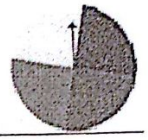
Probability and Fundamental Counting Principle Name: _____

Problem: A spinner has 4 equal sectors colored yellow, blue, green and red. What are the chances of landing on blue after spinning the spinner? What are the chances of landing on red?



Solution: The chances of landing on blue are 1 in 4, or $\frac{1}{4}$ .25 25%

The chances of landing on red are 1 in 4, or $\frac{1}{4}$ .25 25%

This problem asked us to find some probabilities involving a spinner. Let's look at some definitions and examples from the problem above.

Use the following formula for finding the probability of an event.

* $P(A) = \frac{\text{The Number Of Ways Event A Can Occur}}{\text{The total number Of Possible Outcomes}}$

Experiment 1: A single 6-sided die is rolled. What is the probability of each outcome? What is the probability of rolling an even number? of rolling an odd number?

Outcomes: The possible outcomes of this experiment are: {1, 2, 3, 4, 5, 6}

Probabilities: P(1) = 1/6

P(even) = 3/6 = 1/2

P(odd) = 3/6 = 1/2

Experiment 2: A glass jar contains 6 red, 5 green, 8 blue and 3 yellow marbles. If a single marble is chosen at random from the jar, what is the probability of choosing a red marble? a green marble? a blue marble? a yellow marble?

Outcomes: The possible outcomes of this experiment are red, green, blue and yellow.

Probabilities: $P(R) = \frac{6}{22} = \frac{3}{11}$ $P(B) = \frac{8}{22} = \frac{4}{11}$

$P(G) = \frac{5}{22}$ $P(Y) = \frac{3}{22}$

The outcomes in this experiment are not equally likely to occur. You are more likely to choose a blue marble than any other color. You are least likely to choose a yellow marble.

Example: In a certain state, automobile license plates display 3 letters followed by 3 digits. How many such plates are possible if repetition of the letters is...

0-9: 10 digits

...allowed:

26	26	26	10	10	10

To find the answer, multiply all the boxes together. In this case your answer is 17,576,000.

...not allowed:

A

26	25	24	10	10	10

To find the answer, multiply all the boxes together. In this case your answer is 15,600,000 because not repeating letters is limiting.

Fundamental Counting Principle:

Suppose that two events occur in order. If the first can occur in a ways and the second in b ways (after the first has occurred), then the two events can occur in order in a·b ways.

Example: You have two pairs of pants (khakis and jeans) and 3 shirts (red, yellow, and blue). Draw the two different tree diagrams that will tell you how many outfits you can make. 2·3 = 6 outfits

Example: In an upcoming race with 105 runners, prizes will be given to those finishing in the top. Assuming there are no ties, how many different outcomes are there for the first...

... 5 places:	... 3 places:
$105 \cdot 104 \cdot 103 \cdot 102 \cdot 101$ 1.16×10^{10} 1,160,000,000,000	$105 \cdot 104 \cdot 103$ 1,124,760

Example: In how many ways can 4 people be seated in a row of 4 seats?

4	3	2	1

$4 \cdot 3 \cdot 2 \cdot 1 = 24$

4! → 4 Factorial

MATH → PRB → #4

$5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

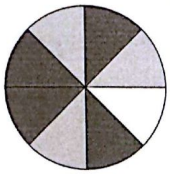
KEY

Basic Probability

Name:

Use each diagram to solve the problems.

1) How many pieces are there total in the spinner?



2) If you spun the spinner 1 time, what is the probability it would land on a gray piece?

3) If you spun the spinner 1 time, what is the probability it would land on a black piece?

4) If you spun the spinner 1 time, what is the probability it would land on a white piece?

5) If you spun the spinner 1 time, what is the probability of landing on either a gray piece or a white piece?

6) If you were to roll the dice one time what is the probability it will land on a 2?

7) If you were to roll the dice one time what is the probability it will NOT land on a 3?

8) If you were to roll the dice one time, what is the probability of it landing on an even number?

9) How many shapes are there total in the array?

