

Name: _____

Date: _____

Probability----Review Sheet

A. PROBABILITY (DEFINITION): chance of an event occurring

B. Where is probability used: answers will vary, but sports related, games, etc.

number cubes

Theoretical Probability (Formula): number of ways the event can occur
Total number of possible outcomes

Sample questions:

1. A single die is rolled. Find the probability of rolling a:

6 outcomes

a. 5 $\frac{1}{6}$

b. an even number

$\frac{3}{6} = \frac{1}{2}$

c. a number > 4

$\frac{2}{6}$

d. a prime number $\frac{3}{6}$

e. an odd number < 3

$\frac{1}{6}$

number greater than 1 whose only factors are 1 and itself!

2, 3, 5

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

P(certain event) = 1

P(impossible event) = 0

Exercises:

2. The probability of rain is $\frac{1}{3}$. What is the probability of *no* rain?

$$1 - \frac{1}{3} = \boxed{\frac{2}{3}}$$

3. A die is rolled. What is the probability of obtaining a number:

a. less than 7? 1

b. greater than 7? 0

D. $P(A \text{ or } B) = \underline{P(A) + P(B)}$

4. The mail contained 2 letters, 3 bills, and 5 ads. Mr. Jacobsen picked up the first piece of mail without looking at it. Express, in fractional form, the probability that this piece of mail is:

⑩

a. a letter $\frac{2}{10} = \boxed{\frac{1}{5}}$

b. a bill $\frac{3}{10}$

c. an ad $\frac{5}{10}$

d. a letter or an ad $\frac{2}{10} + \frac{5}{10} = \boxed{\frac{7}{10}}$

e. a bill or an ad $\frac{3}{10} + \frac{5}{10} = \boxed{\frac{8}{10}}$

f. not a bill $\frac{7}{10}$

g. not an ad $\frac{5}{10}$

h. a bill and an ad $\boxed{0}$

$\frac{7}{10}$

5. An outfit consists of a shirt and a pair of pants. There are 4 different shirts and 3 different pairs of pants.

a. Represent all different outfits by a **TREE DIAGRAM**

S_1P_1, S_1P_2, S_1P_3

b. List the ordered pairs

S_2P_1, S_2P_2, S_2P_3

c. How many outcomes in the sample space?

S_3P_1, S_3P_2

$4 \cdot 3 = 12$

S_3P_3

THE COUNTING PRINCIPLE: If one event can occur in any of "m" ways, and following this, a second activity can occur in any of "n" ways, then both activities can occur in $m \cdot n$

S_4P_1
 S_4P_2
 S_4P_3

Exercises:

6. A lunch menu consists of 3 appetizers, 5 main dishes and 1 dessert. How many different meals that have one appetizer, one main dish and one dessert are possible?

$3 \cdot 5 \cdot 1 = 15$
[different meals]



F. **INDEPENDENT EVENTS** - when the results of one activity in no way influence the result of a second activity

A COMPOUND EVENT consists of two or more independent events .
ex. rolling 2 dice, tossing 3 coins, spinning an arrow 5 times

The counting principle can be used to find the probability that two independent events occur at the same time:

When two events E and F are independent, and when the probability of event E is m ($0 \leq m \leq 1$) and the probability of event F is n ($0 \leq n \leq 1$), then the probability of the compound event in which E and F occur jointly is the product $m \cdot n$

Examples:

AND = multiplication

7. The probability that the Bears will beat the Eagles is $\frac{1}{2}$. The probability that the Bears will beat the Cubs is $\frac{3}{5}$.

$P(\text{lose}) = \frac{1}{2}$

a. What is the probability that the Bears will win both games?

$$\frac{1}{2} \cdot \frac{3}{5} = \frac{3}{10}$$

b. What is the probability that the Bears will lose both games?

$$\frac{1}{2} \cdot \frac{2}{5} = \frac{2}{10} = \frac{1}{5}$$

c. What is the probability that the Bears will beat the Eagles, but lose to the Cubs?

$$\frac{1}{2} \cdot \frac{2}{5} = \frac{1}{5}$$

$$1 - \frac{3}{5} = \frac{2}{5}$$

$$P(\text{lose}) = \frac{2}{5}$$

8. A single die is rolled twice. What is the probability of obtaining a "3" on the first roll and then a "4" on the second roll?

$$\frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$$

$\begin{matrix} \underline{\quad} \\ < 3 & 1, 2 \\ \leq 3 & 1, 2, 3 \end{matrix}$

9. If a coin is tossed and then a die is rolled, what is the probability of getting a head and a number less than 3?

$$\frac{1}{2} \cdot \frac{2}{6} = \frac{2}{12} = \frac{1}{6}$$

$$\frac{1}{6}$$

What is the probability of tossing a coin and getting tails on both outcomes?

