Probability: Part 3

- Topics: Compound Events

- Objective: Students will be able to calculate sample spaces and probabilities of compound events.

- Standards: CCSS Math: 7.SP.C.8, 7.SP.C.8b, AP Stats: VAR-4 (EU), VAR-4.E (LO), VAR-4.E.1 (EK), VAR-4.E.2 (EK)

Sample Spaces: Tables

Definition: A sample space is a set of elements that represents all possible outcomes of a statistical experiment.

Example 1: You're playing a fantasy game that allows you to create your own character. There are 5 options for the race of the character, and there are 3 options for the character's main tool.
If you randomly choose the race and the tool, which of these diagrams can be used to find all of the possible outcomes?

Diagram A

	Magic	Sword	Slingshot
Elf	Magic Elf	Sword Elf	Slingshot Elf
Hobbit	Magic Hobbit	Sword Hobbit	Slingshot Hobbit
Human	Magic Human	Sword Human	Slingshot Human
Orc	Magic Orc	Sword Orc	Slingshot Orc
Troll	Magic Troll	Sword Troll	Slingshot Troll

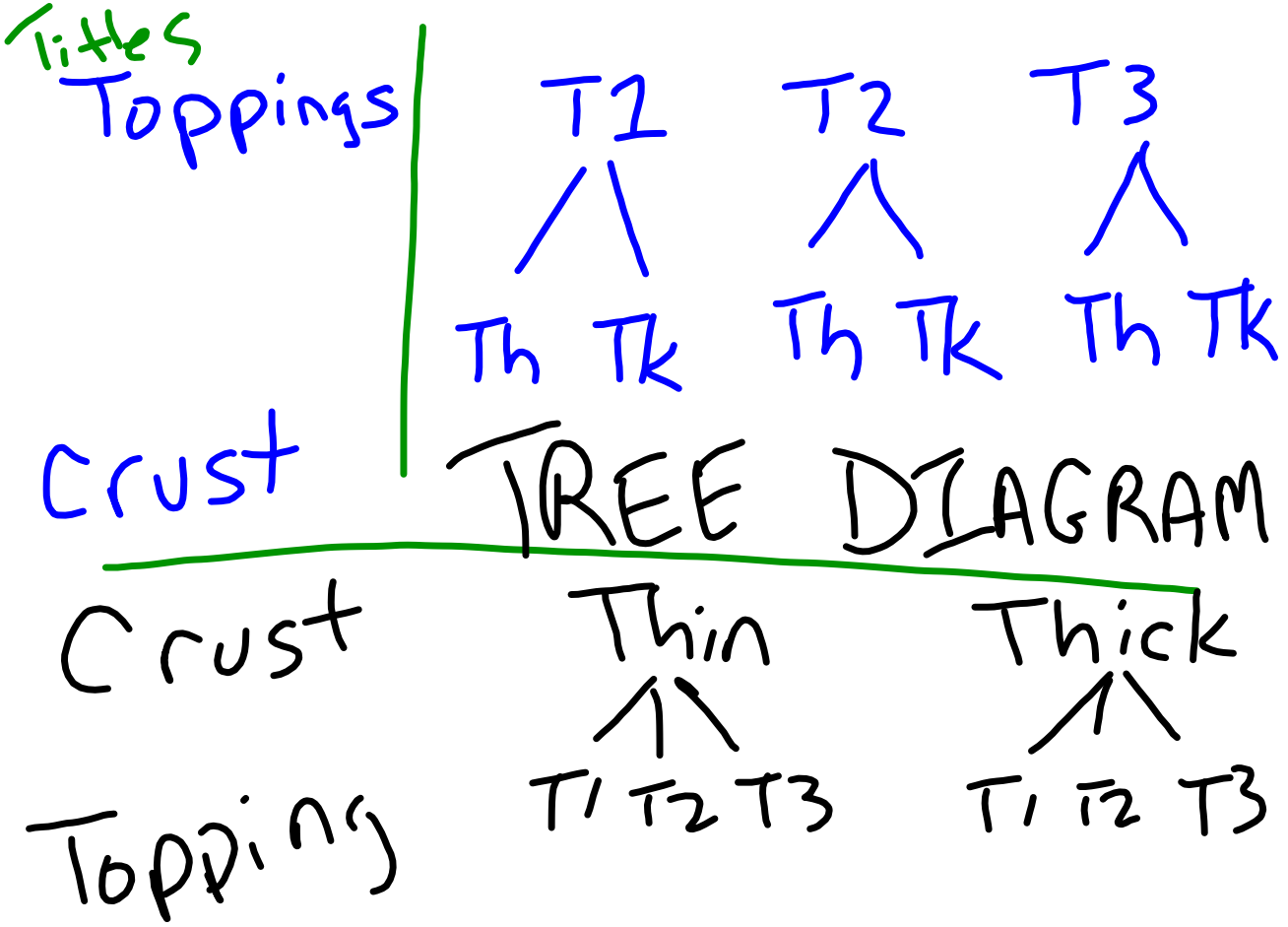
Diagram B:

