

**Directions:** Solve and classify these probability questions. Look for general methods of solution that work for entire classes of problems.

1. Two cards are drawn from a well-shuffled, standard deck of cards. What is the probability of drawing 2 hearts?
2. A single card is drawn from a well-shuffled, standard deck of cards. What is the probability of not drawing a face card?
3. What is the probability that a randomly dealt bridge hand (13 cards) has exactly 7 spades?
4. ELENA writes the letters of her name on slips of paper and draws one at random. Find the probability of (a) drawing an E or (b) drawing an L.
5. The state of Alaska has license plates with 2 letters followed by 3 numbers. What is the probability, if letters and numbers are chosen at random, that no letter or number is repeated?
6. A social agency is investigating a bank's claim that 10 out of 100 of their successful loan applications to construction companies go to minority-owned firms. They randomly select 30 loans of which only 2 are to minorities. What is the probability of this happening if the bank's claim is actually true?
7. A committee is being formed at the United Nations. 1 person will be selected at random for president. If there are 8 people from Japan, 6 from New Zealand, 12 from Russia and 4 from Belarus in the drawing, find the probability of the person (a) being from Belarus, (b) being from Japan or (c) being from Russia.
8. A red ball and 4 white balls are placed in an urn. If 2 are drawn at random, find the probability that (a) the red ball is drawn first, (b) the red ball is drawn last and (c) the red ball is not drawn.
9. The letters ENTW are in a bag. If 4 letters are drawn (without replacement) from the bag, what is the probability they spell "newt"?
10. American Roulette tables have 38 slots numbered 1 – 36, 0 and 00. Find the probability of the ball landing on an odd number for three consecutive spins.
11. Thirteen cubes numbered 1 – 13 are placed in a bag. If two are drawn at random without replacement, what is the probability that (a) both are odd, (b) exactly one is even or (c) none are even?
12. A single card is drawn from a well-shuffled, standard deck of cards. What is the probability of drawing a spade?
13. A single card is drawn from a well-shuffled, standard deck of cards. What is the probability of drawing a nine?
14. Two appellate court judges will be appointed at random (which might more sense than our current filibuster-riddled process!) from a panel of trial court judges that includes 23 men and 7 women. Find the probability that (a) both judges will be female, (b) neither will be female, and (c) at least one will be female.
15. What is the probability of Joe (who knows absolutely nothing about *Pride and Prejudice*) gets a passing grade of at least 3 out of 5 on a 5-question multiple choice test (with answers A – D for each question) by guessing at random? How does this change if there

- are 5 possibilities for each questions (A – E)? How does this change if there 10 questions?
16. The letters AAKLS are in a bag. If 6 letters are drawn (without replacement) from the bag, what is the probability they spell “Alaska”?
  17. A single card is drawn from a well-shuffled, standard deck of cards. What is the probability of drawing a face card (Hint: Aces don’t have faces)?
  18. What is the probability that a randomly dealt bridge hand (13 cards) has exactly 4 spades, 4 hearts, 4 diamonds and a club?
  19. What is the probability of rolling “snake eyes” (double ones) three times in a row with a pair of fair dice?
  20. When rolling two fair dice and summing (as in Monopoly or Craps), what is the probability of rolling (a) a 7, (b) an 11 or (c) a 2?
  21. Drawing a letter at random from the letters ALASKA, find the probability of (a) not drawing an A and (b) not drawing a consonant.
  22. An urn contains 8 red marbles and 5 white marbles. If 3 are drawn at random, find the probability that (a) all are red, (b) all are white and (c) the at least 2 red are drawn.
  23. Your poker opponent holds an obvious 2 pair, but you have that hand beat. The question is whether he has a full house. You know 9 cards, 5 of yours and 4 of his. What is the probability he does not have a full house?
  24. In a poker game, you need a face card or Ace in the suit of hearts. You know the 4 cards in your hand, so what is your probability of getting the needed card?
  25. A fair die is rolled and card is drawn at random from a well-shuffled, standard deck of cards. What is the probability that both the die and the card are sixes?
  26. Charlie has 13 socks in a drawer, 7 blue and 6 green. If he selects 5 at random, find the probability that he gets (a) 2 blue and 3 green or (b) 1 blue and 4 green.
  27. In a group of 15 people, 6 are lefties and the rest are right-handed. If 7 people are selected at random, find the probability (a) 3 lefties and 4 righties are selected, (b) no lefties are selected, or (3) exactly 1 lefty is selected.
  28. A stack of 7 baseball cards contains two rookie cards. If 3 cards are selected at random, find the probability that (a) exactly one is a rookie card or (b) at least one of cards is a rookie card?
  29. Three-year-old Emma tears all the labels off the soup cans in the pantry. Here mother remembers that there were 8 cans of vegetable and 2 cans of tomato soup. If she selects 4 cans at random, find the probability that (a) exactly one chosen can is tomato, or (b) both cans of tomato are chosen.
  30. To test a quality assurance program, a plant manages sets up a sample of 100 light bulbs, 2 of which are defective. The rest are known to work properly. If quality assurance technicians draw 5 bulbs at random from every lot of 100, what is the probability that the Q&A process will “catch” one of the 2 defective bulbs?
  31. Two cards are drawn from a well-shuffled, standard deck of cards. What is the probability of drawing exactly one spade?
  32. A fair coin is tossed 3 times. Find the probability of getting (a) exactly 2 heads, (b) at least 2 heads, and (c) no tails.
  33. A pilot is scheduled to fly two missions over hostile territory where his chances of being shot down are 20%. What is the probability that (a) he flies both missions safely and (b) he gets shot down on one of the missions? (Hint: verify that your probabilities all can

