NPS Learning in Place

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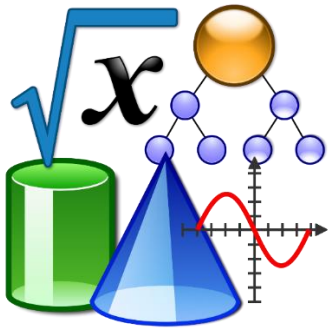


Name _____ School _____ Teacher _____

Week 1 **April 27-May 01**	**Permutations** **Week 1: Day 1- 5**
Week 2 **May 04 - 08**	**Combination and Permutations** **Week 2: Day 1-5**
Week 3 **May 11 – 15**	**Sampling and Bias** **Week 3: Day 1-5**

Week 1 Day 1

Permutation Vs Combination Notes

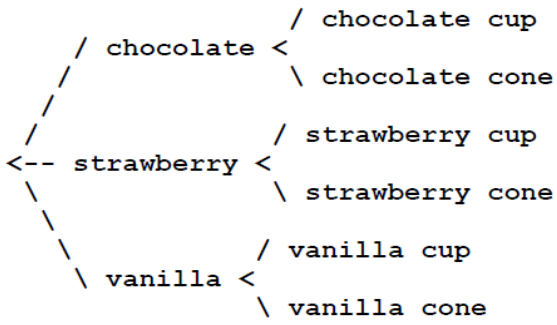
Notes

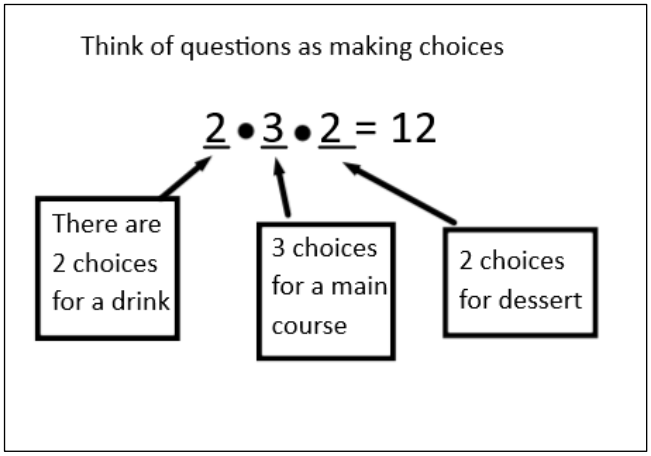
Fundamental Counting Principle Review:

The Basic or Fundamental Counting Principle can be used to find the number of possibilities when given several groups.

How to calculate: Multiply the number of elements in each group together.

Example: Ice cream comes in either a cup or a cone and the flavors available are chocolate, strawberry, and vanilla





Combinations and permutations determine the number of ways to choose a certain number of items from a given group of items.

Example:

"My fruit salad is a combination of apples, grapes and bananas"

- This is a **combination** because the order of the fruit when making the salad does not matter.

- **COMBINATION →Order does NOT matter**

Example:

"The combination to the safe box was 472"

- This is an example of **PERMUTATION** because the only way the safe will open is if "4" goes first, then "7" and then "2". Any other order will not open the safe.

- **PERMUTATION →Oder MATTERS: Think "p" for position**

YOU TRY: Identify each example as Permutations, Combinations, or Fundamental Counting Principle.

1. 3 people are picked from a group of 10.

2. Determine the number of ways 6 people finish in a race if there are no ties and everyone finishes the race.

3. Choosing 3 ice cream topping from 5 in the ice cream shop.

4. Determine the number of unique license plates made from 4 digits and 3 letters.

5. Three players from the chess club of 10 members are chosen to go to the tournament.

6. A team of 8 basketball players needs to choose a captain and co-captain.

7. Rob and Mary are planning trips to nine countries this year. There are 13 countries they would like to visit. They are deciding which countries to skip.

8. The batting order for seven players on a 12 person team.

9. In a race in which six automobiles are entered and there are not ties, in how many ways can the first four finishers come in?

10. The model of the car you are thinking of buying is available in nine different colors and three different styles (hatchback, sedan, or station wagon). In how many ways can you order the car?

