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Langley High School Curriculum Night (Jan-2019)

Description of Statistics Courses:

I. Probability & Statistics

II. AP Statistics

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Overview

Both courses...

1. Are full-year math electives,
2. Are often, but not always, taken during a student's senior year,
3. Provide an excellent introduction to the language and principles of statistics,
4. Help students to analyze data and think critically when reading articles and studies where statistics are used (and *misused*):
 - a) Political or public opinion polls,
 - b) Scientific studies (e.g., Does texting while driving cause accidents?),
 - c) Financial analysis (e.g., Should I diversify my stock portfolio?)...
5. Show mathematics applied across numerous fields:
 - a) Medicine (testing effectiveness/risks of new medicine or medical procedure)
 - b) Law (determining whether there is evidence of age discrimination)
 - c) Sports (do statistics justify a higher salary, or a trade)
 - d) Politics, Psychology, Agriculture, Science, Business, Gaming, Journalism, Genetics, ...
6. Prepare students for statistics classes in college (most college majors have some requirement for statistics, often specialized to the specific major).

Which Course is Best for You (or Your Child)?

Characteristics of a student well-suited for Statistics...

Both Courses

- ☐ An inquisitive, curious spirit
- ☐ Genuine interest in exploring & investigating statistical concepts in real-life scenarios
- ☐ Good attendance & willing to participate in class discussions & activities
- ☐ Proactive, and seeks help when needed
- ☐ Ability to make connections & analyze data
- ☐ Can handle the cumulative demands of a math course

Prob/Stat

- ☐ Enjoys activity-based learning
- ☐ Seeks less-demanding workload
- ☐ Committed to keep up with the work throughout the year

AP Stat

- ☐ Enjoys difficult & challenging math problems
- ☐ Extremely disciplined work habits
- ☐ Strong Algebra skills (B+ or better in Alg II)
- ☐ Accustomed to rapid pace of instruction
- ☐ Enthusiastic reader who enjoys performing critical analysis
- ☐ Skilled writer, capable of expressing thoughts clearly and concisely
- ☐ Willing to dedicate 1+ hours of study per night
- ☐ Appreciates & embraces scientific method
- ☐ Prepared for long, time-constrained tests

Class Expectations & Procedures

Topic	Probability & Statistics	AP Statistics
Homework	Assigned daily; <u>In-class time</u> given to complete; expected time to complete <u>20-30 minutes</u> .	Assigned daily; <u>No in-class time</u> given to complete; expected time to complete <u>1-2 hours</u> .
Reading Assignments	<u>No assigned reading</u> . Students are encouraged to read text on their own for additional examples.	Assigned reading each class. Occasional "reading quizzes". Student will read about <u>800 pages</u> of textbook by April.
Textbook	College-level textbook. Reading can be difficult.	College-level textbook. Reading can be difficult.
Writing	Students are expected to <u>write a minimum amount</u> , as required by the teacher's discretion.	Students are expected to write complete, concise answers to homework & test problems. Following a <u>rigorous scientific process</u> , making insightful conclusions are more important than calculations. Write in <u>paragraphs, in context</u> .
Class Structure	Warm-up homework questions, lecture/notes. Activities-based.	Warm-up homework questions, lecture/notes, in-class practice problems.
Formula Memorization	Formula sheet provided.	AP Formula sheet provided; some formulas must be memorized. Precise vocabulary critical.
Projects/Activities	Medium size projects or activities <i>throughout the course</i> , with time in class to complete.	Complex, detailed 4Q project covering multiple dimensions of content and requiring critical thinking on subject-matter and strict adherence to scientific method. Most work outside of class.
End of Course Assessment(s)	Cumulative final exam.	AP Exam early May (college credit for '4' or '5'). 4Q project (post-AP Exam). Cumulative Final Exam.

Comparison of Curriculum Topics

	Probability & Statistics	AP Statistics
Descriptive Statistics – Mean, Median, Standard Deviation, Displays of Data	✓	✓
Experimental Design – Sampling, Surveys & Bias	✓	✓
General Probability	✓	✓
Special Probability Distributions – Binomial, Geometric, Poisson	✓	✓
Normal Distribution	✓	✓
Sampling Distributions	✓	✓
Confidence Intervals, Margin of Error, Central Limit Theorem	✓	✓
Inference Testing for Means & Proportions		✓
Chi-Squared Testing		✓
Bivariate Data – Correlation, Scatterplots, Regression Line	✓	✓
Regression Analysis	✓	✓

AP Statistics covers these topics with greater rigor & depth.

Upon completion of the course:

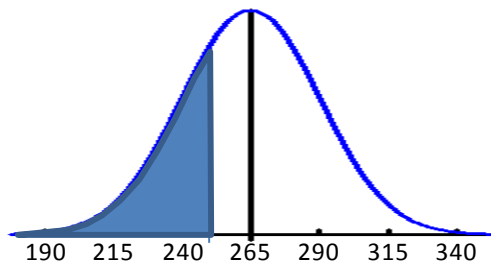
- Prob/Stat students should have a good appreciation for statistical principles & concepts, and recognize how they are applied in real-world applications (such as political polls, games, or business situations).
- AP Statistics students should be prepared to follow detailed scientific methods to solve real-world problems and draw well-formed and persuasive conclusions. Students should be capable of understanding, explaining, and making critical assessments of published scientific papers.

