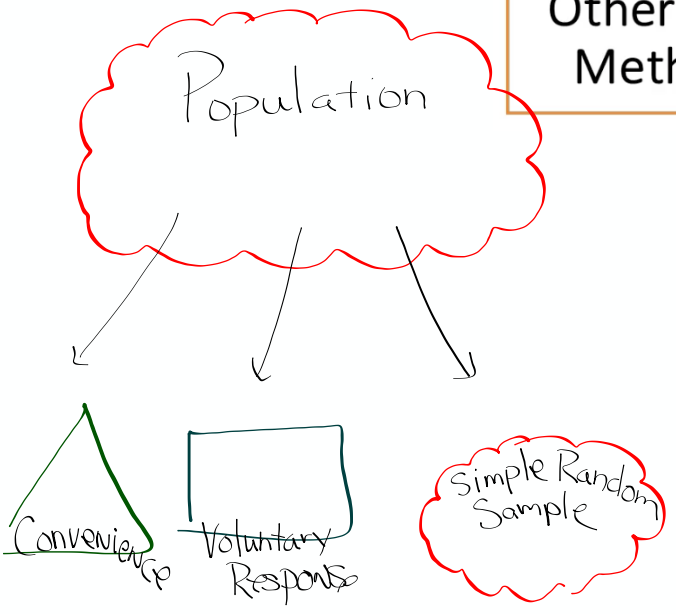
I have copies of detailed solutions for questions 11, 13, and 15 from last night's HW

On question 13, note the details on how to select random integers without repeats on some calculators.

Other Random Sampling Methods (pages 229–232)



Learning Targets

DESCRIBE how to select a sample using:

- **stratified random sampling** and
- **cluster sampling**

DISTINGUISH stratified random sampling from cluster sampling, and GIVE an advantage of each method.

One of the most common alternatives to simple random sampling is called

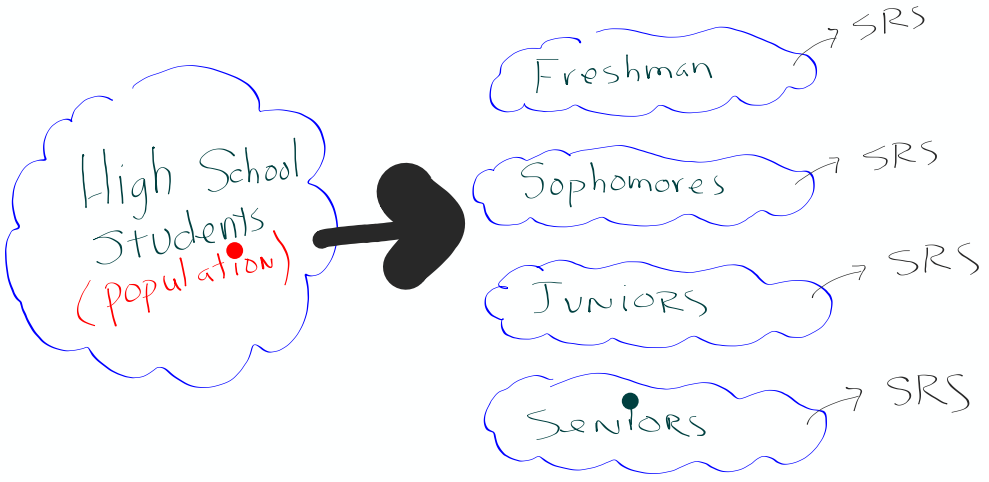
stratified random sampling.

Strata are groups of individuals in a population who share characteristics thought to be **associated** with the variables being measured in a study.

Stratified random sampling selects a sample by choosing an **SRS** from each stratum and combining the SRSs into one overall sample.

Strata is the plural form of Stratum.

(just as data is the plural form of datum)



Population split into several strata

AP Statistics Classwork – SECTION 4.1 DAY 2

Stratified Random Sample

Strata are groups of individuals in a population who share characteristics thought to be _____ with the variables being measured in a study.

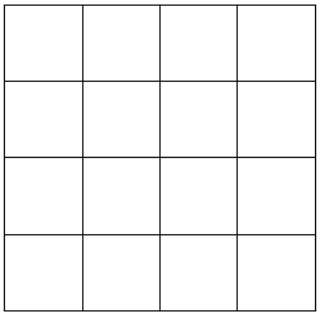
Stratified random sampling selects a sample by choosing an _____ from each stratum and combining the SRSs into one overall sample.

How much do fans love Justin Timberlake?

