ST Math
Summer Immersion

PROBLEM SOLVING JOURNAL WITH DESIGN BOOKLET

This journal belongs to:

_____

Grade 4

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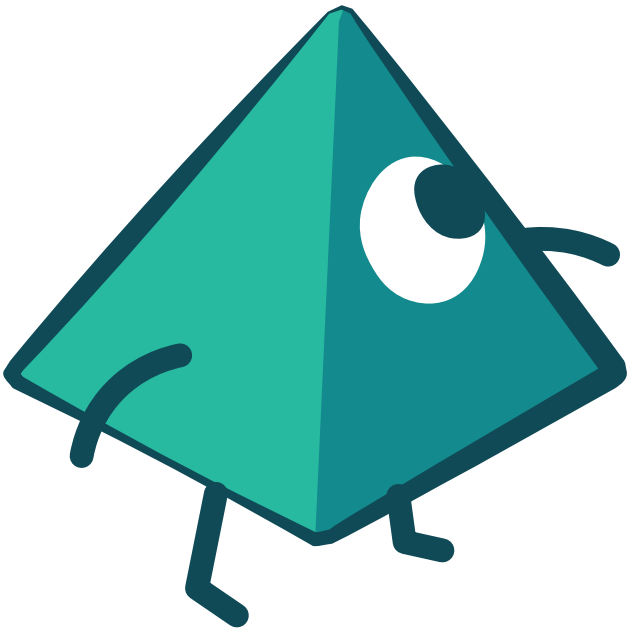

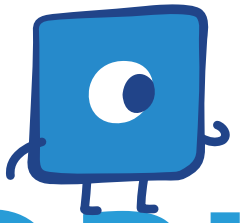

PROBLEM SOLVING JOURNAL

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 | G4_POD_W1_D1

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

PROBLEM OF THE DAY | G4_POD_W1_D2

Describe the class mathematically.

PROBLEM OF THE DAY | G4_POD_W1_D3

Create a bar model of a scale fraction with fourths. Use Cuisenaire rods, connecting cubes or paper strips to create your bar model. Build a number line from 0 to 3 using your bar model. Include fractions from halves, fourths, and eighths up to 3.

PROBLEM OF THE DAY | G4_POD_W1_D4

Kyle and Juan each had the same size chocolate bar. Kyle cut his into 6 equal size pieces and gave 2 pieces to Carla. Juan cut his bar into 3 equal size pieces and gave 1 piece to Carla. Compare how much chocolate bar each friend has.

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

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What are the things I already know about this topic?

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PROBLEM OF THE DAY | G4_POD_W2_D1

Jana and Deklan each brought the same size pan of brownies for the class party. Jana cut her brownie into 4 equal size pieces. Deklan cut his brownie into 3 equal sized pieces. They needed to give 24 students the same size piece. How could they do this with their two pans of brownies?

PROBLEM OF THE DAY | G4_POD_W2_D2

Howard and Imani were in charge of dividing the clay for their table in Art class. Each table had 4 students. Howard divided the clay into 4 equal sized pieces. Imani divided the clay into 8 equal sized pieces. Both tables fair shared all of their clay. Compare and contrast the clay students at each table received.

PROBLEM OF THE DAY | G4_POD_W2_D3

Draw a number line. Place the following fractions $\frac{3}{6}$, $\frac{7}{8}$, $\frac{11}{12}$, $\frac{8}{6}$, $\frac{1}{8}$, $\frac{3}{4}$, $\frac{25}{12}$, $\frac{6}{3}$, $\frac{6}{12}$, $\frac{6}{5}$, $\frac{3}{5}$, and $\frac{14}{8}$ on the number line. Select three of the fractions you placed on the number line and explain how you determined where to place these fractions. Challenge yourself.

PROBLEM OF THE DAY | G4_POD_W2_D4

Isabella baked a pan of lasagna for her family of 4. She cut the lasagna into eight equal pieces. Explain how much lasagna each family member might eat. Write equations/inequalities to compare how much each family member ate. Find at least 3 different ways the family could share the lasagna.

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PROBLEM OF THE DAY | G4_POD_W3_D1

Keyton wanted to make 2 gallons of punch to take to the school picnic. He found a recipe that called for $\frac{3}{4}$ gallon of fruit punch, 2 quarts of orange juice, 3 quarts of lime soda, and $\frac{3}{4}$ gallon of water. If Keyton makes this recipe, will he have as much punch as he wants? Justify your solution.

