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MATH 100
Fall 2022
HW 16: Due 11/09

*"I believe that we do not know anything
for certain, but everything probably."
—Christiaan Huygens*

Problem 1. (10pt) Suppose at a local grocery store, 8 employees work only in the back of the store, 17 work only in the front of the store, and 9 work in both positions.

- (a) Find the percentage of students that work in the back of the store.
- (b) Find the percentage of employees that work in the back of the store or in the front of the store.
- (c) Find the percentage of employees that work either in the front or back of the store, but not both.
- (d) Assuming an employee works in the front of the store, what is the probability that they also work in the back of the store?

Solution.

(a)

$$P(\text{back}) = \frac{8 + 9}{34} = \frac{17}{34} \approx 0.50$$

(b)

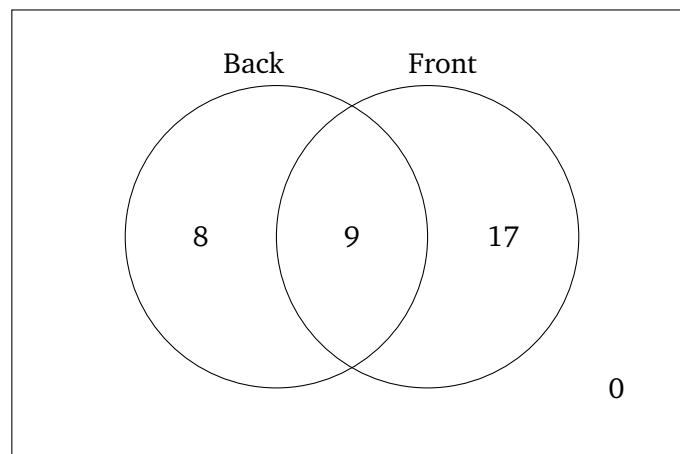
$$P(\text{back or front}) = \frac{8 + 9 + 17}{34} = \frac{34}{34} \approx 1.00$$

(c)

$$P(\text{only front or only back}) = \frac{8 + 17}{34} = \frac{25}{34} \approx 0.7353$$

(d)

$$P(\text{back} \mid \text{front}) = \frac{9}{9 + 17} = \frac{9}{26} \approx 0.3462$$



Problem 2. (10pt) You can either take the ‘short’ way to work or the ‘long’ way. The short way has less distance but you are more likely to hit traffic. If you take the short way, there is a 10% chance that you will be late to work. If you take the long way, there is only a 5% chance that you will be late to work. You take the short way to work 70% of the time.

- (a) What is the probability that you are on-time for work?
- (b) What is the probability that you are late to work?
- (c) What is the probability that you are on-time for work or took the long way to work?
- (d) If you were late to work, what is the probability that you took the long way there?

Solution.

(a)

$$P(\text{on-time}) = 0.63 + 0.285 = 0.915$$

(b)

$$P(\text{late}) = 0.07 + 0.015 = 0.085$$

(c)

$$P(\text{on-time or long way}) = 0.63 + 0.015 + 0.285 = 0.93$$

(d)

$$P(\text{long way} \mid \text{late}) = \frac{0.015}{0.07 + 0.015} = \frac{0.015}{0.085} = 0.1765$$

