Grade Level/Course: 6 – 7
Lesson/Unit Plan Name: Probability, Maybe?
Rationale/Lesson Abstract: This lesson will use the bar model & number line concept as an additional method for determining the probability of an event occurring. This is an additional entry point for practice and review of fraction/decimal/percent concepts.
Timeframe: 50 minutes

Common Core Standard(s): CC.6.RP.3c Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30 /100 times the quantity); solve problems involving find the whole, given a part and the percent.

CC.7.SP.5 Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the even occurring. Larger numbers indicate a greater likelihood. A probability near 0 indicates an unlikely event, a probability near ½ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

Instructional Materials/Resources: Paper, pencil, copies of warm up cards, large area for bar model/number line

Activity/Lesson: Pass out the probability questions (on cardstock) to half of your students and have them remain in their seats. Give the answers to the other half of the students and have them mix around the room to find their corresponding questions.

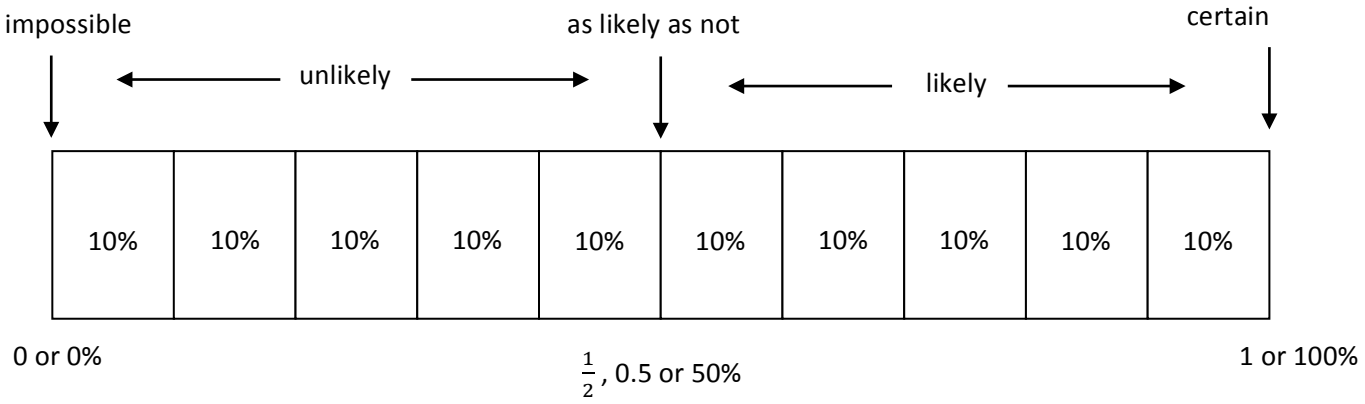
Discuss the answers from least to greatest. Have one pair at a time stand where their answer would go on the giant number line/bar model (on the white board) and debrief using the sentence frames below. The sentence frames are also on the answer cards to cue students during the presentation of their answer. As a review, have students explain how the different forms of their answers are equivalent. "How can you show that $\frac{3}{8}$ is equivalent to 0.375?"

