

MATH 3307

Lesson 9

General Probability Rules

Two events are **independent** if knowing that one occurs does not change the probability that the other occurs.

(Note: This is not the same as sets that are disjoint or mutually exclusive)

If E and F are independent events, then $P(E \cap F) = P(E)P(F)$

Example:

If $P(A) = .36$ and $P(B) = .58$ and A and B are independent, what is $P(A \text{ and } B)$?

Dependent Events

Dependent events, the occurrence of one event does have an effect on the occurrence of the other event. The probability $P(E | F)$ is read “the probability of event E given event F had already occurred”. If E and F are

independent, then $P(E | F) = P(E)$. If events E and F are dependent then
$$P(E | F) = \frac{P(E \cap F)}{P(F)}$$
.

This means $P(E \cap F) =$

Examples:

A clothing store that targets young customers (ages 18 through 22) wishes to determine whether the size of the purchase is related to the method of payment. A sample of 300 customers was analyzed and the information is below:

	Cash	Credit	Layaway	Total
Under \$40	60	30	10	100
\$40 or more	40	100	60	200
Total	100	130	70	300

	Cash	Credit	Layaway	Total
Under \$40	60	30	10	100
\$40 or more	40	100	60	200
Total	100	130	70	300

- a. If a customer is selected at random from this group of customers, what is the probability that the customer paid cash?

- b. If a customer is selected at random from this group of customers, what is the probability that the customer paid with a credit card?

- c. If a customer is selected at random from this group of customers, what is the probability that the customer paid with the layaway plan?

	Cash	Credit	Layaway	Total
Under \$40	60	30	10	100
\$40 or more	40	100	60	200
Total	100	130	70	300

d. If a customer is selected at random from this group of customers, what is the probability that the customer purchased under \$40?

e. If a customer is selected at random from this group of customers, what is the probability that the customer purchased \$40 or more?

	Cash	Credit	Layaway	Total
Under \$40	60	30	10	100
\$40 or more	40	100	60	200
Total	100	130	70	300

f. If a customer is selected at random from this group of customers, what is the probability that the customer paid with a credit card given that the purchase was under \$40?

g. If a customer is selected at random from this group of customers, what is the probability that the customer paid with the layaway plan given that the purchase was \$40 or more?

Example: $P(A) = 0.6$ $P(B) = 0.3$ $P(A \cup B) = 0.8$

Determine the value of $P(A \cap B)$

Determine the value of $P(A|B)$

Determine the value of $P(B|A)$

Are events A and B independent?

Examples:

Thirty percent of the students at a local high school face a disciplinary action of some kind before they graduate. Of those “felony” students, 40% go on to college. Of the ones who do not face a disciplinary action, 60% go on to coll

- a. What is the probability that a randomly selected student both faced a disciplinary action and went on to college?
- b. What percent of the students from the high school go on to college?
- c. Show if events {faced disciplinary action} and {went to college} are independent or not.