

12.2.1: Bayes' Formula (Exercises)

SECTION 12.2 PROBLEM SET: BAYES' FORMULA

<p>1. Jar I contains five red and three white marbles, and Jar II contains four red and two white marbles. A jar is picked at random and a marble is drawn. Draw a tree diagram below, and find the following probabilities.</p> <ol style="list-style-type: none"> $P(\text{marble is red})$ $P(\text{It came from Jar II} \mid \text{marble is white})$ $P(\text{Red} \mid \text{Jar I})$ 	<p>2. In Mr. Symons' class, if a student does homework most days, the chance of passing the course is 90%. On the other hand, if a student does not do homework most days, the chance of passing the course is only 20%.</p> <p>H = event that the student did homework C = event that the student passed the course</p> <p>Mr. Symons claims that 80% of his students do homework on a regular basis. If a student is chosen at random from Mr. Symons' class, find the following probabilities.</p> <ol style="list-style-type: none"> $P(C)$ $P(H C)$ $P(C H)$
<p>3. A city has 60% Democrats, and 40% Republicans. In the last mayoral election, 60% of the Democrats voted for their Democratic candidate while 95% of the Republicans voted for their candidate. Which party's mayor runs city hall?</p>	<p>4. In a certain population of 48% men and 52% women, 56% of the men and 8% of the women are color-blind.</p> <ol style="list-style-type: none"> What percent of the people are color-blind? If a person is found to be color-blind, what is the probability that the person is a male?
<p>5. A test for a certain disease gives a positive result 95% of the time if the person actually carries the disease. However, the test also gives a positive result 3% of the time when the individual is not carrying the disease. It is known that 10% of the population carries the disease. If a person tests positive, what is the probability that he or she has the disease?</p>	<p>6. A person has two coins: a fair coin and a two-headed coin. A coin is selected at random, and tossed. If the coin shows a head, what is the probability that the coin is fair?</p>
<p>7. A computer company buys its chips from three different manufacturers. Manufacturer I provides 60% of the chips and is known to produce 5% defective; Manufacturer II supplies 30% of the chips and makes 4% defective; while the rest are supplied by Manufacturer III with 3% defective chips. If a chip is chosen at random, find the following probabilities:</p> <ol style="list-style-type: none"> $P(\text{the chip is defective})$ $P(\text{chip is from Manufacturer II} \mid \text{defective})$ $P(\text{defective} \mid \text{chip is from manufacturer III})$ 	<p>8. Lincoln Union High School District is made up of three high schools: Monterey, Fremont, and Kennedy, with an enrollment of 500, 300, and 200, respectively. On a given day, the percentage of students absent at Monterey High School is 6%, at Fremont 4%, and at Kennedy 5%. If a student is chosen at random, find the probabilities below: <i>Hint: Convert the enrollments into percentages.</i></p> <ol style="list-style-type: none"> $P(\text{the student is absent})$ $P(\text{student is from Kennedy} \mid \text{student is absent})$ $P(\text{student is absent} \mid \text{student is from Fremont})$

9. At a retail store, 20% of customers use the store's online app to assist them when shopping in the store ; 80% of store shoppers don't use the app.

Of those customers that use the online app while in the store, 50% are very satisfied with their purchases, 40% are moderately satisfied, and 10% are dissatisfied.

Of those customers that do not use the online app while in the store, 30% are very satisfied with their purchases, 50% are moderately satisfied and 20% are dissatisfied.

Indicate the events by the following:

A = shopper uses the app in the store

N = shopper does not use the app in the store

V = very satisfied with purchase

M = moderately satisfied

D = dissatisfied

a. Find $P(A \text{ and } D)$, the probability that a store customer uses the app and is dissatisfied

b. Find $P(A|D)$, the probability that a store customer uses the app if the customer is dissatisfied.

10. A medical clinic uses a pregnancy test to confirm pregnancy in patients who suspect they are pregnant. Historically data has shown that overall, 70% of the women at this clinic who are given the pregnancy test are pregnant, but 30% are not.

The test's manufacturer indicates that if a woman is pregnant, the test will be positive 92% of the time.

But if a woman is not pregnant, the test will be positive only 2% of the time and will be negative 98% of the time.

a. Find the probability that a woman at this clinic is pregnant and tests positive.

b. Find the probability that a woman at this clinic is actually pregnant given that she tests positive.

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