1. In a production of Grease, eight actors are considered for the male roles of Danny, Kenickie, and Marty. In how many ways can the director cast the male roles?

2. On your shelf there are the following movies: 5 m
action/adventure, and 6 come

a) How many ways can you pick one of each to watch
weekend

b) You are going to watch 6 movies over vacation. H
ways can you choose two of each to w

Six students are to be selected for a debate. In the cl
are 9 girls and 8 boys. Find the number of ways of
these six members

a)

b)

Tuesday, May 26, 2020

Outcomes, Probability, and Statistics

Multiplication Counting Principle:
The number of outcomes is the product of the number of choices for each step.

Factorial:
Is mostly used when you are using ALL of a given amount of items and order IS important.

Permutation:
The number of outcomes when order DOES matter.

Combination:
The number of outcomes when order DOESN'T matter.

The lottery game Mega Millions requires you to pick 5 numbers from 1 to 56 then pick the Gold Ball which is a number from 1 to 46.

1. If you buy an Easy Pick ticket then the computer picks these numbers for you. How many different Easy Pick tickets are possible?

ways to pick 5 of 56 numbers AND # ways to pick 1 of 46 numbers

$$({}_{56}C_5) \bullet ({}_{46}C_1) = 175,711,536$$

2. What is the probability that you get a winning ticket? $\dfrac{1}{175,711,536}$

A class has 24 students and the teacher wants them to work in groups. Due to the number of students, groups of 3 or 4 make sense.

How many ways can you make groups of 3 or 4 with this class?

ways for groups of 3 OR # ways for groups of 4

$${}_{24}C_3 + {}_{24}C_4$$
$$2024 + 10,626 = 12,650$$

When finding the number of outcomes:

AND usually means to multiply the results

OR usually means to add the results

Probability:

the chance that a certain outcome will occur

Probability can be given as a:

- fraction
- decimal
- percent

2 kinds of probability

- Experimental Probability
  Using the results of an "experiment" to predict future outcomes.
- Theoretical Probability
  Using knowledge of a situation to predict future outcomes.

Experimental Probability

$$= \frac{\text{\# times an event occurs}}{\text{Total \# of trials}}$$

Theoretical Probability

$$= \frac{\text{\# of favorable outcomes}}{\text{Total possible outcomes}}$$

Total # possible outcomes is often referred to as the

Sample Space

The numbers from 1 to 20 are in a bag. You reach into the bag and randomly pull out a single number. Find each probability as a fraction without reducing.

Theoretical Probability

Sample Space = 20

1. P(muliple of 4)

Multiples of 4 from 1 to 20 are: 4, 8, 12, 16, 20

Favorable Outcomes = 5

P(mult of 4) = $\frac{5}{20}$

2. P(factor of 18)

Factors of 18 from 1 to 20 are: 1, 2, 3, 6, 9, 18

Favorable Outcomes = 6

P(factor of 18) = $\frac{6}{20}$

When using the words OR and AND in probability they aren't the same as when you use them to calculate the number of outcomes.

In Probability:

AND: a favorable outcome using AND means the outcome must meet ALL conditions.

OR: a favorable outcome using OR means the outcome must meet at least one of the conditions (one or more).

3. P(even and multiple of 3)

A favorable outcome must be BOTH even and a multiple of 3, which are the following: 6, 12, 18

favorable outcomes = 3

P(even & multiple of 3) = $\frac{3}{20}$

4. P(odd or multiple of 5)

A favorable outcome could be just an odd, just a multiple of 5, or it could be both.

Odds: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19

Multiples of 5: 5, 10, 15, 20

Since 5 & 15 appear in both lists you have to be sure not to count them twice!

favorable outcomes = 12

P(odd or multiple of 5) = $\frac{12}{20}$

You will spin this spinner once. Find each probability as a fraction without reducing.

Theoretical Probability

Sample Space = 8

1. P(Red or Blue)

A favorable outcome would be a space that is either Red, or it's Blue, or it's both red and blue.

Red spaces = 2

Blue spaces = 4

spaces that are both = 0

We don't have to worry about counting anything twice so the # of Favorable outcomes = 2 + 4 = 6

P(Red or Blue) = $\frac{6}{8}$

2. P(Blue and multiple of 4)

A favorable outcome is a space that is **BOTH** blue and a Multiple of 4.

Spaces that fit that description are: the Blue 4 and Blue 8, therefore,

favorable outcomes = 2

P(Blue & multiple of 4) = $\boxed{\frac{2}{8}}$

Prime Number:

A number that has only two distinct factors (different factors), 1 and itself.

The first Prime Number is 2.

No even # after 2 is Prime.

You roll a die (some books calls this a number cube).

Find each probability as a fraction without reducing.

Theoretical Probability   Sample Space = 6

1. P(Prime and odd)

A favorable outcome is a # that is **BOTH** Prime and ODD

The #'s on a die that fit this description are 3, 5.

favorable outcomes = 2

P(Prime & odd) = $\boxed{\frac{2}{6}}$

2. P(Factor of 8)

A favorable outcome would be a factor of 8 which are 1, 2, 4, and 8.

The #'s on a die that are factors of 8 are: 1, 2, 4

The # of favorable outcomes = 3

P(Factor of 8) = $\boxed{\frac{3}{6}}$

3. P(less than 3 and multiple of 4)

A favorable outcome would be a # that is BOTH less than 3 and a multiple of 4.

The #'s on a die that are less than 3 are: 1, 2
The multiples of 4 on a die are: 4

The # of favorable outcomes that are BOTH = none

P(less than 3 and mult of 4) = $\boxed{\frac{0}{6}}$

You can now do the first few problems from Practice #29.

We'll continue this material tomorrow.

Due date for Practice #29 is still to be determined.