PROBLEM OF THE DAY | G4_POD_W3_D2

Fill in the blank with the correct symbol (i.e., >, <, =) for this equation/inequality: $\frac{3}{6} + \frac{4}{6}$ ____ $\frac{2}{3} + \frac{2}{3}$. Explain how you determined the symbol to use. Then use a number line to compare these two addition expressions.

PROBLEM OF THE DAY | G4_POD_W3_D3

Joan and Brett were decorating picture frames for a class store project. They needed $3\frac{1}{4}$ feet of ribbon to decorate all their frames. Joan had $2\frac{1}{2}$ feet of ribbon but used $\frac{3}{4}$ of a foot of her ribbon for another project. Brett had $2\frac{3}{4}$ feet of ribbon but used $\frac{5}{4}$ of a foot of his ribbon for another project. Do they have enough ribbon for their project? Justify your solution.

PROBLEM OF THE DAY | G4_POD_W3_D4

Iris and her brother needed $2\frac{1}{2}$ bags of popcorn kernels to make enough popcorn to sell at the school bake sale. Iris had $1\frac{1}{4}$ bags and her brother had $1\frac{3}{8}$ bags. Do they have enough bags of popcorn kernels? Explain how you know.

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PROBLEM OF THE DAY | G4_POD_W4_D1

Kevin poured 16 glasses of water from a jug. Each glass held $\frac{1}{8}$ cup of water. How much water was in Kevin's jug?

PROBLEM OF THE DAY | G4_POD_W4_D2

Demarius made cupcakes for his sister's birthday. He made 34 cupcakes. If Demarius used $\frac{1}{8}$ cup of icing on each cupcake, how much icing did he use?

PROBLEM OF THE DAY | G4_POD_W4_D3

Carlos drinks $\frac{2}{3}$ cup of milk at every meal and snack. How much milk does Carlos drink in 1 day if he eats breakfast, lunch, dinner, and an afternoon snack?

PROBLEM OF THE DAY | G4_POD_W4_D4

Bev is knitting a scarf for her mother. She knits $\frac{1}{3}$ of a foot every day. How long will it take her to knit 4 feet of her scarf? Write a multiplication equation to show how long it will take her to make a scarf 4 feet long.

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PROBLEM OF THE DAY | G4_POD_W5_D1

Barry had $4.00. He earned $2.75 a day for 5 days taking care of his neighbor's dog. How much money does he have now? Use a number line to show how much money Barry has now.

PROBLEM OF THE DAY | G4_POD_W5_D2

Loretta keeps time for each lap she runs around a track. The first lap she ran in 1.83 minutes. The second lap she ran in 1.9 minutes. She ran for three laps. Her total time for the three laps was 4.48 minutes. How long was her third lap?

