102 Probability Interview Questions to Hire Top Data Scientists

Questions

1. Imagine you have a bag with red and blue balls. If you pick one without looking, which color are you more likely to pick?

2. If you flip a coin, what are the chances it lands on heads?

3. You have a spinner with equal sections of different colors. What's the chance it lands on your favorite color?

4. What does probability even mean? Can you explain it in simple words?

5. Let's say you roll a six-sided die. What is the probability of rolling a four?

6. If you have two dice, what's the probability that both dice show the same number?

7. You have a standard deck of playing cards. What's the probability of drawing an ace?

8. There are five different doors, and only one leads to candy. If you pick a door at random, what's the chance you get candy?

9. If you keep flipping a coin many times, will you always get exactly half heads and half tails?

10. You are guessing a number between one and ten. What are your odds of guessing correctly on the first try?

11. What is more likely: flipping a coin three times and getting heads every time, or flipping it five times and getting heads every time?

12. You have two bags. One has five red balls, and the other has five blue balls. If you pick one ball from each bag without looking, what is the chance you'll get one red and one blue ball?

13. Explain the difference between something being "likely" and something being "certain."

14. If a lottery has a very low chance of winning, why do people still play?

15. If you draw two cards from a deck, is getting an ace on the first draw independent of getting an ace on the second draw?

16. Imagine you're playing a game where you need to roll a die and get a number greater than four. What is the chance of that happening?

17. If you have two spinners, each divided into equal sections of red, blue, and green, what are the chances that both spinners land on the same color?

18. What's the difference between probability and possibility?

19. Is it possible to predict the future with certainty? How does probability relate to that?

20. Suppose there's a promotion where a store gives a free gift to every tenth customer. What's the probability you'll be the lucky customer to get a free gift?

21. A teacher tells you that half of the class will get an A on a test. Does this mean that if you study really hard, you are guaranteed to get an A?

22. Imagine you have a bag with only red and blue marbles. If you pick one without looking, which color are you more likely to pick, and why?

23. If you flip a coin, what are the chances it lands on heads?

24. You have a spinner with equal sections of different colors. What's the chance it lands on your favorite color?

25. There are different toys in a box. If you close your eyes and pick one, which toy is least likely to be picked?

26. If it rained a lot yesterday, is it more or less likely to rain today? Why do you think so?

27. If you roll a die, what numbers could you possibly get?

28. You have a jar of candies, mostly lollipops. Are you more likely to pick a lollipop or a gummy bear?

29. If you're playing a game, and you need to roll a '6' to win, is it likely you'll win on your next turn?

30. Let's say you have a deck of cards. What's the probability of drawing a heart suit card?

31. You have two bags. One with a few chocolates, the other with many. Which bag gives you a better chance of grabbing a chocolate?

32. If you have a row of cats and dogs, and you close your eyes and point, are you more likely to point at a cat or a dog?

33. You're throwing darts at a balloon. How likely are you to pop the balloon on your first try?

34. If you are picking a random shape from a mix of circles and triangles, which shape will you choose if there are more triangles?

35. What are the odds of picking a Monday if someone asks you to randomly pick a day of the week?

36. If you are about to pick an object out of a box of balls, what information would help you know the probability of picking a red ball?

37. What is more probable: Picking the only apple in a box of oranges, or picking one of the oranges?

38. You have a set of building blocks with many triangles and very few squares. If someone asks you to close your eyes and pick one, which one are you more likely to pick?

39. What is more likely: That you pick a red sock from a drawer full of blue socks, or that you pick a blue sock?

40. If there are clouds gathering, does that mean it will definitely rain?

41. You have a bunch of toys. Some are big and some are small. If there are more small toys, which kind are you more likely to grab?

42. If you have a box full of different kinds of candies, and you are asked to pick a yellow candy, what do you need to know to estimate this probability?

43. What is more likely, to randomly pick your favorite toy out of a pile of toys, or to not pick your favorite toy?

44. Imagine you are choosing a ball in a group of different colored balls. What must be true about the number of balls to ensure there is a high likelihood of you picking a blue ball?

45. What is more probable, that your friend chooses vanilla over chocolate, if you know most of their friends like chocolate?

46. If you see a lot of birds flying south, does it mean that winter is definitely coming?

47. You have a set of dolls with different colors. Is it more likely that you pick a red doll or any other colored doll?

48. You have two coins. One is fair, and the other always lands on heads. If you pick a coin at random and flip it twice, and it lands heads both times, what is the probability you picked the unfair coin?

49. There are 100 lockers and 100 students. The first student opens all the lockers. The second student closes every second locker. The third student changes every third locker (closes if open, opens if closed). The fourth student changes every fourth locker, and so on. After all 100 students have gone through, how many lockers are open?

50. A stick is broken randomly into three pieces. What is the probability that you can form a triangle out of those three pieces?

