

1. A card is drawn at random from a standard 52-card deck. For each of the following events, calculate the probability:
 - (a) The card drawn is an Ace. The probability is: _____
 - (b) The card drawn is not a face card (not a Jack, Queen or King). The probability is: _____
 - (c) The card drawn is not a red card. The probability is: _____

2. A card is drawn at random from a standard 52-card deck. Determine the probability for each of the following scenarios:
 - (a) The card drawn is a Queen. The probability is: _____
 - (b) The card drawn is a black card. The probability is: _____
 - (c) The card drawn is not a heart card. The probability is: _____

3. A box contains 10 green balls numbered 1 to 10 and 6 yellow balls numbered 1 to 6. A ball is drawn at random from the box. Find the probability of the given event.
 - (a) The ball is green.
 - (b) The ball is numbered greater than 5.
 - (c) The ball is green or numbered greater than 5.
 - (d) The ball is yellow and numbered less than 4.

4. A container holds 8 orange balls numbered 1 to 8 and 5 purple balls numbered 1 to 5. A ball is drawn at random from the container. Find the probability of the given event.
 - (a) The ball is orange.
 - (b) The ball is numbered less than 4.
 - (c) The ball is orange or numbered less than 4.
 - (d) The ball is purple and odd-numbered.

5. Suppose a jar contains 15 green marbles and 20 yellow marbles. If you reach in the jar and pull out 2 marbles at random at the same time, find the probability that both are green.

6. Suppose a box contains 12 black balls and 18 white balls. If you reach into the box and pull out 2 balls at random at the same time, find the probability that both are black.

7. A survey was conducted among a group of employees to assess their job satisfaction, summarized below:

	Satisfied	Neutral	Dissatisfied	Total
Male	25	10	5	40
Female	20	15	5	40
Total	45	25	10	80

If one employee is chosen at random, find the probability that the employee was male OR reported being satisfied.

8. In a recent cooking class, the preferences of students for different cuisines were recorded as follows:

	Italian	Mexican	Szechuan	Total
Male	12	8	10	30
Female	15	10	5	30
Total	27	18	15	60

If one student is chosen at random, find the probability that the student was female OR preferred Szechuan cuisine.

9. A local theater group held auditions for a play, and the results based on callbacks by role and gender are summarized below:

	Lead	Supporting	Extras	Total
Male	10	15	11	36
Female	12	10	6	28
Total	22	25	17	64

Table 1: Audition Callbacks by Gender

If one actor is chosen at random from those who auditioned, find the probability that the actor received a callback for Supporting roles GIVEN they are male.

10. A local fitness center conducted a survey to understand members' workout preferences. The results are summarized below:

	Cardio	Strength	Yoga	Total
Male	25	15	5	45
Female	20	10	15	45
Total	45	25	20	90

Table 2: Workout Preferences by Gender

If one member is chosen at random from those surveyed, find the probability that the member prefers Strength training GIVEN they are female.

11. A rare virus has an incidence rate of 0.05%. If the false negative rate is 6% and the false positive rate is 3%, compute the probability that a person who tests positive actually has the virus.

12. In a factory, a certain defect occurs in 0.3% of the products. If the false negative rate for detecting the defect is 7% and the false positive rate is 2%, compute the probability that a product which tests positive actually has the defect.

13. A particular medical condition has an incidence rate of 0.2%. If the false negative rate is 10% and the false positive rate is 4%, compute the probability that a person who tests positive actually has the condition.

14. In a city-wide recycling program, the incidence of correctly sorted recyclables is only 0.4%. If the false negative rate for the sorting machine is 9% and the false positive rate is 2%, compute the probability that an item flagged as recyclable actually is recyclable.

15. Consider a sensor designed to detect the presence of the critically endangered Amur leopard. The likelihood of encountering this species in a given area is 0.1%. The sensor has an 8% chance of missing an Amur leopard when one is present and a 5% chance of indicating the presence of an Amur leopard when it's not actually there. What is the probability that an area flagged by the sensor as having an Amur leopard truly contains one?

16. Consider a smoke detection system installed in a building. The actual incidence of a fire in this building is about 0.2%. The smoke detector has an 6% chance of failing to alert when there is a fire and a 9% chance of falsely signaling a fire when there isn't one. If the smoke detector indicates that there is a fire, what is the probability that a fire is actually present in the building?

