---

**PROBABILITY RULES**

1.   The events "A" and "B" have the following probabilities:     **P(A) = 0.6          P(B) = 0.3**

     If possible, find P(A and B), P(A or B), and P(A|B) if the events A and B are…

        i. independent
        ii. disjoint (a.k.a., "mutually exclusive")
        iii. dependent (but *not* disjoint)

2.   Want more practice?  Repeat #1 with:     **P(A$^c$) = 0.65        P(B$^c$) = 0.41**

3.   Suppose that A and B are two dependent events with P(A) = 0.2, P(B) = 0.4, P(A $\cap$ B) = 0.1.  Find P(A $\cup$ B).

---

**MULTIPLE CHOICE**.   Write the letter corresponding to the <u>best</u> answer.

__4. Which two events are most likely to be mutually exclusive (disjoint)?

    A)  having a flat tire; being late for school
    B)  having a driver's license; having blue eyes
    C)  getting an A in calculus this semester; getting a B in calculus this semester
    D)  having a car accident today;  having 3 inches of snow today
    E)  being a senior;  leaving campus for lunch

__5. Which two events are most likely to be *independent?*

    A)  having a flat tire; being late for school
    B)  having a driver's license; having blue eyes
    C)  getting an A in calculus; getting an A in physics
    D)  having 3 inches of snow today in Michigan; having a car accident today in Michigan
    E)  being a senior;  leaving campus for lunch

__6. If the occurrence of event A changes the probability of event B, then events A and B are said to be

    A) dependent          B) disjoint          C) a trial          D) independent

__7. Which of the following is a correct statement?

    A)   An event that is certain not to happen has a probability of 1.0.
    B)   Probabilities are numbers whose values can be any number from -1 to 1.
    C)   The total of the probabilities assigned to all outcomes in a sample space must be exactly 1.
    D)   Probabilities are always whole numbers.

__8. An ice cream stand reports that 12% of the cones they sell are "jumbo" size.  You want to see what a "jumbo" cone looks like, so you stand and watch the sales for a while.  What is the probability that the first jumbo cone is the fourth cone you see them sell?

    A) 0.33          B) 0.08          C) 0.40          D) 0.60          E) 0.93

___9. Suppose that a distribution of scores has a mean of 16 and standard deviation of 2. If each score is multiplied by 3, what will be the mean and the standard deviation of the distribution of new scores?

| Mean | Standard Deviation |
|------|--------------------|
| A) 16 | 2 |
| B) 19 | 5 |
| C) 48 | 2 |
| D) 48 | 6 |
| E) 48 | 5 |

___10. Which of the following is true about disjoint events?

A) $P(A|B) = 0$          C) $P(A|B) = B$

B) $P(A|B) = A$          D) $P(A|B) = 1$

___11. Government data show that 26% of the civilian labor force have at least 4 years of college and that 15% of the civilian labor force works as laborers. Can you conclude that, because (0.26)(0.15) = 0.039, about 3.9% of the labor force are college-educated laborers?

A) No, because the events might not be independent

B) Yes, by conditional probabilities

C) Yes, by the multiplication rule.

___12. Let us assume that scores on the SAT verbal section are approximately normally distributed. What is the approximate probability that two randomly selected scores are both at least one standard deviation away from the mean score?

A) 0.32      B) 0.64      C) 0.46      D) 0.10      E) 0.16      F) None of these

___13. The all-time leader in career batting average among major league baseball players is Ty Cobb with a career average of 0.366. This means he got a hit in 36.6% of his official at-bats. Consider Cobb's batting to be independent from one at-bat to another. What was Cobb's probability of getting *at least one* hit in four official at-bats?

A) 0.366      B) 0.838      C) 0.092      D) 0.134      E) 0.162

---

**FREE RESPONSE**: It is recommended that you work these out on separate paper.
Round answers to the nearest ten-thousandth (if necessary) and write answers in probability notation.

14. A mother has given birth to 5 boys and the family is planning to have a 6th child. What is the likelihood the next child born to this mother will be a girl? Explain.

15. Three men and two women work in a firm's public relations office. Their employer must choose two of them to attend a conference in Paris. To avoid unfairness, the choice will be made by drawing two names from a hat.

a) What is the probability that the first person selected was male and the second a female?

b) What is the probability that no man was chosen?

16. An advertising agency in a large city is conducting a survey of adults to investigate whether there is an association between highest level of educational achievement and primary source for news. The company takes a random sample of 2,500 adults in the city. The results are shown in the table below.

| Primary Source for News | HIGHEST LEVEL OF EDUCATIONAL ACHIEVEMENT | | | |
| | Not High School Graduate | High School Graduate But Not College Graduate | College Graduate | Total |
| --- | --- | --- | --- | --- |
| Newspapers | 49 | 205 | 188 | 442 |
| Local television | 90 | 170 | 75 | 335 |
| Cable television | 113 | 496 | 147 | 756 |
| Internet | 41 | 401 | 245 | 687 |
| None | 77 | 165 | 38 | 280 |
| Total | 370 | 1,437 | 693 | 2,500 |

a) If an adult is to be selected at random from this sample, what is the probability that the selected adult is a college graduate or obtains news primarily from the internet?

b) If an adult who is a college graduate is to be selected at random from this sample, what is the probability that the selected adult obtains news primarily from the internet?

c) When selecting an adult at random from the sample of 2,500 adults, are the events "is a college graduate" and "obtains news primarily from the internet" independent? Justify your answer.


17. You believe that there is a 20% chance that you will earn an A in your English class, a 10% chance that you will earn an A in your Physics class, and a 5% chance that you will earn an A in both classes. DRAW....

a) Find the probability that you earn an A in English or Physics.

b) Find the probability that you do not get an A in either English or Physics.

c) Are "earning an A in English" and "earning an A in Physics" independent events? Explain.


18. Assume that 75% of AP Stat students study for the test. Forty percent of those who study get an A, but only 10% of those who don't study get an A. HINT: DRAW A TREE DIAGRAM

a) What is the probability that a randomly selected student studies and gets an A on the test?

b) What is the probability that a randomly selected student who studies does not make an A on the test?

c) What is the probability that a randomly selected student earned an A on the test?

d) What is the probability that a randomly selected student who makes an A actually studied for the test?


19. Find the mean (expected value) and the standard deviation of each random variable.
   (This is actually from the beginning of chapter 16, but this WILL be included on this test)

a)

| x | 0 | 1 | 2 |
| --- | --- | --- | --- |
| P(x) | 0.2 | 0.4 | 0.4 |

b)

| x | 100 | 200 | 300 | 400 |
| --- | --- | --- | --- | --- |
| P(x) | 0.1 | 0.2 | 0.5 | 0.2 |