



ST Math.  
Summer Immersion



# PROBLEM SOLVING JOURNAL

# WITH DESIGN BOOKLET

*This journal belongs to:*

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Grade 3

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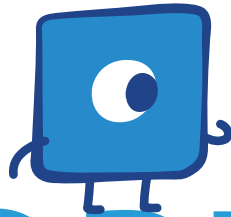
Grade 3

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# PROBLEM SOLVING JOURNAL



# My Thinking Path

TOPIC: \_\_\_\_\_

Starting my math journey...



What are the things I already know about this topic?

What are some questions I have about this topic?



## PROBLEM OF THE DAY | G3\_POD\_W1\_D1

Create a class "Getting to Know Our Class" chart.



## PROBLEM OF THE DAY | G3\_POD\_W1\_D2

Describe the class mathematically.



## PROBLEM OF THE DAY | G3\_POD\_W1\_D3

Compare these fractions and explain how to locate them on a number line:  $\frac{5}{8}$ ,  $\frac{6}{8}$ ,  $\frac{2}{8}$ ,  $\frac{9}{8}$ ,  $\frac{3}{8}$ .



## PROBLEM OF THE DAY | G3\_POD\_W1\_D4

Nancy, Bob, and Devin played a game to see who could get farthest on a number line. They each rolled a fraction cube. Nancy rolled  $\frac{1}{4}$  and 1. Bob rolled  $\frac{3}{4}$  and  $\frac{3}{4}$ . Devin rolled  $\frac{3}{4}$  and  $\frac{1}{2}$ . Where did each player land on the number line? Who won?





# My Thinking Path

TOPIC: \_\_\_\_\_

Reflecting on my math journey...



What new things did I learn? Did this experience make me think of anything differently?

What challenges am I having/questions I still have about this topic?



Exit Ticket

**3** math skills I used today:

**2** examples of what I learned:

**1** strategy I used OR 1 connection I made:



Exit Ticket

**1** big idea I learned today was:

today I discovered:



## ST Math Puzzle Reflection 1

Game:

\_\_ Minutes played \_\_ Puzzles played

Write or draw something you learned today.

Write or draw something that was easy/hard.

This connects to what I learned in class.



## ST Math Puzzle Reflection 2

Game:

\_\_ Minutes played \_\_ Puzzles played

Describe the math you learned.

Give a math example of the math you learned.

Write math vocabulary words you used.



# My Thinking Path

TOPIC: \_\_\_\_\_

Starting my math journey...



What are the things I already know about this topic?

What are some questions I have about this topic?



## PROBLEM OF THE DAY | G3\_POD\_W2\_D1

Joe the baker baked 2 apple pies for the Hughes family. There are 8 people in the Hughes family. The family shared the pies equally. How much pie did each family member get?



## PROBLEM OF THE DAY | G3\_POD\_W2\_D2

Joe the baker baked 7 apple pies to sell in his shop. Four people came in at the same time to buy pie. Joe sold the 7 pies to the four people. Each person got an equal amount of pie. How much pie did each person buy?



## PROBLEM OF THE DAY

| G3\_POD\_W2\_D3

Gordon baked a pan of lasagna for his family of 4. He cut the lasagna into 8 equal pieces. Explain how much lasagna each family member might eat.



## PROBLEM OF THE DAY | G3\_POD\_W2\_D4

Brett and 3 classmates were given a bulletin board to present their Math Challenge. They decided to divide the bulletin board so that each of them had an equal amount of space. Show two different ways they could partition the board. Prove that one partition from your first bulletin board example is equivalent to one partition from the second example.



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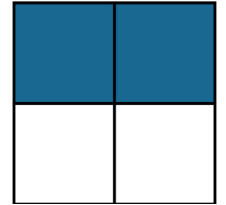
What are the things I already know about this topic?

What are some questions I have about this topic?



## PROBLEM OF THE DAY | G3\_POD\_W3\_D1

Show and explain how the shaded part of this picture could represent each of these numbers:  $\frac{1}{2}$ , 2, 1.



## PROBLEM OF THE DAY | G3\_POD\_W3\_D2

This rectangle is  $\frac{1}{2}$ . Show one whole.



This rectangle is  $\frac{1}{3}$ . Show  $\frac{1}{2}$ .





## PROBLEM OF THE DAY | G3\_POD\_W3\_D3

Jayla's and Jayvon's mother made them each a peanut butter sandwich for lunch. Jayla cut her sandwich into 4 equal sized pieces and ate 2 of the pieces. Jayvon cut his sandwich in 2 equal sized pieces and ate one piece. Jayla said she ate more of her sandwich because she ate 2 pieces. Jayvon disagreed. Who is correct? Justify your answer.



