Big Idea/ Topic
- Investigate chance processes through the development, use and evaluation of probability models.

Standard(s) Alignment

MGSE7.SP.5 Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

MG.SP.7SE7 Develop a probability model and use it to find probabilities of events. Compare experimental and theoretical probabilities of events. If the probabilities are not close, explain possible sources of the discrepancy.

Diagnostic Assessment

1. Which statement best describes the chance of landing on $25.00?
   A. Spinner 1 has the most favorable outcome.
   B. Spinner 2 has the most favorable outcome.
   C. The chance for landing on $25.00 is the same for both spinners.

Explain your choice.

2. The probability of selecting any one section on a three sectioned spinner is $\frac{1}{3}$.

   ___ agree
   ___ disagree
   ___ it depends on

Explain your choice.
Instructional Design

Overview:
This learning plan allows students to explore probability using spinners and to calculate the outcomes of each event. Students will naturally create probability models throughout the lesson.

- Synchronously, the teacher will pace the lesson and guide students while having rich mathematical discussions.
- If delivered asynchronously, students may work at their own pace and share their thought processes, while the teacher provides feedback to guide and support student understanding.
- Additional support materials are provided to ensure a complete understanding of the concept of area at the conclusion of this learning plan.

Instructional Design:

- **Materials:**
  - Electronic device to explore Desmos activity
  - Digital and hard copies of the diagnostic assessment and Desmos
  - Spinners of different sections showcased in Desmos
  - Pencil
  - Paper clip
  - spinner (like screen 8).

- **Teacher Directions:** Use the diagnostic assessment to measure students prior knowledge. This Learning Plan is meant to introduce students to probability models. The activity may take 50 - 60 minutes. Synchronously, the teacher will support students through the Desmos slides as students explore these concepts. Teachers may pace and pause along the way to highlight discussion points and big ideas of the intended learning targets. Asynchronously, consider grouping students to work through the assignment together. Teachers may assess students by their justifications or student work on the Teacher Dashboard within the Desmos platform.
Desmos Activity: **Grade 7: Chance Experiments**

**Engage**

1 Let's play a game.

Here's how it works. You'll spin the spinner.

How do you win? That's up to you. Two options:

1. Spinner lands on RED, you win.
2. Spinner lands on BLUE, you win.

Which option do you want?

**Teacher Moves**

Highlight several student responses for the class. Start with informal math language and reasoning, then move to more formal responses. In particular, watch for students who discuss "likelihood" or "probability."

**Sample Responses**

I want "Win on RED" because the red part of the spinner is much larger. I think the spinner is more likely to land on red.

- **Synchronous** Follow the Teacher Moves guidance after pacing to screen one. **Pace** the activity to screen 1 and highlight student responses and emphasize words coinciding with the probability number line.

- **Asynchronous** Consider providing a word bank couple with the assignment for screen 1. Or consider supplying a pre-recorded video of you answering a similar problem in a think aloud. Introduce the problem to students in a virtual platform; this can be done via e-document or video. Allow students to share responses within the Desmos platform and provide feedback via the teacher dashboard. Additionally, students could use an audio/video to share. Provide feedback to individual student responses and highlight multiple strategies used by students.

- **Unplugged/ Offline** Provide the opening image and question for students to engage in the task. Have students share ideas through email/text/phone. Provide feedback to students and share other students’ ideas before engaging in the remaining screens.

**Explore**

2 Practice

You chose "Win on RED."

Press "Spin" to play a practice round.

When you finish, continue to the next screen.

**Teacher Moves**

Note: The spinner results here (and throughout the activity) are randomly generated for each student. While red is indeed more likely than blue, about 25% of your students will see the spinner land on blue for this screen.
● **Synchronous**: Restrict to screens as you navigate the lesson following the teacher’s moves above. Use screen 4 to determine grouping for screens 6 through 14.

● **Asynchronous**: Using the teacher dashboard, provide feedback via email/text or discussion post. Ensure that enough time is provided for students to participate and respond to your feedback and edit responses as needed.

● **Unplugged/ Offline**: Provide a spinner similar to screen 1 and paper/electronic versions of the images on screens two through five. Have students record results on paper and in tables provided from the Desmos. Note that on screen 4 students will have to spin their spinner 36 times. Allow students time to complete the work and submit through email/text or other means. Provide feedback as students complete their work. Share student submissions to online students and provide online submissions to offline students.
Apply

6 Probability Scale

How likely is each event? Drag the movable points along the probability scale to indicate your answer.

Then explain your thinking.

Teacher Moves

This is a great place to check student progress. Offer individual support where needed, or lead a brief whole-class discussion if enough students are struggling. This may be the first time students have seen a probability scale, so take a moment to introduce it if you think that would be helpful. In particular, help students draw connections between the words on the scale (impossible, equally likely, etc.) and the numbers on the scale (0, 1/2, etc.).

Consider pointing out to students that “unlikely” does not correspond to a probability of 1/4. Rather, it represents the range of probabilities between 0 and 1/2. Similarly, “likely” represents the range of probabilities between 1/2 and 1.

Sample Responses

"Lands on RED" is likely, while "Lands on BLUE" is unlikely.

7 A New Spinner

Malik and Mia played 36 rounds with a different spinner.

Their results are shown in the table.

Which spinner(s) did they most likely use?

Teacher Moves

Display the distribution of student responses. Ask students to justify their choice(s) and critique each others’ reasoning.