11. A book club offers a choice of 8 books from a list of 40. In how many ways can a member make a collection?

12. A medical researcher needs 6 people to test the effectiveness of an experimental drug. If 13 people have volunteered for the test, in how many ways can 6 people be selected?

13. From a club of 20 people, in how many ways can a group of three members be selected?

14. From the 30 pictures I have of my daughter's first birthday, my digital picture frame will only hold 3 at a time.
a. How many different groups of 3 pictures can I put on the frame?
b. What if I just wanted to fill the first three places with my favorite, best smile and best smashing of the cake?

15. A popular brand of pen is available in three colors (red, green or blue) and four tips (bold, medium, fine or micro). How many different choices of pens do you have with this brand?

16. A corporation has ten members on its board of directors. In how many ways can it elect a president, vice-president, secretary and treasurer?

17. How many different ways can a director select 4 actors from a group of 20 actors to attend a workshop on performing in rock musicals?

18. What if the director in #17 wanted to fill positions of lead, supporting actor, extra 1 and extra 2

Week 1 Day 2
Listing Possible Permutations

Notes

Listing All Possible Permutations

Example: ABC
Step 1: Start with the first letter and change the order of the other 2 letters

ABC ACB

Step 2: Start with the second letter, then change the order of the other 2 letters

BAC BCA

Step 3: Start with the last letter, then change the order of the other 2 letters.

CAB CBA

Answer:

ABC	**ACB**
BAC	**BCA**
CAB	**CBA**

You Try: List all possible permutations of the shapes below

List All Possible Permutation
Example: ABC, taking 2 at a time

Step 1: Start with the first letter and then select one other letter

AB AC

Step 2: Start with the second letter and then select one other letter

BA BC

Step 3: Start with the third letter and then select one other letter

CA CB

You Try: List all possible permutations

Example:  **taking 2 at a time**

Week 1 Day 2
Listing possible Permutations

List all possible permutations	
1. PAT	**2. 1, 2, 3**
3 T, V, W, taken two at a time	**4. A, E, I, O , U- taken two at a time**
5. Cat (C), Dog (D), Rabbit (R), Fish (F)- taken three a time	**6. Red (R), Blue (B), Yellow (Y), Orange (O), Green (G), Pink (P)- taken three a time**
7. 	**8.**  **Taken two at a time**
9. Create and solve your own example.	

Week 1 Day 3
Factorial Notation

Notes

The **factorial function** (symbol: **!**) just means to multiply a series of descending natural numbers. Examples:

- $4! = 4 \times 3 \times 2 \times 1 = 24$
- $7! = 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 5{,}040$
- $1! = 1$

NOTE: It is generally agreed that 0! = 1.

If you don't have a calculator, you can leave your answer as the product of the integers. Complete 4! and 5!

$1! = 1$

$2! = 2 \bullet 1$

$3! = 3 \bullet 2 \bullet 1$

$4! =$

$5!$

If you have a calculator, write the expression as the product of the integers and multiply the numbers. Complete 4! and 5!

$1! = 1$

$2! = 2 \bullet 1 = 2$

$3! = \_\_\_ \bullet \_\_\_ \bullet \_\_\_ =$

$4! = \_\_\_ \bullet \_\_\_ \bullet \_\_\_ \bullet \_\_\_\_ =$

$5! = \_\_\_ \bullet \_\_\_ \bullet \_\_\_ \bullet \_\_\_\_ \bullet \_\_\_ =$

You Try!

10!

8!

6!

Week 1 Day 3
Permutation Formula

Notes

Permutation Formula
(Number of ways to choose where the ORDER MATTERS)

P: Permutation

n: total number of objects in the set

r: the number of choosing objects from the set.