## PROBLEM OF THE DAY | G3\_POD\_W3\_D4

Place  $\frac{3}{4}$  on this number line. Be as exact as possible.





# My Thinking Path

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What challenges am I having/questions I still have about this topic?

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**1 strategy I used OR 1 connection I made:**

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**today I discovered:**



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# My Thinking Path

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What are some questions I have about this topic?





## PROBLEM OF THE DAY | G3\_POD\_W4\_D1

Create a number line including the numbers 0 to 2 and all halves and fourths. Name every half and fourth. Circle all of the names for the location of 1 and 2. Explain why these are equivalent.



## PROBLEM OF THE DAY | G3\_POD\_W4\_D2

Create a number line from like yesterday's number line. Write 3 comparison statements and prove them on the number line. Example:  $1 = \frac{4}{4}$  and  $\frac{3}{4} > \frac{1}{2}$ .



## PROBLEM OF THE DAY | G3\_POD\_W4\_D3

$\frac{5}{6}$ ,  $\frac{3}{4}$ ,  $\frac{2}{3}$ ,  $\frac{10}{9}$ . Select the number closest to 1. Draw a number line and place it on your number line. Explain how you knew this number was closest to 1. Explain how you knew where to place the number on the number line.



## PROBLEM OF THE DAY | G3\_POD\_W4\_D4

$\frac{7}{6}$ ,  $\frac{1}{4}$ ,  $\frac{3}{8}$  and  $\frac{8}{9}$ . Select the number closest to  $\frac{1}{2}$ . Draw a number line and place it on your number line. Explain how you knew this number was closest to  $\frac{1}{2}$ . Explain how you knew where to place the number on the number line.



# My Thinking Path

TOPIC: \_\_\_\_\_

## Reflecting on my math journey...



What new things did I learn? Did this experience make me think of anything differently?

What challenges am I having/questions I still have about this topic?



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# My Thinking Path

TOPIC: \_\_\_\_\_

Starting my math journey...



What are the things I already know about this topic?

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## PROBLEM OF THE DAY | G3\_POD\_W5\_D1

Kiesha, Horatio, and Iris wanted to know whose toy car would roll the farthest. They made a long track and marked it every fourth of a foot. Kiesha's car rolled  $\frac{13}{4}$  foot. Horatio's car rolled  $\frac{10}{4}$  foot. Iris' car rolled  $\frac{17}{4}$  foot. Whose car rolled the farthest? What was the order of the cars?



## PROBLEM OF THE DAY | G3\_POD\_W5\_D2

Carlos, Lionel, Jamal, and Jane compared the amount of milk they each drank at lunch. Carlos drank  $\frac{3}{4}$  of his milk, Lionel drank  $\frac{1}{4}$  of his milk, Jamal didn't drink any milk, and Jane drank  $\frac{1}{2}$  of her milk. Compare the fraction of milk each person drank and put them in order from most milk drunk to the least amount of milk drunk.



# My Thinking Path

TOPIC: \_\_\_\_\_

## Reflecting on my math journey...



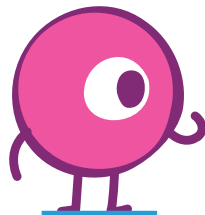
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What challenges am I having/questions I still have about this topic?



