

1. A college plans to interview 8 students for possible offer of graduate assistantships. The college has three assistantships available. How many groups of three can the college select?

Answer: 28

2. A student has to take 9 more courses before he can graduate. If none of the courses are prerequisite to others, how many groups of four courses can he select for the next semester?

Answer: 126

3. From among 8 students how many committees consisting of 3 students can be selected?

Answer: 56

4. Assume you have applied for two scholarships, a Merit scholarship (M) and an Athletic scholarship (A) The probability that you receive an Athletic scholarship is 0.18. The probability of receiving both scholarships is 0.11. The probability of getting at least one of the scholarships is 0.3.

- a. What is the probability that you will receive a Merit scholarship?
- b. Are events A and M mutually exclusive? Why or why not? Explain.
- c. Are the two events A, and M, independent? Explain, using probabilities.
- d. What is the probability of receiving the Athletic scholarship given that you have been awarded the Merit scholarship?
- e. What is the probability of receiving the Merit scholarship given that you have been awarded the Athletic scholarship?

Answers:

- a. 0.23
- b. No, because  $P(A \cap M) \neq 0$
- c. No, because  $P(A \cap M) \neq P(A) P(B)$
- d. 0.4783
- e. 0.6111

5. A survey of a sample of business students resulted in the following information regarding the genders of the individuals and their selected major.

Gender	Selected Major			Total
	Management	Marketing	Others	
Male	40	10	30	80
Female	30	20	70	120

Total	70	30	100	200
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- What is the probability of selecting an individual who is majoring in Marketing?
- What is the probability of selecting an individual who is majoring in Management, given that the person is female?
- Given that a person is male, what is the probability that he is majoring in Management?
- What is the probability of selecting a male individual?

Answers:

- 0.15
- 0.25
- 0.50
- 0.40

- Sixty percent of the student body at UTC is from the state of Tennessee (T), 30% percent are from other states (O), and the remainder are international students (I). Twenty percent of students from Tennessee live in the dormitories, whereas, 50% of students from other states live in the dormitories. Finally, 80% of the international students live in the dormitories..

- What percentage of UTC students live in the dormitories?
- Given that a student lives in the dormitory, what is the probability that she/he is an international student?
- Given that a student **does not** live in the dormitory, what is the probability that she/he is an international student?

Answers:

- 35%
- 0.2286 (rounded)
- 0.7385 (rounded)

- The probability of an economic decline in the year 2000 is 0.23. There is a probability of 0.64 that we will elect a republican president in the year 2000. If we elect a republican president, there is a 0.35 probability of an economic decline. Let “D” represent the event of an economic decline, and “R” represent the event of election of a Republican president.

- Are “R” and “D” independent events?
- What is the probability of a Republican president and economic decline in the year 2000?
- If we experience an economic decline in the year 2000, what is the probability that there will a Republican president?

- d. What is the probability of economic decline or a Republican president in the year 2000? Hint: You want to find  $P(D \cup R)$ .

Answers:

- a. No, because  $P(D) \neq P(D | R)$
- b. 0.224
- c. 0.9739
- d. 0.646

8. A very short quiz has one multiple choice question with five possible choices (a, b, c, d, e) and one true or false question. Assume you are taking the quiz but do not have any idea what the correct answer is to either question, but you mark an answer anyway.
- a. What is the probability that you have given the correct answer to both questions?
  - b. What is the probability that only one of the two answers is correct?
  - c. What is the probability that neither answer is correct?
  - d. What is the probability that only your answer to the multiple choice question is correct?
  - e. What is the probability that you have only answered the true or false question correctly?

Answers:

- a. 1/10
- b. 5/10
- c. 4/10
- d. 1/10
- e. 4/10

9. Assume that each year the IRS randomly audits 10% of the tax returns. If a married couple has filed separate returns,
- a. What is the probability that both the husband and the wife will be audited?
  - b. What is the probability that only one of them will be audited?
  - c. What is the probability that neither one of them will be audited?
  - d. What is the probability that at least one of them will be audited?

Answers:

- a. 0.01
- b. 0.18
- c. 0.81
- d. 0.19

10. Tammy is a general contractor and has submitted two bids for two projects (A and B). The probability of getting project A is 0.65. The probability of getting project B is 0.77. The probability of getting at least one of the projects is 0.90.
- What is the probability that she will get both projects?
  - Are the events of getting the two projects mutually exclusive? Explain, using probabilities.
  - Are the two events independent? Explain, using probabilities.