	Elf	Hobbit	Human
Magic	Magic Elf	Magic Hobbit	Magic Human
Sword	Sword Elf	Sword Hobbit	Sword Human
Shield	Shield Elf	Shield Hobbit	Shield Human
Slingshot	Slingshot Elf	Slingshot Hobbit	Slingshot Human
Umbrella	Umbrella Elf	Umbrella Hobbit	Umbrella Human

Sample Spaces: Tree Diagrams

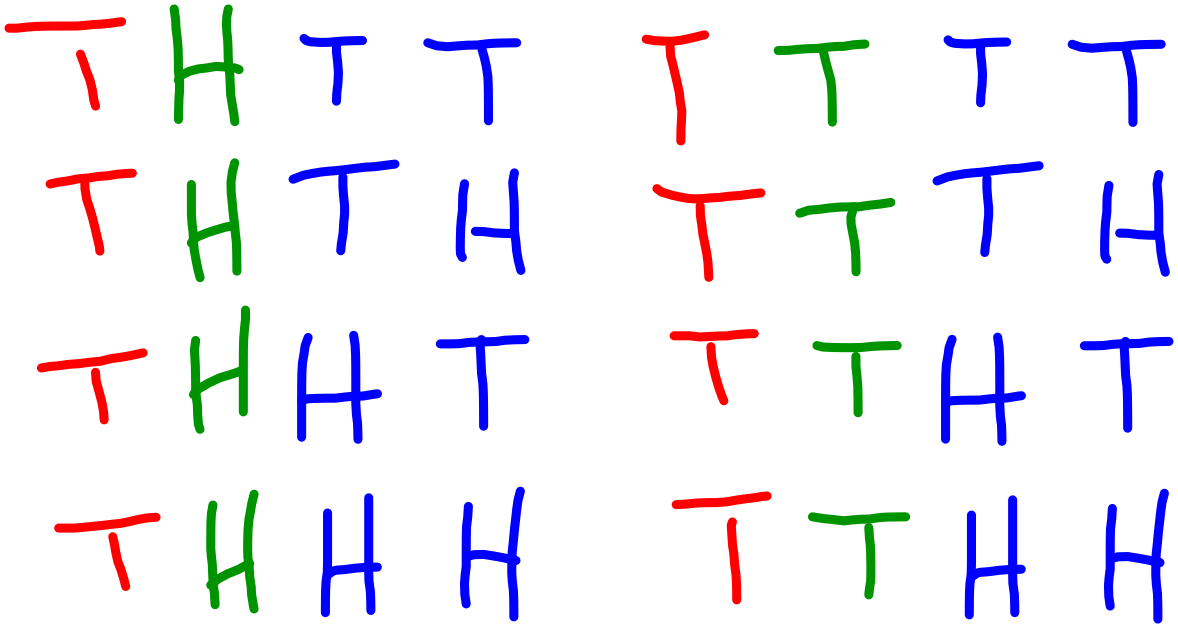
Example 2: You're ordering a one-topping pizza. You can choose from 3 different toppings and 2 types of crust.

If you randomly pick the topping and crust, which of these diagrams can be used to find all of the different kinds of pizza you can order?



Sample Spaces: Flipping Coins

Example 2: What are all of the outcomes of flipping ***n*** number of coins?



