

## COUNTING

1. You are dealt a hand of 5 cards. How many ways can you be dealt at least 3 hearts?
2. Three families are going to a basketball game together. The Smith family has 3 members, the Jones family has 4 members and the Farmer family has 6 members. How many ways can these 13 people be seated in a row if members of the same family sit together?
3. A mantel is being decorated for Spring. There are 9 decorations: 1 large bunny, 4 identical baby bunnies, a pair of identical candlesticks and 2 different plants. How many distinguishable ways can these decorations be arranged?
4. A bag has 5 pennies, 4 dimes and 6 quarters. Four coins are chosen at random from the bag
  - a. How many ways can the chosen coins be all quarters?
  - b. At least one penny
  - c. How many ways can the chosen coins have exactly 3 pennies or exactly 1 dime?
5. How many ways can a class of 18 students be put into 3 groups of 6 students?
6. An ice cream shop has 5 flavors of ice cream to choose from. If flavors are selected at random, what is the probability that a three-scoop cone does not have three of the same flavor?
7. A box of 12 donuts will be purchased from a shop with 16 kinds of donuts. How many ways can the donuts be chosen?

## COUNTING AND PROBABILITY

1. A buyer is considering a lot of 60 collectible cards and the seller will only let her check 4 cards to see if she wishes to purchase the lot. If the buyer finds any bent cards in her sample, she will not purchase the lot. What is the probability that the buyer ends up purchasing the cards given that there are 20 bent cards in the lot?
2. A 4-digit pin code is generated randomly. What is the probability that the last digit is a 7 or the first digit is a 6?
3. There are 72 marbles in a box. There are 18 different colors and 4 marbles of each color. Five marbles are chosen at random from the box. What is the probability of a full house? That is, 3 of one color and 2 of a different color.

## BINOMIAL PROBABILITY

1. The probability that a transistor is defective is 1%. A box contains 500 transistors. What is the probability that a box contains
  - a. zero defective transistors?
  - b. at most 4 defective transistors?
  - c. at least 7 defective transistors?
  - d. between 3 and 8 defective transistors?
2. A student takes a multiple choice test by guessing on each answer. The exam has 15 questions and each question has 3 possible answers.
  - a. What the probability that the student guesses correctly on more than 5 questions but less than 10 questions?
  - b. What the probability that the student guesses correctly on 4 of the first 8 questions and 3 of the last 7 questions?

## RANDOM VARIABLES AND STATISTICS

1. A class of 100 students is given a 10-point quiz with the following results:

Number of points	0	1	2	3	4	5	6	7	8	9	10
Number of students	2	8	5	10	2	10	7	30	8	10	8

Determine an appropriate random variable for this experiment and find the following values for that rv:

Mean = \_\_\_\_\_ median = \_\_\_\_\_ mode = \_\_\_\_\_ standard deviation = \_\_\_\_\_

Display the information in a box-and-whisker plot.

2. Classify each random variable as finite discrete, infinite discrete, or continuous. List the possible values of  $X$ .

- $X$  = The number of times a die is cast until a 5 is rolled.
- $X$  = How long it takes you use an ATM machine.
- $X$  = The number of cadets in a class of 100 students.

3. A bag has 10 oranges, 2 of which are rotten. A sample of 3 is chosen. What is the expected number of rotten oranges in the sample?

4. A gambler decides to play a game of chance by flipping a coin. If the coin shows heads, the gambler's fortune doubles. If the coin shows tails, his fortune is cut in half. The gambler starts with \$32 and plays twice. What is the expected value of his fortune?

5. A man buys a \$10,000 insurance policy on his boat. His premium is \$120 for a year of coverage. If the probability the boat needs to be replaced in the next year 1%, what is the insurance company's expected gain?

6. The probability that a transistor is defective is 1%. A box contains 500 transistors. What is the expected number of defective transistors? What is the standard deviation in the number of defective transistors?

## NORMAL PROBABILITY DISTRIBUTION

1. The weight of 1 week old corn plants can be closely approximated by the normal distribution. If the mean weight is 10 grams with a standard deviation of 0.9 grams, what is the probability that

- a plant weighs more than 12 grams?
- a plant weighs between 7 and 10 grams?
- a plant weighs less than 8 grams?
- How much does a plant in the 60th percentile weigh?
- What plant weights bracket the middle 80% of the population of plants?
- What is the probability that three plants weighed in succession will all be over 11 grams?

2. A data distribution has a mean of 10 and a standard deviation of 1.1. Use Chebychev's theorem to answer the questions below.

- What is the probability that a value is between 7 and 13?
- Find a value of  $c$  such that 84% of the data is in the range  $10-c$  to  $10+c$

3. A tree farm plants 500 trees. A tree has an 85% chance of surviving one year. Use the normal curve approximation to the binomial distribution to estimate the probability that

- more than 430 trees survive one year.
- fewer than 410 trees survive one year.
- between 420 and 425 trees survive one year.

4. The average number of cars passing through a certain toll booth is 15 per hour. Use the Poisson distribution to find the probability that during a given 5-minute period

- no cars go through the toll booth,
- exactly 1 goes through
- more than two go through.