Chances Are

Background: We have talked about probability as being the likelihood of an outcome of an event. The probability of any event can be expressed as a fraction that is between zero and one. Carnival games are set up so that the player is not very likely to win, so the likelihood of winning is closer to zero than to one.

Design Challenge: Design and create a game that uses a spinner.

Criteria:

☐ You may use any number of colors, but the probability of spinning a red must be greater than the probability of spinning a blue.

☐ You must predict the probability of spinning a blue and justify your answer in the portfolio and in your presentation.

☐ You must place the probability of spinning a red on a number line.

☐ The spinner must spin freely for at least a full rotation when it is spun.

☐ You must write a list of rules that tells how to play the game and how to win, and you must post the rules next to your game so that other students can read how to play the game.

Materials: Select from the list below.		**Tools:** Select from the list below.
• cardboard or card stock • glue • paper clip • paper cups • paper scraps	• pipe cleaners • straws • tape • yarn	• hole punch • markers • printed number line (optional) • scissors

Targeted Standard of Learning: Mathematics 4.13
Supporting SOL: Mathematics 4.11, 4.14, 4.15; English 4.1, 4.2, 4.3, 4.7

Targeted Standard for Technological Literacy: 9
Supporting STL: 11

Tips for Teachers

Targeted Standards of Learning:

Mathematics 4.13   The student will
        a)   predict the likelihood of an outcome of a simple event; and
        b)   represent probability as a number between 0 and 1, inclusive.

Supporting SOL: Mathematics 4.11, 4.14, 4.15; English 4.1, 4.2, 4.3, 4.7a,h

Targeted Standards for Technological Literacy:

9   Students will develop an understanding of engineering design.
Supporting STL: 11

Prior Knowledge & Skill	Materials & Preparation	Safety Issues	Class Management	Materials Provided	Design Process
• Unit fractions • Number lines between 0 and 1 • Probability of an outcome of a simple event	• Prepare and print a large number line (optional). Alternatively, students may create their own number lines to show the fractional value of the probability.	• Use of scissors and hole punch	• Partners or groups	• Design Brief • Guided Portfolio (adapt as appropriate/ optional) • Rubric Assessments	Follow the Design Process: • Restate the problem. • Brainstorm solutions. • Create the best solution. • Test the solution. • Evaluate the solution.

Differentiation Option: For students with more advanced reading skills, the following page is provided as an alternative to page 1.

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Supporting STL: 11

Guided Portfolio

Name _____

Group Members _____

1.   What is the problem? State the problem in your own words.

_____

_____

_____

_____

_____

_____

_____

_____

Name _____

2. Brainstorm solutions. Sketch and/or describe some possible solutions.

Name _____

3. Create the solution you think is best.

Keep notes about your problems and how you solve them. Make sketches if they help.

Name _____

4.   Test your solution.

What is the likelihood of spinning a blue? _____

- Justify your answer._____

    _____

Is the probability of spinning a red greater than the probability of spinning a blue?   YES   NO

- Why, or why not?_____

    _____

Did you explain how to predict the likelihood of spinning a blue?   YES   NO

Did you explain how to predict the likelihood of spinning a red?   YES   NO

Does the spinner spin freely for at least one full rotation?   YES   NO

Did you make a list of rules that another person can follow?   YES   NO

Name   _____

5.   Evaluate your solution.

Was it the best solution? Would one of your other ideas have been better? Why, or why not?

_____

_____

_____

What would you have done differently?

_____

_____

_____

Could you add to it to make it better? What would you add to it?

_____

_____

_____

Rubric for Chances Are

Name _____ Date _____

0—no evidence; 1—limited understanding; 2—some understanding with room for improvement; 3—good understanding with room for improvement; 4—substantial understanding

Design Brief Rubric	0	1	2	3	4
The student restated the problem in his/her own words.					
The student brainstormed more than one idea.					
The student kept notes and/or made sketches while creating a solution, to include problems and how they were solved.					
The student tested the game to make sure					
• the probability of spinning a red is greater than that of spinning a blue					
• the probability of spinning a blue is justified					
• the number line shows the likelihood of spinning a red					
• the spinner spins at least one full rotation					
• others can follow the rules to play the game.					
The student evaluated how he/she could make it better next time.					

Rubric for Chances Are

Name _____ Date _____

0—no evidence; 1—limited understanding; 2—some understanding with room for improvement; 3—good understanding with room for improvement; 4—substantial understanding

Communication: Speaking, Listening, Media	4	3	2	1	0
4.1 The student will use effective communication skills in a variety of settings.					
a) Present accurate directions to individuals and small groups.					
b) Contribute to group discussions across content areas.					
c) Seek ideas and opinions of others.					
d) Use evidence to support opinions.					
e) Use grammatically correct language and specific vocabulary to communicate ideas.					
f) Communicate new ideas to others.					
g) Demonstrate the ability to collaborate with diverse teams.					
h) Demonstrate the ability to work independently.					
4.2 The student will make and listen to oral presentations and reports.					
a) Use subject-related information and vocabulary.					
b) Listen to and record information.					
c) Organize information for clarity.					
d) Use language and style appropriate to the audience, topic, and purpose.					

