7.4 Sampling Distribution

<u>Essential Questions:</u>

What does a sampling distribution tell us?

<u>Focus Points:</u>
- Review : random sample, relative frequency, parameter, statistic, and sampling distribution
- From raw data, construct a relative frequency distribution for $\overline{x}$ values and compare the results to a theoretical sampling distribution.

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Recall Vocabulary

A *population* can be thought of as a complete set of measurements (or counts), either existing or conceptual.

A *sample* is a subset of measurements from the population.

The most important samples are *random samples*.

A *statistic* is a numerical descriptive measure of a *sample*. $\overline{X}$

A *parameter* is a numerical descriptive measure of a *population*. M

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SOME COMMONLY USED STATISTICS AND CORRESPONDING PARAMETERS

Samples *Population*

Measure	*Statistic*	*Parameter*
Mean	$\bar{x}$	μ
Variance	s^2	σ^2
Standard Deviation	s	σ
Proportion	$\hat{p}$	p

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TYPES OF INFERENCES

1. Estimation: we estimate the *value* of a population parameter. μ, σ^2, σ

2. Testing: we formulate a *decision* about the value of a population parameter.

3. Regression: we make *predictions or forecasts* about the value of a statistical variable. equation

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A *sampling distribution* is a probability distribution of a sample statistic based on all possible simple random samples of the *same size* form the same population.

SRS

Example 1: Fishing in Wisconsin

Pinedale, Wisconsin, is a rural community with a children's fishing pond. Posted rules state that all fish under 6 inches must be returned to the pond, only children under 12 years old may fish, and a limit of five fish may be kept per day. Susan is a college student who was hired by the community last summer to make sure the rules were obeyed and to see that the children were safe from accidents. The pond contains only rainbow trout and has been well stocked for many years. Each child has no difficulty catching his or her limit of five trout.

As a project for her biometrics class, Susan kept a record of the lengths (to the nearest inch) of all trout caught last summer. Hundreds of children visited the pond and caught their limit of five trout, so Susan has a lot of data. Susan collected 100 children at random and listed the lengths of each of the five trout caught by a child in the sample. Then, for each child, she listed the mean length of the five trout that child caught. SRS

What is the average (mean) length of a trout taken from the Pinedale children's pond last summer?

All 100 sample mean lengths to the nearest inch.

10.8, 9.8, 10.4, 10.6, 11.2, 9.8, 10.0, 9.4, 10.2, 9.4, 11.6, 11.2, 10.2, 10.4, 9.8, 11.0, 9.0, 11.2, 9.4, 10.2, 10.6, 9.8, 10.0, 10.2, 9.0, 11.2, 10.8, 8.4, 10.2, 10.2, 10.4, 10.8, 10.0, 9.4, 10.2, 10.4, 10.6, 10.4, 10.4, 10.6, 10.6, 11.0, 10.2, 9.8, 11.0, 9.8, 10.6, 10.0, 9.6, 9.0, 10.0, 9.8, 10.4, 10.0, 9.6, 10.2, 9.8, 9.4, 9.8, 10.2, 10.6, 10.4, 9.4, 11.0, 10.0, 9.8, 9.6, 9.8, 10.2, 11.0, 9.4, 10.2, 9.0, 10.2, 10.8, 11.8, 9.8, 9.6, 11.2, 10.8, 10.4, 10.2, 10.4, 10.0, 9.4, 9.6, 10.2, 10.0, 10.8, 10.0, 9.0, 9.4, 9.4, 11.6, 9.8, 9.8, 11.0, 10.0, 10.0, 10.4

1. Determine class limits (upper and lower bound). $11.8 - 8.4 / 2 = .38$

9 classes divide range by 9 to get class size, start with lowest number go up the class size until all 9 classes are decided. Class width of 0.38.
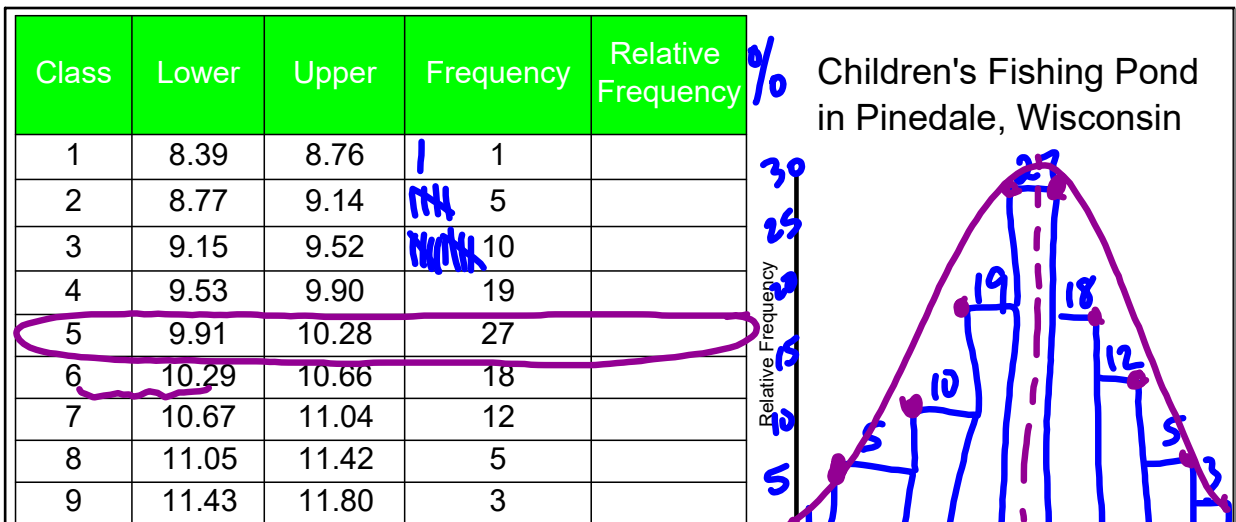
2. Determine the frequency in each class limit.

Tally the number of times a number exists in each of the 9 classes. This number is the frequency for that class.

3. Convert your numbers from frequency to relative frequency (%).

Take your frequency from each class and divide that number by 100 to get the % for each class. Then use these %'s to graph a histogram and sketch a normal curve.

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Class	Lower	Upper	Frequency	Relative Frequency %
1	8.39	8.76	1	
2	8.77	9.14	5	
3	9.15	9.52	10	
4	9.53	9.90	19	
5	9.91	10.28	27	
6	10.29	10.66	18	
7	10.67	11.04	12	
8	11.05	11.42	5	
9	11.43	11.80	3	

Calculate the %. Then graph a histogram and sketch a normal curve.

Children's Fishing Pond in Pinedale, Wisconsin

Average would lie in the middle of the histogram and normal curve in class 5 so the average of that class limit would be the middle at 10.095 in

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7.4 Sampling Distribution with work

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1. Answers vary. Remind students to identify the individuals (subjects) and variable involved.

3. A numerical descriptive measure of a population. Examples: μ, σ^2, σ, p

5. A statistical inference is a conclusion about the value of a population parameter based on information about the corresponding sample statistic and probability. We will do both estimation and testing.

7. They help us visualize the sampling distribution through tables and graphs that approximately represent the sampling distribution.

9. We studied the sampling distribution of mean trout lengths based on samples of size 5.

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