

AP Statistics

Unit 04 – Probability

Day 04 Review

Name Key
Period _____

1. An individual is picked at random from a group of 52 athletes. Suppose 26 of the athletes are female and 6 of them are swimmers. Also, there are 10 swimmers among the males.

a) Given that the individual picked is a female, find the probability that she is a swimmer. $P(\text{swimmer} | \text{female}) = \frac{P(\text{swimmer and female})}{P(\text{female})} = \frac{6}{26} = 23.1\%$

There is a 23.1% chance that a randomly selected female is a swimmer

b) Given that the individual picked is a swimmer, find the probability that he is a male.

$P(\text{male} | \text{swimmer}) = \frac{P(\text{male and swimmer})}{P(\text{swimmer})} = \frac{10}{16} = 62.5\%$

There is a 62.5% chance that a randomly selected swimmer is a male

2. On a TV quiz show, a contestant is asked to pick a number at random from 1 to 100. If the number picked is divisible by 12 or 9, the contestant will win a trip to Hawaii. What is the probability the contestant will win the trip?

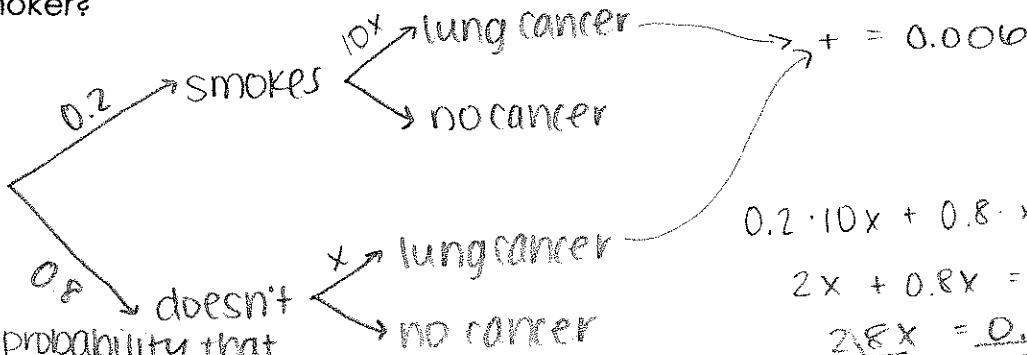
9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99

12, 24, 36, 48, 60, 72, 84, 96

There is a 17% chance that the contestant will win the trip

$$P(9 \text{ or } 12) = P(9) + P(12) - P(9 \text{ and } 12) = \frac{11}{100} + \frac{8}{100} - \frac{2}{100} = \frac{17}{100} = 17\%$$

3. A survey of people showed that 20% were smokers. The probability of death to lung cancer, given that a person smoked, is roughly ten times the probability of death due to lung cancer for non-smokers. If the probability of death due to lung cancer is .006, what is the probability of a death due to lung cancer given that the person is a smoker?



$$0.2 \cdot 10x + 0.8 \cdot x = 0.006$$

$$2x + 0.8x = 0.006$$

$$\frac{2.8x}{2.8} = \frac{0.006}{2.8}$$

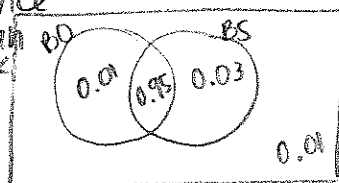
$$x = 0.002143 \cdot 10 = 2.143\%$$

The probability that a person dies due to lung cancer given that a person smokes is 2.143%.

4. Two employees on a college campus, Brian from Operations and Beth from Safety, are assigned to check that a certain building on campus is locked over the weekend. Suppose that on any weekend the probability that Brian checks the building is 0.96, that Beth checks the building is 0.98, and that they both check is 0.95. What is the probability that neither Brian nor Beth check on a weekend?

