

Key

**Observational Study vs Experiment**

Classify each as either an observational study or an experiment.

1. You want to determine the number of strikes thrown by a pitcher in a baseball game out of 100 pitches.  
observational study
2. You want to test the effectiveness of a new medicine in lowering blood pressure. You randomly select a group to take a sugar pill (unknown to the patients) and you randomly select a group to take the new medicine.  
Experiment
3. You want to determine the number of cars driving through the intersection of Richmond Road and Chardon Road during rush hour.  
observational study

**Sampling Techniques**

Modern Managed Hospitals (MMH) is a national for-profit chain of hospitals. Management wants to survey patients discharged this past year to obtain patient satisfaction profiles. They wish to use a sample of such patients. Some sampling techniques are described below. Categorize each technique as simple random, stratified, systematic, cluster, convenience, or voluntary response.

4. Obtain a list of patients discharged from all MMH facilities. Divide the patients according to the length of hospital stay (3 days or less, 3 - 7 days, 8 - 14 days, more than 14 days). Draw simple random samples from each group.  
stratified
5. Obtain a list of patients discharged from all MMH facilities. Number these patients, and then use a random-number table to obtain the sample.  
simple random
6. Randomly select a few MMH facilities from each of five geographic regions, and then take all patients on the discharge list of the selected hospitals.  
cluster
7. At the beginning of the year, instruct all MMH facilities to survey every 500<sup>th</sup> patient discharged.  
systematic
8. Instruct each MMH facility to survey 10 discharged patients this week and send in the results.  
convenience
9. Set up tables with surveys at every exit asking patients to complete after they are discharged.  
voluntary

**Population and Parameter vs. Sample and Statistic**  
Determine the population, sample, parameter, and statistic.

10. On any given day, approximately 4500 people visit the zoo. On one extremely hot day, you are curious to know how many people purchased water at the zoo. Out of the 1,200 people you surveyed that day, 755 had purchased water.

Pop: 4500 zoo visitors      Sample: 1200 surveyed

Parameter: % of all visitors getting water      Statistic: 755 purchased water

11. A survey of 2863 American households found that 74% of the households own a pet.

Pop: All American households      Sample: 2863 households

Parameter: actual % owning a pet      Stat: 74% owning a pet

**Types of Bias**

Identify which kinds of bias is in each of the following scenarios.

12. A police officer asks citizens if they have even stolen from a store.  
response
  13. A principal at a high school asks the freshman class to vote for the school's Teacher of the Year.  
undercoverage
  14. A survey asks the question: "Are you in favor of using pesticides on crops, even though they are horrible on the environment?"  
question wording
  15. An Instagram poll asks the question, "Do you hear 'Yanny' or 'Laurel'?"  
voluntary response
- Margin of Error**
16. A poll reports that 58% of the voters prefer Candidate B with a margin of error of  $\pm 3\%$ . Estimate the number of voters in the poll.  
 $\approx 1111$  voters polled
  17. It is estimated that 80% of all seniors in high school complete their homework every night (margin of error  $\pm 3.5\%$ ). Determine the interval likely to contain the exact percentage.  
76.5% - 83.5%
  18. Determine the margin of error for a sample size of 1700.  
 $\pm 0.024$
- Then determine the sample size you would have to use to cut the margin of error in half.  
6800

Simulations

19. You take a quiz with 6 questions. After you study, you estimate that you would have about an 80% chance of getting any individual question right.

1 - 80 = question correct      81 - 100 = question wrong

Trial #	Numbers	19. Determine the probability of getting all of the questions correct.
1	63, 89, 13, 46, 47, 29	
2	82, 99, 50, 41, 23, 63	$\frac{4}{15}$ 27%.
3	62, 81, 78, 47, 93, 63	20. Determine the probability of getting at least four questions correct.
4	34, 46, 81, 87, 26, 72	100%.
5	47, 48, 22, 10, 37, 18	21. Determine the probability of getting exactly one question wrong.
6	93, 84, 26, 73, 25, 11	$\frac{5}{15}$ 33%.
7	74, 23, 60, 82, 94, 50	
8	10, 41, 65, 36, 82, 73	22. Determine the probability of getting the first question correct.
9	3, 39, 37, 24, 19, 24	$\frac{11}{15}$ 73%.
10	79, 46, 34, 72, 95, 73	
11	14, 38, 57, 59, 34, 23	23. Determine the probability of getting the last question wrong.
12	28, 90, 20, 53, 33, 71	61%.
13	97, 93, 65, 70, 2, 74	
14	96, 32, 51, 41, 24, 11	
15	63, 23, 56, 27, 74, 36	

20. When a woman is pregnant, she has an equal chance of having a boy or a girl. A woman has three children.

1 = boy      2 = girl

Trial #	Numbers	23. Determine the probability of having all boys.
1	2, 1, 2	
2	1, 1, 2	$\frac{3}{18}$ 17%.
3	1, 2, 1	24. Determine the probability of having all girls.
4	1, 1, 1	$\frac{1}{18}$ 6%.
5	1, 1, 1	25. Determine the probability of having only one girl.
6	2, 1, 1	$\frac{8}{18}$ 44%.
7	1, 1, 2	26. Determine the probability that the oldest child is a boy.
8	2, 1, 2	$\frac{12}{18}$ 67%.
9	1, 2, 2	
10	1, 2, 1	
11	1, 2, 1	
12	1, 2, 1	
13	1, 2, 1	
14	2, 2, 2	
15	2, 2, 1	
16	1, 1, 1	
17	1, 2, 2	
18	2, 1, 2	