Permutation Formula

$$\frac{n!}{(n-r)!}$$

Notation:

${}_nP_r$

*** Repetition not allowed****

Example 1:
n: total number = 7
r: how many are being chosen? 2

${}_7P_2$

$$\frac{n!}{(n-r)!} = \frac{7!}{(7-2)!} = \frac{7!}{5!} = \frac{7 \bullet 6 \bullet 5!}{5!} = 42$$

Example 2:

n: total number of members = 10
r: how many are being chosen? 3

${}_{10}P_3$

$$\frac{n!}{(n-r)!} = \frac{10!}{(10-3)!} = \frac{10!}{7!} = \frac{10 \bullet 9 \bullet 8 \bullet 7!}{7!} = 720$$

Example 3: (If you don't have a calculator, list the product of the integers in the numerator and denominator)

n: total number = 4
r: how many are being chosen? 4

${}_4P_4$

$$\frac{n!}{(n-r)!} = \frac{4!}{(4-4)!} = \frac{4!}{0!} = \frac{4 \bullet 3 \bullet 2 \bullet 1}{1} = 24$$

****** Remember 0! = 1**

Week 1 Day 3

Permuation Formula Practice

Directions: Evaluate each expression. (If you don't have a calculator, list the product of the integers in the numerator and denominator)	
1. ${}_6P_3$	**2.** ${}_4P_2$
3. ${}_5P_1$	**4.** ${}_6P_2$
5. ${}_6P_6$	**6.** ${}_7P_3$
7. ${}_{10}P_2$	**8.** ${}_8P_7$
9. ${}_3P_2$	**10.** ${}_7P_5$

Week 1 Day 4
Permutation Word Problems

Notes

Permutation
(Number of ways to choose where the ORDER MATTERS)

P: Permutation

n: total number of objects in the set

r: the number of choosing objects from the set.

Permutation Formula

$$\frac{n!}{(n-r)!}$$

Notation:

${}_nP_r$

*** No repetition****

Example 1:
How many different ways can a chairperson and an assistant chairperson be selected for a research project if there are seven scientists available?

n: total number of scientist = 7
r: how many are being chosen? 2

${}_7P_2$

$$\frac{n!}{(n-r)!} = \frac{7!}{(7-2)!} = \frac{7!}{5!} = \frac{7 \bullet 6 \bullet 5!}{5!} = 42$$

Example 2:
Mr. Vander has five desks in the front row of this classroom and 5 students in the class. How many different ways can he seat students in that first row so that every seat is filled?

n: total number of members = 5
r: how many are being chosen? 5

${}_5P_5$

$$\frac{n!}{(n-r)!} = \frac{5!}{(5-5)!} = \frac{5!}{0!} = \frac{5 \bullet 4 \bullet 3 \bullet 2 \bullet 1}{1} = 120$$

You Try! Example 3: (If you don't have a calculator, list the product of the integers in the numerator and denominator)

A license plate begins with three letters. If the possible letters are A, B, C, D and E, how many different permutations of these letters can be made if no letter is used more than once?

Week 1 Day 4

Permutation Word Problem Practice

Remember: (If you don't have a calculator, just set up the problem)

1. A zip code contains 5 digits. How many different zip codes can be made with the digits 0–9 if no digit is used more than once and the first digit is not 0?

2. *For the Demo concert, 6 items are proposed. Only 4 items will put up at the concert. How many permutations of 4 concert items are there?*

3. Find the number of 5-letter permutations that can be formed from the letters in the word SINGAPORE

4. A club has four officials: president, vice-president, secretary, and treasurer. If a member cannot hold more than one office, in how many ways can the officials be elected if the club has?

a. 12 members *b. 16 members*

5. Alan, Cassie, Maggie, Seth and Roger want to take a photo in which three of the five friends are lined up in a row. How many different photos are possible?

6. You have been asked to judge an art contest with 15 entries. In how many ways can you assign 1st, 2nd and 3rd place?

7. How many three letter words (including nonsense words) can you make from the 26 letters of the English alphabet, if letters cannot be repeated?

