

# Faculty of Economic, Commercial, and Management Sciences

Level: First Year (Branch 2)

Subject: Statistics 2

## Exercise Series No. 3 (Probability)

### Exercise 1

Three light bulbs are randomly selected from a lot of 15 bulbs, 5 of which are defective. Find the probability of the following events:

- \* All selected bulbs are functional (non-defective).
- \* Exactly one bulb is functional and the others are defective.
- \* Exactly one bulb is defective.
- \* At least one bulb is defective.

### Exercise 2

A box contains 8 balls numbered from 0 to 7.

A. Suppose three balls are drawn sequentially without replacement. What is the probability of obtaining:

- \* An odd number?
- \* A number divisible by 5?
- \* A number greater than or equal to 400?
- \* A number greater than or equal to 200 and  $< 500$ ?

B. Answer the same questions assuming the drawing is done with replacement.

### Exercise 3

Three coins are tossed simultaneously. Determine:

- \* The sample space (S).
- \* The probability that the outcomes are heads (H) given that:
  - \* a. The first coin shows heads.
  - \* b. At least one of the three coins shows heads.

### Exercise 4

Consider the random experiment of rolling two fair dice. Calculate the probability of the following events:

- \* Obtaining a 2 on the first die.
- \* The sum of the two dice is 11.
- \* The absolute difference between the two dice is 6.
- \* Obtaining the same number on both dice (a double).
- \* The sum of the two dice is less than 6.

### Exercise 5

Let A and B be two events such that  $P(A \cup B) = 7/8$ ,  $P(A \cap B) = 1/4$ , and  $P(\bar{A}) = 5/8$ .

Required: Calculate  $P(A)$ ,  $P(B)$ , and  $P(A \cap \bar{B})$ .

### Exercise 6

Two hunters, A and B, fire at a target. Each fires exactly once:

- \* The probability that hunter A hits the target is 0.7.
- \* The probability that hunter B hits the target is 0.6.
- \* The probability that both hunters hit the target is 0.5.

Required:

- \* What is the probability that only hunter A hits the target?
- \* What is the probability that at least one of them (A or B) hits the target?

**Exercise 7**

In a specific municipality, 50% of households own their homes, 75% own a car, and 30% own both. A household is selected at random. Find the probability that:

- \* The household owns a car, given that they own their home.
- \* The household does not own their home, given that they own a car.
- \* The household does not own a car, given that they do not own their home.

**Exercise 8**

Assume A and B are independent events where  $P(A) = 1/2$  and  $P(A \cup B) = 2/3$ .

Required: Calculate  $P(B)$ ,  $P(A|B)$ , and  $P(\bar{B}|A)$ .

**Exercise 9**

The total population of second-year Management Science students consists of 48% males and 52% females. Among them, 5% of male students and 25% of female students failed. A student is selected at random.

Required:

- \* What is the probability that the selected student failed?
- \* What is the probability that the selected student passed?
- \* Given that the selected student failed, what is the probability they are male?
- \* Given that the selected student passed, what is the probability they are female?