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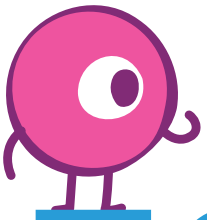
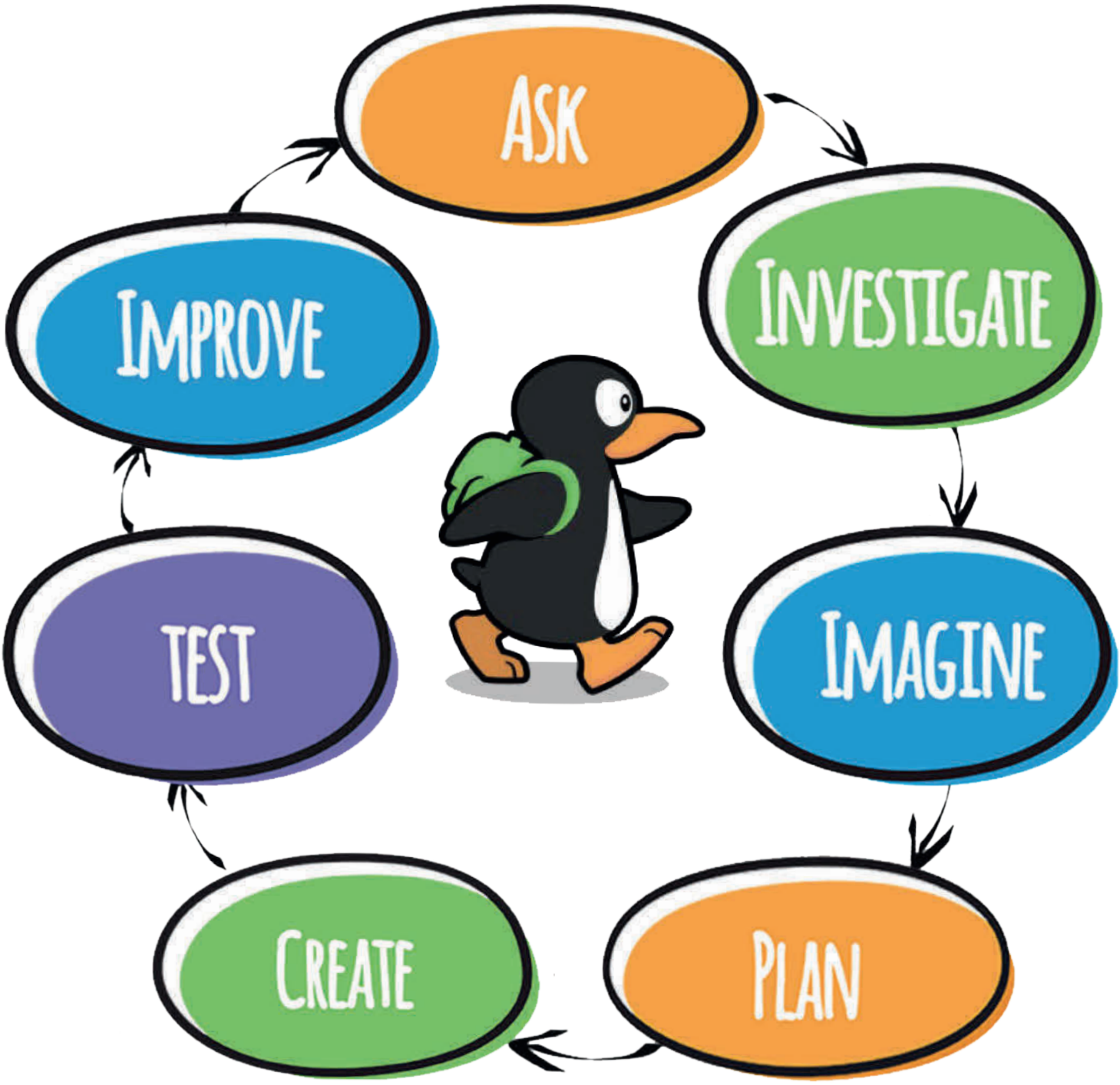


DESIGN CHALLENGE
STUDENT BOOKLET

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.

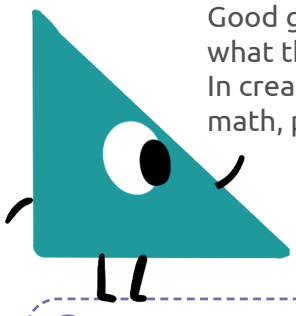
Math Concept Reflection

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 the come up with a solution. They imagine what their game will look like, how their audience will interact with the games, 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 4: PLAN

GAME RULES

Every good game has clear rules. In the space before, write the rules for your game.

New Game Rules

STEP 5: CREATE

JOB ROLE ASSIGNMENT

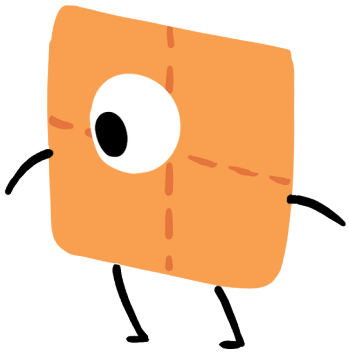
Before you begin creating your own prototype, which designers call their first model, divide the workload. Use the table below to identify the jobs that will need to be done to create this game. Assign each team member a role. Choose due dates to help you stay on time and determine what materials will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

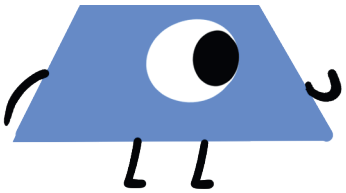
5. **How did I learn or practice the math concept? Is that what you planned?**

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.

1	2	3
4	5	6
7	8	9

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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