Week 1 Day 5

Permutations Practice

Remember: (If you don't have a calculator, just set up the problem)		
1. Compute: ${}_5P_3$	2. Compute: ${}_6P_4$	3. Compute: ${}_{10}P_6$
4. Find the number of ways 4 members from a family of 5 can line up for a photo shoot.		
5. In how many ways can letters of the set {R, S, T, U} be arranged to form codes of 2 letters? (No letters are repeated)		
5. A license plate in Virginia begins with 3 letters. All three of them must be A, B, C, D, or E. How any different permutation of these letters can be made if not letter is used more than once?		
6. In how many ways can a president, vice president, a treasurer and a secretary be chosen from among 7 candidates?		
7. A teacher wants to write an ordered 6- question test from a bank of 10 questions. How many different forms of the test can the teacher write?		
8. Twelve skiers are competing in the final round of the Olympic freestyle skiing aerial completion. In how many different ways can 3 of the skiers finish first, second, and third to win the gold, silver, and bronze medals?		
9. Suppose we are going to use the symbols {a, b, c, d, e, f, g, h} to form a 5-character "password" having no repeated characters. How many different passwords are possible?		

Week 2 Day 1

Listing all Possible Combinations

Notes

Listing All Possible Combinations
****Because Order does not matter, any repeat of the same numbers can be removed**

Example: ABC taken two at a time
Step 1: Start with the first letter and change the order of the other 2 letters

AB AC

Step 2: Start with the second letter, then change the order of the other 2 letters

BA BC

Step 3: Start with the last letter, then change the order of the other 2 letters.

CA CB

Step 5: Remove any repeat of arrangements that contain the same letters

AB	**AC**
BA	**BC**
CA	**CB**

Answer:

AB	AC	BC

You Try: List all possible Combinations of the shapes below taken 2 at a time

List All Possible Combinations takes 3 a time
Example: A, B, C, D

You Try: List all possible Combinations taken 3 a time

Week 2 Day 1
Listing possible Combinations

List all possible permutations	
1. PAT taken 2 at time	**2. 1, 2, 3 taken 2 a time**
3 T, V, W, X taken two at a time	**4. A, E, I, O , U- taken two at a time**
5. Cat (C), Dog (D), Rabbit (R), Fish (F)- taken three a time	**6. Red (R), Blue (B), Yellow (Y), Orange (O), Green (G), Pink (P)- taken three a time**
7.  **Taken 2 at time**	**8.**  **Taken two at a time**
9. Create and solve your own example.	

Week 2 Day 2
Combinations

Notes

Combination: A grouping of outcomes in which the ORDER DOES NOT MATTER

C: Combination

n: total number of objects in the set

r: the number of choosing objects from the set.

Formula

$$_nC_r = \frac{n!}{r!(n-r)!}$$

Notation:

$_nC_r$

*** Repetition not allowed****

Example 1:
n: total number = 6
r: how many are being chosen? 2

$_6C_2$

$$\frac{6!}{2!(6-2)!} = \frac{6!}{2!(4)!} = \frac{6 \bullet 5 \bullet 4 \bullet 3 \bullet 2 \bullet 1}{(2 \bullet 1)(4 \bullet 3 \bullet 2 \bullet 1)} = \frac{30}{2} = 15$$

OR

$$\frac{6!}{2!(6-2)!} = \frac{6!}{2!(4)!} = \frac{6 \bullet 5 \bullet 4!}{(2 \bullet 1)\,4!} = \frac{30}{2} = 15$$

Example 2:
n: total number = 10
r: = how many are chosen at a time? 6

$_{10}C_6$

$$\frac{10!}{6!(10-6)!} = \frac{10!}{6!(4)!} = \frac{10 \bullet 9 \bullet 8 \bullet 7 \bullet 6 \bullet 5 \bullet 4!}{(6 \bullet 5 \bullet 4 \bullet 3 \bullet 2 \bullet 1)4!} =$$

$$\frac{10 \bullet 9 \bullet 8 \bullet 7}{4 \bullet 3 \bullet 2 \bullet 1} = \frac{5040}{24} = 210$$

You Try!
n: total number = 4
r: how many are being chosen? 4

$_4C_4$

$$\frac{4!}{4!(0)!} = \frac{4!}{4!1} = \frac{4 \bullet 3 \bullet 2 \bullet 1}{(4 \bullet 3 \bullet 2 \bullet 1)1} = \frac{24}{24} = 1$$

****** Remember 0! = 1**

You Try!
n: total number 7
r: how many are being chosen? 3

Week 2 Day 2

Combination Formula Practice

Directions: Evaluate each expression. (If you don't have a calculator, list the product of the integers in the numerator and denominator)	
1. $_4C_2$	**2.** $_7C_0$
3. $_4C_3$	**4.** $_{15}C_2$
5. $_{22}C_{20}$	**6.** $_{11}C_8$
7. $_{12}C_8$	**8.** $_{25}C_{23}$
9. $_{24}C_5$	**10.** $_{17}C_{10}$

Week 2 Day 3
Combinations word problems

Notes

Combination
(Number of ways to choose where the ORDER DOES NOT MATTER)

C: Permutation

n: total number of objects in the set

r: the number of choosing objects from the set.

