8.1 Multiplication rules and permutation ----------

Evaluate the permutation. Round to three decimal places when appropriate.

1) P(13, 4)

2) P(12, 12)

3) P(23, 2)

Solve the problem.

4) License plates are made using 2 letters followed by 3 digits. How many plates can be made if repetition of letters and digits is allowed?

5) A restaurant offers 8 possible appetizers, 9 possible main courses, and 5 possible desserts. How many different meals are possible at this restaurant? (Two meals are considered different unless all three courses are the same).

How many distinguishable permutations of letters are possible in the word?

6) CRITICS

7) MISSISSIPPI

Given a group of students: G = {Allen, Brenda, Chad, Dorothy, Eric} or G = {A, B, C, D, E}, count the different ways of choosing the following officers or representatives for student congress. Assume that no one can hold more than one office.

8) Four representatives with titles rep 1, rep 2, Rep 3 and Rep 4.

9) A president, a secretary, and a treasurer, if the president must be a woman and the other two must be men

10) A male president and three representatives

Four accounting majors, two economics majors, and three marketing majors have interviewed for five different positions with a large company. Use the following information to find the number of different ways that five of these could be hired.

11) Two accounting majors must be hired first, then one economics major, then two marketing majors.

12) One accounting major, one economics major, and one marketing major would be hired, then the two remaining positions would be filled by any of the majors left.

An order of award presentations has been devised for seven people: Jeff, Karen, Lyle, Maria, Norm, Olivia, and Paul.

13) In how many ways can the awards be presented so that Maria and Olivia will be next to each other?

14) In how many ways can the first award be presented to Karen and the last to Lyle?

Suppose a traveler wanted to visit a museum, an art gallery, and the state capitol building. 45–minute tours are offered at each attraction hourly from 10 a.m. through 3 p.m. (6 different hours). Solve the problem, disregarding travel time.

15) In how many ways can the traveler visit all three places in one day?

16) In how many ways could the traveler schedule all three tours in one day, with the museum tour being after noon?

To win the World Series, a baseball team must win 4 games out of a maximum of 7 games. To solve the problem, list the possible arrangements of losses and wins.

17) How many ways are there of winning the World Series in exactly 7 games if the winning team loses the first game?

18) How many ways are there of winning the World Series in exactly 7 games if the winning team wins the first two games?

19) How many ways are there of winning the World Series in exactly 6 games if the winning team wins the last two games?

8.2 Combinations ----------

Evaluate the combination.

20) C(9, 3)

21) C(29, 1)

22) C(40, 40)

Solve the problem.

23) How many ways can a committee of 3 be selected from a club with 12 members?

24) The chorus has six sopranos and eight baritones. In how many ways can the director choose a quartet that contains at least one soprano?

Decide whether the situation involves permutations or combinations.

25) A batting order for 9 players for a baseball game.

26) A sample of 4 items taken from 65 items on an assembly line.

Solve the problem.

27) If you toss six fair coins, in how many ways can you obtain at least two heads?

28) A bag contains 5 apples and 3 oranges. If you select 4 pieces of fruit without looking, how many ways can you get 4 apples?

29) A bag contains 9 apples and 7 oranges. If you select 8 pieces of fruit without looking, how many ways can you get exactly 7 apples?

8.3 Probability Applications with Counting ----------

A bag contains 6 cherry, 3 orange, and 2 lemon candies. You reach in and take 3 pieces of candy at random. Find the probability.

30) All cherry

31) 2 orange, 1 lemon

Solve.

32) A 6–sided die is rolled. What is the probability of rolling a number less than 6?

33) Two 6–sided dice are rolled. What is the probability that the sum of the two numbers on the dice will be greater than 10?

Solve the problem. (These are tough)

34) What is the probability that at least 2 students in a class of 36 have the same birthday?

Solve the problem.

35) At the first tri–city meeting, there were 8 people from town A, 7 people from town B, and 5 people from town C. If the council consists of 5 people, find the probability of 3 from town A and 2 from town B.