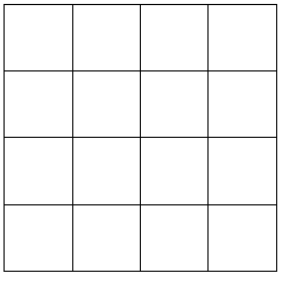
Justin Timberlake's concert promoter wants to find out how much fans enjoy his concerts. He wants to ask attenders, "From 1 to 10, where 10 is the most, how much did you enjoy the concert?" The area surveyed is square and divided into 16 equally sized sections (4 rows x 4 columns). The stage runs along the Northern edge of the venue (where Justin is pictured). We want to take a sample of 4 seats.

Stage

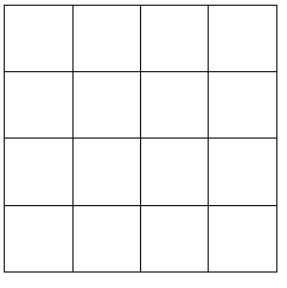
1. Using a random number generator, pick a simple random sample (SRS) of 4 seats. Place an X in the 4 seats that you choose.



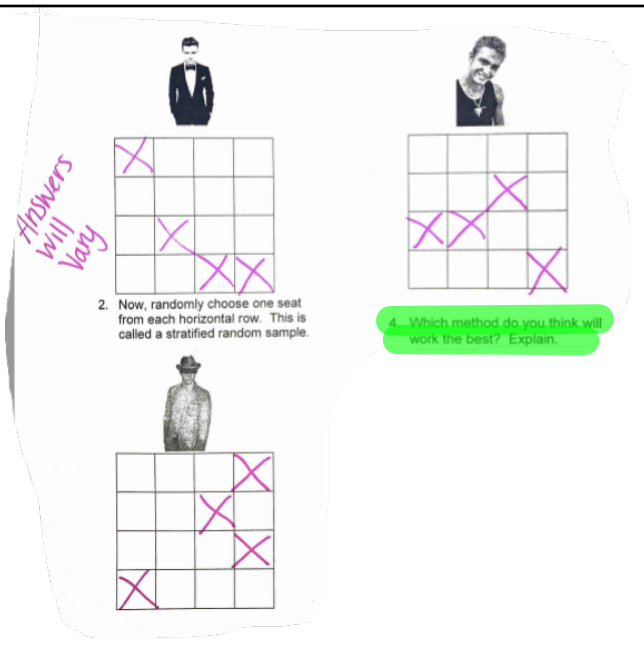
2. Now, randomly choose one seat from each horizontal row. This is called a stratified random sample.



3. Finally, randomly choose one seat from each vertical column. This is also a stratified random sample.



4. Which method do you think will work the best?



5. Now, it's time for the actual data. The numbers below are the average enjoyment for each of the 16 sections. For each of your three samples above, calculate the average enjoyment. Add your average to the dotplots on the board.

9.5	9.8	9.7	9.4
8.1	8.3	8.2	8.3
6.8	7.1	6.9	7.0
5.1	5.8	5.7	5.4

Sample #1:

Sample #2:

Sample #3

5. Now, it's time for the actual data. The numbers below are the average enjoyment for each of the 16 sections. For each of your three samples above, calculate the average enjoyment. Add your average to the dotplots on the board.

Answers will vary

Sample #1: $\frac{+ \quad + \quad +}{4} = \bar{x}$

Sample #2: $\frac{+ \quad + \quad +}{4} = \bar{x}$

Sample #3: $\frac{+ \quad + \quad +}{4} = \bar{x}$

9.5	9.8	9.7	9.4
8.1	8.3	8.2	8.3
6.8	7.1	6.9	7.0
5.1	5.8	5.7	5.4

Graphing the results:

Simple Random Sample:

average enjoyment

Stratified by Row:

average enjoyment

Stratified by Column:

average enjoyment

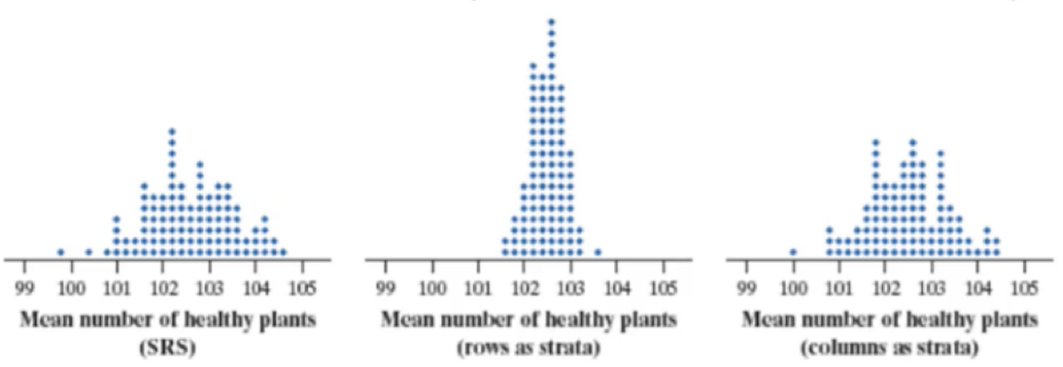
6. Which method was best? Why?

