

Print all group member's names here. Circle the name of the group member who turns this in.

SOLUTIONS

1. A surveyor recorded the age of members of a group, and whether or not they owned dogs, in order to begin a study on how pets affect aging.

age (years)	18-49	50-64	65 or over	total
own dog(s)	144	54	29	227
no dog	144	71	58	273
total	288	125	87	500

- a. How many people are in the group? 500

Suppose we choose a person at random. Let D be the event that the person owns a dog, Y (younger) the event they are between 18 and 49 years old, M (middle) that they are between 50 and 64 years old, and E (elder) that they are 65 or older. Find the following probabilities (leave your answer as fractions; no need to reduce).

b. $P(M) = \frac{125}{500}$

c. $P(\bar{D}) = \frac{273}{500}$

d. $P(D \cap Y) = \frac{144}{500}$

e. $P(D \cup E) = \frac{144 + 54 + 29 + 58}{500} = \frac{285}{500}$ or: $= P(D) + P(E) - P(D \cap E) = \frac{227}{500} + \frac{87}{500} - \frac{29}{500}$

f. $P(Y \cap \bar{D}) = \frac{144}{500}$

g. $P(Y \cup E) = \frac{288 + 87}{500} = \frac{375}{500}$ or: $= \frac{288}{500} + \frac{87}{500} - \frac{0}{500}$ (no one is both younger and elder)

h. $P(Y \cap E) = \frac{0}{500} = 0$

i. $P(D|Y) = \frac{144}{288}$ ← total # of younger

j. $P(Y|D) = \frac{144}{227}$ ← total # of dog owners

Can you express these in words? Compare your answers to parts (d), (i) and (j). Why are the answers different?

(d) Prob. the person is both a dog owner and younger

(i) Given that the person is younger, the prob. they own a dog

(j) Given that they own a dog, the prob. they are younger

2. A special deck of cards has three suits (A, B, and C). Suit A has cards 1 through 10. However, suit B has only cards 1 through 8, and suit C has only cards 1 through 7.

- a. How many cards are in this deck?

(you may want to draw the whole deck:)

$$\text{total cards} = 10 + 8 + 7 = 25$$

deck: $\left[\begin{array}{cccccccccc} A1 & A2 & A3 & A4 & A5 & A6 & A7 & A8 & A9 & A10 \\ B1 & B2 & B3 & B4 & B5 & B6 & B7 & B8 & & \\ C1 & C2 & C3 & C4 & C5 & C6 & C7 & & & \end{array} \right.$

Suppose we draw a card at random. Find the following probabilities (leave your answer as fractions; no need to reduce).

- b. The probability the card is not an eight:

$$P(\overline{\text{eight}}) = 23/25$$

- c. The probability that the card has suit B and the number 8:

$$P(B \cap \text{eight}) = 1/25$$

- d. The probability the card has suit B, or is the number 8 (or both):

$$P(B \cup \text{eight}) = 9/25$$

- e. The probability that the card is suit A, given that we know the card is an 8:

$$P(A | \text{eight}) = 1/2$$

- f. The probability that the card is an 8, given that we know the card is suit A:

$$P(\text{eight} | A) = 1/10$$

- g. The probability the card has an even number, given that we know the suit is not A:

$$P(\text{even} | \bar{A}) = 7/15$$

- h. Suppose we know the card has the number 6. Find the probability that the card is suit A:

$$P(A | \text{six}) = 1/3$$

- i. Suppose someone drew a card and got B3, and ate it. Find the probability that the *second* card drawn is suit A.

$$P(A | \text{first B3}) = 10/24$$