Math 7: Week of May 25th

Lesson 13: Probability

Target:

Find and interpret experimental and theoretical probabilities.

Directions:

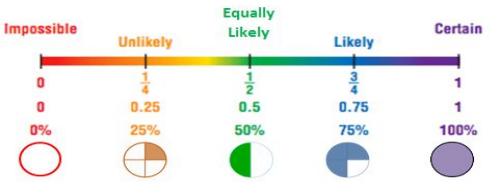
- Go through the slides (notes) and work through the examples on a separate piece of paper.
- Complete the practice problems on a separate piece of paper.
- Check your answers with the key given at the end of the lesson. If you got any incorrect, use the right answer to problem solve and find the error.
- Check Google Classroom and/or your school email for the schedule of online help sessions.

Vocabulary

- **Probability**: The measure of how likely it is an event will occur.
- **Outcome**: *One possible result* from an experiment or probability event.
- **Event**: A desired outcome or group of outcomes.
- **Trial**: A single act of performing an experiment.
- **Complement**: Two probabilities whose sum is 1. Together they make up all the possible outcomes without repeating any outcomes.

Vocabulary (Continued)

- **Theoretical Probability**: The ratio of favorable outcomes to the number of possible outcomes. (What should happen)
- **Experimental Probability**: The ratio of the number of times an event occurs to the total number of trials. (What does happen)



Theoretical Probability

$$\text{Probability of an event} = P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

Experimental Probability

$$P(\text{event}) = \frac{\text{number of times the event occurs}}{\text{total number of trials}}$$

Theoretical Probability

Example 1

FYI: Number cubes are dice.
1 number cube = die
2+ number cubes = dice

Find P(1 or 2) when rolling a number cube.

"Find the probability of rolling a 1 or 2 on a number cube"

$$P(1 \text{ or } 2) = \frac{\text{number of favorable outcomes } (1,2)}{\text{number of possible outcomes } (1,2,3,4,5,6)} = \frac{2}{6} = \frac{1}{3}$$

This means rolling a 1 or 2 should happen once for every three times you roll the die. This doesn't mean it will happen.

Theoretical Probability

Example 2

Find P(7) when rolling a number cube.

"Find the probability of rolling a 7 on a number cube (die)"

$$P(7) = \frac{\text{number of favorable outcomes } (7)}{\text{number of possible outcomes } (1,2,3,4,5,6)} = \frac{0}{6} = 0$$

When it equals 0, that means it's impossible for the event to occur.

EXPLORE! **COIN FLIP**

Step 1: Copy the table below. Flip a coin 10 times.

a. Using tallies, record the number of times the coin lands on heads and the number of times it lands on tails.

Heads	Tails

b. Determine your experimental probability of the coin landing on heads from 10 flips by putting numbers in the following ratio. Write the probability as a fraction and a decimal.

$$P(\text{heads}) = \frac{\text{number of heads}}{\text{total number of trials}}$$

Step 2: Flip the coin 10 more times (now you have flipped the coin 20 times).

a. Add tallies to your chart for each additional head and tail.

b. Determine your experimental probability of the coin landing on heads with 20 flips as you did in **Step 1b.** Write the probability as a fraction and a decimal.

EXPLORE! **CONTINUED**

Step 3: Flip the coin 10 more times (now you have flipped the coin 30 times).

a. Add tallies to your chart for each additional head and tail.

b. Determine your experimental probability of the coin landing on heads with 30 flips as you did in **Step 1b.** Write the probability as a fraction and a decimal.

Step 4: Repeat this process until you have flipped the coin 100 times. Stop after every 10 flips to record your results and experimental probability of the coin landing on heads.

Step 5: Find the theoretical probability of the coin landing on heads. How many heads would you expect to get after 100 flips?

Step 6: After which set of flips was the probability closest to 0.5?

Step 7: Why do you think doing more trials makes the experimental probability closer to the theoretical probability?

Experimental Probability

Example 3

Kyle rolled a number cube 60 times. His results are shown in the table below.

Number rolled	1	2	3	4	5	6
Frequency	8	12	6	15	4	15

a. Find Kyle's *experimental probability* of rolling a 6.

$$P(6) = \frac{\text{number of times a 6 was rolled}}{\text{number of trials}} = \frac{15}{60} = \frac{1}{4}$$

b. Find Kyle's *experimental probability* of not rolling a 6.

$$P(\text{not } 6) = \frac{\text{number of times a 6 was not rolled } (8+12+6+15+4)}{\text{number of trials } (60)} \quad \frac{45}{60} = \frac{3}{4}$$

Example 3 (Continued)

Kyle rolled a number cube 60 times. His results are shown in the table below.

