Chapter 5

Probability

5-2 Sample Spaces and Probability

- A **probability experiment** is a process that leads to well-defined results called outcomes.
- An **outcome** is the result of a single trial of a probability experiment.
- ***NOTE:*** A tree diagram can be used as a systematic way to find all possible outcomes of a probability experiment.

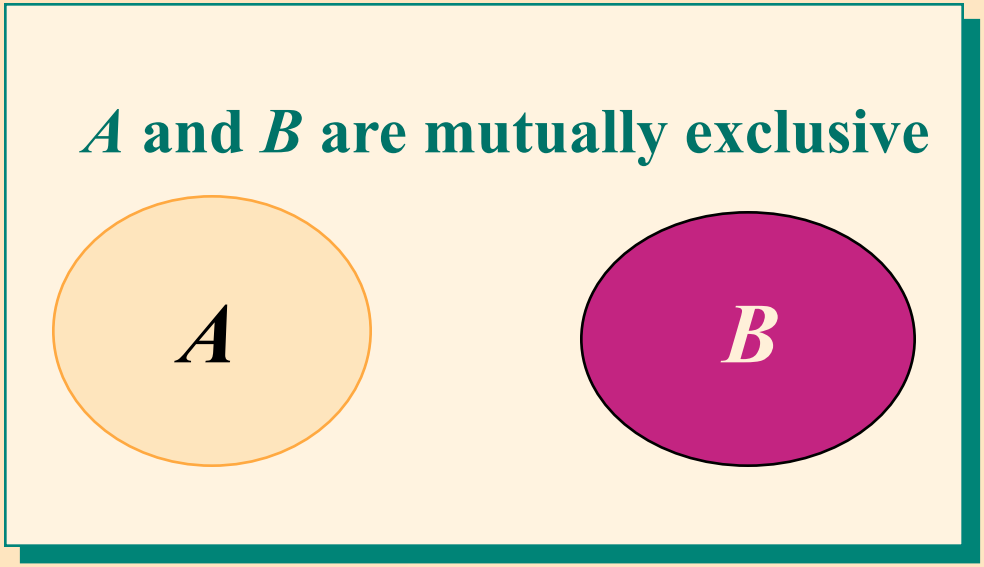
5-2 Sample Spaces - Examples

EXPERIMENT	SAMPLE SPACE
Toss one coin	H, T
Roll a die	1, 2, 3, 4, 5, 6
Answer a true-false question	True, False
Toss two coins	HH, HT, TH, TT

5-3 The Addition Rules for Probability

- Two events are **mutually exclusive** if they cannot occur at the same time (i.e. they have no outcomes in common).

5-3 The Addition Rules for Probability



5-3 Addition Rule 1

When two events A and B are mutually exclusive, the probability that A or B will occur is

$$P(A \text{ or } B) = P(A) + P(B)$$

5-3 Addition Rule 1- Example

- At a political rally, there are 20 Republicans (R), 13 Democrats (D), and 6 Independents (I). If a person is selected, find the probability that he or she is either a Democrat or an Independent.
- **Solution:** $P(\text{D or I}) = P(\text{D}) + P(\text{I})$
  $= 13/39 + 6/39 = 19/39.$

