of the equation and pick the color you want.

GLOWPIX: SAMPLE CLASSROOM INTRO

LEVEL 2

Learning Goal: Students will understand how to use GlowPix Level 2

Key Terms: equation

Time: 5-20 min

Today we will be working with the GlowPix app, where you can write math **equations** to make pictures with Glow. Open the GlowPix app. Tap "New Picture" and choose Level 2 in the drop-down menu. Then tap "Start Creating."

Give your picture a name. *You may want to have students add their names or initials to the file name so they can identify it later.* Tap the white box to choose where to start. For now, let's all start at 9. Once you choose a number, you will see that number light up on Glow.

Next, let's all drag in an addition block from the bar on the left and connect it to your start block.

LEVEL 2

You will see a white "ghost block" when it is close enough to snap into place. Our new block has two white boxes where we need to add numbers. Let's choose the number we're going to add to 9. I'm going to choose 7. Now I see 9 + 7. What is 9 + 7? Let's tap the white box to enter the answer. When the problem is correct, you will see the answer light up on Glow.

Let's add more blocks to make a picture. Drag out a new block. **The first number in your equation will be the answer to the previous problem**, and then you will choose the second number.

Try it! What do you notice? How is Level 2 different from Level 1? Remember, if you want to change the color of the light, tap the small circle beside the equation and pick the color you want.

GLOWPIX: SAMPLE CLASSROOM INTRO

LEVEL 3

Learning Goal: Students will understand how to use GlowPix Level 3

Key Terms: equation, minuend, subtrahend

Time: 5-20 min

Today we will be working with the GlowPix app, where you can write math **equations** to make pictures with Glow. Open the GlowPix app. Tap "New Picture" and choose Level 3 in the drop-down menu. Tap "Start Creating."

Give your picture a name. *You may want to have students add their names or initials to the file name so they can identify it later.*

On the screen, you will see your start block. Let's start by dragging in a subtraction block from the bar on the left. Connect it to your start block.

LEVEL 3

The new block enables us to create a subtraction equation. We tap the white boxes to put in numbers. First, let's choose the **minuend**, the number we are subtracting from. I am choosing 20. Next, we can choose the **subtrahend**, the number that we are subtracting. I am choosing 13. Now I have 20 -13. What is 20 - 13? Let's enter the answer.

Now you can add more blocks to make a picture. What do you think this block with two plus signs is for? Try it out! What do you notice? How is Level 3 different from Level 2?

Suppose that you want to light up number 38. What are some different ways you could do that? *Point out that there are a lot of equations that can be used to light up a number.*

Remember, if you want to change the color of the light, tap the small circle beside the equation and pick the color you want.

GLOWPIX: SAMPLE CLASSROOM INTRO

LEVEL 4

Learning Goal: Students will understand how to use GlowPix Level 4

Key Terms: equation

Time: 5-20 min

Today we will be working with the GlowPix app, where you can write math **equations** to make pictures with Glow. Open the GlowPix app. Tap "New Picture" and choose Level 4 in the drop-down menu. Tap "Start Creating."

Give your picture a name. *You may want to have students add their names or initials to the file name so they can identify it later.*

On the screen, you will see your start block and four operator blocks on the left. Start by dragging in a multiplication block and connect it to your start block.

LEVEL 4

Our new block enables us to create a multiplication equation. Tap the white boxes to put in two numbers to multiply together. I am choosing 4 and 5. Now I have 4 x 5. What is 4 x 5? Let's enter the answer.

Now you can add more blocks to make a picture. Try it out! What do you notice? How is Level 4 different from Level 3?

Suppose that you want to light up number 36. What are some different ways that you could do that?

Point out that there are a lot of equations that can be used to light up a number.

Remember, if you want to change the color of the light, tap the small circle beside the equation and pick the color you want.

GLOWPIX: SAMPLE CLASSROOM INTRO

LEVEL 5

Learning Goal: Students will understand how to use GlowPix Level 5

Key Terms: equation

Time: 5-20 min

Today we will be working with the GlowPix app, where you can write math **equations** to make pictures with Glow. Open the GlowPix app. Tap "New Picture" and choose Level 5 in the drop-down menu. Tap "Start Creating."

Give your picture a name. *You may want to have students add their names or initials to the file name so they can identify it later.*

On the screen, you will see the start block and a block with an equals sign that says "Add an operator." There are four operator blocks on the left.

LEVEL 5

Drag a multiplication block into the equal block. You will see a pair of parentheses and the multiplication sign appear. You can also drag operator blocks into one another. Drag an addition block into your multiplication block. Now you'll see a second set of parentheses!

Now we have an equation that will add two numbers and then multiply them by a third. I am going to add 6 and 7 and then multiply by 2. Now I have 2 x (6 + 7). What is that? Enter the answer.