Answers:

- 0.52
  - No, the intersection is not zero.
  - No,  $P(A|B) = 0.6753 \neq P(A)$
11. Assume you are taking two courses this semester (A and B). The probability that you will pass course A is 0.835, the probability that you will pass both courses is 0.276. The probability that you will pass at least one of the courses is 0.981.
- What is the probability that you will pass course B?
  - Is the passing of the two courses independent events? Use probability information to justify your answer.
  - Are the events of passing the courses mutually exclusive? Explain.

Answers:

- 0.422
  - No,  $P(A|B) = 0.654 \neq P(A)$
  - No, the intersection is not zero.
12. In a random sample of UTC students 50% indicated they are business majors, 40% engineering majors, and 10% other majors. Of the business majors, 60% were females; whereas, 30% of engineering majors were females. Finally, 20% of the other majors were female.
- What percentage of students in this sample was female?
  - Given that a person is female, what is the probability that she is an engineering major?

Answers:

- 44%
- 0.2727

13. A company sells its products to wholesalers in batches of 1,000 units only. The daily demand for its product and the respective probabilities are given below.

<b>Demand (Units)</b>	<b>Probability</b>
0	0.2
1000	0.2
2000	0.3
3000	0.2
4000	0.1

- Determine the expected daily demand.
- Assume that the company sells its product at \$3.75 per unit. What is the expected daily revenue?

Answers:

- 1800
- \$6,750

14. The records of a department store show that 20% of its customers who make a purchase return the merchandise in order to exchange it. In the next six purchases,
- what is the probability that three customers will return the merchandise for exchange?
  - what is the probability that four customers will return the merchandise for exchange?
  - what is the probability that none of the customers will return the merchandise for exchange?

Answers:

- 0.0819
- 0.0154
- 0.2621

15. In a large university, 15% of the students are female. If a random sample of twenty students is selected,
- what is the probability that the sample contains exactly four female students?
  - what is the probability that the sample will contain no female students?
  - what is the probability that the sample will contain exactly twenty female students?
  - what is the probability that the sample will contain more than nine female students?
  - what is the probability that the sample will contain fewer than five female students?
  - what is the expected number of female students?

Answers:

- 0.1821
- 0.0388
- 0.0000
- 0.0002
- 0.8298
- 3

16. In a southern state, it was revealed that 5% of all automobiles in the state did not pass inspection. Of the next ten automobiles entering the inspection station,
- what is the probability that none will pass inspection?
  - what is the probability that all will pass inspection?
  - what is the probability that exactly two will not pass inspection?
  - what is the probability that more than three will not pass inspection?
  - what is the probability that fewer than two will not pass inspection?
  - Find the expected number of automobiles not passing inspection.
  - Determine the standard deviation for the number of cars not passing inspection.

Answers:

- 0.0000
- 0.5987
- 0.0746
- 0.0011
- 0.9138
- 0.5
- 0.6892

17. A manufacturing company has 5 identical machines that produce nails. The probability that a machine will break down on any given day is .1. Define a random variable  $X$  to be the number of machines that will break down in a day.
- What is the appropriate probability distribution for  $X$ ? Explain how  $X$  satisfies the properties of the distribution.
  - Compute the probability that 4 machines will break down.
  - Compute the probability that at least 4 machines will break down.
  - What is the expected number of machines that will break down in a day?
  - What is the variance of the number of machines that will break down in a day?

Answers:

- binomial
- 0.00045
- 0.00046
- 0.5
- 0.45

18. John parks cars at a hotel. On the average, 6.7 cars will arrive in an hour. A driver's decision on whether to let John park the car does not depend upon any other person's decision. Define the random variable  $X$  to be the number of cars arriving in any hour period.
- What is the appropriate probability distribution for  $X$ ? Explain how  $X$  satisfies the properties of the distribution.
  - Compute the probability that exactly 5 cars will arrive in the next hour.
  - Compute the probability that no more than 5 cars will arrive in the next hour.

Answers:

- Poisson
- 0.1385
- 0.3406

19. Twenty-five percent of all resumes received by a corporation for a management position are from females. Fifteen resumes will be received tomorrow.
- What is the probability that exactly 5 of the resumes will be from females?
  - What is the probability that fewer than 3 of the resumes will be from females?
  - What is the expected number of resumes from women?
  - What is the variance of the number of resumes from women?

Answers:

- 0.1651
- 0.2361
- 3.75
- 2.8125

20. The average number of calls received by a switchboard in a 30-minute period is 15.
- What is the probability that between 10:00 and 10:30 the switchboard will receive exactly 10 calls?
  - What is the probability that between 10:00 and 10:30 the switchboard will receive more than 9 calls but fewer than 15 calls?
  - What is the probability that between 10:00 and 10:30 the switchboard will receive fewer than 7 calls?

Answers:

- 0.0486
- 0.3958
- 0.0075