

The **conditional probability of A, given B** (the probability of event A, computed on the assumption that event B has happened) is

$$P(A | B) = \frac{P(A \cap B)}{P(B)} \quad (\text{assuming } P(B) \neq 0).$$

Similarly, the **conditional probability of B, given A** is

$$P(B | A) = \frac{P(A \cap B)}{P(A)} \quad (\text{assuming } P(A) \neq 0).$$

3. (continued)

The probability that a randomly selected student at Anytown College owns a bicycle is 0.55, the probability that a student owns a car is 0.30, and the probability that a student owns both is 0.10.

	C	C'	
B	0.10	0.45	0.55
B'	0.20	0.25	0.45
	0.30	0.70	1.00

$P(B) = 0.55, P(C) = 0.30, P(B \cap C) = 0.10.$

- a) What is the probability that a student owns a bicycle, given that he/she owns a car?

- b) Suppose a student does not have a bicycle. What is the probability that he/she has a car?

5. (continued)

Suppose

$$P(A) = 0.22,$$

$$P(B) = 0.25,$$

$$P(C) = 0.28,$$

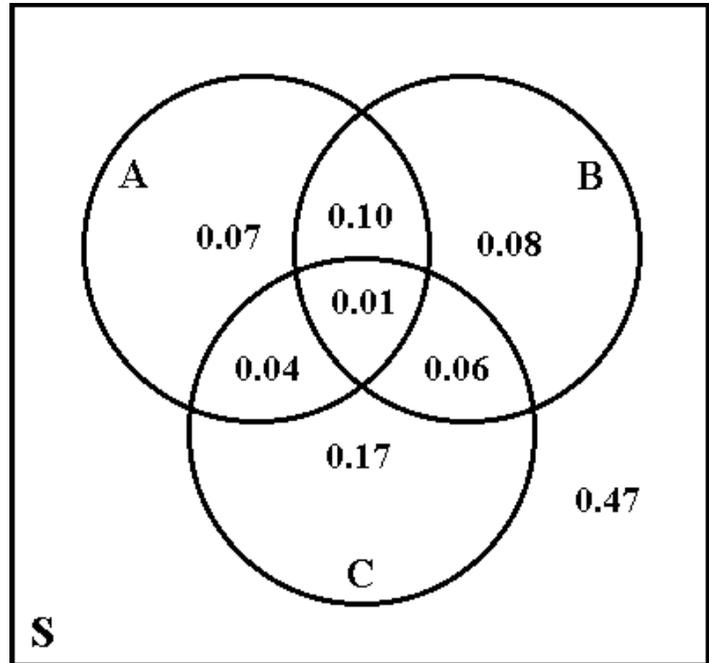
$$P(A \cap B) = 0.11,$$

$$P(A \cap C) = 0.05,$$

$$P(B \cap C) = 0.07,$$

$$P(A \cap B \cap C) = 0.01.$$

Find the following:



a) $P(B | A)$

b) $P(B | C)$

c) $P(B \cap C | A)$

d) $P(B \cup C | A)$

e) $P(C | A \cup B)$

f) $P(C | A \cap B)$

g) $P(A \cap B \cap C | A \cup B \cup C)$

Multiplication Law of Probability

If A and B are any two events, then

$$P(A \cap B) = P(A) \cdot P(B | A)$$

$$P(A \cap B) = P(B) \cdot P(A | B)$$

- 8.** It is known that 30% of all the students at Anytown College live off campus. Suppose also that 48% of all the students are females. Of the female students, 25% live off campus.
- a) What is the probability that a randomly selected student is a female and lives off campus?
- b) What is the probability that a randomly selected student either is a female or lives off campus, or both?
- c) What proportion of the off-campus students are females?
- d) What proportion of the male students live off campus?

9. Suppose that Joe's Discount Store has received a shipment of 25 television sets, 5 of which are defective. On the following day, 2 television sets are sold.

- a) Find the probability that both of the television sets are defective.

- b) Find the probability that at least one of the two television sets sold is defective.

10. Cards are drawn one-by-one **without** replacement from a standard 52-card deck. What is the probability that ...

- a) ... both the first and the second card drawn are ♥'s?

- b) ... the first two cards drawn are a ♥ and a ♣ (or a ♣ and a ♥)?

- c) ... there are at least two ♥'s among the first three cards drawn?