

MATH 108: Elementary Probability and Statistics*Ramapo College of New Jersey*

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Homework Problem H0:

(a) What is a census?

(b) Determine whether the underlined term in the following sentence is a parameter or a statistic:

“In a national survey of 1100 adult women the average height was 5 feet 4 inches.”

(c) A bag contains some red, blue, and green marbles, but it is not known how many marbles of each color are in the bag. By experimentation, 100 drawings with replacement resulted in 22 red marbles. Find the probability of drawing a red marble from this bag.

(d) A bag contains 10 marbles. Two of them are red, three blue, five green. If a marble is drawn at random, find the probability that it will be red.

(e) To estimate the probability of getting a six on a certain weighted die, some experimentation is done (it is not known how the die is weighted). The die is rolled 50 times, resulting in 12 sixes. What is the probability of getting a six on a single roll of this die?

(f) What is the probability of getting a 6 on a single roll of a fair die?

Solution to problem H0:

(a) What is a census?

A **census** is a list of all individuals in a population of individuals along with data obtained from each individual regarding certain variable(s) of interest X .

Example: A national census aims to count and collect demographic data from every resident of a country.

(b) Parameter or Statistic?

Statement: “In a national survey of 1100 adult women, the average height was 5 feet 4 inches.” This is a value computed from a sample (1100 women), not the entire population of adult women.

Answer: Statistic

A **statistic** summarizes sample data. A **parameter** would summarize an entire population.

(c) Experimental Probability (Drawing Marbles)

Let A = get a red marble.

$$P(A) = \frac{\text{Number of red marbles drawn}}{\text{Total number of draws}} = \frac{22}{100} = 0.22 \approx 22\%$$

This is an **empirical (experimental)** probability based on relative frequency.

(d) Classical Probability (Marbles)

Let A = get a red marble.

Total marbles: $2 + 3 + 5 = 10$

$$P(A) = \frac{2}{10} = 0.2 \approx 20\%$$

This is a **classical probability** since all outcomes are equally likely and known.

(e) Experimental Probability (Weighted Die)

Let A = get six on one toss.

$$P(A) = \frac{12}{50} = 0.24 \approx 24\%$$

Since the die is weighted and the true probabilities are unknown, this is an **empirical probability**.

(f) Classical Probability (Fair Die)

Let A = get six on one toss. A fair die has 6 sides, each equally likely.

$$P(A) = \frac{1}{6} \approx \boxed{0.1667} \approx 17\%$$

This is a **classical probability** because all outcomes are equally likely and known in advance.