

Math 111

Practice Test for Chapter 11

Solve the following problems by using the Fundamental Counting Principle.

- 1) There are 4 roads leading from King of Prussia to Bryn Mawr, 10 roads leading from Bryn Mawr to Wayne, and 3 roads leading from Wayne to Paoli. How many ways are there to get from King of Prussia to Paoli?

- 2) You are taking a multiple-choice math test that has 10 questions. Each of the questions has 5 choices, with one correct choice per question. If you select one of these options per question and leave nothing blank (like you good students do 😊), in how many ways can you answer the questions?

- 3) Kingswood Apartments offers rooms with 4 different options:
 - a. Number of bedrooms (one through four)
 - b. Number of bathrooms (one through three)
 - c. Floor (first through fifth)
 - d. Outdoor additions (balcony or no balcony)How many apartment options are available?

- 4) Gina is joining a music club. As part of her 4-CD introductory package, she can choose from 12 rock selections, 10 alternative selections, 7 country selections (which she would never choose in real life), and 5 classical selections. If Gina chooses one selection from each category, how many ways can she choose her introductory package?

- 5) You have just moved into your room in Xavier Hall and you are arranging your 12 favorite CDs on a little shelf above your computer. How many different ways can you arrange the CD's assuming that the order of the CD's does make a difference to you?

- 6) A popular and well-loved math teacher takes 8 of her students to one of the Cabrini basketball team's game. They sit on a bleacher 2 rows up from the court. In how many ways can this be done if the teacher must be seated in the middle and a difficult student must sit to the teacher's immediate left?

Evaluate:

7) $\frac{7!}{5!}$

8) $(7-3)!$

9) $\frac{6!}{(6-4)!}$

Use the Permutation Formula to solve for the following:

10) 4^P0

11) 8^P8

12) SGA elects a president, vice-president, and secretary-treasurer. How many sets of officers are possible if there are 9 members and any member can be elected to each position? No person can hold more than one office, even if they are overachievers.

13) In how many distinct ways can the letters in ENGINEERING be arranged?

14) How many arrangements can be made using 2 letters of the word HYPERBOLAS if no letter is to be used more than once?

In the following exercises, does the problem involve permutations or combinations? Explain your answer. It is not necessary to solve the problem.

15) The BURN radio station on campus offers a choice of 7 records from a list of 45. In how many ways can a member make a selection?

16) How many different user ID's can be formed from the letters W, X, Y, Z if no repetition of letters is allowed?

Use the Combination Formula to evaluate the expression.

17) 9^C9

18) $\frac{10^C3}{6^C4}$

19) To win at LOTTO in a certain state, one must correctly select 6 numbers from a collection of 49 numbers (one through 49). The order in which the selection is made does not matter. How many different selections are possible?

20) In how many ways can a committee of three men and four women be formed from a group of 12 men and 12 women?

Use the theoretical probability formula to solve. Express the probability as a fraction reduced to lowest terms.

21) You are dealt one card from a standard 52-card deck.

a. Find the probability of being dealt an ace or a 8.

b. Find the probability of getting a face card.

22) A fair coin is tossed two times in succession. The set of equally likely outcomes is {HH, HT, TH, TT}. Find the probability of getting the same outcome on each toss.

23) A die is rolled. The set of equally likely outcomes is {1, 2, 3, 4, 5, 6}. Find the probability of getting a 9.

Use the empirical probability formula to solve the exercise. Express the answer as a fraction. Then express the probability as a decimal, rounded to the nearest thousandth, if necessary.

- 24) The table below represents a random sample of the number of deaths per 100 cases for a certain illness over time. If a person infected with this illness is randomly selected from all infected people, find the probability that the person lives 3-4 years after diagnosis.

<u>Years after diagnosis</u>	<u>Number of Deaths</u>
1-2	15
3-4	35
5-6	16
7-8	9
9-10	6
11-12	4
13-14	2
15+	13

- 25) In 1999, the stock market took big swings up and down. A survey of 1029 adult investors asked how often they tracked their portfolio. The table shows the investor responses. What is the probability that an adult investor tracks his or her portfolio daily?

<u>How Frequently?</u>	<u>Responses</u>
Daily	238
Weekly	290
Monthly	287
Couple of times a year	147
Don't Track	67

Solve the following problems:

- 26) Gina, Diane, Jackie, John, Carol, and Steve have all been invited to a VIP dinner at the mansion with President Idarolla. They arrive randomly and each person arrives at a different time.
- In how many ways can they arrive?
 - In how many ways can Diane arrive first and Jackie last?
 - Find the probability that Diane will arrive first and Jackie will arrive last.