10) If you were to select 1 shape at random from the array, what is the probability it will be a circle?

11) If you were to select 1 shape at random from the array, what shape do you have the greatest probability of selecting?

12) Which shape has a 37.5% chance (6 out of 16) of being selected?

Answers

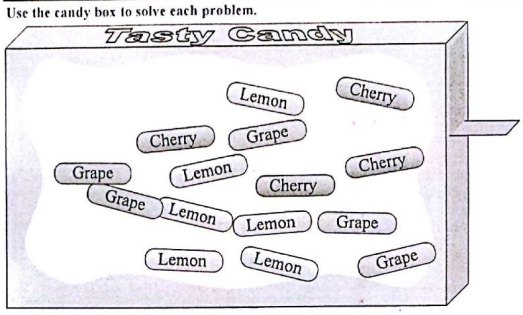
1. 8
2. 3/8
3. 4/8
4. 1/8
5. 4/8
6. 1/6
7. 5/16
8. 3/6
9. 16
10. 6/16
11. diamond
12. circle

1-10	92	83	75	67	58	50	42	33	25	17
11-12	8	0								

Determining Probability with Candy

Name:

Use the candy box to solve each problem.



1) How many total pieces of candy are in the box?

2) What is the probability of selecting a cherry piece?

3) What is the probability of selecting a lemon piece?

4) What is the probability of selecting a grape piece?

5) If you picked 1 piece of candy out of the box which flavor would you have the highest probability of selecting?

6) Which flavor has the lowest probability of being selected?

7) If you picked a piece at random would you be more likely to select, a lemon piece of a cherry piece?

8) What is the probability of selecting either a cherry piece OR a grape piece?

9) Your friend wants either a cherry piece or a grape piece. If you picked a piece out randomly, which one would you have the highest probability of selecting?

10) If you ate 6 lemon pieces, 4 cherry pieces and 2 grape pieces, which flavor would you have the highest probability of selecting next?

Answers

1. 15
2. 4/15
3. 6/15
4. 5/15
5. lemon
6. cherry
7. lemon
8. 9/15
9. grape
10. grape

1-10	90	80	70	60	50	40	30	20	10	0

HW Day 1

Fundamental Counting Principle Day 1

You are given a test with five true-false questions and seven multiple-choice questions, each with four possible answers. $4 \cdot 4 \cdot 4 \ldots$

1. How many possible answers are there for each true-false question?
   2
2. How many ways are there to complete the true-false section?
   $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \quad 2^5 = 32$
3. How many ways are there to complete the multiple-choice section?
   $4^7 = 16384$
4. How many different answer sheets could be filled out?
   $2^5 \cdot 4^7 = 524\,288$

At Pasta Panic, there are five different salads, four different soups, two types of bread, 4 different pastas, 9 different pasta sauces, and 10 desserts.

5. How many ways can you order a salad, bread, and pasta with sauce?
   $5 \cdot 2 \cdot 4 \cdot 9 = 360$
6. How many ways can you order a soup, bread, and pasta with sauce?
   $4 \cdot 2 \cdot 4 \cdot 9 = 288$
7. How many ways can you order pasta with sauce, bread, and dessert ?
   $4 \cdot 9 \cdot 2 \cdot 10 = 720$
8. How many ways can you order a salad, a soup, bread, pasta with sauce, and a dessert?
   $5 \cdot 4 \cdot 2 \cdot 4 \cdot 9 \cdot 10 = 14400$

Using only the letters in SEQUOIA:

9. In how many ways could you select a vowel and a consonant?
   $5 \cdot 2 = 10$
10. How many different four-letter "words" could you form using no letter more than once in any given word?
    $7 \cdot 6 \cdot 5 \cdot 4 = 840$
11. How many different five-letter "words" could you form using no letter more than once in any given word where the first letter can only be a vowel and the last letter can only be a consonant?
    $5 \cdot 6 \cdot 5 \cdot 4 \cdot 2 = 1200$

There are 25 students in Mr. Election's room. The students are asked to select officers for the class from these 25 students. The four positions are president, vice-president, treasurer, and secretary.