Number rolled	1	2	3	4	5	6
Frequency	8	12	6	15	4	15

c. Find the *theoretical probability* of rolling a 6.

$$P(6) = \frac{\text{number of favorable outomes}}{\text{number of possible outcomes}} = \frac{1}{6}$$

d. Find the *theoretical probability* of not rolling a 6.

$$P(\text{not } 6) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}} = \frac{5}{6}$$

Example 4 (Theoretical and Experimental)

Mr. Smith has a deck of cards numbered 1 through 20. The cards are shuffled. One card is picked at random. Find each probability.

1. P(7) --- There's only one 7 in the deck; 20 cards total to choose from.
   Answer~ 1: 20
2. P(odd number) --- There are 10 odd numbers in the deck; 20 cards total
   Answer~ 10:20 = 1:2
3. P(40) --- There isn't a 40 in the deck; 20 cards total
   Answer~ 0:20 = 0
4. **Martha picked cards 40 times and picked a "7" four times.**
   a. What is the *experimental probability* Martha will pick a "7"?
   She picked the "7" four times; 40 cards picked --- 4: 40 = 1:10
   b. Is Martha's experimental probability greater than or less than the theoretical probability of picking a "7"?
   Greater; E.P. = 1:10 and the T.P.= 1:20

Practice~

Find each probability for 1 roll of a regular number cube. Write as a fraction in simplest form.

1. P(2) **2.** P(3, 4 or 5) **3.** P(8)

4. P(even number) **5.** P(number less than 3) **6.** P(1 through 6)

A student is chosen at random from a 7th grade math class of 16 girls and 8 boys. Find each probability.

7. P(girl) **8.** P(boy) **9.** P(not a boy)

10. P(boy or girl) **11.** P(neither boy nor girl) **12.** P(not a girl)

Practice Continued~

13. Mark and Abby played a game which required flipping a coin. Mark won when the coin landed heads and Abby won when the coin landed tails. Below is the table showing their wins.

Person	Mark	Abby
Number of Wins	10	15

a. Find the experimental probability Mark wins.
b. Find the experimental probability Abby wins.
c. Find the theoretical probability Mark will get a win on the next flip of the coin.

14. Paul hit 4 homeruns out of 16 pitches at batting practice. Find the experimental probability he will hit a homerun on his next pitch at batting practice.

Practice Answers:

Check your work!

Answers Provided Here!

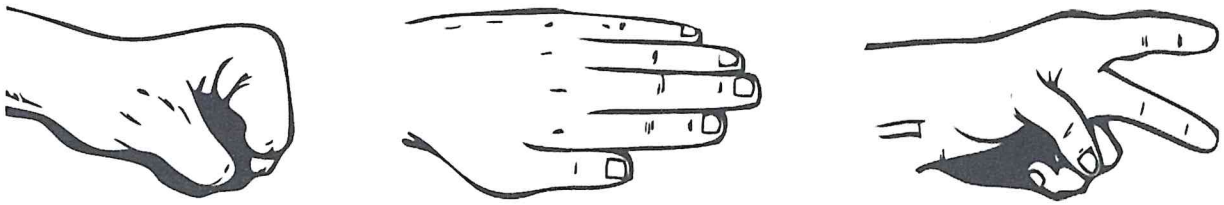
If you're stuck, ASK! Help sessions are provided each week. Check Google Classroom for dates and times.

Worksheet 13

1. $\frac{1}{8}$
2. $\frac{1}{2}$
3. 0
4. $\frac{1}{2}$
5. $\frac{1}{2}$
6. 1
7. $\frac{2}{3}$
8. $\frac{1}{3}$
9. $\frac{2}{3}$
10. 1
11. 0
12. $\frac{1}{3}$
13. a. $\frac{2}{5}$
b. $\frac{3}{5}$
c: $\frac{1}{2}$
14. $\frac{1}{4}$

FINAL SLIDE FOR MATH 7!

Probability Rock, Paper, Scissors



Probability: The chance that something will happen.

If you and a friend are playing rock, paper, scissors...

1. What is the probability that your friend will throw a rock?

2. What is the probability that your friend will not throw paper?

Get together with a partner and play rock, paper, scissors. Play a total of 20 times and record your data.

1. How many times was rock thrown by your partner? _____

   A. What was the probability? _____ / _____

2. How many times was paper thrown by your partner? _____

   A. What was the probability? _____ / _____

3. How many times was scissors thrown by your partner? _____

   A. What was the probability? _____ / _____

4. What do these results tell you? _____

_____