ST Math
Summer Immersion

PROBLEM SOLVING JOURNAL WITH DESIGN BOOKLET

This journal belongs to:

_____

Grade 5

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ST Math
Summer Immersion

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_____

Grade 5

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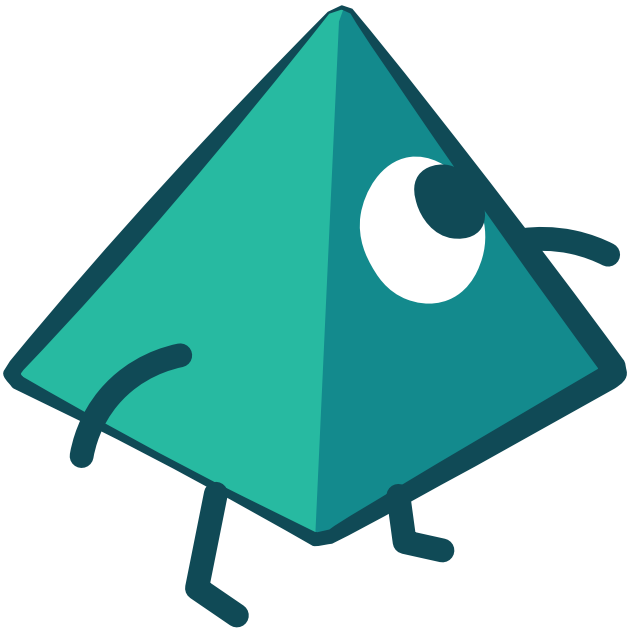

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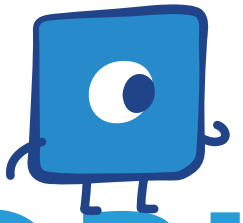

PROBLEM SOLVING JOURNAL

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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?

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PROBLEM OF THE DAY | G5_POD_W1_D1

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

PROBLEM OF THE DAY | G5_POD_W1_D2

Describe the class mathematically.

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PROBLEM OF THE DAY | G5_POD_W1_D3

Trisha was in charge of making a sign for each $\frac{1}{4}$ mile distance for a 2 mile race. She marked the distances in decimals. What numbers did Trisha write on her signs?

PROBLEM OF THE DAY | G5_POD_W1_D4

Trisha's coach gave her this number line to record her distances for the first mile. Mark and label the quarter mile distances shown on her signs. If needed, you can draw the number line larger below.

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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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Exit Ticket

3 math skills I used today:

2 examples of what I learned:

1 strategy I used OR 1 connection I made:

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1 big idea I learned today was:

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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.

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PROBLEM OF THE DAY | G5_POD_W2_D1

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 | G5_POD_W2_D2

Use the bars below to add the fractions by turning them into equivalent fractions with the same denominator. $\frac{1}{4} + \frac{1}{3} = ?$ Do the same to problem number 2. $\frac{2}{3} + \frac{1}{6} = ?$

Problem 1

$\frac{1}{4}$ = = $\frac{?}{?}$

+

$\frac{1}{3}$ = = $\frac{?}{?}$

Problem 2

$\frac{2}{3}$ = = $\frac{?}{?}$

+

$\frac{1}{6}$ = = $\frac{?}{?}$

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PROBLEM OF THE DAY | G5_POD_W2_D3

Darla wanted to make 2 gallons of punch to take to the school picnic. She found a recipe that called for $\frac{3}{4}$ gallons of fruit punch, 2 quarts of orange juice, $\frac{3}{8}$ gallons of lime soda, and $\frac{1}{2}$ gallon of water. If Darla makes this recipe, will she have as much punch as she wants? Justify your solution.

PROBLEM OF THE DAY | G5_POD_W2_D4

Kevin filled 4 glasses with different amounts of water so they would make different sounds when he rubbed his finger along the rim. Glass A held $\frac{5}{8}$ cup of water, glass B held $\frac{3}{4}$ cup of water, glass C held $\frac{3}{6}$ cup of water, glass D held $\frac{2}{6}$ cup of water. How much water did Kevin use? How much water could he put in a fifth glass if he had 3 cups of water?

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PROBLEM OF THE DAY | G5_POD_W3_D1

Partner A: Ribbon at Jones' Ribbon Shop is sold in various lengths. Rebecca bought two pieces of red ribbon to make hair bows. She selected the red ribbon from the bin with lengths of $\frac{3}{4}$ foot. How much ribbon did Rebecca buy? Compare your problem to your partner's problem. Partner B: Ribbon at Jones' Ribbon Shop is sold in various lengths. Chris bought a piece of ribbon that was 2 feet long. He used $\frac{3}{4}$ of the ribbon. How much ribbon did he use? Compare your problem to your partner's problem.