- $P(BO) = 0.96$
- $P(BS) = 0.98$
- $P(BO \text{ and } BS) = 0.95$
- $P(BO \text{ or } BS) = ?$
- $P(\text{neither } BO \text{ or } BS) = ?$

There is a 1% chance that neither Brian nor Beth check on a weekend



$$P(BO \text{ or } BS)^c = 1 - P(BO \text{ or } BS) = 1 - 0.99 = 0.01$$

$$P(BO \text{ or } BS) = P(BO) + P(BS) - P(BO \text{ and } BS) = 0.96 + 0.98 - 0.95 = 0.99$$

5. In the table, 400 individuals are classified according to whether or not they were vaccinated against the flu and whether or not they got the flu.

	Vaccinated	Not Vaccinated	total
Got the flu	60	85	145
Didn't get the flu	190	65	255
total	250	150	400

If a person is chosen at random, find the probability that:

- a) the person was vaccinated and got the flu.

$$P(\text{vac and flu}) = \frac{60}{400} = 15\%$$

There is a 15% chance that a randomly selected person was vaccinated and got the flu.

- b) the person got the flu, given that the person was vaccinated.

$$P(\text{flu} | \text{vac}) = \frac{P(\text{flu and vac})}{P(\text{vac})} = \frac{60}{250} = 24\%$$

There is a 24% chance that a randomly chosen person who was vaccinated got the flu.

- c) the person did not get the flu, given the person was not vaccinated.

$$P(\text{flu}^c | \text{vac}^c) = \frac{P(\text{flu}^c \text{ and } \text{vac}^c)}{P(\text{vac}^c)} = \frac{65}{150} = 43.3\%$$

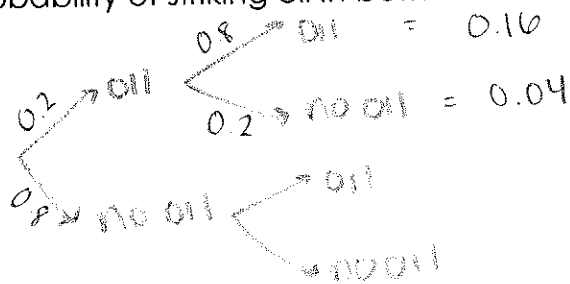
There is a 43.3% chance that a randomly chosen person did not get the flu, given that they were not vaccinated.

- d) the person was vaccinated, given the person got the flu.

$$P(\text{vac} | \text{flu}) = \frac{P(\text{vac and flu})}{P(\text{flu})} = \frac{60}{145} = 41.4\%$$

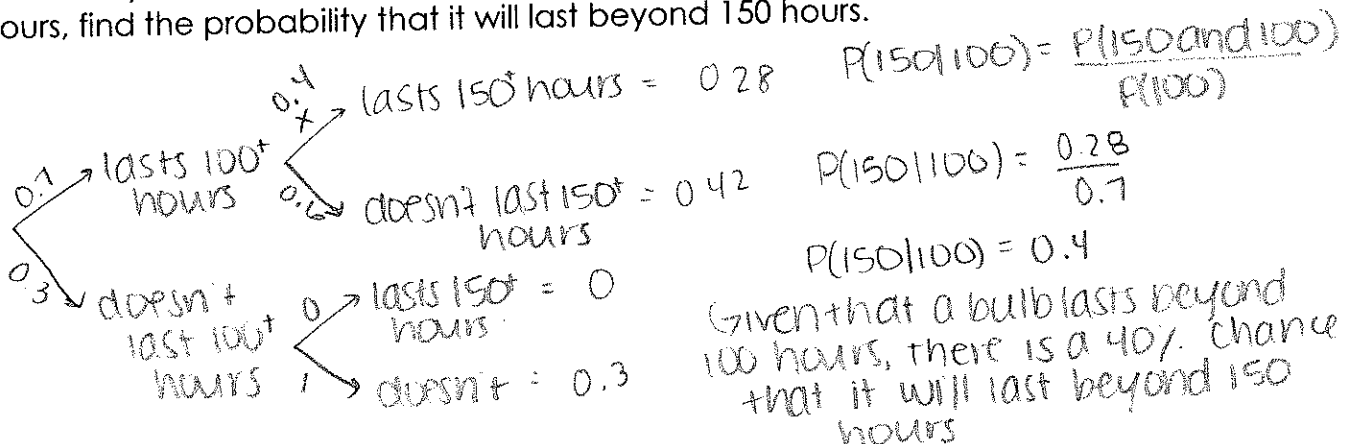
There is a 41.4% chance that a randomly chosen person was vaccinated given that they got the flu.