Now you can add more blocks to make a picture. To make each equation, first drag in an equals block and connect it to your list. Then add operator blocks. Try it out!

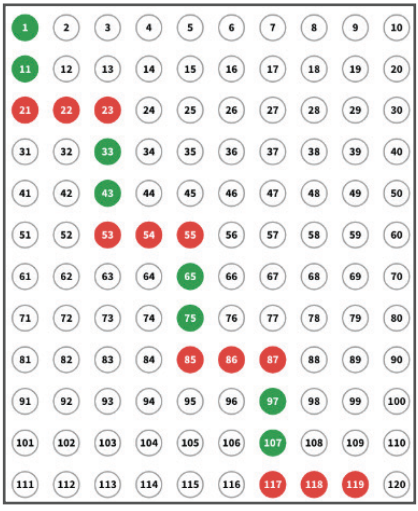
Suppose that you want to light up number 73. What are some different ways you could do that? *Point out that there are a lot of equations that can be used to light up a number.*

GLOWPIX: STUDENT PROMPTS

NOTE:
Find these printables on our website!

LEVEL 1

Make a Square

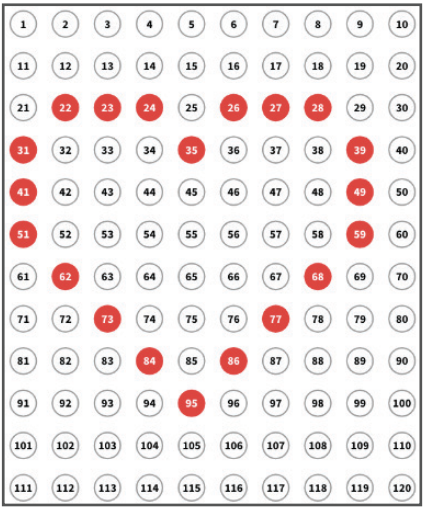


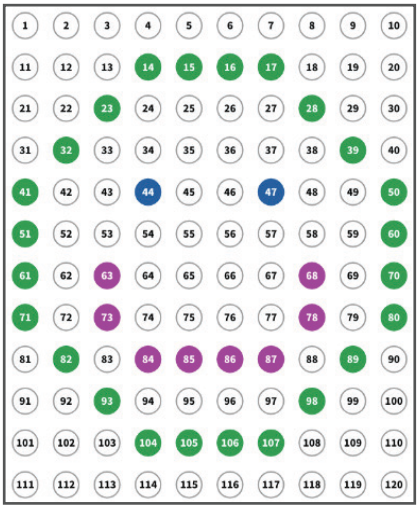
Make a ZigZag

OWLET MATH TOOLS

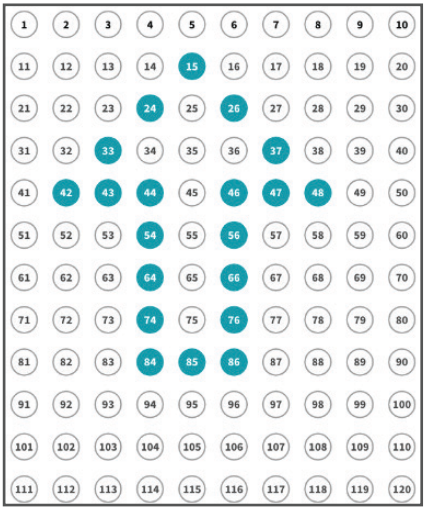
GLOWPIX: STUDENT PROMPTS

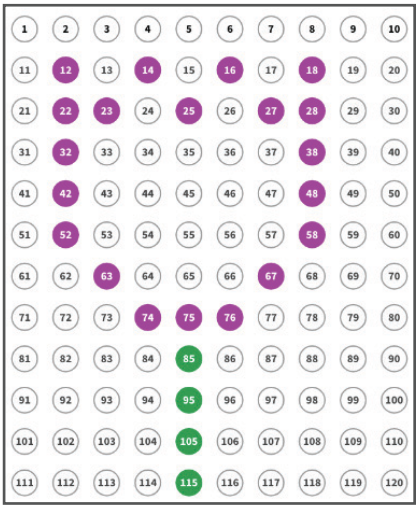
LEVEL 2





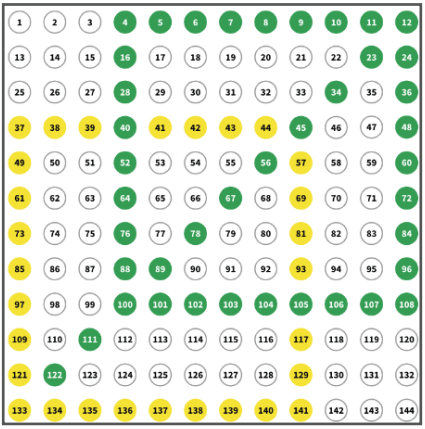
LEVEL 3

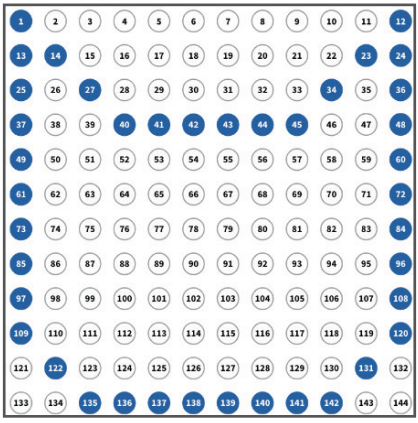




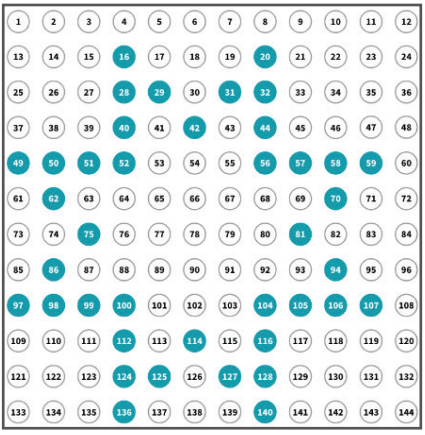
GLOWPIX: STUDENT PROMPTS

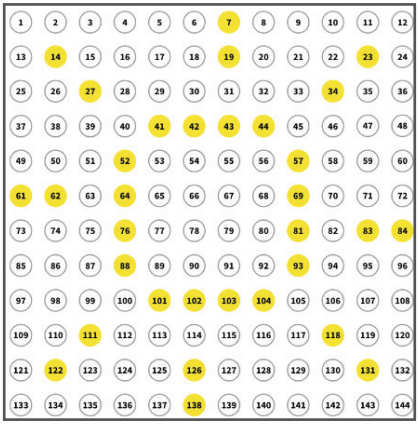
LEVEL 4





LEVEL 5





GLOWPIX: DISCUSSION QUESTIONS

LEVEL 1

- Start at __. Add 1 (or 10) __ times. Where are you?
- Start at __. Subtract 1 (or 10) __ times. Where are you?

LEVELS 1 & 2

- Start at __. How can you get to __?
- Which numbers can you reach from __?
- How many different ways can you get to the number __?

LEVELS 3, 4, & 5

- How many different ways could you light up the number __?

GLOWPIX: DISCUSSION QUESTIONS

LEVEL 5

- Think about 9 x (3 + 5). How could you use the distributive property to write this expression differently?

- Can you make …
  - A letter of the alphabet?
  - An emoji?
  - An animal?
  - A flower?