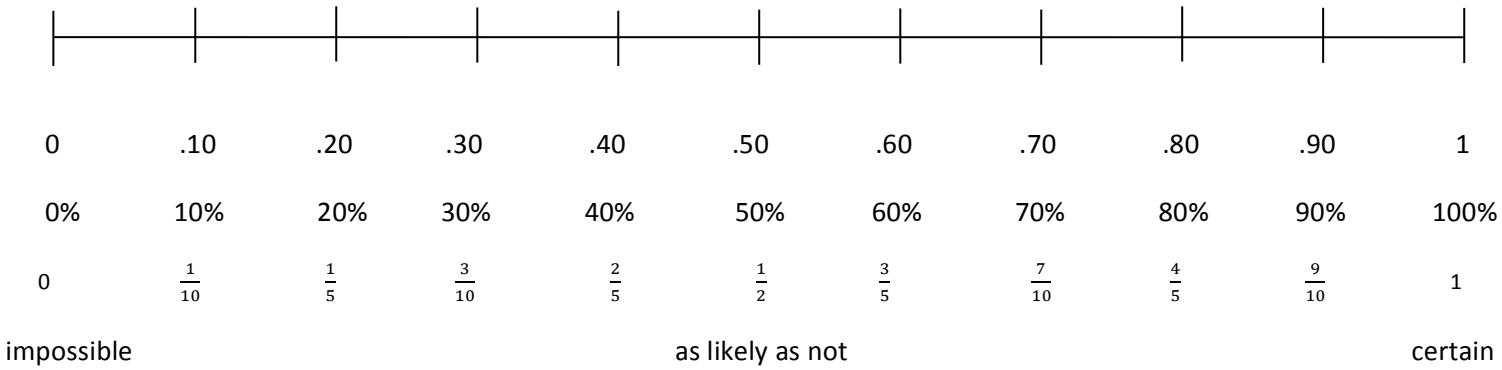
Partner A: "Our question was _____."

Partner B: " As a fraction, the probability of _____ is _____.

As a decimal, the probability is _____. As a percent, the probability is _____ because _____

_____."


impossible
as likely as not
certain
unlikely
likely
10%
10%
10%
10%
10%
10%
10%
10%
10%
10%
0 or 0%
$\frac{1}{2}$, 0.5 or 50%
1 or 100%


0
.10
.20
.30
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.70
.80
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1
0%
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70%
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90%
100%
0
$\frac{1}{10}$
$\frac{1}{5}$
$\frac{3}{10}$
$\frac{2}{5}$
$\frac{1}{2}$
$\frac{3}{5}$
$\frac{7}{10}$
$\frac{4}{5}$
$\frac{9}{10}$
1
impossible
as likely as not
certain

Activity/Lesson continued:

Example 1: The probability of a soup can being defective is 15%. Express the probability as a fraction in simplest form and as a decimal. In addition, describe how likely it is that the can is defective.

15% $= \frac{15}{100}$ $= \frac{3 \cdot 5}{2 \cdot 5 \cdot 2 \cdot 5}$ $= \frac{3}{20}$	15% $= \frac{15}{100}$ $= \frac{15}{100} \div \frac{100}{100}$ $= .15$	It is not very likely that the soup can is going to be defective. This is a good time to check the number line or bar model and see where $\frac{3}{20}$ or .15 might fall.

You Try 1: The probability of a tornado occurring is 60%. Express the probability as a fraction in simplest form and as a decimal. In addition, describe how likely it is that a tornado will occur.

60% $= \frac{60}{100}$ $= \frac{2 \cdot 3 \cdot 2 \cdot 5}{2 \cdot 5 \cdot 2 \cdot 5}$ $= \frac{3}{5}$	60% $= \frac{60}{100}$ $= \frac{60}{100} \div \frac{10}{10}$ $= \frac{6}{10}$ $= 0.6$	It is more likely than not that a tornado will occur. Again, use this opportunity to refer to the number line or bar model to see where these probabilities lie, and their relationship to other likelihoods.

Activity/Lesson continued:

Example 2: Suppose you select a letter at random from the word AARDVARK. Express the probability of selecting the letter A as a fraction, as a decimal, and as a percent. In addition, describe how likely it is that you will select the letter A.

The word AARDVARK contains 8 letters, 3 of which are "A." Therefore, the probability of selecting an "A" is $\frac{3}{8}$.

$\frac{3}{8}$

$= 0.375$

$\frac{3}{8}$

$= 0.375$

$= \frac{375}{1000}$

$= \frac{375}{1000} \div \frac{10}{10}$

$= \frac{37.5}{100}$

$= 37.5\ \%$

It is not very likely that you will select the letter A.