$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$

G. PROBABILITY WITH AND WITHOUT REPLACEMENT!

Urn = JAR

In 10-12, there are 3 black marbles, 4 red marbles, 2 white marbles, and one green marbles in an urn. One marble is drawn at random, its color noted, and the marble is returned. A second marble is drawn at random and its color is noted. What is the probability that:

3BL
 4R
 2W
 1G

10. both marbles are red?

$$\frac{4}{10} \cdot \frac{4}{10} = \frac{16}{100}$$

11. the first marble is red and the second marble is green? _____

$$\frac{4}{10} \cdot \frac{1}{10} = \frac{4}{100}$$

12. neither marble is red? _____

$$\frac{6}{10} \cdot \frac{6}{10} = \frac{36}{100}$$

2R, 3G, 4B
P(G and G) no
More review!

~~3~~ ~~2~~
9 8
no
replacement

$$\frac{6}{72}$$

1. On two successive rolls of a die, what is the probability that:

a. both numbers will be even

$$\frac{3}{6} \cdot \frac{3}{6} = \frac{9}{36}$$

b. the first is even and the second is odd

$$\frac{3}{6} \cdot \frac{3}{6} = \frac{9}{36}$$

2. The probability that an event will *not* occur is $\frac{7}{12}$. What is the probability that the event will occur?

$$1 - \frac{7}{12} = \frac{5}{12}$$

3. A die is rolled. What is the probability of rolling an even number ~~or a number less than 5~~?

$$\frac{2}{6}$$

4. There are three ways of going from town A to town B and six way of going from town B to town C. Find the total number of ways in which a person can go from town A to town B to town C.

11 ways

counting principle

$$3 \cdot 6 = 18$$

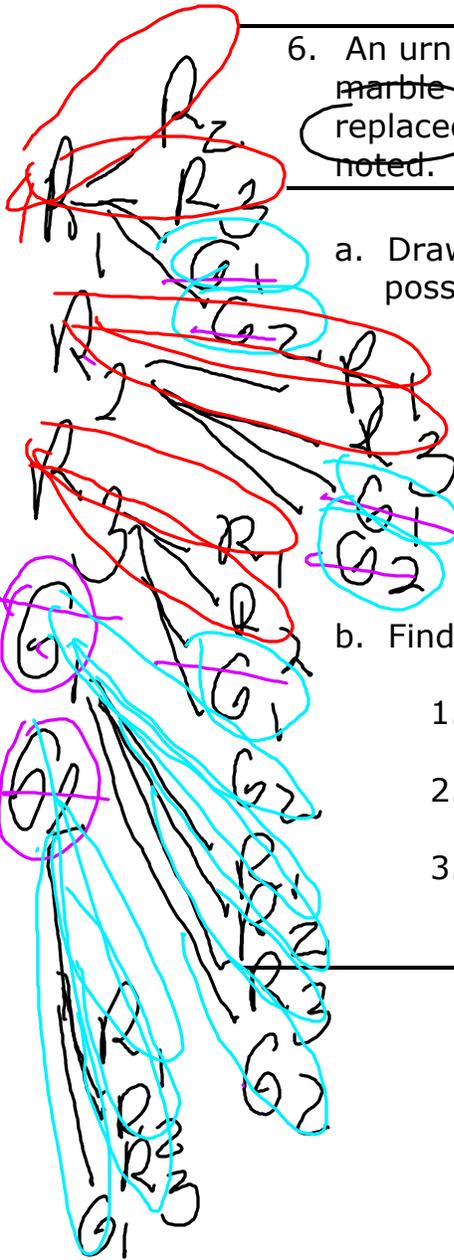
ways

5. If all seven letters of the word "REGENTS" were placed in a hat, what would be the probability of drawing an E on the first draw?

$$\frac{2}{7}$$

6. An urn contains 3 red marbles and two green marbles. One marble is randomly selected, its color noted, and it is not replaced. A second marble is then selected and its color is noted.

a. Draw a tree diagram or list the sample space showing all possible outcomes.



$$5 \cdot 4 = 20$$

b. Find the probability that:

1. both marbles are green

$$\frac{2}{20}$$

G₁ G₂

2. neither marble is green

$$\frac{6}{20}$$

G₂ G₁

3. at least one marble is green

$$\frac{14}{20}$$

1 green
or 2 green