Geometry

13.1 Notes

EXPERIMENTAL AND THEORETICAL PROBABILITY

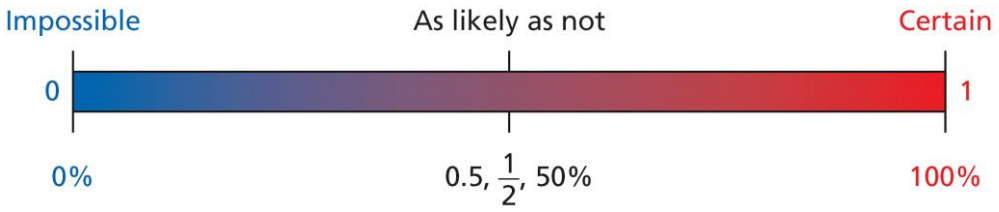
Target 13.1 a) I can find experimental and theoretical Probability

Target 13.1 b) I can define outcome, events, sample space, complement

PART I: VOCABULARY

- ✓ **Probability –** measures the likelihood an event will occur. * can be a ratio, decimal or % b/w 0 → 1
- ✓ **Outcomes –** - possible result of a situation/experiment
- ✓ **Sample Space –** set of all possible outcomes
- ✓ **Event -** may be single outcome or a group of outcomes

Experiment or Situation	Rolling a number cube 	Spinning a spinner 
Sample Space	{1, 2, 3, 4, 5, 6}	{red, blue, green, yellow}



PART II: THEORETICAL PROBABILITY

↳ Describes likelihood of event based on mathematical reasoning

Theoretical Probability – for equally likely outcomes:

$$P(\text{event}) = \frac{\#\text{ of favorable outcomes}}{\#\text{ of possible outcomes}}$$

Let's Practice theoretical probability!

Example 1: Each letter of the word PROBABLE is written on a separate card. The cards are placed face down and mixed up. What is the probability that a randomly selected card has a consonant?

How many possible outcomes are there? 8 How many favorable outcomes? 5

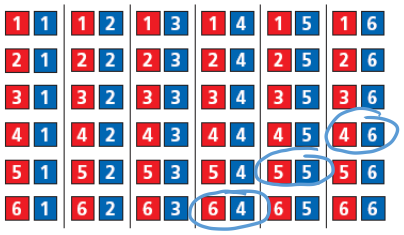
P(consonant) = $\frac{5}{8}$

Example 2: A CD has 5 upbeat dance songs and 7 slow ballads. What is the probability that a randomly selected song is an upbeat dance song?

How many possible outcomes are there? 12 How many favorable outcomes? 5

P(upbeat dance song) = $\frac{5}{12}$

Example 3: Two number cubes are rolled. What is the probability that the sum is 10?



# of poss outcomes = 36

# of sum=10 = 3

$P(\text{sum } 10) = \frac{3}{36} = \frac{1}{12}$

Example 4: Two number cubes are rolled. What is the probability the difference is 6?

impossible 0/36

PART III: EXPERIMENTAL PROBABILITY – of an event measures the likelihood that the event occurs based on the actual results of the experiment

Experimental Probability = $\frac{\#\text{ of times event occurs}}{\#\text{ of times experiment is done}}$

***Note: Experimental probability is based on observations or the results of trials, so it likely will notmatch the theoretical probability.**

Let's Practice Experimental Probability!

Example 1: The table shows the results of a spinner experiment. Find the experimental probability of spinning a 4.

Number	Occurrences
1	6
2	11
3	19
4	14

Total = 50

$P(4) = \frac{14}{50} = \frac{7}{25}$

Example 2: Find the experimental probability of spinning a number greater than 2.

$P(3 \text{ or } 4) = \frac{33}{50}$

Example 3: The table shows the results of choosing one card from a deck of cards, recording the suit, and then replacing the card. Find the experimental probability of choosing a card that is not a club.

Card Suit	Hearts	Diamonds	Clubs	Spades
Number	5	9	7	5

Total = 26

$P(\heartsuit\text{'s}, \diamondsuit\text{s}, \text{Sp.}) = \frac{19}{26}$

PART IV: PROBABILITY OF A COMPLEMENT

consists of all of the possible outcomes in a sample space that are NOT part of the event

Complement – the probability of the complement of an event is

P(not event) = 1 − P(event)

Let's practice conditional probability!

Example 1: There are 25 students in study hall. The table shows the number of students who are studying a foreign language. What is the probability that a randomly selected student is not studying a foreign language?

Language	Number
French	6
Spanish	12
Japanese	3

total = 21

P(not F.L.) = 1 − P(F.L.)

$= 1 - \frac{21}{25}$

P(not studying foreign lang) = $\frac{4}{25}$

Example 2: A jar contains 10 red marbles, 8 green marbles, 5 blue marbles, and 6 white marbles. What is the probability that a randomly selected marble… total = 29

a) Is green?

$\frac{8}{29}$

b) is not green?

1 − P(green)

$1 - \frac{8}{29} = \frac{21}{29}$

c) Is not blue?

1 − P(blue)

$1 - \frac{5}{29}$

$\frac{24}{29}$

d) is white?

$\frac{6}{29}$

PART V: Difference between Experimental and Theoretical

Drake used a standard deck of 52 cards and selected a card at random. He recorded the suit of the card she picked, and then replaced the card. The results are in the table below.

Diamonds	𝍸 ||	7
Hearts	𝍸 ||||	9
Spades	𝍸 𝍸 |	11
Clubs	|||	3

30

a) Based on his results, what is the experimental probability of selecting a heart?

$9/30 = .3$

b) What is the theoretical probability of selecting a heart?

$13/52 = .25$

c) Based on her results, what is the experimental probability of selecting a diamond?

$7/30 = .23$

d) What is the theoretical probability of selecting a diamond?

$13/52 = .25$

**Why is there a difference between the experimental probability and the theoretical probabilities above??*

smaller sample space

larger sample space