36) Suppose 6 people sit at a circular table. Find the probability that 2 particular people are sitting next to each other.

8.4 Binomial probability ----------

Find the requested probability.

37) A family has five children. The probability of having a girl is 1/2. What is the probability of having no girls?

38) A family has five children. The probability of having a girl is 1/2. What is the probability of having exactly 3 girls and 2 boys?

39) A family has five children. The probability of having a girl is 1/2. What is the probability of having at least 4 girls?

A die is rolled five times and the number of fours that come up is tallied. Find the probability of getting the given result.

40) Exactly zero fours

41) Exactly two fours

A die is rolled 20 times and the number of twos that come up is tallied. Find the probability of getting the given result.

42) More than three twos

Find the requested probability.

43) A child rolls a 6–sided die 6 times. What is the probability of the child rolling no more than three twos?

In a certain college, 33% of the physics majors belong to ethnic minorities. Find the probability of the event from a random sample of 10 students who are physics majors.

44) Two or less belong to an ethnic minority.

8.5 Probability Distributions ----------

Prepare a probability distribution for the experiment. Let x represent the random variable, and let P represent the probability.

45) Three coins are tossed, and the number of tails is noted.

Give the probability distribution and sketch the histogram.

46) A class of 44 students took a 10–point quiz. The frequency of scores is given in the table.

Number of Points	Frequency
5	2
6	5
7	10
8	15
9	9
10	3
	Total: 44

Find the expected value for the random variable.

47)

x	2	3	4	5
P(x)	0.4	0.2	0.1	0.3

48) A business bureau gets complaints as shown in the following table. Find the expected number of complaints per day.

Complaints per Day	0	1	2	3	4	5
Probability	0.04	0.11	0.26	0.33	0.19	0.12

Find the expected value of the random variable in the experiment.

49) Three coins are tossed, and the number of tails is noted.

50) Five rats are inoculated against a disease. The number contracting the disease is noted and the experiment is repeated 20 times. Find the probability distribution and the expected number of rats contracting the disease.

Number with Disease	Frequency
0	2
1	4
2	7
3	3
4	1
5	3
Total:	20

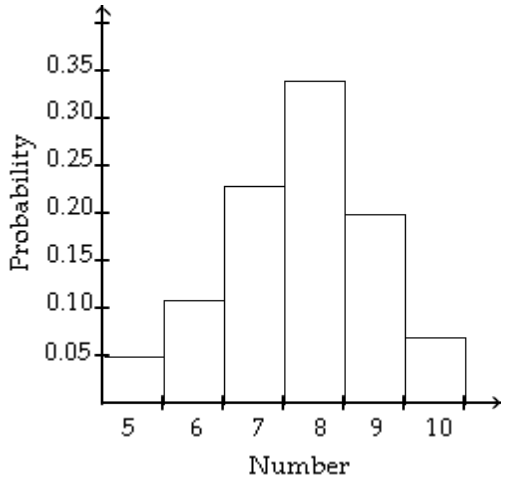
1) 17,160
2) 479,001,600
3) 506
4) 676,000 plates
5) 360 meals
6) 1260
7) 34,650
8) 120
9) 12
10) 72
11) 144 ways
12) 720 ways
13) 1440
14) 120
15) 120
16) 60
17) 10 ways
18) 4 ways
19) 6 ways
20) 84
21) 29
22) 1
23) 220 ways
24) 931 ways
25) Permutation
26) Combination
27) 57 ways
28) 5 ways
29) 252 ways
30) 0.1212
31) 0.0364
32) $\frac{5}{6}$
33) $\frac{1}{12}$
34) 0.832
35) 0.076
36) 0.4
37) 0.0313
38) 0.3125
39) 0.1875
40) 0.402
41) 0.161
42) 0.433
43) 0.9913
44) 0.3070

45)

x	P(x)
0	1/8
1	3/8
2	3/8
3	1/8

46)

x	5	6	7	8	9	10
P(x)	0.05	0.11	0.23	0.34	0.20	0.07



47) 3.3
48) 2.98
49) 1.5
50) 2.3