

Probability Distribution Problems

[Answers](#)

1. A large department store claims that 75% of shoplifters in the store will be detected by the store's closed circuit TV system, 25% by the store's security officers, and 10% by both. If the claims are true, what is the probability that a shoplifter will be detected?
2. Results from a faculty survey found that 40% of all faculty at CSULA read the Los Angeles Times (LAT), 55% read the New York Times (NYT) and 20% read neither paper.
 - a. What is the probability a randomly selected faculty member reads both papers?
 - b. What is the probability a randomly selected faculty member does not read the NYT?
 - c. What is the probability a randomly selected faculty member reads only one of the papers?
 - d. What is the probability a randomly selected faculty member reads at least one of the publications?
 - e. Given that a faculty member reads the NYT, what is the probability the person also reads the LAT?
3. Suppose 20% of the faculty at CSULA teach in one of the sciences (biology etc.). Assume females make up 45% of all the faculty members in the university. Eight percent of the faculty are females who teach in the sciences.
 - A. What is the probability that a randomly selected professor does not teach in the sciences?
 - B. What is the probability a randomly selected professor is not female?
 - C. What is the probability a randomly selected professor is non-female and teaches in the sciences?
 - D. What is the probability a randomly selected professor is a female who teaches in the sciences?
 - E. Given that a professor is female, what is the probability the professor teaches in the sciences?
 - F. Given that a professor is not a female, what is the probability the professor teaches in the sciences?

4. Many traits are controlled by a dominant gene, **A**, and a recessive gene, **a**. Suppose two parents carry the genes and the probability of either parent giving the dominant gene to an offspring is .75. The probability of giving the recessive gene is .25. Assume the probability obtaining a gene from one parent is independent of getting the gene from the other parent.
- A. Use the assumption of independence to fill in the joint probability table below. (**A_m** – dominant gene from the male; **A_f** – dominant gene from the female).

	A_m	a_m	<u>marginal probability</u>
A_f			
a_f			
<u>marginal probability</u>			

- B. What is the probability the child will receive the dominant gene from both parents?
- C. What is the probability the child will receive a dominant gene from one parent and a recessive gene from the other?
- D. What is the probability the child will receive the recessive gene from her father?
- E. Suppose the dominant gene represents brunette hair. If a child receives the dominant gene from at least one of her parents, she will have brunette hair. Otherwise she will be blonde. What is the probability the child will be blonde?
- F. What is the probability the child will be brunette?

5. In commercial aviation, speed sensors ([pitot tubes](#)) are affixed to the outer skin of the front fuselage or wing of every plane. Vehicle speed is critical information for pilots especially during take-offs and landings. The sensors are known to sometimes malfunction mainly due to icing or insects. Suppose a commercial jetliner has two pitot tubes. The probability the sensor on the front fuselage will function properly on a given flight (Event A) is 0.94. The probability the sensor on the right wing will work properly (Event B) is 0.96. Suppose the probability both pitot tubes will work is 0.93.
- A. Construct a joint probability distribution.
 - B. What is the probability that at least one of the sensors will function properly on a flight?
 - C. What is the probability neither sensor will function properly?
 - D. What is the probability one of the sensors will function properly, the other improperly? (This could be a problem for pilots if the sensors register conflicting speeds).
 - E. If the right wing sensor failed, what is the probability the front fuselage sensor will fail? Compare this to the unconditional probability of the front fuselage sensor failing. Why shouldn't we expect the events to be independent?