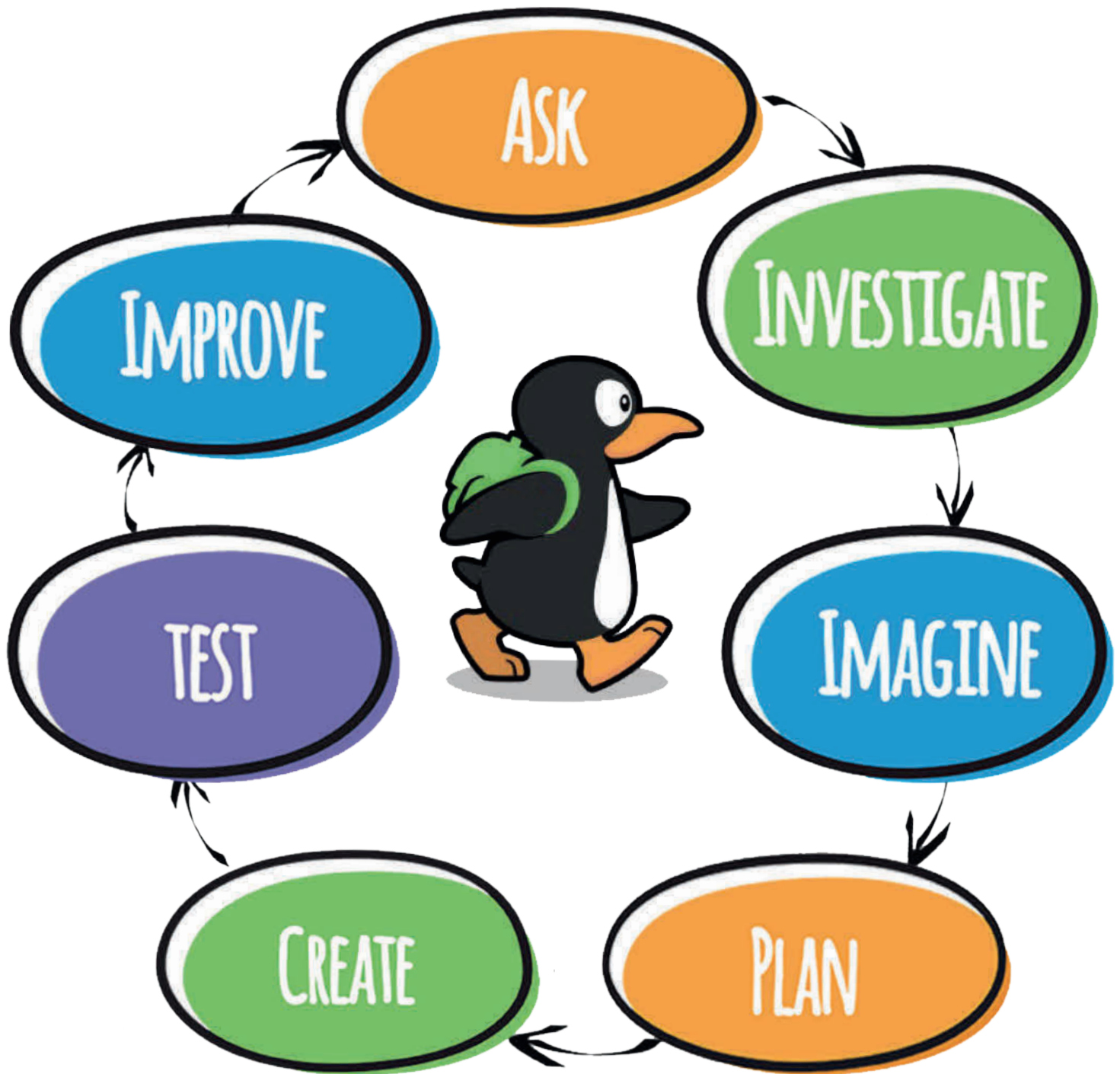


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# DESIGN CHALLENGE STUDENT BOOKLET

# DESIGN PROCESS



# THE DESIGN PROCESS

## *Designing a Math Game*



### STEP 1 - ASK

#### THINKING ABOUT THE PROJECT

Engineers ask questions about what they want to design. During ST Math Immersion, you will be designing a math game. Questions to consider: What type of game do you want to design? Who are you designing for? What are the requirements of the game? What is your goal?

### STEP 2 - INVESTIGATE

#### EXPLORING WHAT YOU KNOW

Think about the different types of games you've played and who the games were designed for. What are some ways you can incorporate the different aspects of other games to create a unique game? What materials do you have to make the game?

### STEP 3 - IMAGINE

#### BRAINSTORMING MATH GAME IDEAS

As a team, work together to brainstorm ideas and develop a game idea you want to design. Every team member should have an opportunity to share ideas and build off of each other. Remain focused on the task. A good design is about working together. Think about the areas in math that you or others may have struggled in and could use more help.

### STEP 4 - PLAN

#### DISCUSSING WHAT YOU WANT TO DESIGN

Once everyone has shared, take all your ideas and combine it to make one big idea. Be sure to review the requirements of the math game and the game planner found in the Design Challenge Station Booklet. Start a plan and move forward to creating it.

### STEP 5 - CREATE

#### CONSTRUCTING YOUR FIRST MODEL

Using your plans, build your first model and make your ideas real! This is the time to be creative, use your imagination and construct a math game.

### STEP 6 - TEST

#### EVALUATING THE GAME

Once you have built your first model, you need to test it and see how it works. Get some feedback from other classmates. Use the information you learned from your classmates to decide what works and what needs to be changed.

### STEP 7 - IMPROVE

#### REVIEWING FEEDBACK

Discuss how you could improve your design. Make the changes needed. Repeat steps 6 & 7 until you are happy with your design.