Please note that this is a great time to review division. Although this may be a benchmark fraction, it's important to show how to get from the fraction to the decimal. It's also a good idea to discuss how close $\frac{3}{8}$ is to $\frac{4}{8}$ or $\frac{1}{2}$, so the likelihood is approaching as likely as not.

*However, it is more likely that you will select the letter A than any other letter.

You Try 2: Suppose you select a letter at random from the word AUDITION. Express the probability of selecting a vowel as a fraction, as a decimal, and as a percent. In addition, describe how likely it is that you will select a vowel.

The word AUDITION contains 8 letters, 5 of which are vowels. Therefore, the probability of selecting a vowel is $\frac{5}{8}$.

$= \frac{5}{8}$

$= 0.625$

$\frac{5}{8}$

$= 0.625$

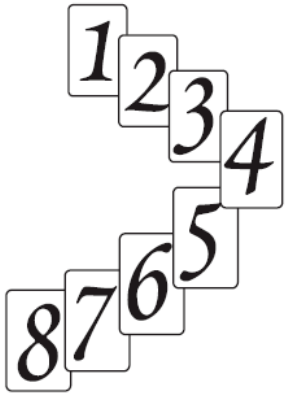
$= \frac{625}{1000}$

$= \frac{625}{1000} \div \frac{10}{10}$

This is another good opportunity to discuss the multiple methods for dividing numbers, as well as benchmark fractions. Additionally, looking at how close $\frac{5}{8}$ is to $\frac{4}{8}$ or $\frac{1}{2}$ may be helpful to see that, while this event is more likely than not, it is very close to "as likely as not."

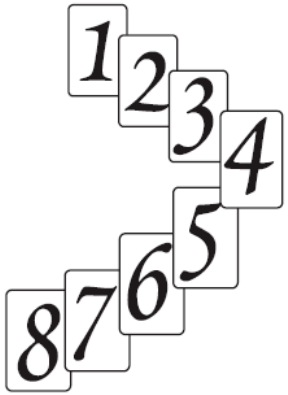
	$= \frac{62.5}{100}$ $= 62.5\%$		It is more likely than not that you will select a vowel.
Example 3: A (very special) 20-sided number cube is numbered from 1 to 20. Find the probability that a prime number is rolled. Express your answer in the form of a fraction, a decimal, and a percent. In addition, describe how likely it is that a prime number is rolled.			
There are 8 prime numbers between 1 and 20. Therefore, the probability of rolling a prime number is $\frac{8}{20}$.			
$\frac{8}{20}$ $= \frac{2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 5}$ $= \frac{2}{5}$	$\frac{8}{20}$ $= \frac{8}{20} \div \frac{2}{2}$ $= \frac{4}{10}$ $= 0.4$	$\frac{8}{20}$ $= \frac{8}{20} \cdot \frac{5}{5}$ $= \frac{40}{100}$ $= 40\%$	It is unlikely that a prime number will be rolled.
You Try 3: A drawer contains 20 shirts. 8 are long-sleeved. Find the probability of selecting a short-sleeved shirt. Express your answer in the form of a fraction, a decimal, and a percent. In addition, describe how likely it is that a short-sleeved shirt is selected.			
There are 20 shirts, 8 of which are long-sleeved. This means that 12 of the shirts are short-sleeved. Therefore, the probability of selecting a short-sleeved shirt is $\frac{12}{20}$.			
$\frac{12}{20}$ $= \frac{2 \cdot 2 \cdot 3}{2 \cdot 2 \cdot 5}$ $= \frac{3}{5}$	$\frac{12}{20}$ $= \frac{12}{20} \div \frac{2}{2}$ $= \frac{6}{10}$ $= 0.6$	$\frac{12}{20}$ $= \frac{12}{20} \cdot \frac{5}{5}$ $= \frac{60}{100}$ $= 60\%$	It is likely that a short-sleeved shirt will be selected.