Stratified random sampling works best when the individuals within each stratum are similar with respect to what is being measured and when there are large differences between strata.

from another class

Stratified Random Sampling

- Goal is to get more precise estimates



Least variability

Cluster Sampling

Cluster Sampling

When populations are large and spread out over a wide area, we'd prefer a method that selects groups (clusters) of individuals that are "near" one another. That's the idea of cluster sampling.

A **cluster** is a group of individuals in the population that are located near each other. **Cluster Sampling** selects the sample by randomly choosing clusters and including each member of the selected clusters in the sample.

Cluster sampling works best when the clusters look just like the population but on a smaller scale.

Cluster sampling is often used for practical reasons, like saving time and money.

6. A good read *Other sampling methods*

A school librarian wants to know the average number of pages in all the books in the library. The library has 20,000 books, arranged by type (fiction, biography, history, etc.) in shelves that hold about 50 books each. You want to select a random sample of 500 books.

(a) Explain how to select a stratified random sample of 500 books. Justify your choice of strata. Why might the librarian want to choose a stratified random sample?

(a) Explain how to select a stratified random sample of 500 books. Justify your choice of strata. Why might the librarian want to choose a stratified random sample?

Stratify by type because different types of books may be longer (or shorter) than other types. This will provide a more precise estimate of the average page length than a SRS would.

To select the sample, take an appropriately sized SRS of each type of book and combine the books selected from each type to form a sample.

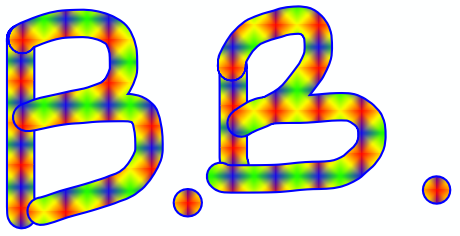
(for example, if there are 1000 biographies [5% of 20,000], select an SRS of 25 biographies (5% of 500) using method in part (a)

(b) Explain how to select a cluster sample of 500 books. Justify your choice of clusters. Why might the

Clusters are formed by grouping books that are located near each other, making it easier for the librarian to select a random sample.

We can use each shelf of 50 books as a cluster and randomly select 10 shelves to obtain the 500 books for our sample.

Number the shelves from 1 to 400 and choose an SRS of 10 shelves. Then use all the books on the 10 selected shelves.



Summary of Sampling Methods

Big Ideas:

Lesson 4.1: Day 2: Other Random Sampling Methods

Big Ideas:

- Stratified Random sample: splits population into groups (strata) and chooses an SRS from each group.
- Cluster sampling: split population into groups based on location (clusters) and randomly select clusters. Take to everyone in cluster.

Simple Random Sample: choosing a group from the population so that every individual and group of individua has an equal chance of being chosen.

Steps for SRS: ① Label ② Randomize ③ Select.

Check Your Understanding:

Check Your Understanding:

A factory runs 24 hours a day, producing wood pencils on three 8-hour shifts— day, evening, and overnight. In the last stage of manufacturing, the pencils are packaged in boxes of 10 pencils each. Each day a sample of 300 pencils is selected and inspected for quality.

1. Describe how to select a stratified random sample of 300 pencils. Explain your choice of strata.

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1. Describe how to select a stratified random sample of 300 pencils. Explain your choice of strata.

For each shift (Day, evening, overnight) choose 100 pencils.

① LABEL all pencils, 1 to N
② Randomly choose 100 pencils
③ Check the 100 pencils.

2. Describe how to select a cluster sample of 300 pencils.
Explain your choice of clusters.

2. Describe how to select a cluster sample of 300 pencils.
Explain your choice of clusters.

Boxes are the clusters.

① Label every box 1 to ... N

② Randomly choose 30 boxes.

③ Check pencils in 30 boxes.

3. Explain a benefit of using a stratified random sample and a benefit of using a cluster random sample in this context.

Stratified

We get 100 from every shift so we get a more precise estimate.

Cluster

Simplifies the process. We don't have to label every pencil, just every box.

4.1 17, 19, 21, 22, 23