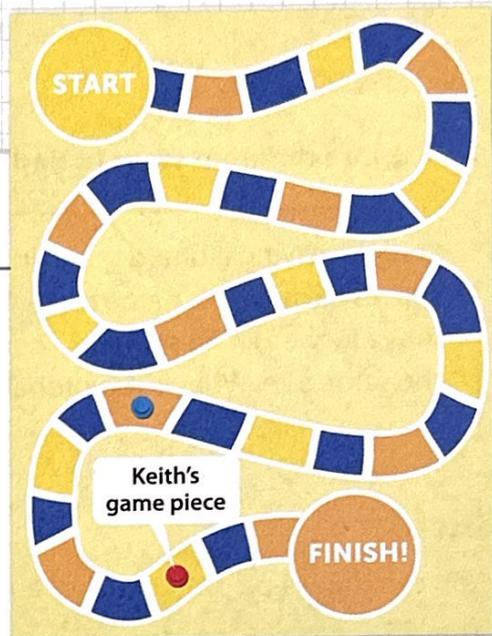


Develop Finding Theoretical Probabilities

► Read and try to solve the problem below.

Keith is playing a board game in which he spins a spinner to determine how many spaces to move his game piece. He is 3 spaces away from the finish and can only move forward if he spins a 1, 2, or 3 on his next turn. All sections of the spinner have the same size. What is the probability that Keith moves forward on his next turn?



TRY IT



Math Toolkit index cards, number cubes, spinners, sticky notes

$$\frac{4}{6} = \frac{2}{3}$$

Keith has a $\frac{2}{3}$ chance of moving forward on his next turn

DISCUSS IT

Ask: How did you reach that conclusion?

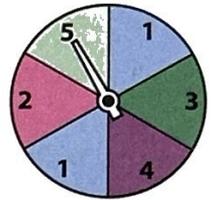
Share: I knew ... so I ...

DISCUSS IT

continued

► **Explore different ways to find theoretical probabilities.**

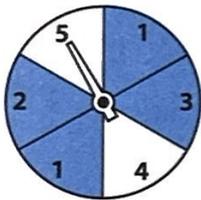
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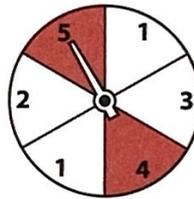
Picture It

You can draw a picture to make sense of the problem.

There are 6 possible outcomes.



There are **4 favorable** outcomes.



There are **2 non-favorable** outcomes.

Model It

You can find the theoretical probability of each event.

$$\text{Probability of 1, 2, or 3} = \text{Probability of 1} + \text{Probability of 2} + \text{Probability of 3}$$

The spinner has 6 sections of the same size. It is equally likely that the spinner lands in any of the sections.

There are 6 possible outcomes: 1, 1, 2, 3, 4, and 5.

$$\text{Probability of 1: } \frac{\text{number of sections labeled 1}}{\text{total number of outcomes}} = \frac{2}{6}$$

$$\text{Probability of 2: } \frac{\text{number of sections labeled 2}}{\text{total number of outcomes}} = \frac{1}{6}$$

$$\text{Probability of 3: } \frac{\text{number of sections labeled 3}}{\text{total number of outcomes}} = \frac{1}{6}$$

$$\text{Probability of 4: } \frac{\text{number of sections labeled 4}}{\text{total number of outcomes}} = \frac{1}{6}$$

$$\text{Probability of 5: } \frac{\text{number of sections labeled 5}}{\text{total number of outcomes}} = \frac{1}{6}$$

CONNECT IT

- Use this page to deepen your understanding of finding theoretical probabilities.

1 Talk About It

- a. Look at **Picture It**. Keith can move forward only if he spins a 1, 2, or 3. Why are there 4 favorable outcomes, not 3?

There are two sections with a 1

- b. Why are there 6 possible outcomes in total?

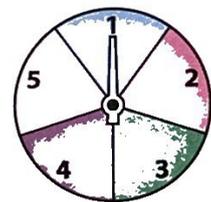
There are 6 sections on the spinner.

2 Show What You Know

- a. Suppose Keith could use the spinner at the right instead. All sections of the spinner have the same size. Would Keith be more or less likely to move forward with this spinner? Explain.

$$\frac{3}{5} = 0.6 \quad \frac{2}{3} = 0.\bar{6}$$

Keith would be less likely to move forward because $0.6 < 0.\bar{6}$



- b. The probability that Keith will spin a 2 with the spinner in problem 2a is $\frac{1}{5}$.

The probability that he will spin a 2 with the spinner in **Try It** is $\frac{1}{6}$.

For both spinners, there is only one way to spin a 2. Why are the probabilities for spinning a 2 not equal?

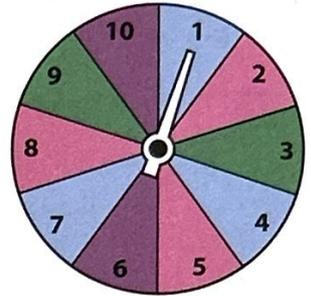
There are more sections in the Try It spinner so each part is smaller making it harder to land on that section

- 3 **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand how to find theoretical probability.

Apply It

► Use what you learned to solve these problems.

- 4 A board game uses the spinner at the right. All sections of the spinner have the same size. In order to win a bonus card, a player has to spin a prime number. Find the probability that a player will spin a prime number. Show your work.



2, 3, 5, 7

$$\frac{4}{10} = \frac{2}{5}$$

SOLUTION The probability of spinning a prime number is $\frac{2}{5}$.

- 5 A teacher brings a bag of bagels to their class. There are 4 everything bagels, 6 sesame seed bagels, and 8 whole wheat bagels in the bag. One student selects a bagel at random from the bag. What is the probability that the bagel is whole wheat?



4
everything bagels

6
sesame bagels

8
whole wheat bagels

A $\frac{1}{6}$

B $\frac{4}{9}$

C $\frac{1}{3}$

D $\frac{3}{8}$

$$\frac{8}{18} = \frac{4}{9}$$

- 6 Magdalena records the eye color of each person on her soccer team. What is the probability that a person on her soccer team selected at random has blue eyes? Green eyes? Brown eyes? Show your work.

Eye Color	Number of People
Blue	4
Green	1
Brown	15

Bl Gr Br

$$\frac{4}{20} = \frac{1}{5} \quad \frac{1}{20} \quad \frac{15}{20} = \frac{3}{4}$$

$$\begin{array}{r} + \\ 15 \\ \hline 20 \end{array}$$

SOLUTION The probability of selecting blue is $\frac{1}{5}$, green is $\frac{1}{20}$ and brown $\frac{3}{4}$.