- actually happen and that they add up to one!)
34. Six red balls and four blue balls are placed in an urn. If two are drawn at random with replacement, find the probability that (a) no reds are drawn, (b) at least one blue is drawn, or (c) no blues are drawn.
  35. Suppose a marksman hits the bull's eye 1500 times out of 5000 shots. What is his probability of (a) hitting the bull's eye 4 times in a row and (b) hitting the bull's eye at least 2 times out of 4?
  36. Jenny has 14 red balloons, 9 blue balloons and 12 green balloons. If Jenny chooses one balloon at random to give to her friend Eva, find the probability of her giving away (a) a red balloon or (b) a blue balloon.
  37. A single card is drawn from a well-shuffled, standard deck of cards. What is the probability of not drawing a heart?
  38. The first digit of a telephone number cannot be a 0 or a 1. This being the case, what is the probability that randomly selected 7-digit phone number has all seven digits the same?
  39. In New York, the lottery has a game called Pick 10. There are 80 numbers from which the state picks 20 and contestants pick 10. If all 10 of a contestant's numbers are in the list of 20, that contestant is a Big Winner. What is the probability of being a Big Winner?
  40. A retailer has a purchase agreement with a DVD manufacturer that says the retailer may sample 5 DVD players from a shipment of 100. If he finds one or more to be defective, he gets the entire shipment free of charge. If only 3 of the DVD players are defective, what is the probability that the retailer gets the shipment free?
  41. American Roulette tables have 38 slots numbered 1 – 36, 0 and 00. Find the probability of the ball on a single spin landing on an odd number.
  42. Eight horses are entered in a race. You randomly predict the complete order of finish. What is the probability that your prediction is correct?
  43. Eight horses are entered in a race. You randomly predict the win-place-show (1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> place, in order). What is the probability that your prediction is correct?
  44. A jar contains 3 types of cookies: 9 chocolate chip, 6 peanut butter and 5 oatmeal raisin. If Joe reaches in and grabs 1 at random, find the probability of (a) grabbing a chocolate chip cookie, (b) grabbing a peanut butter cookie or (c) grabbing an oatmeal raisin cookie.
  45. In a certain Lotto game called 6-49, the player picks 6 numbers out of 49. What is the probability of selecting at least 5 of the correct 6 numbers?
  46. Find the probability that, in a group of 8 students, at least two have the same birthday. How many students would be required to ensure there was at least a 50-50 chance of having two people share a birthday?
  47. When rolling two fair dice and summing (as in Monopoly or Craps), what is the probability of (a) not rolling a 7, (b) not rolling 5 or higher, and (c) not rolling either a 2 or a 9?
  48. The state of Alaska has license plates with 2 letters followed by 3 numbers. In a hit-and-run accident, a nearby motorist noticed that the escaping car's license plate contained a J and two 4's. What percent of the total possible Alaskan license plates could have caused the accident?
  49. Kelly is a squad leader during FROG week where her squad consists of 3 women and 7 men. If the squad line up at random after push-ups, what is the probability of all 3 women lining up in the first five slots (from left to right).

50. If each letter of the word MISSISSIPPI is written on a card, and one of the cards is drawn at random, find the probability that (a) an S is drawn, (b) an I is drawn or (c) a P is drawn.