Independent Probability

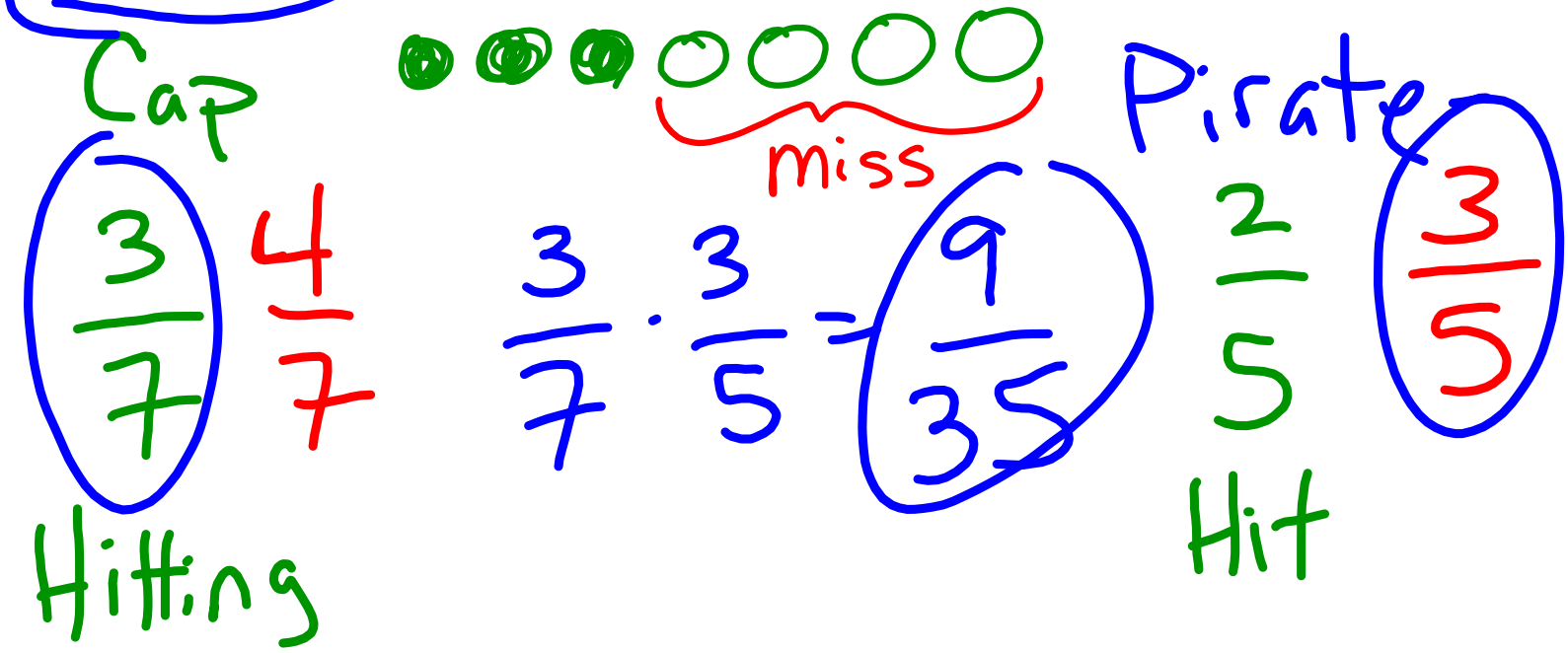
Definition: When two events are said to be **independent** of each other, what this means is that the **probability** that one event occurs in no way affects the **probability** of the other event occurring. An example of two **independent** events is as follows; say you rolled a die and flipped a coin.

Independent Probability: Fractions

Example 1: Captain Umaima has a ship, the H.M.S. Khan. The ship is two furlongs from the dread pirate Nadia and her merciless band of thieves.

The Captain has probability of 3/7 of hitting the pirate ship. The pirate only has one good eye, so she hits the Captain's ship with probability of 2/5.

If both fire their cannons at the same time, what is the probability that the Captain hits the pirate ship, but the pirate misses?



Independent Probability: Percentages

Example 2: Chris Paul is shooting free throws. Making or missing free throws doesn't change the probability that he will make his next one, and he makes his free throws 88% of the time.
What is the probability of Chris Paul making all of his next 9 free throw attempts?

Choose 1 answer:

(A) $9 \cdot 0.88$

(B) 0.88^9

(C) $(1 - 0.88)^9$

(D) $9 \cdot (1 - 0.88)$

88% as decimal: .88

1 2 3

.88

making .88 · .88 · .88 ·

missing 12^9

100
-88
12

Probability of Compound Events

NOTE 1: You will need the Sample Space of outcomes for each of these problems.

NOTE 2: You may need to create the sample space yourself...

Example 1: If you flip three fair coins, what is the probability that you'll get at least two heads?

