

AP Statistics

Unit 03 – Sampling & Study Design
Day 03 – Rolling Down the River Lab

Name _____

Period _____

A farmer has planted a new field for corn. It is a rectangular plot of land with a river that runs along the right side of the field. The corn looks good in some areas of the field but not others and the farmer is not sure that harvesting the field is worth the expense. The farmer decided to subdivide the entire rectangular field into 100 smaller plots as shown in the grid below. He then decided to harvest 10 of these plots, find the mean yield for these 10 plots, and use this information to estimate the mean yield per plot for the entire field. Based on this estimate, he will decide whether to harvest the entire field.

A. Method #1: Convenience Sample

The farmer began by choosing 10 plots that would be easy to harvest because they were closest to where his farm equipment was located. These plots are marked with X on the grid below.

	0	1	2	3	4	5	6	7	8	9
0	X									
1	X									
2	X									
3	X									
4	X									
5	X									
6	X									
7	X									
8	X									
9	X									

But before actually harvesting the corn from those 10 plots, the farmer has had second thoughts about his selection and has decided to come to you (knowing that you are an AP statistics student, somewhat knowledgeable, but far cheaper than a professional statistician) to determine the approximate yield of the field. You will still be allowed to pick 10 plots to harvest. Your job is to determine which of the following methods is the best one to use – and to decide if this is an improvement over the farmer's original plan.

B. Method #2: Simple Random Sample

Use your calculator or a random number table to choose 10 plots to harvest. Describe your method of selection, perform the selection, and mark the plots selected on the grid below with an X.

Description of your method:

	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

C. Method #3: Stratified Sample (Vertical Strata)

Consider the field as grouped in vertical columns (called strata). Using your calculator or a random number table, randomly choose one plot from each vertical column and mark these plots with an X on the grid below.

	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

Description of your method:

D. Method #4: Stratified Sample (Horizontal Strata)

Consider the field as grouped in horizontal rows (also called strata). Using your calculator or a random number table, randomly choose one plot from each horizontal row and mark these plots with an X on the grid below.

	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

Description of your method:

E. Method #5: Cluster Sampling (Vertical Clusters)

In this method, you will randomly select an entire vertical column of data as a cluster. Discuss your method for selecting this column and mark each plot in the column with an X in the grid below.

	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

Description of your method:

F. Method #6: Cluster Sample (Horizontal Clusters)

In this method, you will randomly select an entire horizontal row of data as a cluster. Discuss your method for selecting this column and mark each plot in the column with an X in the grid below.

	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

Description of your method:

G. Method #7: Systematic Sample

In this method, you will randomly select the first plot in the grid and then select every 10th plot after that until you have selected a total of 10 plots. Discuss your method for selecting the starting plot and the direction you moved for selecting the subsequent plots. Mark each plot with an X in the grid below.

	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

Description of your method:

The crop is ready and it is time to harvest. Below is a grid with the yield in bushels of corn per plot. Estimate the average yield per plot based on each of the seven sampling techniques and enter these values in the table below.

	0	1	2	3	4	5	6	7	8	9
0	6	17	20	38	47	55	69	76	82	97
1	7	14	23	34	43	56	63	75	81	92
2	2	14	28	30	50	50	62	80	85	96
3	9	15	27	34	43	51	65	72	88	91
4	4	15	28	32	44	50	64	76	82	97
5	5	16	27	31	48	59	69	72	86	99
6	5	18	28	34	50	60	62	75	90	90
7	8	15	20	38	40	54	62	77	88	93
8	7	17	29	39	44	53	61	77	80	90
9	7	19	22	33	49	53	67	76	86	97

Sampling Method	Sample Mean Yield
A. Convenience	
B. SRS	
C. Vertical Strata	
D. Horizontal Strata	
E. Vertical Clusters	
F. Horizontal Clusters	
G. Systematic	

Discussion Questions:

1. You have looked at seven different methods of choosing plots. Discuss with your group some reasons (other than convenience) to choose one method over another.
2. Compare your results with those of your group. Were your results similar?
3. The actual average yield per plot of the farmer's field was 50.04 bushels of corn. How do the plots and average yield values relate to this actual value? Which sampling method(s) had an average yield that was close to this actual value? Based on this information, which method would you choose and why?