  - Parallel or perpendicular lines?

- Can you light up …
  - The prime numbers?
  - The Fibonacci numbers?

GLOWPIX: TEACHING TIPS

TIPS FOR ALL LEVELS

- Students can work in pairs. Have students plan their picture together, then one student can enter a few equations into the app while the other checks their work. Then switch!

- In Levels 1-3, encourage students to use their number grid strategies with the overlay sticker.

- In Levels 3-5, you may wish to give some rules about what equations students can use, e.g., you can only add or subtract 1 once (too easy!).

- At the end of a session, provide time for a gallery walk so students can see one another's pictures. Point out instances where different equations have been used to reach the same number.

- Have one student create a picture and then challenge another student to recreate it. Then have students compare the equations that they used.

NOTES

FRACTIONS

½ FRACTIONS: APP OVERVIEW

Fractions is one of 3 apps for Glow. Students turn Glow's dials to model fractions in the app. The Fractions app will save students' work and send teacher reports.

Scan to download apps >>

The Fractions app has three categories:

Foundations: Exploring unit fractions and dividing a whole into equal parts

Intro: Begin to work with fractions and mixed numbers

Equivalence: Equivalent fractions

OWLET MATH TOOLS

½ FRACTIONS: APP OVERVIEW

There are four different activity modes within the three categories. **Explore** and **Make** are available in all categories. The Intro category also has **Build** and **Compare** modes:

Explore: Explore: Model fractions

Make: Make fractions from prompts

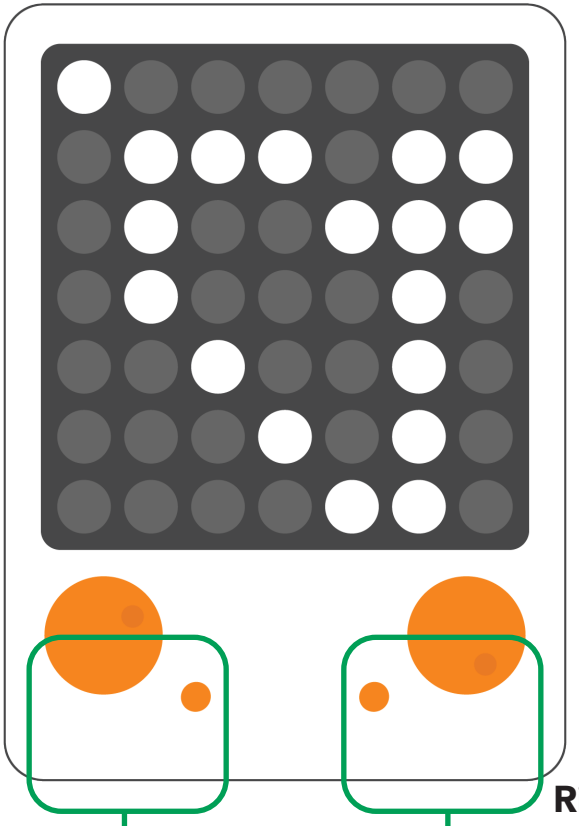
Build: Make a fraction, then find other fractions that are equal to it. *Only in Intro.*

Compare: Make two fractions and then compare them. *Only in Intro.*

Make, **Build**, and **Compare** randomly generate problems for students, while **Explore** is open-ended. Because problems are randomly generated, pairs of students will be given different problems.

½ FRACTIONS: APP OVERVIEW

NOTE:
Find these printables on our website!



Left Dial adjusts the denominator.

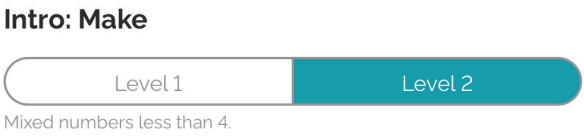
Right Dial adjusts the numerator.

½ FRACTIONS: APP OVERVIEW

Levels

You can change your level in Intro mode*. Simply select the level in the top left hand corner of the screen and choose the level you would like to switch to.

Level 1	• Fractions less than 1.
Level 2	• Mixed numbers less than 4 (2 for Build).



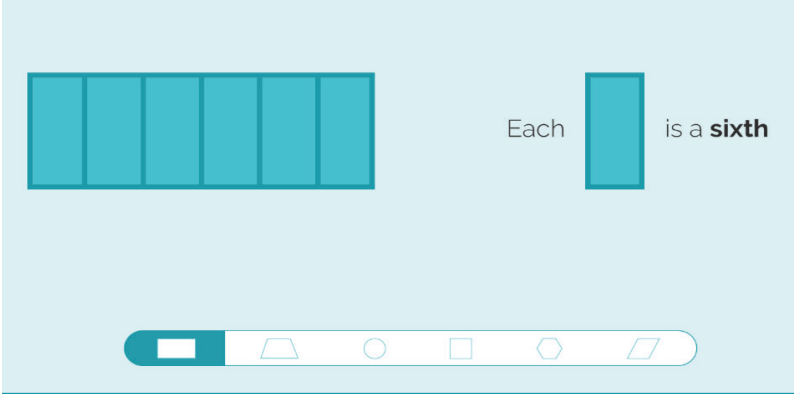
**There are no levels for the Foundation or Equivalence modes.*

HOW TO PLAY: EXPLORE

Choose your category, Foundations.

Tap the compass symbol for Explore mode.

Turn the left dial and see what happens in the app. What do you notice? What happens when you touch a different shape on the bar at the bottom of the app?

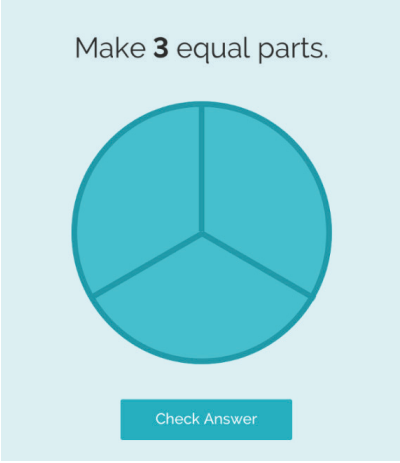


HOW TO PLAY: MAKE

Choose your category, Foundations.

Tap the magnifying glass symbol for Make mode.

The app will ask you to make a number of equal parts. Turn the left dial to choose the number of parts.



Tap the "Check Answer" button

SAMPLE CLASS INTRO: EXPLORE

Learning Goal: Students will understand how to use Explore mode in Fractions - Foundations

Key Terms: divide, dials

Time: 5-20 min

Today we're exploring how to **divide** shapes into equal pieces. In the Fractions app, tap the divided circle symbol for Foundations. Tap the compass symbol for Explore mode.

Try turning the left **dial**. What do you notice on the tablet as you turn the dial?