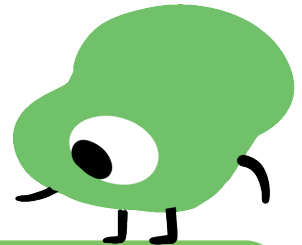


# STEP 1: ASK

## EXPERIENCING A NEW GAME

Good designers begin their process of designing by exploring what they games they already are familiar with and ask themselves what other games they can create like it. As you play the game Traffic Lights Tic-Tac-Toe and Dara, think about what style of game it is, what are the rules, what do you have to do to win?

### Reviewing Games



Compare the two games below.

TRAFFIC LIGHTS TIC-TAC-TOE	DARA
Two things I liked about this game were:	Two things I liked about this game were:
One thing I didn't like or wish I could change:	One thing I didn't like or wish I could change:

# STEP 2: INVESTIGATE

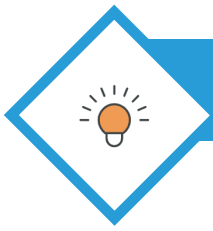


## COMPARISON GAMES

When creating a new game, it is important for designers to experience playing a variety of games. As you play Traffic Lights, Tic-Tac-Toe and Dara with your group, think about what you are learning, how the game makes you think, and the strategies you were using. Good game designers work to uncover the characteristics of a good game. Answer the questions below.

### Compare the Games

- 1 Which game was your favorite game? Why?
- 2 How did the rules make the players use skill and/or strategy? Give examples.
- 3 How was the mathematics involved in each of these games?
- 4 What are some ways other than computation that a game can include mathematics?



# STEP 3: IMAGINE

## GENERATING GAME IDEAS

Review the research and use it to help brainstorm ideas. Begin to imagine what type of game you would to create. Think about all the games you've explored up until now. What information will you take from your knowledge of these games to help you brainstorm with your game ideas?

### Brainstorming Ideas

**1 What style of game are you interested in creating?** *For example: fun, adventurous, strategy, logic, physically active, trivia.*

**2 Who are you designing this game for?** *For example: younger siblings, classmates, friends, family.*

**3 How many players can play?** *For example: 1 player, 2 players, 4 players, teams.*

**4 What math concept(s) will you include into your game? Why?**

**5 How might you combine some of your game styles and math ideas to help people who struggle with the math concept?**

# STEP 3: IMAGINE



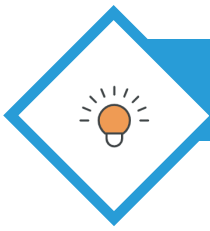
## DECIDING ON A MATH CONCEPT

Discuss among you different concepts of math you have struggled with. Now think about which math concept or concepts you want to design your game around. Below are some questions to help you refine your thoughts about how to articulate the concept as a game.

### Math Concept Reflection

Concept Choice(s): \_\_\_\_\_

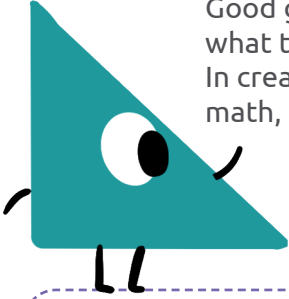
- 1 How have you used/experienced this concept? Give examples.
- 2 Describe the concept mathematically.
- 3 How could you create a game to help someone with this concept?
- 4 What are some of the things that make this concept hard? Why?
- 5 How is this concept related to things you have learned before?
- 6 Draw a visual representation of the concept.



# STEP 3: IMAGINE

## GAME PLANNING MOCK UP

Good game designers look at all their ideas and then come up with a solution. They imagine what their game will look like, how their audience will interact with the game, and much more. In creating a math game, it is important to think about how your audience will explore the math, problem solve and demonstrate their understanding.



### Game Mock Up

**1 Name of the game**

**2 Brief Description**

**3 We are choosing this style of game because**



# STEP 3: IMAGINE



## GAME RULES CHALLENGE

What game doesn't have rules? Think about some games you have strategized to win and how you win. Let's explore a very simple old game below.

### Rules Challenge



**1 SKETCH:** Standard picture of Tic-Tac-Toe grid on the left. Then, write the rules beside it.

**2 CHALLENGE:** Now write 1 new rule. Then play the game with this new rule.

**3 DESCRIBE YOUR EXPERIENCE:** What was it like playing the game with the new rule? How did it change the game? What didn't work?

**4 SHARE YOUR THOUGHTS:** What are some things you have learned that are important when determining rules for your game?



## STEP 4: PLAN

### GAME BLUEPRINT

Good game designers develop a plan before building a game. They use creativity and the information they gathered to write a "blueprint" for their game. This gives them the opportunity to see what the game will look like.