12. How many different ways can the four officers be selected?
    $4 \cdot 3 \cdot 2 \cdot 1 = 24$
13. There are 10 girls and 15 boys in the group. If the president and secretary must be a girl and the vice-president and treasurer must be a boy, how many different ways can the officers be selected?
    $10 \cdot 9 \cdot 15 \cdot 14 = 18900$

Many states use car license plates that have seven characters.

14. If the first position must be a letter and the last six positions must be digits, how many different plates can be made?
    $26 \cdot 10^6$
15. If the first three positions must be a letter and the last four positions must be digits, how many different plates can be made?
    $26^3 \cdot 10^4$
16. If all the positions can be either a letter or a digit, how many different plates can be made?
    36^7

Try These:

1. How many ways can two 6-sided dice be rolled (first die and then second die)? $6 \cdot 6 = 36$	2. How many ways can a card be drawn from a deck of 52 and be a 9 or an Ace? omit
3. How many ways can 10 true/false questions be answered on a test? 2^{10}	4. How many 6 character passwords are possible if each character can be a letter or a digit? 36^6
5. A briefcase lock has 3 rotating cylinders, each containing 10 digits. How many numerical codes are possible? $10 \cdot 10 \cdot 10 \quad 10^3$	6. A golf club manufacturer makes irons with 7 different shaft lengths, 3 different grips, 5 different lies, and 2 different club head materials. How many different combinations are offered? $7 \cdot 3 \cdot 5 \cdot 2 = 210$
7. There are five different routes that a commuter can take from her home to the office. In how many ways can she make a round trip if she uses a different route coming than going? $5 \cdot 4 = 20$	8. In how many ways can the 4 call letters of a radio station be arranged if the first letter must be W or K and no letters repeat? $2 \cdot 25 \cdot 24 \cdot 23 = 27600$
9. At First Rate Movies rental store, there are 100 dramas, 250 comedies, and 75 musicals. In how many ways can you pick a drama, a comedy, and a musical? $100 \cdot 250 \cdot 75$	10. The menu at Valerio's lists seven kinds of salad, eleven entrees, and nine kinds of dessert. How many different salad-entree-desert meals could you select? $7 \cdot 11 \cdot 9 = 693$

Fundamental Counting Principle Day 1 More Problems

1. Ward Robe has 15 pairs of slacks, 23 shirts, 4 belts, and 7 pairs of shoes. In how many different ways could he select a slack-shirt-belt-shoes combination?

$15 \cdot 23 \cdot 4 \cdot 7 = 9660$

2. A salesman has 7 customers in Denver, 13 customers in Paris, 9 customers in Reno, and 12 customers in Chicago. In how many different ways could he telephone a customer in Denver, then a customer in Paris, then a customer in Reno, and then a customer in Chicago?

$7 \cdot 13 \cdot 9 \cdot 12 = 9828$

3. Admiral Motors manufactures cars with five different body styles, uses eleven different colors of paint, and has six different interior colors. Suppose that the Admiral Motors dealer for whom you work wants to order one of each possible variety of car to display in the showroom. Show your boss that the plan would be impractical.

$5 \cdot 11 \cdot 6 = 330$

4. A scholarship committee receives 15 applicants and must chose a winner for the $50,000, $25,000, and $10,000 scholarship prizes. In how many different ways can the three winners be selected?

$15 \cdot 14 \cdot 13 = 2730$

5. Using only the letters in LOGARITHM:

a. In how many ways could you pick a vowel and a consonant?

$3 \cdot 6 = 18$

b. How many different three-letter "words" could you make, using each letter no more than once in any given word? ("words" can be "gar" or "thm" etc)

$9 \cdot 8 \cdot 7 = 504$

6. Nine people on a baseball team are trying to decide who will play which position. Two players can pitch, and three different players can catch.

a. In how many different ways could they select a pitcher, catcher, and a first baseman?

omit

b. In how many different ways could they select a pitcher, catcher, a first baseman, and a shortstop?

omit