PROBLEM OF THE DAY | G5_POD_W3_D2

Partner A: Janet discovered that the distance to the park and back to her house is $\frac{3}{4}$ mile. She ran to the park and back home 5 times. How far did she run? Compare your problem to your partner's problem. Compare your problem to your partner's problem.

Partner B: Bailey lives 5 miles from the park. She decided to run to the park. She got $\frac{3}{4}$ of the way there, stopped and called her mother to pick her up. How far did Bailey run? Compare your problem to your partner's problem.

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PROBLEM OF THE DAY | G5_POD_W3_D3

James built a launchpad for his toy space ship. The pad was 2 feet by $\frac{7}{8}$ foot. What was the area of James' launchpad?

PROBLEM OF THE DAY | G5_POD_W3_D4

LeVonne tiled her bedroom with carpet squares. Her bedroom is 12 tiles by 16 tiles. The carpet tiles she used were $\frac{3}{4}$ foot by $\frac{3}{4}$ foot. What is the area of LeVonne's bedroom?

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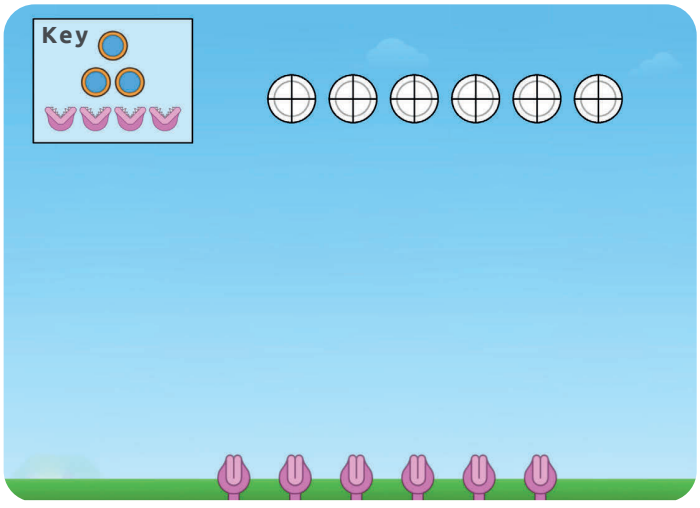
PROBLEM OF THE DAY | G5_POD_W4_D1

Bill, Jack, and Jill each had an empty pail. They had to carry 2 gallons of water up the hill. If they each carried the same amount of water, how much water did each friend carry? Prove that the total amount of water they carried equals two pails of water.

PROBLEM OF THE DAY | G5_POD_W4_D2

How many pies will 6 monsters eat? Write an equation to show you could solve the problem.



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PROBLEM OF THE DAY | G5_POD_W4_D3

Ibrahim did $\frac{1}{5}$ of his homework problems on his bus ride home. He completed 3 problems. How many problems did Ibrahim have for homework?

PROBLEM OF THE DAY | G5_POD_W4_D4

Mylo eats a cup of cereal a day. He ate $\frac{1}{3}$ of a box in 6 days. How many cups of cereal were in the full box?

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PROBLEM OF THE DAY | G5_POD_W5_D1

My dog's food comes in 8-pound bags. My dog eats $\frac{1}{4}$ of a pound of food each meal. How many meals will one bag of dog food serve?

PROBLEM OF THE DAY | G5_POD_W5_D2

The art teacher had 6 cups of sparkles for an art project. He gave each student in Ms. Clark's class $\frac{1}{3}$ of a cup of sparkles to use. How many students are there in Ms. Clark's class? Write the equation and draw a picture to show how you got your answer.

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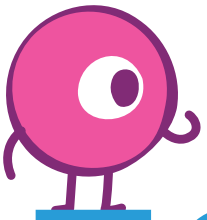