#### Mapping the Skeleton

1 **TARGET AUDIENCE:**

2 **NUMBER OF PLAYERS:**

3 **GAME TYPE:** (choose)

board game  card game  
 app/digital  other

4 **MATERIALS/RESOURCES:** What materials/tools might you need to build the game?  
Continue to add or remove materials as you need to create your plan.

5 **GAME GOAL:** What does a player have to do to win? Is there a strategy involved in winning?

6 **LEARNING GOAL(S):** By playing the game, what can a player expect to be experiencing and learning?

# STEP 4: PLAN



## GAME BLUEPRINT

Good game designers develop a plan before building a game. They use creativity and the information they gathered to write a "blueprint" for their game. This gives them the opportunity to see what the game will look like.

### Writing a Blueprint

#### CONCEPTS:

What math concepts are involved?

#### GAME MECHANICS:

How does the player interact with the game?

#### GAME RULES & CHALLENGES:

What are things a player can and cannot do in the game?

What obstacles are in place to make the game more challenging and interesting?



## STEP 4: PLAN

### SKETCH YOUR GAME





# STEP 5: CREATE

## JOB ROLE ASSIGNMENT

Before you begin creating your own prototype, which designers call their first model, divide the workload. Use the table below to identify the jobs that will need to be done to create this game. Assign each team member a role. Choose due dates to help you stay on time and determine what materials will be needed.

Team Member	Job Role	Materials Needed	Due Date

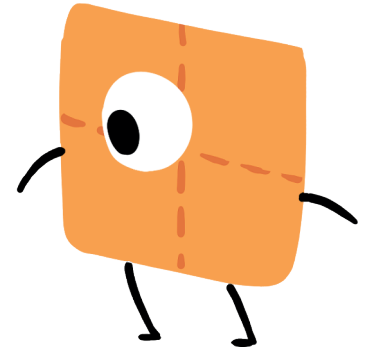
# STEP 5: CREATE



## INITIAL REFLECTION

Good game designers analyze their game as honestly as they can. Be sure to continually rethink aspects of your game and play it as often as you can, especially during development.

### ANALYZING YOUR GAME



Use the questions below to analyze your game.

- 1 What makes the game challenging and interesting?
- 2 What strategies do I need/did I use to win?
- 3 Can the rules be simplified? If so, how?
- 4 How did I learn or practice the math concept? Is that what you had planned?
- 5 Where do you think players might get stuck? How can you revise your game to solve the problem?



# STEP 6: TEST

## WATCHING OTHERS TEST YOUR PROTOTYPE

Good game designers test their prototype and gather feedback. Watch the gameplay and respond to the following questions based on what you observe. Have a group of people play your game and test it out. Provide them with the Game Tester Report to share their experiences playing the game.

### Game Feedback Form

*For Game Designers*

**1** Do the players find the game challenging and interesting?

**2** What strategies are the players/teams using to win?

**3** Were the directions/rules clearly understood by the players?

**4** What was the math concept level? Too hard? Too easy?

**5** How did I learn or practice the math concept? Is that what you planned?

**6** Where do you think players might get stuck? How can you revise your game to solve the problem?

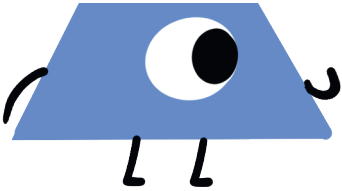


# STEP 7: IMPROVE



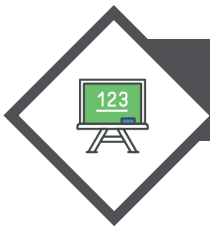
## MAKING ADJUSTMENTS

Once the games have been tested, good game designers use the feedback to improve their games. What ideas do you have for improving your game? How will these improvements make your game better?



### Reflecting on Improvements

- 1 What ideas do you have for improving your game?
- 2 How will these improvements make your game better?
- 3 Why do you think it's important to test games?
- 4 When do you know a game is ready for others to play after making the changes?



# PRESENTING YOUR GAME

## PREPARE A STORY BOARD

Game designers present their ideas to others after they've made updates to improve their game. Use a Story Board to help you share your game design. The Story Board helps you organize what you want to say and in what order you want to share it. Decide what each team member will share.

### Share Your Game

**Use the boxes to write notes.** Don't forget to include: title of the game, how many players, who it was designed for, style of game, concept(s) used in the game and why, rules of the game, team members and their roles.

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**ST Math® Summer Immersion provides students in grades K-5 with an opportunity to accelerate math learning during the summer months. Students experience engaging and fun puzzles, lessons, and projects that focus on grade-level development of content knowledge, reasoning skills, and growth mindset.**

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