

## 15.2.4: Chapter 5 Homework

- In the game of Craps, two dice are rolled and the sum totaled. One set of 4 bets are called hard ways, in which the player has to roll the number in doubles before a 7 or a non-hard way version of the number is rolled. For example, suppose you want to bet on hard way 6. To win, you must roll a pair of threes before you roll a seven or any other combination that adds to 6. All others rolls are ignored.



- For the hard way 6, list the sample space of rolls that have an effect on the game. Then find the probability of winning.
  - For the hard way 4, list the sample space of rolls that have an effect on the game. Then find the probability of winning.
  - For the hard way 4, the casino will pay 7 to 1 if you win. For the hard way 6, the casino will pay 9 to 1 if you win. Compare the payoff to the actual odds. Does the casino have an advantage in this game?
- 40% of students at a community college are on financial aid. 30% of students at the same college live with at least one parent. 15% of students are on financial aid and live with at least one parent.
    - Find the probability that a community college student does not live with at least one parent. Is this marginal, joint or conditional probability?
    - Find the probability that a community college student is on financial aid or lives with at least one parent. Is this marginal, joint or conditional probability?
    - Find the probability that a community college student who lives with at least one parent is also on financial aid. Is this marginal, joint or conditional probability?
  - A poll of American registered voters was taken by Politico/Morning Consult in November, 2017 after the Las Vegas mass shooting, in which 58 concertgoers were murdered by a single gunman. The poll asked the question, "Do you support or oppose stricter gun laws in the United States? The results of the poll, cross-tabulated by gender, are shown in the contingency table.

	Strong Support	Somewhat Support	Somewhat Oppose	Strong Oppose	Don't Know	Total
Male	350	208	127	191	54	930
Female	476	250	130	136	73	1065
Total	826	458	257	327	127	1995

- What percentage of all registered voters support (strong or somewhat) stricter gun laws?
  - What percentage of males support (strong or somewhat) stricter gun laws?
  - What percentage of females support (strong or somewhat) stricter gun laws?
  - Are gender and support of stricter gun laws independent events? Explain
- A student has a 90% chance of getting to class on time on Monday and a 70% chance of getting to class on time on Tuesday. Assuming that these are independent events, determine the following probabilities:
    - The student is on time both Monday and Tuesday.
    - The student is on time at least once (Monday or Tuesday).
    - The student is late both days.
  - A class has 10 students, 6 females and 4 males. 3 students will be sampled without replacement for a group presentation.
    - Construct a tree diagram of all possibilities (there will be 8 total branches at the end)
    - Find the following probabilities:
      - All male students in the group presentation.
      - Exactly 2 female students in the group presentation.

- iii. At least 2 female students in the group presentation.
6. 20% of professional cyclists are using a performance enhancing drug. A test for the drug has been developed; this test has a 60% chance of correctly detecting the drug (true positive). However, the test will come out positive in 2% of cyclists who do not use the drug (false positive).
- Construct a tree diagram in which the first set of branches are cyclists with and without the drug, and the second set is whether they test positive.
  - From the tree diagram, create a contingency table.
  - What percentage of cyclists will test positive for the drug?
  - If a cyclist tests positive, what is the probability that the cyclist did really used the drug?
7. 1% of the population of a country has disease X. A test for the disease has been developed; this test has a 95% probability of correctly detecting the disease (true positive). However, the test will come out positive in 2% of people who do not have disease X (false positive).
- Construct a tree diagram in which the first set of branches are people with and without the disease, and the second set is whether they test positive. Assign probabilities to each option.
  - From the tree diagram create a contingency table with a radix of 10000

	Tests Positive	Tests Negative	Total
Has Disease X			
Does Not Have Disease X			
Total			10000

- What percentage of the population will test positive for disease X?
  - If a person tests positive, what is the probability that the person really has disease X?
8. We wish to determine the morale of a certain company. We give each of the workers a questionnaire, and from their answers we can determine the level of their morale, whether it is 'Low', 'Medium' or 'High: also noted below is the 'worker type' for each of the workers. For each worker type, the frequencies corresponding to the different levels of morale are given below.

WORKER MORALE

	Low	Medium	High
Executive	1	14	35
Upper Management	5	30	65
Lower Management	5	40	55
Non-Management	354	196	450

- We randomly select 1 worker from this population. What is the probability that the worker selected
  - is an executive?
  - is an executive with medium morale?
  - is an executive or has medium morale?
  - is an executive, given the information that the worker has medium morale.
- Given the information that the selected worker is an executive, what is the probability that the worker
  - has medium morale?
  - has high morale?
- Are the following events independent or dependent? Explain your answer:
  - is an executive', 'has medium morale', are these independent?

II. is an executive', 'has high morale', are these independent?

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