Financial Lit Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 WS Assessment

 Target 22:

Counting rule

**I can:**

* Understand the definition of simple random sample.
* Calculate ordered arrangements using factorials.
* Calculate combinations and permutations.
* Calculate probabilities with factorials.

**Unit 10 Math Topics:**

* Probabilities using multiplicative rule
* Combination rule
* Permutation rule

**Basic Counting Rule**

****Suppose at a particular restaurant you have three choices for an appetizer (soup, salad or breadsticks) and five choices for a main course (hamburger, sandwich, quiche, fajita or pizza). If you are allowed to choose exactly one item from each category for your meal, how many different meal options do you have?

****Another ways is use tree diagram



There are 21 novels and 18 volumes of poetry on a reading list for a college English course. How many different ways can a student select one novel and one volume of poetry to read during the quarter?

Suppose at a particular restaurant you have three choices for an appetizer (soup, salad or breadsticks), five choices for a main course (hamburger, sandwich, quiche, fajita or pasta) and two choices for dessert (pie or ice cream). If you are allowed to choose exactly one item from each category for your meal, how many different meal options do you have?

A quiz consists of 3 true-or-false questions. In how many ways can a student answer the quiz?

In how many different ways can you seat 8 people at a dinner table?

**Factorial Notation n! =**

How many different ways can the letters of the word MATH be rearranged to form a four-letter code word?

How many ways can five different door prizes be distributed among five people?

**Permutation**

A charity benefit is attended by 25 people and three gift certificates are given away as door prizes: one gift certificate is in the amount of $100, the second is worth $25 and the third is worth $10. Assuming that no person receives more than one prize, how many different ways can the three gift certificates be awarded?

Eight sprinters have made it to the Olympic finals in the 100-meter race. In how many different ways can the gold, silver and bronze medals be awarded?



Redo the above problem using Permutations

I have nine paintings and have room to display only four of them at a time on my wall. How many different ways could I do this?

How many ways can a four-person executive committee (president, vice-president, secretary, treasurer) be selected from a 35-member board of directors of a non-profit organization?

**Combinations**

In the previous section we considered the situation where we chose r items out of n possibilities without replacement and where the order of selection was important. We now consider a similar situation in which the order of selection is not important.

****

A group of four students is to be chosen from a 35-member class to represent the class on the student council. How many ways can this be done?

The United States Senate Appropriations Committee consists of 29 members, 15 Republicans and 14 Democrats. The Defense Subcommittee consists of 19 members, 10 Republicans and 9 Democrats. How many different ways can the members of the Defense Subcommittee be chosen from among the 29 Senators on the Appropriations Committee?

In a certain state's lottery, 48 balls numbered 1 through 48 are placed in a machine and six of them are drawn at random. If the six numbers drawn match the numbers that a player had chosen, the player wins $1,000,000. In this lottery, the order the numbers are drawn in doesn’t matter. Compute the probability that you win the million-dollar prize if you purchase a single lottery ticket.

In the state lottery from the previous example, if five of the six numbers drawn match the numbers that a player has chosen, the player wins a second prize of $1,000. Compute the probability that you win the second prize if you purchase a single lottery ticket.

Compute the probability of randomly drawing five cards from a deck and getting exactly one Ace.

Compute the probability of randomly drawing five cards from a deck and getting exactly two Aces.

Let's take a pause to consider a famous problem in probability theory:

Suppose you have a room full of 30 people. What is the probability that there is at least one shared birthday?

Let's start with a simpler problem first

Suppose three people are in a room. What is the probability that there is at least one shared birthday among these three people?

There are a lot of ways there could be at least one shared birthday. Fortunately there is an easier way. We ask ourselves “What is the alternative to having at least one shared birthday?” In this case, the alternative is that there are no shared birthdays. In other words, the alternative to “at least one” is having none. In other words, since this is a complementary event,

P(at least one) = 1 – P(none)

We will start, then, by computing the probability that there is no shared birthday. P(none)

P(none) = $\frac{}{365} \frac{}{365} \frac{}{365}$ =

P(shared birthday) = 1 – P(no shared birthday) =

Formula: 1 – 365P3/365 =

Suppose five people are in a room. What is the probability that there is at least one shared birthday among these five people?

Suppose you have a room full of 30 people. What is the probability that there is at least one shared birthday?

A math class consists of 25 students, 14 female and 11 male. Two students are selected at random to participate in a probability experiment. Compute the probability that

1. a male is selected, then a female.

2. a female is selected, then a male.

3. two males are selected.

4. two females are selected.

5. no males are selected.

**Assessment Target 22**

**I can…** use factorial to do permutation and combination counting

Show work

Suppose at a particular restaurant you have eight choices for an appetizer, eleven choices for a main course and five choices for dessert. If you are allowed to choose exactly one item from each category for your meal, how many different meal options do you have?

How many 5 character passwords can be made using the letters A through Z

a. if repeats are allowed b. if no repeats are allowed

The United States Senate Appropriations Committee consists of 29 members; the Defense Subcommittee of the Appropriations Committee consists of 19 members. Disregarding party affiliation or any special seats on the Subcommittee, how many different 19-member subcommittees may be chosen from among the 29 Senators on the Appropriations Committee?

A multiple-choice question on an economics quiz contains 10 questions with five possible answers each. Compute the probability of randomly guessing the answers and getting 9 questions correct.

Compute the probability of randomly drawing five cards from a deck of cards and getting three Aces and two Kings.

Suppose 10 people are in a room. What is the probability that there is at least one shared birthday among these 10 people?