Combination Formula

$$\frac{n!}{r!\,(n-r)!}$$

Notation:

${}_nC_r$

*** Repetition not allowed****

Example 1:

In how many ways can a coach choose three swimmers from among five swimmers?

n: total number of scientist = 5
r: how many are being chosen? 3

${}_5C_3$

$$\frac{5!}{3!(5-3)!} = \frac{5!}{3!(2)!} = \frac{5 \bullet 4 \bullet 3 \bullet 2 \bullet 1}{(3 \bullet 2 \bullet 1)(2 \bullet 1)} = \frac{5 \bullet 4}{2 \bullet 1} = \frac{20}{2} = 10$$

Example 2:

Six friends want to play enough games of chess to be sure everyone plays everyone else. How many games will they have to play? (Hint: Only two people can play at a time)

n: total number of members = 6
r: how many are being chosen? 2

${}_6C_2$

$$\frac{6!}{2!(6-2)!} = \frac{6!}{2!(4)!} = \frac{6 \bullet 5 \bullet 4 \bullet 3 \bullet 2 \bullet 1}{(2 \bullet 1)(4 \bullet 3 \bullet 2 \bullet 1)} = \frac{6 \bullet 5}{2 \bullet 1} = \frac{30}{2} = 15$$

You Try! Example 3: (If you don't have a calculator, list the product of the integers in the numerator and denominator)

A student need 8 more classes to complete her degree. If she met the prerequisites for all the courses, how many ways can she take 4 classes next semester?

Week 2 Day 3
Combinations word problems

1. How many combinations can the seven colors of the rainbow be arranged into groups of three colors each?

2. 10 people exchange greetings at a business meeting. How many greetings are exchanged if everyone greets each other once? (Hint: two people greet each other at a time)

3. How many different 12-member juries be chosen from a pool of 32 people?

4. A test consists of 20 questions, but you are told to only answer 15. In how many different ways can you choose the 15 questions?

5. How many ways can nine starting players be chosen from a softball team of 15?

6. Four seniors will speak at graduation. If 30 students audition to speak how many different groups of 4 speakers can be selected?

7. The local bowling team plays in a 7-team league where each team plays other teams 4 times in a season. Using the combination formula, how many different games will be played in a season?

8. Alice places five apples, three oranges and ten peaches in a fruit basket. Her son, Brian selects three fruits from the basket. How many different ways can Brian select the fruits?

Week 2 Day 4
Combination Practice

Direction: List all possible Combinations	
1. L, M, N, taken two at a time	**2. A, B, C, D taken two at a time**
3.  **taken two at a time**	**4. 5, 6, 7, 8, taken four at a time**
Directions: Evaluate each expression. (If you don't have a calculator, list the product of the integers in the numerator and denominator)	
5. ${}_9C_4$	6. ${}_5C_5$
7. ${}_9C_0$	8. ${}_{12}C_8$
Directions: Solve each problem. . (If you don't have a calculator, list the product of the integers in the numerator and denominator)	
9. Supposed you need to answer any four of seven essay questions on a history test and you can answer them in any order. How many different question combinations are possible?	
10. In how many ways can you select a committee of 3 students out of 10 students?	
11. At the ice-cream shop 5 different ice-creams are sold. A father would like to buy 15 caps of ice-cream for his family. In how many ways can he buy the ice-cream?	
12. Lisa has 12 different ornaments and she wants to give 5 ornaments to her mom as a birthday gift (the order of the gifts does not matter). How many ways can she do this?	

Week 2 Day 5
Permutation and Combination Practice

When working with **permutations** and **combinations**, it is vital that you are able to distinguish when the counting order is important, or not.