DESIGN CHALLENGE
STUDENT BOOKLET

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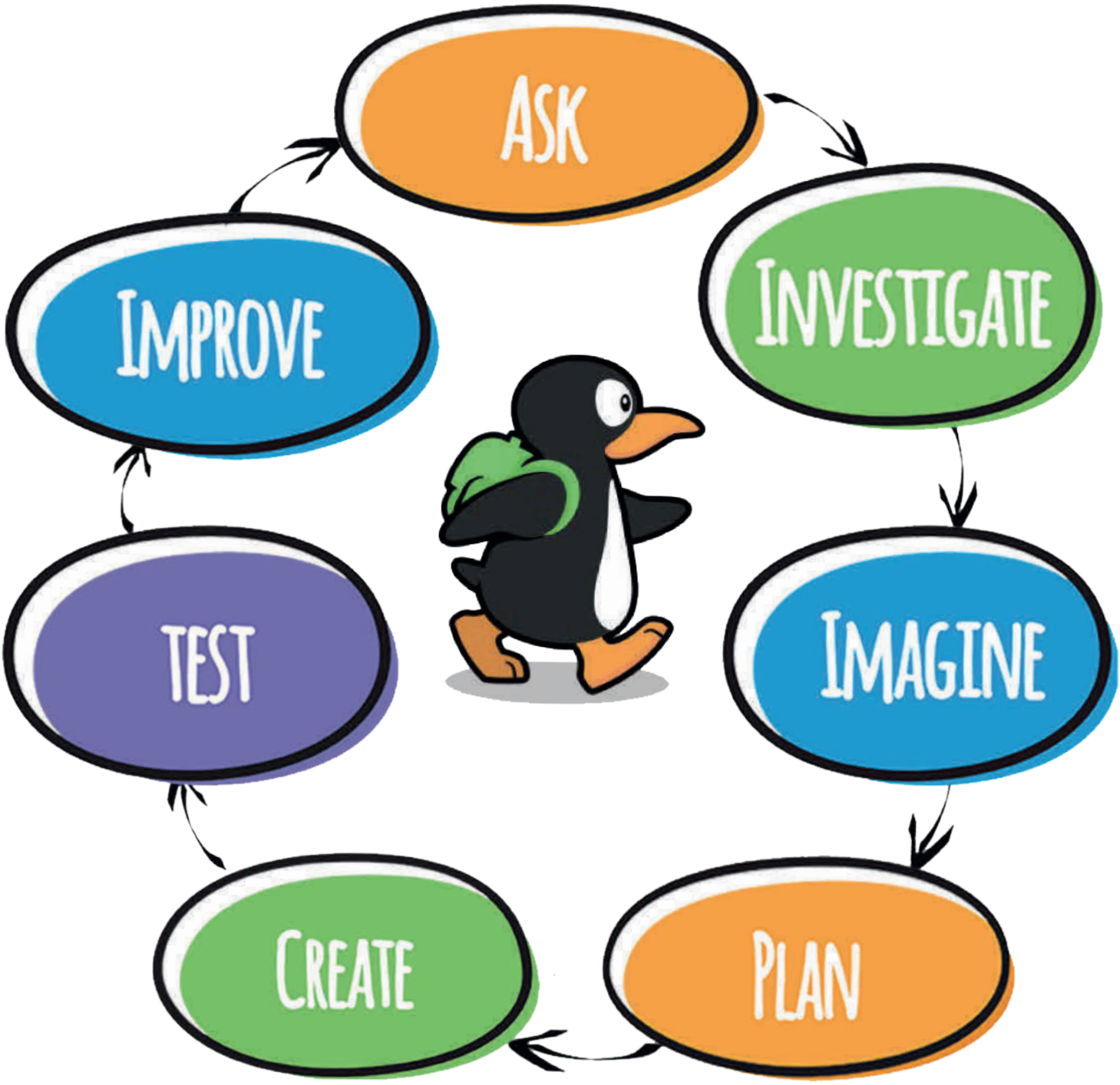
Design Process



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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.

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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:

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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?**

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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?**

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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.**

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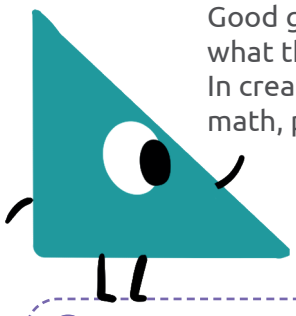
STEP 3: IMAGINE

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**

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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?

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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?

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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?

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STEP 4: PLAN

SKETCH YOUR GAME

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STEP 4: PLAN

GAME RULES

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

New Game Rules

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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

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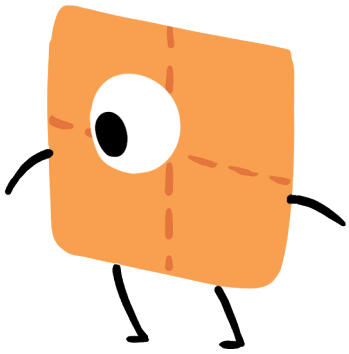
STEP 5: CREATE

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?**

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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?**

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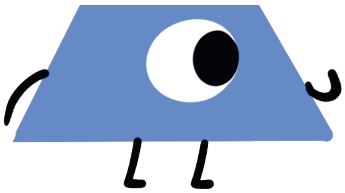
STEP 7: IMPROVE

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?**

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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

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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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