What is this shape on the left? What is this shape on the right? How many of this __ (*point to the shape on the right*) do you see in the __ (left shape)? The __ (right shape) is a __ (half, third, etc.) of the __ (right shape).

SAMPLE CLASS INTRO: EXPLORE

Tap on the bar at the bottom of the screen to choose a different shape. How many parts do you see as you turn the dial? What do you notice about the parts?

SAMPLE CLASS INTRO: MAKE

Learning Goal: Students will understand how to use Make mode in Fractions - Foundations

Key Terms: divide, dials

Time: 5-20 min

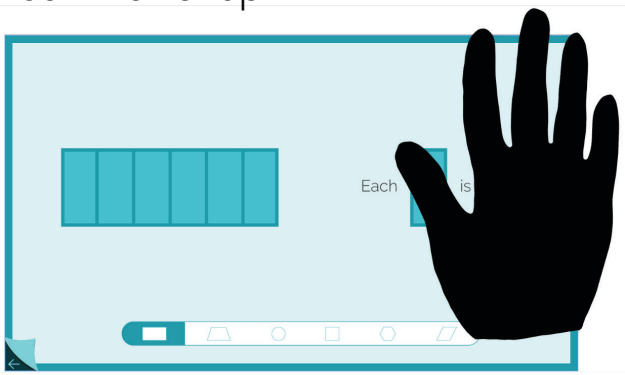
Today we're exploring how to **divide** shapes into equal pieces. In the Fractions app, tap the divided circle symbol for Foundations. Tap the Magnifying glass symbol for Make mode.

The app shows you a shape and asks you to divide it into equal parts. My shape is a __, and it is asking me to divide it into __ equal parts.

I can turn the left **dial** to divide my shape. Have a volunteer turn the dial to divide the shape. Now that we think we have an answer, I'll tap the "Check Answer" button.

STUDENT PROMPTS: EXPLORE

1. **The maker and the guesser**: The maker chooses a shape and uses the left dial to divide it. Cover the word at the end of the sentence. The guesser has to guess the word that is covered. Then swap!



2. **The writer and the modeler**: The writer writes one of these words on paper or a small whiteboard: half, third, fourth, fifth, sixth, seventh, eighth. The modeler has to choose a shape and turn the left dial to model the word. Then swap!

DISCUSSION QUESTIONS

- How many different ways can you divide the hexagon?

- Draw a pizza on the board. What are some different ways that we could evenly divide this pizza? How can we share it between ____ friends?

- What happens to the size of the pieces as you divide the shape into more parts?

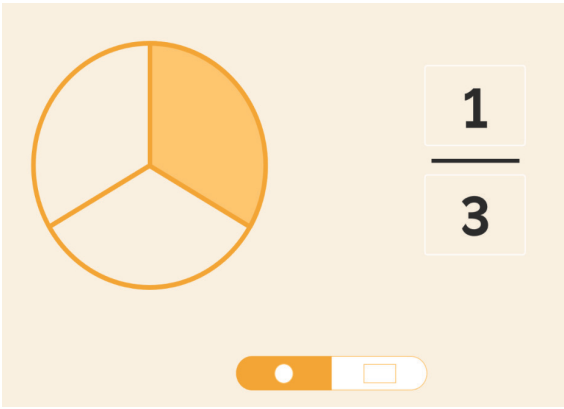
- Show a sample problem from the Foundations mode. What is the part, and what is the whole?

HOW TO PLAY: EXPLORE

Choose your category, Intro. $\frac{1}{3}$

Tap the compass symbol  for Explore mode.

Turn the left dial and see what happens on the tablet. What do you notice? Now turn the right dial. What happens when you touch a different shape on the bottom bar in the app?

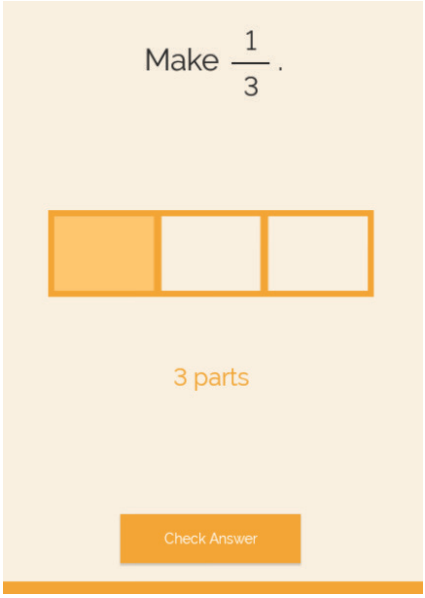


HOW TO PLAY: MAKE

Choose your category, Intro. $\frac{1}{3}$

Tap the magnifying glass symbol for Make mode.

The app will ask you to make a fraction. Turn the left dial to choose the denominator. Turn the right dial to choose the numerator. Tap the "Check Answer" button.