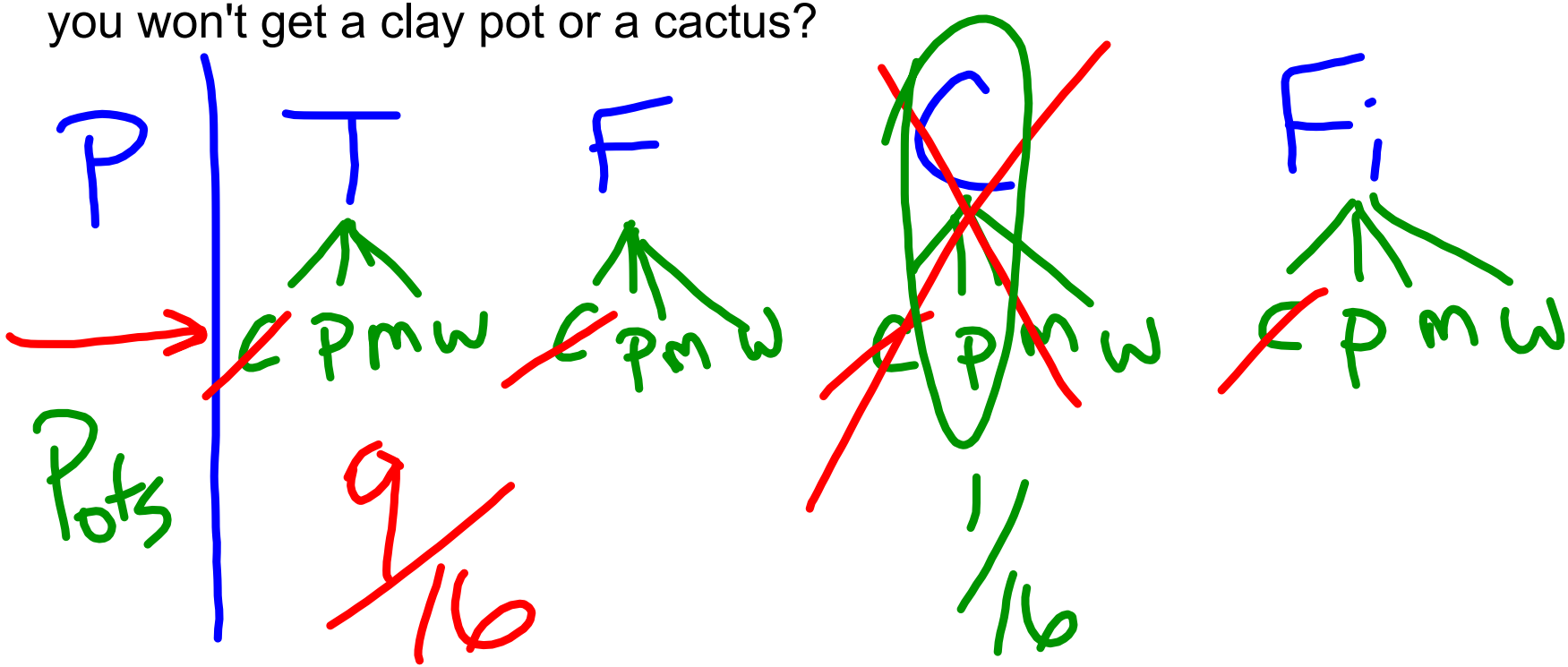
Outcome	Flip 1	Flip 2	Flip 3
1	H	H	H
2	H	H	T
3	H	T	H
4	H	T	T
5	T	H	H
6	T	H	T
7	T	T	H
8	T	T	T

$\frac{4}{8}$

Probability of Compound Events

Example 2: You've decided you want a plant for your room. At the gardening store, there are 4 different kinds of plants (tulip, fern, cactus, and ficus) and 4 different kinds of pots to hold the plants (clay pot, plastic pot, metal pot, and wood pot).

If you randomly pick the plant and the pot, what is the probability that you won't get a clay pot or a cactus?



SS_Probability of "at-least one" Success

Formulas:

P(at-least one ***Success)*** = 1 - P(all ***Failures)***
or

P(at-least one ***Failure)*** = 1 - P(all ***Successes)***

https://www.khanacademy.org/math/ap-statistics/probability-ap/probability-multiplication-r

Shota built a time travel machine, but he can't control the duration of his trip. Each time he uses the machine he has a 0.8 probability of staying in the alternative time for more than an hour. During the first year of testing, Shota uses his machine 20 times.

Assuming that each trip is equally likely to last for more than an hour, what is the probability that at least one trip will last less than an hour?

Round your answer to the nearest hundredth.

$P(\text{at least one} < 1 \text{ hour}) =$ ☐

want $<1\text{hr} = 1 - >\text{hr}$

$1 - .8^{20}$

Not def = .98

4 chips (Not def) = $.98^4$

Iterations

Displaying and Comparing Quantitative Data

You should be working on the following skills:

1. Sample space of compound events
2. Independent probabilities
3. Probabilities of compound events
4. Probability of "at-least one" success

Attachments

Ztable.pdf