These 8 cards are shuffled and placed face down. If Beatrice turns over only one card, what is the probability that she will get a card with a number less than 4? (CaHSEE Practice Test)



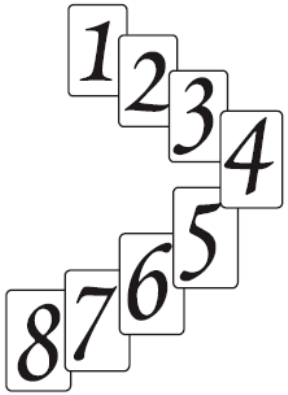
As a fraction,	As a decimal,	As a percent,
the probability is	the probability is	the probability is
$\frac{3}{8}$	**.375**	**37.5%**

These 8 cards are shuffled and placed face down. If Beatrice turns over only one card, what is the probability that she will get a card with a number that is not 4? (CaHSEE Practice Test)



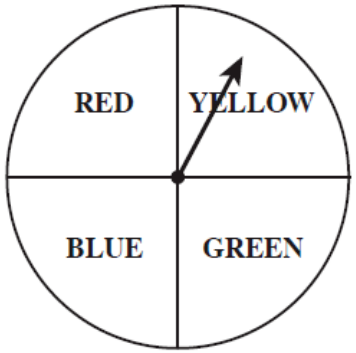
As a fraction,	As a decimal,	As a percent,
the probability is	the probability is	the probability is
$\frac{7}{8}$	**.875**	**87.5%**

These 8 cards are shuffled and placed face down. If Beatrice turns over only one card, what is the probability that she will get a card with a number less than 3? (CaHSEE Practice Test)



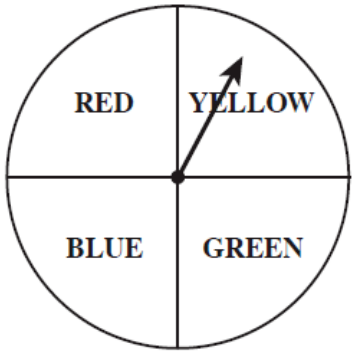
As a fraction,	As a decimal,	As a percent,
the probability is	the probability is	the probability is
$\frac{1}{4}$	**.25**	**25%**

The spinner shown is fair. What is the probability that the spinner will stop on either red or yellow if you spin it one time? (CST Released Item, Grade 6)



As a fraction,	As a decimal,	As a percent,
the probability is	the probability is	the probability is
$\frac{1}{2}$	**.5**	**50%**

The spinner shown is fair. What is the probability that the spinner will NOT stop on red if you spin it one time? (CST Released Item, Grade 6)



As a fraction,	As a decimal,	As a percent,
the probability is	the probability is	the probability is
$\frac{3}{4}$	**.75**	**75%**

The table shows how many shirts of each color Paul has in his closet. If Paul chooses a shirt without looking, what is the probability that it will be blue? (CST Released Item, Grade 6)

Color	Number of Shirts
Green	3
Red	4
White	5
Blue	8
Total	20

As a fraction,

the probability is

$\frac{8}{20}$

As a decimal,

the probability is

.4

As a percent,

the probability is

40%

The table shows how many shirts of each color Paul has in his closet. If Paul chooses a shirt without looking, what is the probability that it will be green? (CST Released Item, Grade 6)

Color	Number of Shirts
Green	3
Red	4
White	5
Blue	8
Total	20

As a fraction,

the probability is

$\frac{3}{20}$

As a decimal,

the probability is

.15

As a percent,

the probability is

15%

The table shows how many shirts of each color Paul has in his closet. If Paul chooses a shirt without looking, what is the probability that it will be red?

(CST Released Item, Grade 6)

Color	Number of Shirts
Green	3
Red	4
White	5
Blue	8
Total	20

As a fraction,

the probability is

$\frac{4}{20}$

As a decimal,

the probability is

.2

As a percent,

the probability is

20%

In her pocket, Kira has 2 red marbles, 3 green marbles and 2 blue marbles that are all the same size. If Kira picks one marble out of her pocket without looking, what is the probability that it will be either red or green?