This in only recognizable after a considerable amount pf practice

Consider this example:

The Mrs. Brown's Seminar class had to choose 4 out of 7 people who were nominated to serve on Student Council. How many different groups of students could be selected?

The **order** in which the people are being selected **does not matter** because the positions for which they are being selected are the same. They are all going to be members of the Student Council, with the same duties. **(COMBINATION)**

However, if Mrs. Brown's class was choosing 4 out of 7 students to be president, vice-president, secretary, and treasurer of the Student Council, then the **order in which they are selected would matter**. **(PERMUTATION)**

State if each scenario involves a permutation or combination, then find the number of possibilities. (If you don't have a calculator, list the product of the integers in the numerator and denominator)	
1. It's election time at a high school that has a total of 50 students in the junior class. How many ways can a class president, class vice president, class treasurer, and class secretary be chosen if each student may only hold one office?	2. The same class of 50 students wants to form a prom committee. How many ways can a four person prom committee be selected from the junior class?
3. If we want to form a group of five students and we have 20 to choose from, how many ways is this possible?	4. How many ways can we arrange four letters from the word "computer" if repetitions are not allowed, and different orders of the same letters count as different arrangements?
5. How many ways can we arrange four letters from the word "computer" if repetitions are not allowed, and different orders of the same letters count as the same arrangement?	**6.** How many different four digit numbers are possible if we can choose any digits from 0 to 9 and all of the digits must be different?
7. If we are given a box containing seven books, how many ways can we arrange three of them on a shelf?	8. If we are given a box containing seven books, how many ways can we choose collections of three of them from the box?
9**. Journal/writing Prompt** What is the difference between permutation and combination	
10**. Journal/writing Prompt:** Should a combination lock be called a "combination" lock or a "permutation" lock? Explain	

Week 3 – Day 1

Intro to Samples and Bias

Notes

Samples

You may have heard of a census, like the 2020 Census. It is the result of measuring or counting every individual. However, a census and a sample are not the same.

Census versus a Sample

- Census
  - every member of a population is measured
  - expensive to do (and time consuming)
- Sample
  - subset of the population is measured (telephone polls usually sample about 1000 people)
  - inferences about the entire population are made from the measurements gathered in the sample

Example: Suppose we want to find out how many college students volunteered over Spring Break. Would sample size of 1, 25, and 2 million be best?

Let's think about it:
A sample size of 1 would be very small. That won't work.
A sample size of 25 would be easy to collect, and better than a sample size of 1.
A sample size of 2 million, would get us closer to the median, but might be difficult to collect.

Therefore, a sample size of 25 would be the best option.

Bias and Sampling Methods

Have you ever heard of the word bias? What context did your hear it? What does it mean?

Bias can affect the results of a survey.

- Nonrespondents – people are left out OR Self-selection – gets only the extremes on an issue
- Undercoverage results from an incomplete frame on the surveyor's part
- Nonresponse can be from either the surveyor or the person's unwillingness to answer
- Response bias (lies) can result from either the respondent or the influence of the interviewer

Summary:

Poor sampling methods can produce misleading conclusions

- Voluntary Response Sampling -- people choose themselves by responding to a general appeal (self – selection)
- Convenience Sampling -- choosing individuals who are easiest to reach

Example: A survey of high school students to measure how many 13-18 year olds work outside of school is biased because it leaves out parts of the high school population, such as home school students.

You try: On another sheet of paper, in the following example problems

a) Determine is the survey design is flawed
b) If flawed, is it due to the sampling method or the survey itself
b) For flawed surveys, identify the cause of the error
d) Suggest a remedy to the problem

1: MSHS wants to conduct a study regarding the achievement of its students. The principal selects the first 50 students who enter the building on a given day and administers the survey.

2: The Marion town council wishes to conduct a study regarding the income level of households in Marion. The town manager selects 10 homes in one neighborhood and sends an interviewer to the homes to determine household incomes.

3: The owner of radio station wants to know what their listeners think of the new format. He has the announcers invite the listeners to call in and voice their opinion.

