

MA 110 SECTION 8.3: CONDITIONAL PROBABILITY, INTERSECTION, AND INDEPENDENCE  
**HOMEWORK: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 27, 29, 37, 59, 63**

1. **CONDITIONAL PROBABILITY:** Sometimes the probability of an event will become more likely (or less likely) if we are informed of the occurrence of another event.
2. Color blindness is an inherited characteristic that is dominant in males. Suppose it is known that in a group of 500 males and 500 females, the distribution of colorblindness is as follows:

	<u>Color Blind</u>	<u>Not Color Blind</u>
Male	21	479
Female	4	496

Since color blindness is a dominant characteristic in males – males are more likely than females to be colorblind. So if we know that a person is a male, we would expect the probability to increase for that person to be colorblind. If we know the person is a female, we would expect the probability to decrease for that person to be colorblind.

A.  $P(C) =$

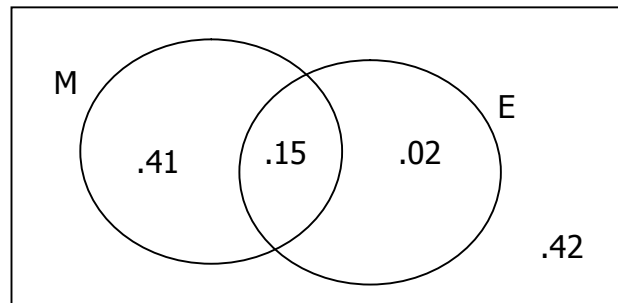
- B.  $P(C|M) =$  "The probability that a person is color blind, given that we already know the person is male." This is the conditional probability of C given M.

$$P(C|M) = P(C \cap M) / P(M) \quad ** \text{ When using a table } P(C|M) = n(C \cap M) / n(M)$$

- C.  $P(C|M')$  = "The probability that a person is color blind, given that we already know the person is male complement = female."

3. **INDEPENDENCE:** Two events A and B are independent if the likelihood of one does not affect the likelihood of the other. Obviously, the events C and M are not independent. You can confirm whether two events are independent by determining whether or not  $P(A \cap B) = P(A)P(B)$  or if  $P(A|B) = P(A)$ .

4. At a certain school, the probability that a student takes a course in mathematics is .56, the probability that a student takes a course in economics is .17, and the probability that a student takes a course in mathematics or economics is .58.



- A. Find the probability that a student takes mathematics given that the student does not take economics.
- B. Find the probability that a student takes mathematics given that the student takes economics.
- C. Are the events a student takes mathematics and a student takes economics independent?