27) A box contains 26 iPods, 4 of which are defective. If 4 are sold at random, find the probability that

a. All are defective

b. None are defective

28) If you are dealt 6 cards from a shuffled deck of 52 cards, find the probability of getting 3 jacks and 3 aces.

29) You are dealt one card from a 52-card deck. Find the probability

a. that you are not dealt a 9

b. that you are not dealt a spade

c. that you are dealt an ace or a 6

d. A numbered card or a club

30) A single die is rolled twice. The set of 36 equally likely outcomes is $\{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (2,1), (2,2), (2,3), (2,4), (2,5), (2,6), (3,1), (3,2), (3,3), (3,4), (3,5), (3,6), (4,1), (4,2), (4,3), (4,4), (4,5), (4,6), (5,1), (5,2), (5,3), (5,4), (5,5), (5,6), (6,1), (6,2), (6,3), (6,4), (6,5), (6,6)\}$

a. Find the probability of getting a sum of 3 or 4.

31) It is equally probable that a pointer on a spinner will land on any one of eight regions, numbered 1 through 8. If the pointer lands on a borderline, spin again. Find the probability that the pointer will stop on an even number or a number less than 4. (one answer)

32) The following table shows the percentage of children in the U.S. whose parents are college graduates in one-parent households and two-parent households. Use the information to solve the problem

	Percentage of U.S. Children Whose Parents Are College Graduates
In One-Parent Households	9%
In Two-Parent Households	29%

- a. What are the odds in favor of a child in a one-parent household having a parent who is a college graduate?
- b. What are the odds against a child in a one-parent household having a parent who is a college graduate?

33) If you are given odds 8 to 6 in favor of winning a bet, what is the probability of winning the bet?

34) The winner of a raffle will receive a new car. If 10,000 raffle tickets were sold and you purchased 22 tickets, what are the odds against your winning the car?

Solve the problem involving probabilities with independent events

35) If you toss a fair coin 11 times, what is the probability of getting all heads?

36) You are at a magic show and you're the volunteer! You are dealt one card from a 52 card deck. Then the card is replaced in the deck, the deck is shuffled, and you draw again. Find the probability of getting a picture card the first time and a diamond the second time.

37) The probability that a region prone to hurricanes will be hit by a hurricane in any single year is $\frac{1}{5}$.
What is the probability of a hurricane at least once in the next 5 years?

38)

Solve the problem that involves probability with events that are not mutually exclusive

39) Numbered disks are placed in a box and one disk is selected at random.

- a. If there are 4 red disks numbered 1 through 4, and 7 yellow disks numbered 5 through 11, find the probability of selecting a disk numbered 3, given that a red disk is selected.
- b. If there are 6 red disks numbered 1 through 6, and 4 yellow disks numbered 7 through 10, find the probability of selecting a yellow disk, given that the number selected is less than or equal to 3 or greater than or equal to 8.

- 40) An ice chest contains 4 cans of apple juice, 8 cans of grape juice, 9 cans of orange juice, and 3 cans of pineapple juice. Suppose that you reach into the container and randomly select three cans in succession. Find the probability of selecting no grape juice.
- 41) A spinner has a pointer which can land on one of the three regions labeled 1, 2, and 3 respectively. Compute the expected value for the number on which the pointer lands if the probabilities for the three regions are $\frac{1}{2}$, $\frac{1}{7}$, $\frac{5}{14}$ respectively.
- 42) A 25 year-old can purchase a one-year life insurance policy for \$10,000 at a cost of \$100. Past history indicates that the probability of a person dying at the age 25 is 0.0025. Determine the company's expected gain per policy.
- 43) A store specializing in electronics is to open in one of 2 malls. If the first mall is selected, the store anticipates a yearly profit of \$250,000 if successful and a yearly loss of \$110,000 otherwise. The probability of success is $\frac{1}{2}$. If the second is selected, it is estimated that the yearly profit will be \$110,000 if successful; otherwise, the annual loss will be \$50,000. The probability of success at the second mall is $\frac{3}{4}$. What is the expected profit at each of the two malls?

Solve the problem that involves computing expected values in a game of chance

- 44) A game is played with one die. If the die is rolled and shows a 2, the player wins 47. If the die shows any number other than 2, the player wins nothing. If there is a charge of \$1 to play the game, what is the game's expected value?
- 45) A numbers game run by many state governments allows a player to select a three-digit number from 000 to 999. There are 1000 such numbers. A bet of \$12 is placed on a number. If the number is selected, the player wins \$1200. If any other number is selected, the player wins nothing. Find the expected value for the game.