1. A computer is programmed to compute various chances. Match the numerical answers with the verbal descriptions (which may be used more than once).

   Numerical Answer | Verbal Description
   (a) -50% | (i) This is as likely to happen as not.
   (b) 0% | (ii) This is very likely to happen, but it's not certain.
   (c) 10% | (iii) This won't happen.
   (d) 50% | (iv) This may happen, but it's not likely.
   (e) 90% | (v) This will happen, for sure.
   (f) 100% | (vi) There's a bug in the program.
   (g) 200% |

2. A coin will be tossed 1000 times. About how many heads are expected?

3. A die will be rolled 6000 times. About how many aces are expected?

4. In five card draw poker, the chance of being dealt full house (one pair and three of a kind) is 0.14 of 1%. If 10000 hands are dealt, about how many will be a full house?

5. One hundred tickets will be drawn at random with replacement from one of the two boxes below. On each draw, you will be paid the amount on the ticket, in dollars. Which box is better and why?

   (a) A box with two tickets: one labeled "1" and the other labeled "2".

   (b) A box with two tickets: one labeled "1" and the other labeled "3".

6. Two tickets are drawn at random without replacement from a box with four tickets, labeled "1","2","3","4".

   (a) What is the chance that the second ticket is "4"?

   (b) What is the chance that the second ticket is "4", given the first is "2"?

7. Same question as above, only the the draws are made with replacement.

8. A penny is tossed 5 times.

   (a) Find the chance that the 5th toss is a head.

   (b) Find the chance that the 5th toss is a head, given the first four are tails.

9. Five cards are dealt off the top of a well-shuffled deck.

   (a) Find the chance that the 5th card is the queen of spades.

   (b) FInd the chance that the 5th card is the queen of spades, given that the first four cards are hearts.

10. A deck is shuffled and two cards are dealt.

(a) Find the chance that the second card is a heart given the first card is a heart.

(b) Find the chance that the first card is a heart and the second card is a heart.

11. A die is rolled three times.

(a) Find the chance that the first card is a king.

(b) Find the chance that the first card is a king, the second is a queen, and the third is a jack.

12. A die is rolled six times. You have a choice –

(a) to win $1 if at least one ace shows

(b) to win $1 if an ace shows on all the rolls

Which option offers the better chance of winning? Or are they the same? Explain.

13. A coin is tossed 3 times.

(a) What is the chance of getting 3 heads?

(b) What is the chance of not getting 3 heads?

(c) What is the chance of getting at least one tail?

(d) What is the chance of getting at least one head?

14. Every week you buy a ticket in a lottery that offers one chance in a million of winning. What is the chance that you never win, even if you keep this up for ten years?

15. Suppose that in a certain class, there are

- 80% men and 20% women;
- 15% freshmen and 85% sophomores.

(a) The percentage of sophomore women in the class can be as small as _____.

(b) This percentage can be as large as _____.

16. One student is chosen at random from the class described above.

(a) The chance of getting a sophomore woman can be as small as _____.

(b) This chance can be as large as _____.

17. In 2002, about 50.9% of the population of the United States was female. Also, 1.6% of the population was age 85 and over. True or false, and explain: the percentage of the population consisting of women age 85 and over is $0.509 \times 0.016 = 0.0081 = 0.81\%$.

18. In a certain psychology experiment, each subject us presented with three ordinary playing cards, face down. The subject takes ine of these cards. The subject also takes one card at random from a separate, full deck of playing cards. If the two cards are from the same suit, the subject wins a prize. What is the chance of winning? If more information is needed, explain what you need, and why.

19. True or false, and explain:

    (a) If something has probability 1000%, it is sure to happen.
    (b) If something has probability 90%, it can be expected to happen about nine times as often as its opposite.

20. Two cards will be dealt off the top of a well-shuffled deck. You have a choice:

    (a) To win $1 if the first is a king.
    (b) To win $1 if the first is a king and the second is a queen.

    Which option is better? Or are they equivalent? Explain briefly.

21. Four cards will be dealt off the top of a well-shuffled deck. There are two options:

    (a) To win $1 if the first card is a club and the second is a diamond and the third is a heart and the fourth is a spade.
    (b) To win $1 if the four cards are of different suits.

    Which option is better? Or are they the same? Explain.

22. A poker hand is dealt. Find the chance that the first four cards are aces and the fifth is a king.

23. A deck of cards is shuffled and the top two cards are placed face down on a table. True or false, and explain:

    (a) There is a 1 in 52 chance for the first card to be the ace of clubs.
    (b) There is a 1 in 52 chance for the second card to be the ace of diamonds.
    (c) The chance of getting the ace of clubs and then the ace of diamonds is $\frac{1}{52} \times \frac{1}{52}$.

24. A coin is tossed six times. Two possible sequences of results are

    (a) HTTHTH
    (b) HHHHHH

    (The coin must land H or T in the order given; H=heads, T=tails.) Which of the following is correct? Explain.

(a) The first sequence is more likely.

(b) The second sequence is more likely.

(c) Both sequences are equally likely.

25. A die is rolled four times. What is the chance that –

    (a) all the rolls show 3 or more spots?

    (b) none of the rolls show 3 or more spots?

    (c) not all the rolls show 3 or more spots?

26. A die is rolled 10 times. Find the chance of –

    (a) getting 10 sixes.

    (b) not getting 10 sixes.

    (c) all the rolls shwoing 5 spots or less.

27. Which of the two options is better, or are they the same? Explain briefly.

    (a) You toss a coin 100 times. On each toss, if the coin lands heads, you win \$1. If it lands tails, you lose \$1.

    (b) You draw 100 times at random with replacement from a box with two tickets: one labeled "1" and the other labeled "0". On each draw, you are paid (in dollars) the number on the ticket.

28. You are thinking about playing a lottery. The rules: you buy a ticket, choose 3 different numbers from 1 to 100, and write them on the ticket. The lottery has a box with 100 balls numbered 1 through 100. Three balls are drawn at random without replacement. If the numbers on these balls are the same as the numbers on your ticket, you win. (Order doesn't matter.) If you decide to play, what is your chance of winning?