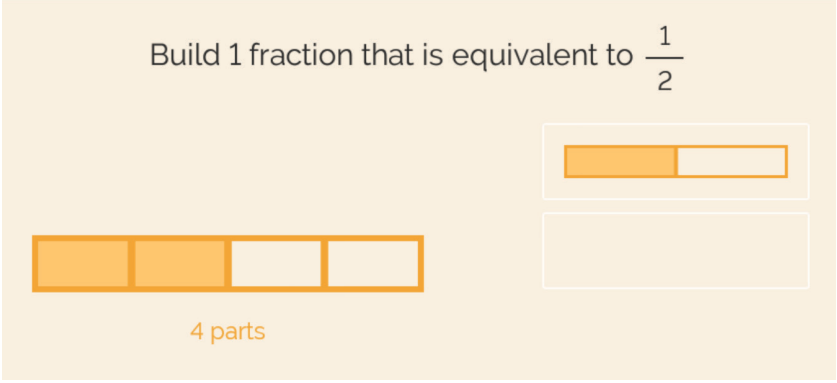


HOW TO PLAY: BUILD

Choose your category, Intro. $\frac{1}{3}$

Tap the hammer symbol  for Build mode.

Build a fraction by turning the left dial for the denominator and the right dial for the numerator. Tap "Check Answer". Next, make more fractions that are equal to the first one. Each time you find one, tap "Check Answer". Your goal is to find different fractions to fill up all the boxes.

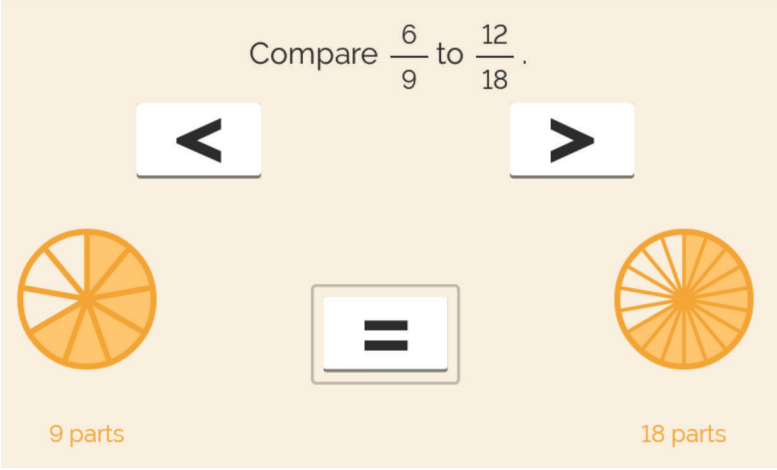


HOW TO PLAY: COMPARE

Choose your category, Intro. $\frac{1}{3}$

Tap the less than symbol < for Compare mode.

Build two fractions by turning the left dial for the denominator and the right dial for the numerator. Tap "Check Answer". Next, compare the fractions by dragging the correct sign into the box between the fractions. Tap "Check Answer".



SAMPLE CLASS INTRO: EXPLORE

Learning Goal: Students will understand how to use Explore mode in Fractions - Intro

Key Terms: divide, dials, numerator, denominator

Time: 5-20 min

Today we're making fractions with Glow. In the Fractions app, tap the $\frac{1}{3}$ for Intro. Tap the compass symbol for Explore mode.

Try turning the **dials**. What do you notice in the app?

What does the total number of parts in the whole tell you? Based on student responses, talk about the denominator of the fraction. Which dial controls the **denominator**?

SAMPLE CLASS INTRO: EXPLORE

What do the shaded parts tell you? *Based on student responses, talk about the numerator of the fraction*. Which dial controls the **numerator**?

Level 2 Only: When does another whole pop onto the screen? Why did that happen?

SAMPLE CLASS INTRO: MAKE

Learning Goal: Students will understand how to use Make mode in Fractions - Intro

Key Terms: divide, dials, numerator, denominator

Time: 5-20 min

Today we're making fractions with Glow. In the Fractions app, tap the $\frac{1}{3}$ for Intro. Tap the magnifying glass for Make mode.

The app will ask you to make a fraction (or mixed number in level 2). The app is asking me to make ___. I can turn the left **dial** to **divide** my shape into pieces. How many pieces do I need? *Have a volunteer turn the left dial to choose the* **denominator**. Now I can turn the right dial to shade some of the pieces. How many pieces should I shade? *Have a volunteer turn the left dial to choose the* **numerator**.

Finally, tap the "Check Answer" button.

SAMPLE CLASS INTRO: BUILD

Learning Goal: Students will understand how to use Build mode in Fractions - Intro

Key Terms: equivalent fractions, dials, denominator, numerator

Time: 5-20 min

Today we're using Glow to make **fractions that are equal, or equivalent**. In the Fractions app, tap the $\frac{1}{3}$ for Intro. Tap the hammer symbol for Build mode.

