

# Probability Review 41

For the following problems, give the probability to four decimals, or give a fraction, or if necessary, use scientific notation.

Use  $P(A) = 1 - P(\text{not } A)$

- 1) A coin is tossed 6 times. Find the probability of getting at least 1 head.
- 2) What is the probability that a 3 letter word contains at least 1 b?
- 3) What is the probability that a 5 digit number has at least 1 odd digit?

## Number Problems

- 4) Find the probabilities.
  - a) A two digit number contains only the digits 5, 6, and 7.
  - b) A three digit number contains the digits 4, 5, and 6.
  - c) A four digit number contains only the digits 1 and 2.
  - d) A three digit number is  $> 799$  and contains the digits 8, 9, and 0.
  - e) A three digit number contains at least one 5.
  - f) A three digit number contains exactly two 5's.
  - g) A four digit number contains only even digits.
  - h) A three digit number has digits that are all different.

## Dice Problems

- 5) Two dice are rolled. Find the probabilities.



- a)  $P(\text{two black})$                       b)  $P(\text{one black and one white})$

One marble is picked from one of the jars. Find the probabilities (use a tree diagram).

- c)  $P(\text{white})$                               d)  $P(\text{black})$

11) A jar contains 4 black and 3 white marbles. Two marbles are picked. Find the probabilities.

- a)  $P(W \text{ and } W)$                       b)  $P(B \text{ and } B)$                       c)  $P(B \text{ and } W \text{ any order})$

12) A jar contains 3 red, 5 blue and 6 yellow marbles. Pick three marbles. Find the probabilities.

- a)  $P(3 \text{ red})$                               b)  $P(2 \text{ blue, } 1 \text{ yellow})$                       c)  $P(3 \text{ yellow})$

### **Binomial Problems**

13) The probability of winning a game is 0.55. Find the following probabilities if four games are played.

- a)  $P(1 \text{ win})$                               b)  $P(2 \text{ wins})$                               c)  $P(4 \text{ wins})$

14) Five dice are rolled. Find the probabilities.

- a)  $P(\text{one } 4)$                               b)  $P(\text{two } 5\text{'s})$                               c)  $P(\text{at least three } 2\text{'s})$

15) Suppose that 30 coins are tossed. Find the probability of getting 18 heads.

16) A survey was taken in a large town. It was found that 70% of people like cats, and 30% of people hate cats. Use the binomial distribution to find the

probability that 8 people will like cats in a random selection of 12 people.

### **Conditional Probabilities**

17) A card is drawn from a deck. Find the following conditional probabilities.

- a) The card is a heart, given that it is not a diamond.
- b) The card is a heart, given that it is a face card.
- c) The card is a face card, given that it is a club.
- d) The card is a king, given that it is a club or a spade.

18) The probability that a battery lasts one year is 0.8. The probability that it lasts two years is 0.5. If the battery lasts one year, give the probability that it will last two years.

### **Card Problems**

19)a) A card is dealt from a shuffled deck. It is not known. What is the probability that the next card dealt will be black?

b) A red card is dealt from a shuffled deck. What is the probability that the next card will be black?

20) Two cards are dealt from a shuffled deck. Find the probabilities.

- a) P(two red)
- b) P(two kings)
- c) P(one red, one black)
- d) P(one club)
- e) P(two clubs)
- f) P(no clubs)

21) Five cards are dealt from a deck. Find the probabilities.

- a) P(ace of diamonds)

b)  $P(2 \text{ hearts and } 3 \text{ spades})$

c)  $P(4 \text{ kings})$

22) Five cards (a poker hand) are dealt from a shuffled deck. Find the probabilities.

a)  $P(\text{royal flush})$

b)  $P(\text{straight flush, includes royal flush})$

c)  $P(\text{flush, includes straight flush and royal flush})$

d)  $P(\text{four of a kind})$

e)  $P(\text{full house})$

f)  $P(\text{three of a kind, including full house})$

g)  $P(\text{straight, including straight flushes})$

h)  $P(\text{two pair})$

### Bayes Theorem

23) Jar 1 contains two red and three green marbles. Jar 2 contains three red and four green marbles. A marble is picked from one of the jars. It is red. What is the probability that the ball came from jar 1?

24) Al and Bob work on an assembly line making computers. Al produces 60% of the computers and does unsatisfactory work 8% of the time. Bob produces 40% of the computers and does unsatisfactory work 5% of the time. A computer at the end of the line is picked at random. Find the probabilities.

a) Find the probability that the computer has had unsatisfactory work done on it.

b) What is the probability that Al worked on the computer if it is

unsatisfactory.

c) What is the probability that Bob worked on the computer if the work is satisfactory.

### Other Problems

25) What is the probability that a 3 digit number does not contain a five?

26) What is the probability that a card dealt from a deck, is a three, a heart, or a face card?