4: Cold Stone Creamery is considering opening a new store in Marion. Before opening the store, the company would like to know the percentage of households in Marion that regularly visit an ice cream shop. The market researcher obtains a list of households in Marion and randomly selects 150 of them. He mails a questionnaire to households and ask about their ice cream eating habits and flavor preferences. Of the 150 questionnaires mailed, 14 are returned.

5: The owner of shopping mail wishes to expand the number of shops available in the food court. She have a market researcher survey mall customers during weekday mornings to determine what types of food the shoppers would like to see added to the food court.

Week 3 - Day 2
Sampling

Sampling Techniques:

Simple Random Sample (SRS)	**Stratified Sampling**	**Cluster Sampling**
A method that uses a subset of a statistical population in which each member of the subset has an equal probability of being chosen. This avoids bias.	A method of sampling that involves the division of a population into smaller sub-groups known as strata.	A method that divides the population into clusters and then takes a simple random sample from each cluster.

Examples of Each Technique

SRS procedure:	**Stratified Sampling**	**Cluster Sampling**
Names of 25 employees being chosen out of a hat from a company of 250 employees	A researcher would like to know the number of college students in 2019 who received a job offer within three months of graduation. He might decide to take a SRS of some of graduates and run a survey. Or, he could divide the population into strata and take a random sample from the strata.	A chain store owner wants to find out the quality of customer service at a chain of grocery stores. He could select a random subset of stores, then select a random sample at each store to survey. This is less precise but costs less than the other techniques.

You Try! On another sheet of paper –

1) Create a graphic organizer with the key points and procedures for each type of sampling discussed. Insert examples of each one.

2) Using SRS: In a population of 20 students, how many different samples of size 5 are possible? (Hint**:** $_{20}C_5 = ?$)

Week 3 – Day 3

Simple Random Samples

Working with Simple Random Samples (SRS)

Notes

Random numbers are a primary tool in selecting random samples. This ensures every individual in the population has an equal chance of being selected.

Simple random sampling (SRS)

- All possible samples of a given size must be equally likely
- Most important sampling technique and many of the inference techniques have it as a requirement

Consider this example:

A sample of size 100 is to be selected from each of the following populations. Give a reason to justify if a Simple Random Sample could be taken.

a. All the dolphins in the Atlantic Ocean.
Answer: No! Why?

b. All the students enrolled in AFDA in your school.
Answer: Yes! Why?

You try! On another sheet of paper, answer each question using the table of class scores below.

Sampling Example: The table below shows the current grades for all 20 students in Mr. Horton's economics class.

ID	Name	Grade		ID	Name	Grade
1	Adams	78		11	Lee	67
2	Baker	84		12	Maloney	91
3	Cooper	82		13	Nelson	69
4	Davenport	95		14	O'Brien	74
5	Elacqua	71		15	Park	81
6	Flanagan	83		16	Reeves	79
7	Grant	97		17	Snider	62
8	Haught	65		18	Thoreson	88
9	Jacobs	80		19	Vilece	93
10	Kim	78		20	Whiting	63

a) Compute the mean and median for the class

b) What do these values represent?

c) Use your calculator to generate 10 random numbers.

d) Use the first 3 distinct (non-repeating) as an SRS of Mr Horton's class and calculate the mean and median

e) Repeat steps b and c with a sample size of 5

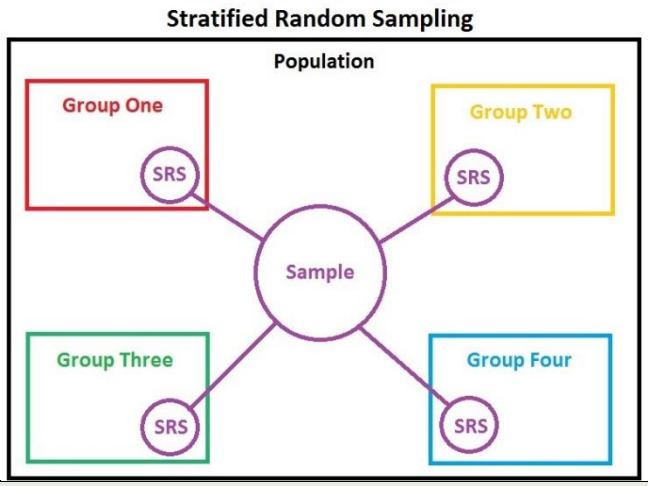
f) What is the probability of selecting your particular sample of size 5 from the class?

g) What do we notice as sample size increases?

