Definitions:

- **experiment**: is the act of making an observation or taking a measurement.

- **outcome**: one of the possible things that can occur as a result of an experiment.

- **sample space**: set of all possible outcomes.

- **event**: any subset of the sample space.

- **equally likely**: two events are equally likely if they occur with equal relative frequency; equally often.

Probability of an event with equally likely outcomes: Suppose all outcomes in sample space $S$ are equally likely. Let $E$ be any event and $n(E)$ = the number of outcomes in $E$ and $n(S)$ = the number of outcomes in $S$. Then the probability of event $E$, denoted $P(E)$, is

$$P(E) = \frac{n(E)}{n(S)}$$

Remarks:

- $E$ is an **impossible event** if $P(E) = 0$.

- $E$ is a **certain event** if $P(E) = 1$.

- Recall that $\overline{E}$ represents the complement of $E$. Then $P(\overline{E}) = 1 - P(E)$.

- Recall that $A \cup B$ represents the union of $A$ and $B$. Then

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Properties of Probability

1. For any event $E$, we have $0 \leq P(E) \leq 1$.

2. $P(\emptyset) = 0$.

3. $P(S) = 1$ where $S$ is the sample space.
1. If each of the 25 numbers in set \( S = \{1, 2, 3, 4, \ldots , 25\} \) is being chosen at random, that is, with an equal chance of being drawn, calculate each probability below.
   
   (a) The event \( A \) that an even number is drawn.
   
   (b) The event \( B \) that a number less than 10 and greater than 20 is drawn.
   
   (c) The event \( C \) that a number less than 26 is drawn.
   
   (d) The event \( D \) that a prime number is drawn.
   
   (e) The event \( E \) that a number both even and prime is drawn.

2. A golf bag contains two red tees, four blue tees, and five white tees.
   
   (a) What is the probability of the event that a tee drawn at random is red?
   
   (b) What is the probability of the event that a tee drawn at random is not red?
   
   (c) What is the probability of the event that a tee drawn at random is either red or blue?

3. Find the probability of rolling a sum of 7 or 11 when rolling a fair pair of dice.

4. If the spinner shown is spun, find the probabilities of obtaining each of the following:
   
   (a) \( P(\text{factor of 35}) \)
   
   (b) \( P(\text{multiple of 3}) \)
   
   (c) \( P(\text{even number}) \)
   
   (d) \( P(6 \text{ or } 2) \)
   
   (e) \( P(11) \)

5. Suppose two fair coins are tossed. Find the probability for each of the following:
   
   (a) Exactly one head  
   (b) At least one head  
   (c) At most one head

6. Suppose that a card is chosen at random from a standard deck of playing cards. What is the probability of drawing:
   
   (a) Spade  
   (b) Queen

   (c) Queen of Spades  
   (d) Queen or Spade