51. You have 25 horses, and you want to find the fastest 3 horses. You can race 5 horses at a time. What is the minimum number of races required to determine the fastest 3?

52. You are given a shuffled deck of cards. You turn over the cards one by one. At any point, you can guess that the next card is the Ace of Spades. What strategy maximizes your probability of guessing correctly, and what is the probability of success with that strategy?

53. Two players take turns flipping a fair coin. The first player to flip heads wins. What is the probability that the first player wins?

54. You have two light bulbs and a 100-story building. You want to find the highest floor from which a bulb will not break when dropped. What is the optimal strategy to minimize the worst-case number of drops?

55. A bag contains one counter, known to be either white or black. A white counter is put in, and then a counter is drawn at random which proves to be white. What is the probability that the original counter was white?

56. You have two ropes. Each rope takes exactly one hour to burn completely, but they don't burn at a constant rate. How can you measure exactly 45 minutes using only these two ropes and a lighter?

57. Two cars start at the same point and travel in perpendicular directions. One car travels at 40 mph and the other at 30 mph. How far apart are they after 2 hours?

58. You have a drawer with 12 black socks and 12 white socks. You randomly pull out socks without looking. What is the minimum number of socks you must pull out to guarantee you have a matching pair?

59. What is the probability that a randomly chosen leap year contains 53 Sundays?

60. You have a circular pizza. You make three straight cuts across the pizza. What is the maximum number of pieces you can create?

61. A fair coin is flipped 10 times. What is the probability of getting exactly 5 heads?

62. You roll two fair six-sided dice. What is the probability that the sum of the numbers rolled is 7?

63. You have two jars. One jar contains 50 red marbles and 50 blue marbles. The other jar contains 100 red marbles. How can you distribute the marbles into the two jars to maximize your chance of picking a red marble if you randomly choose a jar and then randomly choose a marble from that jar?

64. You are given a biased coin that lands heads with probability 0.7. You flip it twice. What is the probability of getting one head and one tail?

65. There are three boxes. One contains only apples, one contains only oranges, and one contains both apples and oranges. The boxes are labeled incorrectly such that no label identifies the actual contents of the box it describes. By opening just one box, and without looking into the box, you take out one piece of fruit. By looking at the fruit, how can you immediately label all of the boxes correctly?

66. A drunk man is standing in the middle of a bridge. He takes a step forward or backward with equal probability. He will fall off the bridge if he takes N steps in either direction. What is the probability he survives after taking K steps, where K < N?

67. Given 12 balls, 11 of which are of equal weight and one of which is of different weight. How can you identify the different ball and determine whether it is lighter or heavier in just 3 weighings using a balance scale?

68. You have a bag with n balls. You pick a ball, look at it and return it to the bag. You do this k times. What is the probability that you have seen every ball at least once?

69. There are two envelopes. One contains twice the amount of money as the other. You choose one envelope at random and open it, finding $100. You are then given the option to switch to the other envelope. Should you switch? Explain your reasoning.

70. How would you model the probability of a user clicking on an ad, given various user features and ad characteristics?

71. Describe a scenario where Bayesian A/B testing would be preferred over frequentist A/B testing, and why?

72. Explain how you would estimate the probability of a rare event, given a limited dataset.

73. How do you approach a probability problem when the underlying distribution is unknown?

74. Design a system to detect fraudulent transactions using probabilistic methods.

75. What are some common biases in probability estimation, and how can you mitigate them?

76. How would you explain the concept of a p-value to a non-technical audience?

77. Discuss the trade-offs between precision and recall in the context of a probabilistic classification model.

78. How can Markov Chain Monte Carlo (MCMC) methods be used to solve complex probability problems?

79. Describe a situation where you would use a Hidden Markov Model (HMM) to model a sequence of events.

80. Explain the difference between conditional probability and joint probability, and provide examples.

81. How would you handle missing data when calculating probabilities?

82. Design a probabilistic model to predict customer churn.

83. How do you validate a probabilistic model to ensure its accuracy and reliability?

84. Explain the concept of entropy and its relevance in information theory and probability.

85. How would you simulate a real-world process using Monte Carlo simulation?

86. Describe the limitations of using probability to make decisions in uncertain environments.

87. How would you combine multiple probabilistic models to improve prediction accuracy?

88. Explain how you would use probability to optimize a supply chain.

89. Design a system to estimate the probability of equipment failure in a manufacturing plant.

90. How do you deal with non-stationary data when building probabilistic models?

91. Describe a situation where you would use a Bayesian network to model dependencies between variables.

92. How would you use probability to personalize recommendations for users on an e-commerce website?

93. Explain the concept of a confidence interval and its interpretation.

94. How would you design an experiment to measure the effectiveness of a new drug using probabilistic methods?

95. Describe the challenges of applying probability theory to real-world problems.

96. How would you use probability to detect anomalies in a network security system?