(CST Released Item, Grade 6)

As a fraction,	As a decimal,	As a percent,
the probability is	the probability is	the probability is
$\frac{5}{7}$	**.714**	**71%**

In her pocket, Kira has 2 red marbles, 3 green marbles and 2 blue marbles that are all the same size. If Kira picks one marble out of her pocket without looking, what is the probability that it will be green?

(CST Released Item, Grade 6)

As a fraction,	As a decimal,	As a percent,
the probability is	the probability is	the probability is
$\frac{3}{7}$	**.429**	**43%**

In her pocket, Kira has 2 red marbles, 3 green marbles and 2 blue marbles that are all the same size. If Kira picks one marble out of her pocket without looking, what is the probability that it will be red?

(CST Released Item, Grade 6)

As a fraction,

the probability is

$\frac{2}{7}$

As a decimal,

the probability is

.286

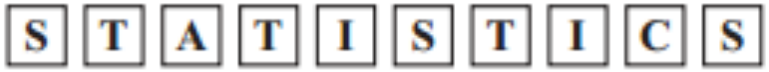
As a percent,

the probability is

29%

Anna has the letter tiles below in a bag. She reached in the bag and pulled out an S. She then put the tile back in the bag. If Anna randomly selects at tile from the bag, what is the probability that she will select an S again?

(CaHSEE Practice Test)



As a fraction,

the probability is

$\frac{3}{10}$

As a decimal,

the probability is

.3

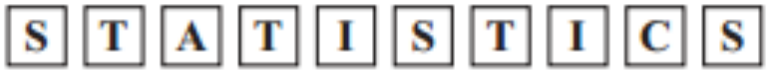
As a percent,

the probability is

30%

Anna has the letter tiles below in a bag. If Anna randomly selects at tile from the bag, what is the probability that she will select an M?

(CaHSEE Practice Test)



As a fraction,

the probability is

$\frac{0}{10}$

As a decimal,

the probability is

0

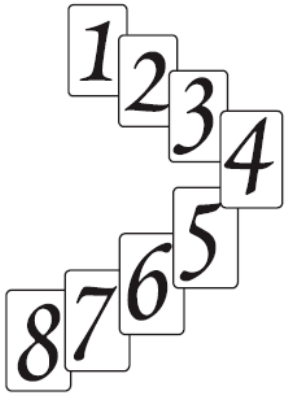
As a percent,

the probability is

0%

This event is impossible!

These 8 cards are shuffled and placed face down. If Beatrice turns over only one card, what is the probability that she will get a card with a number that is less than 12? (CST Released Item, Grade 6)



As a fraction,

the probability is

$\frac{8}{8}$

As a decimal,

the probability is

1

As a percent,

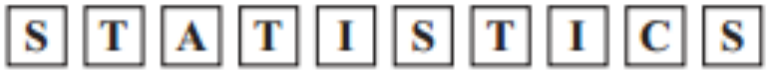
the probability is

100%

This event is certain!

Anna has the letter tiles below in a bag. If Anna randomly selects at tile from the bag, what is the probability that she will select an A?

(CaHSEE Practice Test)



As a fraction,

the probability is

$\frac{1}{10}$

As a decimal,

the probability is

0.1

As a percent,

the probability is

10%

** A few notes about the lesson:

- The items selected for the Warm-Up Activity are intended to challenge the students' knowledge of probability to get the conversation started. Some of the answers are rounded (approximations), and some are not (exact).
- Discuss with your students that there are examples of probability around them everyday, and encourage them to find them in their lives.
- Continue the conversation of probability as it related to their lives, keeping in mind that this is all theoretical probability. It's important to discuss how that is different from experimental probability.