5-3 Addition Rule 1- Example

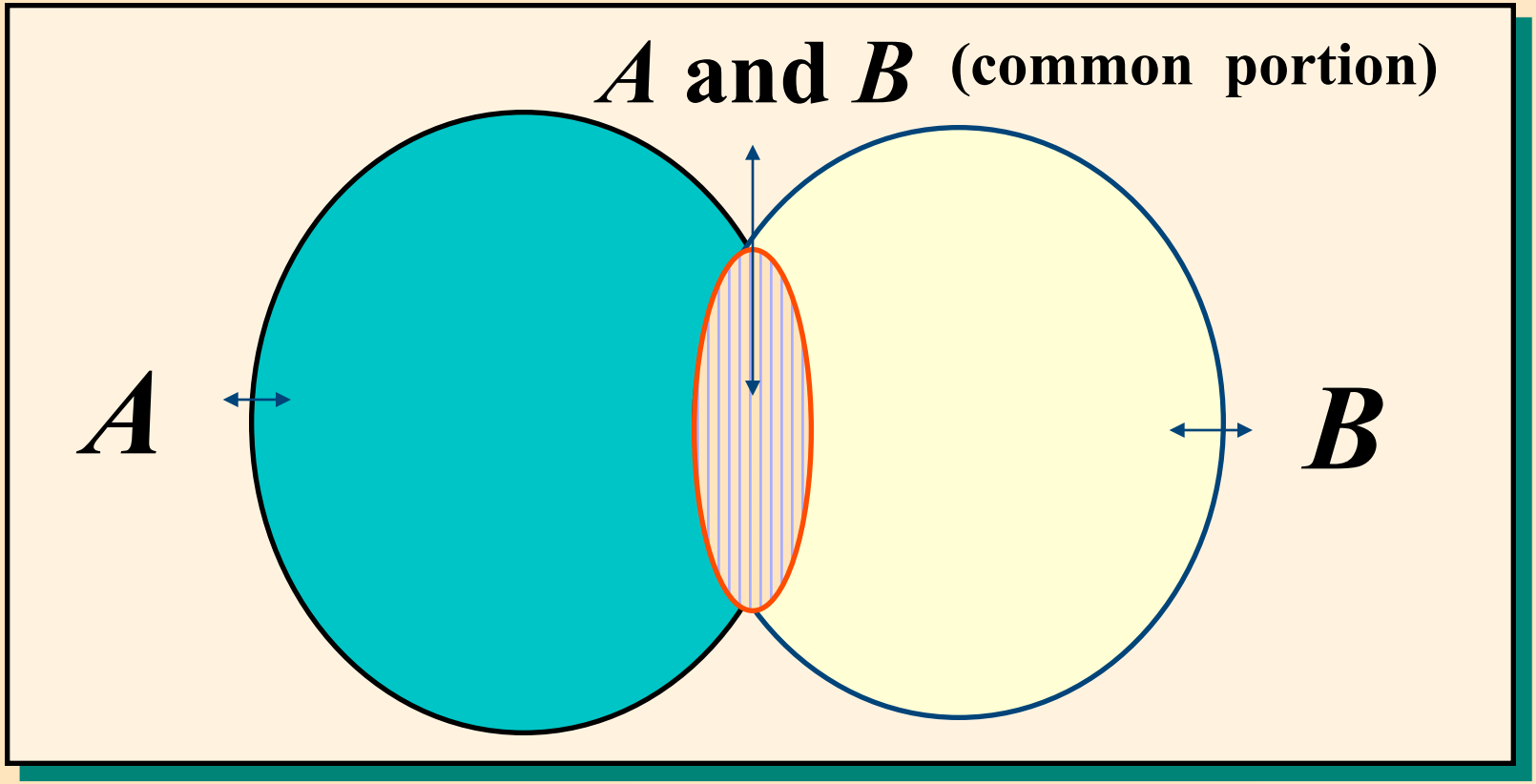
- A day of the week is selected at random. Find the probability that it is a weekend.
- Solution: *P*(Saturday or Sunday)
  = *P*(Saturday) + *P*(Sunday)
  = 1/7 + 1/7 = 2/7.

5-3 Addition Rule 2

When two events A and B are not mutually exclusive, the probability that A or B will occur is

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

5-3 Addition Rule 2



5-3 Addition Rule 2- Example

- In a hospital unit there are eight nurses and five physicians. Seven nurses and three physicians are females. If a staff person is selected, find the probability that the subject is a nurse or a male.
- The next slide has the data.

5-3 Addition Rule 2 - Example

STAFF	FEMALES	MALES	TOTAL
NURSES	7	1	8
PHYSICIANS	3	2	5
TOTAL	10	3	13

5-3 Addition Rule 2 - Example

- **Solution:** P(nurse or male) = P(nurse) + P(male) – P(male nurse) = 8/13 + 3/13 – 1/13 = 10/13.

5-3 Addition Rule 2 - Example

- On New Year's Eve, the probability that a person driving while intoxicated is 0.32, the probability of a person having a driving accident is 0.09, and the probability of a person having a driving accident while intoxicated is 0.06. What is the probability of a person driving while intoxicated or having a driving accident?

5-3 Addition Rule 2 - Example

- **Solution:**

P(intoxicated or accident)

= *P*(intoxicated) + *P*(accident)

– P(intoxicated and accident)

= 0.32 + 0.09 – 0.06 = 0.35.