Week 3 – Days 4

Stratified Sampling

Notes



With **stratified sampling**, the researcher divides the population into separate groups, called strata. Then, a probability **sample** (often a simple random **sample**) is drawn from each group.

It ensures that subgroups (strata) of a given population are each adequately represented within the whole **sample** population of a research study.

For **example**, one might divide a **sample** of adults into subgroups by age, like 18–29, 30–39, 40–49, 50–59, and 60 and above.

YOU TRY!

1) **Which of the following is an example of stratified random sampling when obtaining a sample of 100 high school students?**

   a. Choosing 100 students sitting in one random section of the cafeteria at a high school
   b. Choosing 100 students at random from an AP Statistics class at a high school
   c. Choosing 100 students at random from a specific grade level at a high school
   d. Choosing 100 students at random from a high school
   e. Choosing 25 students at random from each of four different grade levels at a high school

Answer and justification:

2) **Describe how a university can conduct a survey regarding its campus safety. The registrar of the university has determined that the community of the university consists of 6,204 students in residence, 13,304 nonresident students, and 2,401 staff. The president has funds for only 1000 surveys to be given and then analyzed. How should she conduct the survey?**

Step 1: Find the total school population

Step 2: Find the part of each group to the whole. This ratio must be used in the 1000 total sample.

Answer:
Number of students in residence :
Number of nonresident students:
Number of staff:

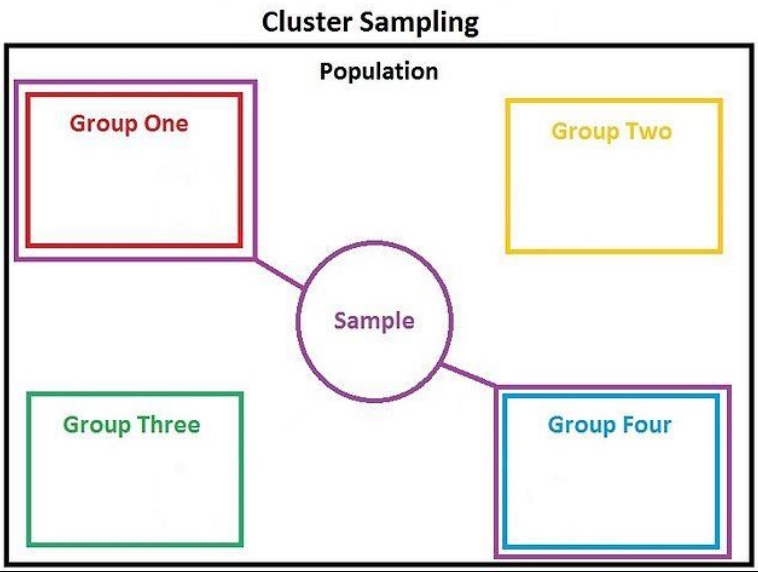
Week 3 – Day 5

Cluster Sampling

Notes

In this sampling plan, the total population is divided into groups (known as clusters) and a SRS of the groups is selected.

A researcher wants to survey academic performance of middle school students in the US. He can divide the entire population (population of US) into different **clusters** (states). Then the researcher selects a number of **clusters** depending on his research through simple or systematic random **sampling**.



YOU TRY!

1) The manager of Walmart wants to measure the satisfaction of the store's customers. Design a sampling technique that can be used to obtain a sample of 40 customers.

2) Apple wants to measure the smartphone usage in the United States. Could they use cluster sampling? Why or why not. Explain.

3) How do cluster sampling and stratified sampling differ?

A. In cluster sampling, the sample must match the proportion of the groups in the population, but in stratified random sampling this is not necessary.
B. Stratified random sampling requires selection from each group proportional to their share of the population, but cluster sampling does not.
C. Stratified random sampling allows groups to mix together, but cluster sampling does not.
D. Cluster sampling allows groups to mix together, but stratified random sampling does not.