

Conditional Probabilities Class Work

🦋 **Objective:** You will be able to calculate the probability of an event, given that another event has occurred. You will also be able to use this conditional probability to determine if two events are dependent or independent.

★ **Conditional Probability**

Conditional probability is the probability of an event A, given another event B.

For example, if we want to determine the probability that a student in this class is a female, given that the student is right handed, we would consider this a conditional probability.

	Left-Handed	Right-Handed	Ambidextrous	Total
Female				
Male				
Total				

In order to determine conditional probabilities, we must divide the probability of A and B (both events combined) by the probability of event B.

That is,

$$P(A \text{ given } B) = \frac{P(A \text{ and } B)}{P(B)}$$

In this example, $P(\text{female given right-handed}) = P(\text{female and right-handed}) / P(\text{right-handed})$

Determine the probability that a student in this class is male given that the student is left-handed.

Determine the probability that a student in our class is right handed given that the student is male.

★ Dependent vs. Independent Events

Two events are dependent if the probability of one affects the probability of the other.

That is, if $P(A)$ is different from $P(A \text{ given } B)$, then A and B are dependent events.

Two events are independent if the probability of one does not affect the probability of the other.

That is, if $P(A)$ is exactly the same as $P(A \text{ given } B)$ and $P(B)$ is the same as $P(B \text{ given } A)$, then A and B are independent events.

Guided Example:

In a school, there are a total of 800 athletes. 480 of these athletes play baseball, 260 play football, and 175 play both baseball and football. One athlete will be chosen at random.

Consider the events:

T: The selected athlete plays football.

V: The selected athlete plays baseball.

Are T and V independent? Support your answer thoroughly.

☛ **Now You Try Some:**

1. Consider the events F: rolling a four on a normal six-sided die and J: picking a Jack from a normal deck of cards. Are F and J independent? Support your answer thoroughly.

2. Consider the two-way table of people in a room.

	Under 30 Years Old	30 years Old	Over 30 Years Old	Total
Exercises at least once per week	10	23	8	41
Does not exercise at least once per wee	1	2	3	6
Total	11	25	11	47

One person will be selected at random to participate in a study. Consider the events:

C: The selected person is 30 years old

D: The selected person exercises at least once per week.

Are C and D independent? Support your answer thoroughly.

3. Frank's batting average is .281, meaning he makes it on base 281 out of every 1000 times he is at bat. Chris' batting average is .183. Consider the event of Frank making it on base and Chris making it on base. Are these events independent? Thoroughly support your answer.

★ ***Sum It Up:***

*How can you determine the probability of an event, given another event?

*How can you determine whether or not two events are independent?