The app will ask us to make a fraction (*or mixed number)*. The app is asking me to make __. I can turn the left **dial** to choose the **denominator** and the right dial to choose the **numerator**. *Have a volunteer use the dials to make the fraction.*

Tap "Check Answer."

SAMPLE CLASS INTRO: BUILD

Now the app asks me to make __ fractions (or mixed numbers) that are equal to the first one we made. I want you to think about our strategy. How can we find a fraction that is equal? *Have a volunteer make another fraction while the class votes on whether it looks equal.*

Our goal is to find equal fractions to fill up these empty boxes. Once we fill them all, we'll see a "That's Correct!" message.

SAMPLE CLASS INTRO: COMPARE

Learning Goal: Students will understand how to use Compare mode in Fractions - Intro

Key Terms: equivalent fractions, dials, denominator, numerator

Time: 5-20 min

Today we're using Glow to compare fractions. In the Fractions app, tap $\frac{1}{3}$ or Intro. Tap the less than sign for Compare mode.

The app asks you to make a fraction (or mixed number). The app is asking me to make __. I can turn the left dial to choose the **denominator** and the right dial to choose the **numerator**. *Have a volunteer make the fraction.* Let's tap "Check Answer."

Now the app asks me to make a second fraction. *Have a volunteer make the second fraction.*

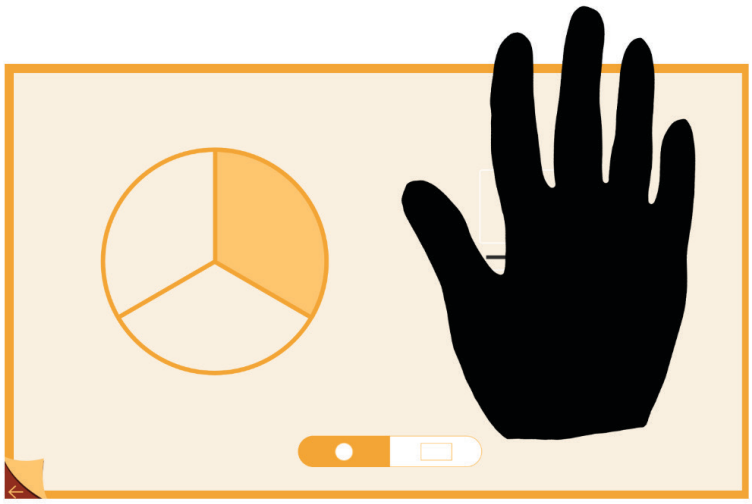
SAMPLE CLASS INTRO: COMPARE

Finally, the app will ask you to compare the two fractions. Let's drag in one of these symbols to show whether our number is less than, greater than, or equal to ___.

Have students vote by giving you a thumbs up for less than, equal to, and greater than. Select the option chosen by most students. Once you have dragged a symbol, tap "Check Answer".

STUDENT PROMPTS: EXPLORE

1. **The maker and the guesser**: The maker makes a fraction, then covers the name of the fraction in the app. The guesser guesses the fraction name that is covered. Then swap!



2. **The writer and the modeler**: The writer writes a fraction on paper or a small whiteboard. The modeler creates that fraction in the app. Then swap!

DISCUSSION QUESTIONS

Explore

- Compare the fractions __ and __. Which is bigger? Show me why.

Make

- Draw a picture of a half shaded circle. Is this 1/2 or 2/4? Reinforce that both are correct. The app will accept either answer.

Build

- How many fractions can you make that are equal to __?

Mixed Numbers

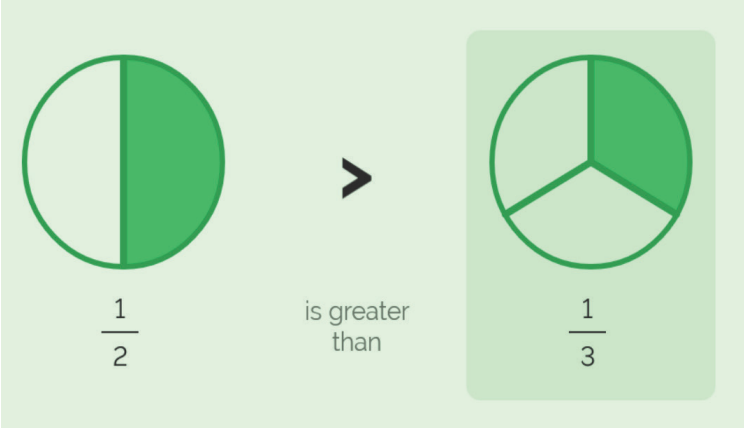
- Why did 1/3 have only one circle, but 1 2/3 had two circles?
- How many sixths are in a whole? How many are in two wholes?
- How many halves are in three wholes?

