Marietta City Schools

2025–2026 District Unit Planner

AP Statistics

Unit title	Unit 5: Sampling Distributions	Unit duration (hours)	7.5-12 hours

Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): *What will students learn?*

The unit applies probabilistic reasoning to sampling, introducing students to sampling distributions of statistics they will use when performing inference in Units 6 and 7. Students should understand that sample statistics can be used to estimate corresponding population parameters and that measures of center (mean) and variability (standard deviation) for these sampling distributions can be determined directly from the population parameters when certain sampling criteria are met. For large enough samples from any population, these sampling distributions can be approximated by a normal distribution. Simulating sampling distributions helps students to understand how the values of statistics vary in repeated random sampling from populations with known parameters.

GA DoE Standards

Standards

5.1 Introducing Statistics: Why is My Sample Not Like Yours?
5.2 The Normal Distribution Revised
5.3 The Central Limit Theorem
5.4 Biased and Unbiased Point Estimates
5.5 Sampling Distributions for Sample Proportions
5.6 Sampling Distributions for Differences in Sample Proportion
5.7 Sampling Distribution for Sample Means
5.8 Sampling Distributions for Difference in Sample Means

Concepts/Skills to support mastery of standards

- Distinguish between a parameter and a statistic
- Create a sampling distribution using all possible samples from a small population
- Determine if a statistic is an unbiased estimator of a population parameter.
- Use the sampling distribution of a statistic to evaluate a claim about a parameter.

- Calculate the mean and standard deviation of a sample proportion and interpret the standard deviation
- Determine if a sampling distribution of a sample proportions is approximately normal.
- If appropriate, use a normal distribution to calculate probabilities involving a sample proportion.
- Calculate the mean and standard deviation of a sampling distribution of a difference in sample proportions.
- Calculate the mean and standard deviation of a sample mean and interpret the standard deviation
- If appropriate, use a normal distribution to calculate probabilities involving sample means.
- Explain how the shape of the sampling distribution of a sample mean is affected by the shape of the population distribution and the sample size.
- Calculate the mean and standard deviation of a sampling distribution of a difference in sample means.

Vocabulary

Parameter	Statistic	Sampling distribution	Unbiased estimator	10% condition
Large Counts	Central Limit Theorem			

Notation

Sampling distributions for means:

Random Variable	Parameters of Sampling Distribution		Standard Error* of Sample Statistic
For one population: $\overline{X}$	$\mu_{\overline{X}} = \mu$	$\sigma_{\overline{X}} = \dfrac{\sigma}{\sqrt{n}}$	$s_{\overline{X}} = \dfrac{s}{\sqrt{n}}$
For two populations: $\overline{X}_1 - \overline{X}_2$	$\mu_{\overline{X}_1 - \overline{X}_2} = \mu_1 - \mu_2$	$\sigma_{\overline{X}_1 - \overline{X}_2} = \sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}$	$s_{\overline{X}_1 - \overline{X}_2} = \sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}$

Sampling distributions for proportions:

Random Variable	Parameters of Sampling Distribution		Standard Error[*] of Sample Statistic
For one population: $\hat{p}$	$\mu_{\hat{p}} = p$	$\sigma_{\hat{p}} = \sqrt{\dfrac{p(1-p)}{n}}$	$s_{\hat{p}} = \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$
For two populations: $\hat{p}_1 - \hat{p}_2$	$\mu_{\hat{p}_1 - \hat{p}_2} = p_1 - p_2$	$\sigma_{\hat{p}_1 - \hat{p}_2} = \sqrt{\dfrac{p_1(1-p_1)}{n_1} + \dfrac{p_2(1-p_2)}{n_2}}$	$s_{\hat{p}_1 - \hat{p}_2} = \sqrt{\dfrac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \dfrac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$ When $p_1 = p_2$ is assumed: $s_{\hat{p}_1 - \hat{p}_2} = \sqrt{\hat{p}_c(1-\hat{p}_c)\left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}$ where $\hat{p}_c = \dfrac{X_1 + X_2}{n_1 + n_2}$

Essential Questions

What is the difference between a parameter and a statistic?
How do we distinguish among the distribution of a population, the distribution of a sample, and the sampling distribution of a statistic?
How do we find the mean and standard deviation of the sampling distribution of a sample proportion?
How do we find the mean and standard deviation of the sampling distribution of a sample mean?
How likely is it to get a value this large just by chance?
How can we anticipate patterns in the values of a statistic from one sample to another?
Why is my sample not like yours?

Assessment Tasks

List of common formative and summative assessments.

Formative Assessment(s):

Common Formative Assessment – Ticket out the Door, Homework, Quiz
Summative Assessment(s):

Common Summative Assessment – Unit 5 Test(50% Multiple Choice/50% Free Response)

Learning Experiences
Add additional rows below as needed.

Objective or Content	Learning Experiences	Personalized Learning and Differentiation
3.B Determine parameters for probability distributions **3.C Describe probability distributions** **4.B Interpret statistical calculations and findings to assign mean or assess a claim.**	**Math Medic Lesson: What's the proportion of orange Reese's Pieces?** #1 Calculate the mean and standard deviation of the sampling distribution of a sampling proportion and interpret the standard deviation. #2 Determine if a sampling distribution of a sample proportion is approximately normal. #3 If appropriate, use a normal distribution to calculate probabilities involving a sample proportion.	Graphic organizers are provided for each lesson and additional practice as needed. Some students will move through the task independently. Others will need prompts and support for understanding
3.B Determine parameters for probability distributions **3.C Describe probability distributions** **4.B Interpret statistical calculations and findings to assign mean or assess a claim.**	**Math Medic Lesson: How tall to be in the NBA?** #1 Calculate the mean and standard deviation of the sampling distribution of a sample mean and interpret the standard deviation. #2 If appropriate, use a normal distribution to calculate probabilities involving sample means.	Graphic organizers are provided for each lesson and additional practice as needed. Some students will move through the task independently. Others will need prompts and support for understanding
Content Resources		

- The Practice of Statistics, 5th Edition
- Notes, Review, and Extra Practice are all provided on Schoology.
- College Board
- Math Medic
- AP Statistics Formula Sheet