17. Imagine a security alarm system installed in a museum to detect potential burglaries. The actual incidence of a burglary at the museum is about 0.1%. The alarm system has an 8% chance of failing to trigger when a burglary occurs and a 5% chance of sounding an alarm when there is no burglary. If the alarm goes off, what is the probability that a burglary is actually taking place in the museum?

18. Consider a cybersecurity system designed to detect data breaches in a healthcare facility. The actual rate of data breaches occurring is about 0.2%. The system has a 10% chance of failing to detect a breach when one happens and a 3% chance of falsely alerting when no breach has occurred. If the system indicates that a data breach has been detected, what is the probability that a breach is actually taking place?

19. Imagine a blood glucose monitoring device used by individuals with diabetes. The actual incidence of dangerously high blood glucose levels in this population is about 10%. The device has a 7% chance of failing to detect high glucose levels when they are present and a 5% chance of incorrectly indicating high levels when they are normal. If the device alerts that blood glucose levels are high, what is the probability that the levels are indeed elevated?

20. In his art class, a boy has 1 canvas, 1 type of paint, 5 brushes, and 3 different palettes. If he wants to create a new masterpiece, how many unique combinations can he use if he has to pick one of each item?

21. An avid gardener has a collection of plants. She has 1 type of pot, 1 kind of soil, 5 different seeds, and 3 types of fertilizer. How many unique plant arrangements can she create if she must use one of each item?

22. A party planner is organizing an event. She has 1 theme, 1 type of music playlist, 5 decorations, and 3 types of food. How many unique party setups can she create if she must choose one of each element?

23. At a dinner party, a host invites 7 guests. How many different ways can the guests be seated around the table if the arrangement matters?

24. An art curator has 9 paintings to display in an exhibition. How many different ways can the curator arrange the paintings on the wall?

25. A traveler has 6 cities to visit on a trip. How many different ways can they arrange the order of their visits to these cities?

26. In a talent show featuring 120 performers, the judges are set to award first, second, and third place as well as audience choice to the standout acts. How many different ways can the awards be given?

27. In a community garden, 150 members are entered into a raffle for a chance to win first, second, and third prizes. How many different ways can these prizes be assigned to the lucky winners?

28. A chef is planning a dinner menu and has 12 different recipes to choose from. She wants to select 5 recipes for the evening's meal. In how many ways can she choose the recipes?

29. A film festival director has 8 films submitted for screening. She needs to choose 3 films to feature in the festival. How many different ways can she select the films?

30. A gardener has 13 different types of flowers to choose from for her garden. She wants to plant 4 of them this season. In how many ways can she choose the flowers?

31. From a group of 10 volunteers, you randomly select 3 to help organize a community event. What is the probability that they are the 3 volunteers who signed up first?

32. In a team of 11 players, you randomly choose 2 for a special task. What is the probability that you select the goalkeeper and the captain?
33. In a country of 50 million residents, the number plates are of the form letter letter letter number number number, and all variations can be found in this country. What is the probability that the car that you drive in this country has a number plate with the first two letters XY?
34. In a raffle, participants select 6 tickets from a pool of 20. If a participant's tickets match all 6 drawn numbers, they win \$50,000. If not, they lose \$5. What is the expected value of participating in this raffle?
35. In a Wheel of Fortune game, a robot must fill in 6 letters to complete a phrase, choosing from the alphabet (A to Z). If the robot correctly identifies all 6 letters in the phrase, it wins \$50,000. If it fails, it loses \$1. What is the expected value of the robot participating in this game?
36. In a casino game, a player bets \$10 on a spin of an American roulette wheel, which has 38 numbers (1-36, 0, and 00). If the ball lands on the player's chosen number, they win \$350. If it lands on any other number, they lose their \$10 bet. What is the expected value of playing this game?
37. A jar contains 3 red candies, 7 blue candies, and 15 green candies. Someone proposes a game: You randomly select one candy from the jar. If it is red, you win \$5. If it is blue, you win \$3. If it is green, you lose \$2. What is your expected value if you play this game?