Standards of Learning

English (2010)

Writing

4.1   The student will use effective oral communication skills in a variety of settings.
       a)   Present accurate directions to individuals and small groups.
       b)   Contribute to group discussions across content areas.
       c)   Seek ideas and opinions of others.
       d)   Use evidence to support opinions.
       e)   Use grammatically correct language and specific vocabulary to communicate ideas.
       f)   Communicate new ideas to others.
       g)   Demonstrate the ability to collaborate with diverse teams.
       h)   Demonstrate the ability to work independently.

4.2   The student will make and listen to oral presentations and reports.
       a)   Use subject-related information and vocabulary.
       b)   Listen to and record information.
       c)   Organize information for clarity.
       d)   Use language and style appropriate to the audience, topic, and purpose.

4.3   The student will learn how media messages are constructed and for what purposes.
       a)   Differentiate among auditory, visual, and written media messages.
       b)   Identify the characteristics of various media messages.

4.7   The student will write cohesively for a variety of purposes.
       a)   Identify intended audience.
       b)   Focus on one aspect of a topic.
       c)   Use a variety of pre-writing strategies.
       d)   Organize writing to convey a central idea.
       e)   Recognize that different modes of writing have different patterns of organization.
       f)   Write a clear topic sentence focusing on the main idea.
       g)   Write two or more related paragraphs on the same topic.
       h)   Use transition words for sentence variety.
       i)   Utilize elements of style, including word choice and sentence variation.

j) Revise writing for clarity of content using specific vocabulary and information.

k) Include supporting details that elaborate the main idea.

Mathematics (2009)

Geometry

4.11   The student will

a) investigate congruence of plane figures after geometric transformations, such as reflection, translation, and rotation, using mirrors, paper folding, and tracing; and

b) recognize the images of figures resulting from geometric transformations, such as translation, reflection, and rotation.

Probability and Statistics

4.13   The student will

a) predict the likelihood of an outcome of a simple event; and

b) represent probability as a number between 0 and 1, inclusive.

4.14   The student will collect, organize, display, and interpret data from a variety of graphs.

Patterns, Functions, and Algebra

4.15   The student will recognize, create, and extend numerical and geometric patterns.

Standards for Technological Literacy

Standard 9:   Students will develop an understanding of engineering design.

Standard 11:   Students will develop the abilities to apply the design process.

Please give us some feedback.

Complete the form below to let us know how this design brief worked for you and your students. Please be specific so that we might use your suggestions to improve the activity. *You can fill this out on your computer, or you can print it, fill it out manually, and scan it.*

Teacher: _____

School: _____

School division: _____

Design brief title: _____

Background *Put an X in the appropriate column:*	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Does it set the context for the activity?			
Is it age-appropriate in language, length, and complexity?			
Does it reference prior learning and/or research that the students did that will facilitate designing a solution to a problem?			
Is it detailed enough that an adult will understand the purpose for the design brief?			
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

Design Challenge	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Does the challenge support your curriculum?			
Is it age-appropriate in language, length, and complexity?			
Is it detailed enough that an adult will understand the purpose for the design brief?			
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

Criteria Criteria are part of the challenge. They set the limitations for the design. They are not directions.	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use	N/A
Are the limitations age-appropriate?				
Do the limitations encourage critical thinking?				
Is the application of mathematic knowledge/skills integrated into the criteria? If not, should the skill area be addressed?				
Is the application of science knowledge/skills integrated into the criteria? If not, should the skill area be addressed?				
Is the application of social studies knowledge/skills integrated into the criteria? If not, should the skill area be addressed?				
Are language skills integrated into the criteria? If not, should the skill area be addressed?				
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*				

Materials Materials help set the limitations for the design. The list should include materials that might work.	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use	N/A
Does the materials list encourage a variety of design solutions?				
Does the materials list include a variety of choices for joining items?				
Does the materials list include materials that force students to make decisions?				
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*				

Tools Tools can be used in the construction of the designed product. They are used to manipulate materials. They cannot become part of the product.	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Are the tools listed age appropriate?			
Are all tools needed for the activity included?			
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

Standards of Learning	Yes	No
Does the design brief reinforce the targeted Standard of Learning(s)?		
Are the supporting Standards of Learning appropriate?		
What Standards of Learning would you add or remove?		

Standards for Technological Literacy	Yes	No
Does the design brief reinforce the targeted Standard(s) for Technological Literacy?		
Are the supporting Standards for Technological Literacy appropriate?		
What Standards for Technological Literacy would you add or remove?		

Tips for Teachers	Yes	No
Are the tips listed in the chart helpful for a first-time teacher?		
What tips would you add?		

Guided Portfolio	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Are the instructions and questions age appropriate and clear?			
In the "Test your solution" section, do the questions force students to thoroughly test their solutions?			
In the "Evaluate your solution" section, do the questions force students to honestly evaluate their solutions			
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

Additional Comments
Please use this area to provide general suggestions for improving this design brief.