27) In a certain town, a survey shows that 80% of the people own a house, 90% of the people own a car, and 75% own both a car and a house. Find the probabilities.

a)  $P(\text{a person does not own a house or a car})$

b)  $P(\text{a person owns a car but not a house})$

c)  $P(\text{a person owns a car or a house})$

28) Three boys, Allan, Bob and Carl, write their names on three cards. The cards are placed in a hat. Each then picks a card. Find the probabilities.

a) Each picks the card with their name.

b) Each picks a card that doesn't have their name.

c) Only one of the boys picks a card with their name.

29) Seven cards are numbered from 1 to 7, and put in a box. Two cards are picked. Find the probabilities.

a)  $P(\text{two odds})$

b)  $P(\text{one odd})$

c)  $P(\text{sum} > 8)$

30) In a shipment of 200 computer chips, 8 are known to be defective. If 10 of the chips are picked at random, what is the probability that 2 of the chips

are defective?

31) Three cards are dealt from a shuffled deck. What is the probability of getting the ace of hearts?

32) On a multiple choice test, John guesses the answers. There are 10 questions. Each question has 4 possible answers. Find the probability that John answers five questions correctly and just passes the test. Use the binomial theorem.

33) Find the probability of picking the right combination of a lock. There are 40 different numbers. Three different numbers must be chosen.

34) In a shop, machine A works 80% of the time. Machine B works 70% of the time. Find the probabilities.

a) Both machines do not work.

b) Both machines do work.

c) Only one of the machines works.

35) John has two job interviews. He thinks the chance of getting job A is 0.6, and the chance of getting job B is 0.7. Draw a Venn diagram to find the probabilities.

a) P(two job offers)

b) P(no job offer)

c) P(one job offer)

36) A teacher chooses two students from a class of 10 to do a project. What is the probability that Robert is chosen, but John is not chosen?

37) A bridge hand consists of 13 cards. Find the probability of getting exactly seven diamonds.

Answers: 1) 0.9844, 2) 0.1110, 3) 0.9722, 4)a) 0.1000, b) 0.0300, c) 0.0018, d) 0.0200, e) 0.2800, f) 0.0289, g) 0.0556, h) 0.7200, 5)a) 0.3056, b) 0.1667, 6)a) 0.0046, b) 0.3472, c) 0.4213, d) 0.0694, e) 0.5787, f) 0.5556, 7)a) 0.0154, b) 0.1157, 8)a) 0.0078, b) 0.9922, c) 0.2734, d) 0.2266, 9)a) 0.3333, b) 0.5556, c) 0.0988, 10)a) 0.5000, b) 0.4167, c)

0.2917, d) 0.7083, 11)a) 0.1429, b) 0.2857, c) 0.5714, 12)a) 0.0027, b) 0.1648, c) 0.0549, 13)a) 0.2005, b) 0.3675, c) 0.0915, 14)a) 0.4019, b) 0.1608, c) 0.0355, 15) 0.0806, 16) 0.2311, 17)a) 0.3333, b) 0.2500, c) 0.2308, d) 0.0769, 18) 0.6250, 19)a) 0.5000, b) 0.5098, 20)a) 0.2451, b) 0.0045, c) 0.5098, d) 0.3824, e) 0.0588, f) 0.5588, 21)a) 0.0962, b) 0.0086, c)  $1.847 \times 10^{-5}$ , 22) ( $H = {}_{52}C_5$ ), a)  $4/H = 1.539 \times 10^{-6}$ , b)  $4 \times 10/H = 1.539 \times 10^{-5}$ , c)  $4 \times {}_{13}C_5/H = 0.0020$ , d)  $13 \times 48/H = 2.401 \times 10^{-4}$ , e)  $13 \times {}_4C_3 \times {}_4C_2 \times 12/H = 1.441 \times 10^{-3}$ , f)  $13 \times {}_4C_3 \times {}_{48}C_2/H = 2.257 \times 10^{-2}$ , g)  $10 \times 4^5/H = 0.0039$ , h)  $44 \times ({}_4C_2)^2 \times {}_{13}C_2/H = 0.0475$ , 23) 0.4828, 24)a) 0.0680, b) 0.7059, c) 0.4077, 25) 0.7200, 26) 0.4808, 27)a) 0.0500, b) 0.1500, c) 0.9500, 28)a) 1/6, b) 1/3, c) 1/2, 29)a) 2/7, b) 4/7, c) 3/7, 30)  $[{}_8C_2 \times {}_{192}C_8 / {}_{200}C_{10}] = 0.04928$ , 31)  $1 \times {}_{51}C_2 / {}_{52}C_3 = 3/52 = 0.05769$ , 32) 0.05840, 33)  $1.687 \times 10^{-5}$ , 34)a) 0.0600, b) 0.5600, c) 0.3800. 35)a) 0.42, b) 0.12, c) 0.46, 36) 8/45, 37) 0.0088, 38) Choose the other door, because your chances of winning will be 1/2. If you stick with your first choice, your chances of winning are 1/3.