HOW TO PLAY: EXPLORE

Choose your category, Equivalence.

Tap the compass symbol for Explore mode.

The shaded fraction is selected. Turn the left and right dials to make a fraction. Tap the unshaded fraction to select it. Turn the left and right dials to make a second fraction. What do you notice? How can you find equivalent fractions?

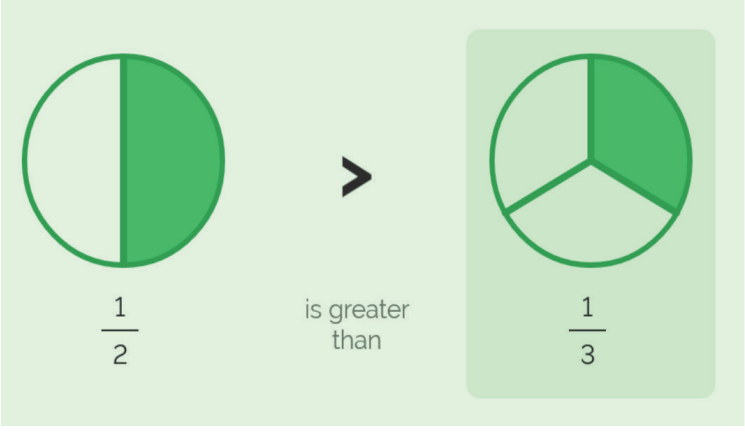


HOW TO PLAY: MAKE

Choose your category, Equivalence.

Tap the magnifying glass symbol for Explore mode.

The shaded fraction is selected. Turn the left and right dials to make a fraction. Tap the unshaded fraction to select it. Turn the left and right dials to make a second fraction. What do you notice? How can you find equivalent fractions?



FRACTIONS EQUIVALENCE

SAMPLE CLASS INTRO: EXPLORE

Learning Goal: Students will understand how to use Explore mode in Fractions - Equivalence

Key Terms: equivalent fractions, dials

Time: 5-20 min

Today we're using Glow to make **equivalent fractions**. In the Fractions app, tap the equals sign for the Equivalence category. Tap the compass symbol for Explore mode.

Before you turn the **dials**, what do you notice on the screen? Now turn the dials to make a fraction. Which of the fractions are you making? How do you think you can change the other fraction? *Students discover that they can tap a fraction to select it.*

Now change the second fraction. What do you notice? Try making two different fractions that are equal.

SAMPLE CLASS INTRO: MAKE

Learning Goal: Students will understand how to use Make mode in Fractions - Equivalence

Key Terms: equivalent fractions, denominator, numerator, dials

Time: 5-20 min

Today we're using Glow to name fractions and make **equivalent fractions**. In the Fractions app, tap the equals sign for theEquivalence category. Tap the magnifying glass symbol for Make mode.

The app will show you a fraction and ask you to name it. *Show what's on your screen.* What is the **denominator** of this fraction? Let's tap the denominator and enter that number. What is the **numerator**? *Enter numerator.*

Now let's tap "Check Answer."

SAMPLE CLASS INTRO: MAKE

Next, the app asks us to make equivalent fractions. We can use the dials to model each fraction. *Have student volunteer use the **dials** to create an equivalent fraction.*

Now tap the numerator and denominator boxes to name each fraction. *Have a student volunteer name the equivalent fraction.*

Can you think of other fractions that are equivalent? *Point out that there are many possible solutions. Have students choose solutions, then tap the "Check Answer" button.*

STUDENT PROMPTS: EXPLORE

Two makers: Maker #1 turns dials to make a fraction on the tablet. Maker #2 turns dials to create a second fraction that is equivalent to the first one. Then swap!

DISCUSSION

- How many fractions can you make that are equal to __? *Make a list with student suggestions.* What do you notice about the numerators? What do you notice about the denominators?

- Discuss different strategies for finding fractions that are equal.

½ FRACTIONS: TEACHING TIPS

TIPS FOR ALL ACTIVITY MODES

- Students can write down some of the problems that they solve to reinforce their learning. You could also have them draw the fractions they make on a number line.

- You can extend the Explore activities by giving students word problems to solve.

- You can also extend activities by having students write a number story to go with the fraction.

- Leave time at the end of class for students to share their work and their strategies for solving problems.

NOTES

YOU DID IT!

We hope you enjoy bringing Glow into your classroom!

Glow is part of the Owlet Math Tools collection by BirdBrain Technologies. If you enjoy teaching with Glow, we think you'll love Glow's buddy, Cube! Cube complements Glow as a tool for place value, including whole numbers, money, and decimals.

Learn more at www.birdbraintechnologies.com

OWLET MATH TOOLS

OWLET® MATH TOOLS

BY BIRDBRAIN LLC TECHNOLOGIES®