Sample Responses

• I chose the spinner that is split into four parts. Half are red, half are blue, and each part is the same size.
• I chose the spinner with two equal-sized sections. I would expect about half of the spins for that spinner to land on red, and about half to land on blue.
Drag the movable point to create a spinner where
Landing on RED is almost IMPOSSIBLE.
Landing on BLUE is almost CERTAIN

Then press "Submit" and continue to the next screen.

**Teacher Moves**

Highlight several unique spinners for the class. Ask students to justify their responses and critique each others' reasoning.

Dashboard Note: ✓ indicates that the student created a spinner where the probability of landing on red is more than 0% and less than 10%.

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Here's the spinner you created on the previous screen.

You said that landing on RED is almost impossible, and landing on BLUE is almost certain.

Press "Spin" to play the game 36 times.

When you finish, continue to the next screen.

**Teacher Moves**

Invite students to create a spinner that lands on red only ONCE here on Screen 9.

Malik claims he can create a spinner where red and blue are both unlikely. Mia says that's not possible.

Who do you think is correct?

**Teacher Moves**

Highlight some of the best arguments for each choice. Ask students to respond with counterarguments.

**Sample Responses**

If the spinner can have more than two colors (as we saw for one of the choices on Screen 7), then Malik is correct.
Mikey marked a probability number line with an arrow after viewing the tables below.

Which table and landing color did he most likely use?

**Teacher Moves**

Display the distribution of student responses. Ask students to justify their choice(s) and critique each others’ reasoning.

**Sample Responses**

• I chose the table that has a probability of landing on blue as 9%. The arrow on the number line is less than half way between Impossible and Unlikely making it less than 12.5%.

Below are the outcomes of the spinner shown. Fill in the table with the missing values.

**Teacher Moves**

Ask students to explain where 1/4 and 0.25 came from. After students fill in the table, anonymize and highlight correct and incorrect thinking.

Ask students what the fractions add up to.
Ask students what the decimals add up to.

**Sample Responses**

As a fraction:
P(Blue) = 1/4
P(Grey) = 1/4

As a decimal:
P(Green) = 0.25
P(Maroon) = 0.25
P(Grey) = 0.25
● **Synchronous** Restrict screen six through fourteen. Students can work on screens six through fourteen in groups through a platform similar to Zoom breakout rooms or Google Meet. Students can join the main room while highlights and misconceptions are addressed. Students could disperse back to their breakout room once whole group discussions are done to complete the task. Use the teacher dashboard to facilitate instruction when visiting the breakout rooms.
• **Asynchronous** Give students time to complete the screens and provide feedback. Consider showcasing correct and incorrect anonymized responses using Desmos snapshots in a discussion post. Encourage students to weigh in on accuracy of the responses and provide alternatives. Ensure that enough time is provided for students to participate in the Desmos and discussion post. Make sure time is provided for students to respond to your and their peer’s feedback and edit responses as needed.

• **Unplugged/ Offline** Provide students images and questions from screens six through fourteen. Students will have to create their own spinner using a paperclip and pencil from screen eight. Students must spin the created spinner 36 times and record results in table from screen nine. Ask students to complete the questions and have them submit responses via email/text/phone. Provide feedback, share these responses with other students, and share other students’ responses with them.

**Reflect**

![3-2-1:]

**3-2-1:**

List three things you learned in this lesson, two things you want to know more about, and one thing you are confused about.

**Teacher Moves**

Consider editing the graph and change either of the questions to your learning targets.

Have students share out their 3-2-1 summarizer or customize and allow students to see each other’s responses.

• **Synchronous** Students could share their responses aloud in a virtual platform and/or read other responses on Desmos.

• **Asynchronous** Students could post their response in a Flipgrid and respond to a peers 3-2-1.

• **Unplugged** Students can write their answers on the hard copy provided.

**Evidence of Student Success**

• Learners who can use random samples to create probability models will show evidence of success on screens 13 and 14.

• Screens 7 and 11 demonstrate the learner’s ability to evaluate probability models.

• Have students review their diagnostic assessment and identify, describe and explain any errors.
Student Learning Supports

Establish mathematics goals to focus learning.
- Make instructions and expectations clear for the activities.
- Make explicit connections between current and prior lessons or units.

Facilitate meaningful mathematical discourse.
- Explicitly model and teach good “discussion board” etiquette.

Pose purposeful questions.
- Predetermine when you will call on the student or use the pause feature within the activities.
- Break class into small discussion groups to work collaboratively and then have groups report back to the whole group.

Support productive struggle in learning mathematics.
- Offer outlines and other scaffolding tools and share tips that might help students learn.
- Provide feedback using the feedback feature within activities and offer corrective opportunities.
- Consider the pacing of the lesson.

Elicit and use evidence of student thinking.
- Anticipate any misconceptions or questions students might have about the task, materials or technology. Proactively address them with readily available and accessible resources.
  - Students can read and reference this probability number line.

![Probability Number Line](image)

Have students come up with more examples of each part of the labeled number line. Also, have students label the number line with rational numbers in between the numbers given. Next, have students draw new pictures (circles with partition or spinners) of what those numbers they put down would look like. Have students explain why they drew the partitions in the circle like they did.
<table>
<thead>
<tr>
<th><strong>Engaging Families</strong></th>
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<tbody>
<tr>
<td><strong>Georgia Home Classroom</strong> has great video tutorials and visuals to use as practice to deepen understanding of probability, sample space and probability number lines. Watch with a family member before or after the Desmos activity, Chance Experiments.</td>
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<tr>
<td>● <a href="#">Probability with Dice GPB</a></td>
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