6. A petroleum company exploring for oil has decided to drill two wells, one after the other. The probability of striking oil in the first well is 0.2. Given that the first attempt is successful, the probability of striking oil on the second attempt is 0.8. What is the probability of striking oil in both wells?



The probability of striking oil in both wells is 16%.

7. It is known that the probability that a light bulb will last beyond 100 hours is 0.7 and the probability that it will last beyond 150 hours is 0.28. Given that a bulb lasts beyond 100 hours, find the probability that it will last beyond 150 hours.



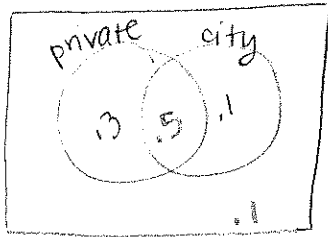
$$P(150 | 100) = \frac{P(150 \text{ and } 100)}{P(100)}$$

$$P(150 | 100) = \frac{0.28}{0.7}$$

$$P(150 | 100) = 0.4$$

Given that a bulb lasts beyond 100 hours, there is a 40% chance that it will last beyond 150 hours.

8. A town has two ambulance services: the city service and a private service. In an emergency, the probability that the city service responds is 0.6, the probability that the private service responds is 0.8, and the probability that either of the services responds is 0.9. Find the probability that both services will respond to an emergency.



$$P(\text{city or private}) = P(\text{city}) + P(\text{private}) - P(\text{city and private})$$

$$0.9 = 0.6 + 0.8 - P(\text{city and private})$$

$$0.9 = 1.4 - P(\text{city and private})$$

$$-1.4 = -1.4$$

$$+0.5 = +P(\text{city and private})$$

There is a 50% chance that both services will respond to an emergency

9. A person owns five stocks. The probabilities that exactly 0, 1, 2, 3, 4, or 5 of the stocks go up in price on a given day are, respectively, 0.1, 0.2, 0.3, 0.22, 0.1, and 0.08. Find the probability that:

- a) at least one stock goes up.

$$P(\text{at least one stock goes up}) = 1 - P(\text{no stock goes up})$$

$$= 1 - 0.1 = 0.9$$

There is a 90% chance that at least one stock goes up.

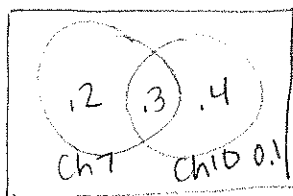
- b) at most four stocks go up.

$$P(\text{at most 4 stocks go up}) = 1 - P(\text{5 stocks go up}) =$$

$$1 - 0.08 = 0.92$$

there is a 92% chance that, at most, 4 stocks go up.

10. Television channels 7 and 10 are affiliated with the same network. The probability that channel 7 carries a particular sports event is 0.5, that channel 10 carries it is 0.7, and the probability that they both carry it is 0.3. What is the probability you can watch the program on either of the channels?



$$P(7 \text{ or } 10) = P(7) + P(10) - P(7 \text{ and } 10)$$

$$P(7 \text{ or } 10) = 0.5 + 0.7 - 0.3$$

$$P(7 \text{ or } 10) = 0.9$$

There is a 90% chance that you can watch the program (particular sports event) on either of the channels.