Finish April 7

Comparing Complexity of Problems & Solutions (I)

Background: The weights of college football players have a mean of 265 pounds and a standard deviation of 25 pounds.

Prob/Stat: The weights are normally distributed. What is the chance that a randomly-selected player will weigh less than 250 pounds?



$$z = \frac{250 - 265}{25} = -0.6$$

$$P(z < -0.6) = 0.2743$$

Prob/Stat answers focus on finding the correct **answer**.

AP Stat answers require adherence to a detailed, structured, scientific **process**.

AP Stat: What is the probability that a randomly sample of 32 players will have a mean weight less than 260 pounds?

Population: College football players

Parameter of Interest: Mean weight of 32 players

Conditions:

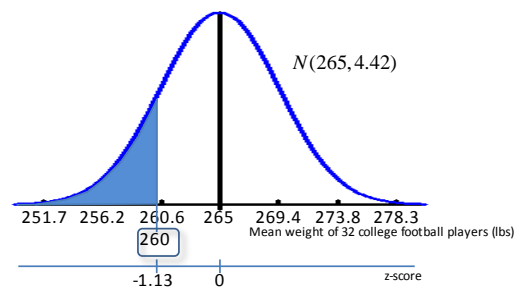
SRS – The sample was randomly selected, so the sample is representative of the population (is unbiased).

Normality – The shape of the population is unknown.

We can apply the Central Limit Theorem to confirm that the sampling distribution is *approximately normal*, since the sample size is large ($n \geq 30$; $n = 32$).

Independence – The population of college football players is greater than 320 (10x the sample size), so we have independent trials and can use the formula for $\sigma_{\bar{x}}$

$$\mu_{\bar{x}} = \mu = 265 \quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{25}{\sqrt{32}} = 4.42$$

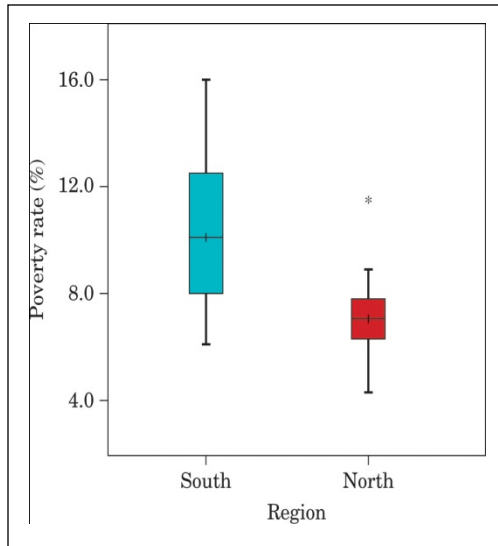


$$z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}} = \frac{260 - 265}{4.42} = -1.13$$

$$P(\bar{x} < 260) = P(z < -1.13) = \text{normalcdf}(-100, -1.13) = 0.1292$$

There is a 12.92% probability that a random sample of 32 college football players would have a mean weight less than 260 pounds.

Comparing Complexity of Problems & Solutions (II)



Seen above are boxplots comparing the poverty rates of southern and northern states east of the Mississippi in 2009. Compare the two distributions.

Acceptable Prob/Stat Answer:

The median poverty rate for the southern states is approximately 10% which is larger than the median of the northern states at approximately 7%. The northern states have a poverty rate outlier at approximately 12%.

[only need 2 sentences]

Acceptable AP Stat Answer:

The distributions of the proportion of poverty in the populations of Southern and Northern states east of the Mississippi in 2009 have several distinct differences. The *shape* of the poverty rates of southern states is skewed left, while the poverty rates of northern states are skewed right. The *center* of the poverty rates of southern states is greater than that of northern states, with a median of approximately 10% compared to about 7% for northern states. The *spread* of southern state poverty rates is much greater than that of northern states, with an inter-quartile range of about 5% compared to an IQR of less than 2% for northern states. The distribution for northern states has an *unusual feature*, with a high outlier at a 12% poverty rate.

[answer must address “shape, center, spread, and unusual features”, use “comparative language”, and be written “in context”]

What Students Taking the Course Say about Prob/Stat

"I took Prob/Stat because I knew math was not my best subject.

This class is an understandable version of math and it has a lot of fun activities."

"I took Prob/Stat to have an extra math credit for my advanced diploma.

It's not a joke class, be prepared to learn."

"Prob/Stat is fun and easy to understand. To future students - make sure to do your homework."

"I took Prob/Stat to balance out my schedule with my other AP classes.

The material is fun to learn since it relates to real life!"

"I took Prob/Stat because I wanted a more real-life type of math.

Advice - make sure to do your homework, apply yourself, and you'll be fine in the class."

What Students Taking the Course Say about AP Stat

"I took AP Stat because I wanted an additional AP course to challenge myself. The course requires constant and diligent studying, but is very fun and also relevant to many real-life situations, unlike other math courses."

"I took AP Stat for college credit. It is not the easiest class, but if you do the reading and focus in class, you can get a 'B'. Don't expect an easy 'A' "

"This course is not anything like Algebra 2. Very concept and writing focused, as opposed to simple use of formulas. Don't fall behind."

"I took AP Stat because it seems very far-reaching in its applicability later in life. It feels more like a logic class rather than a math class."

"I have never had to *think* so much in class, and when taking a test"

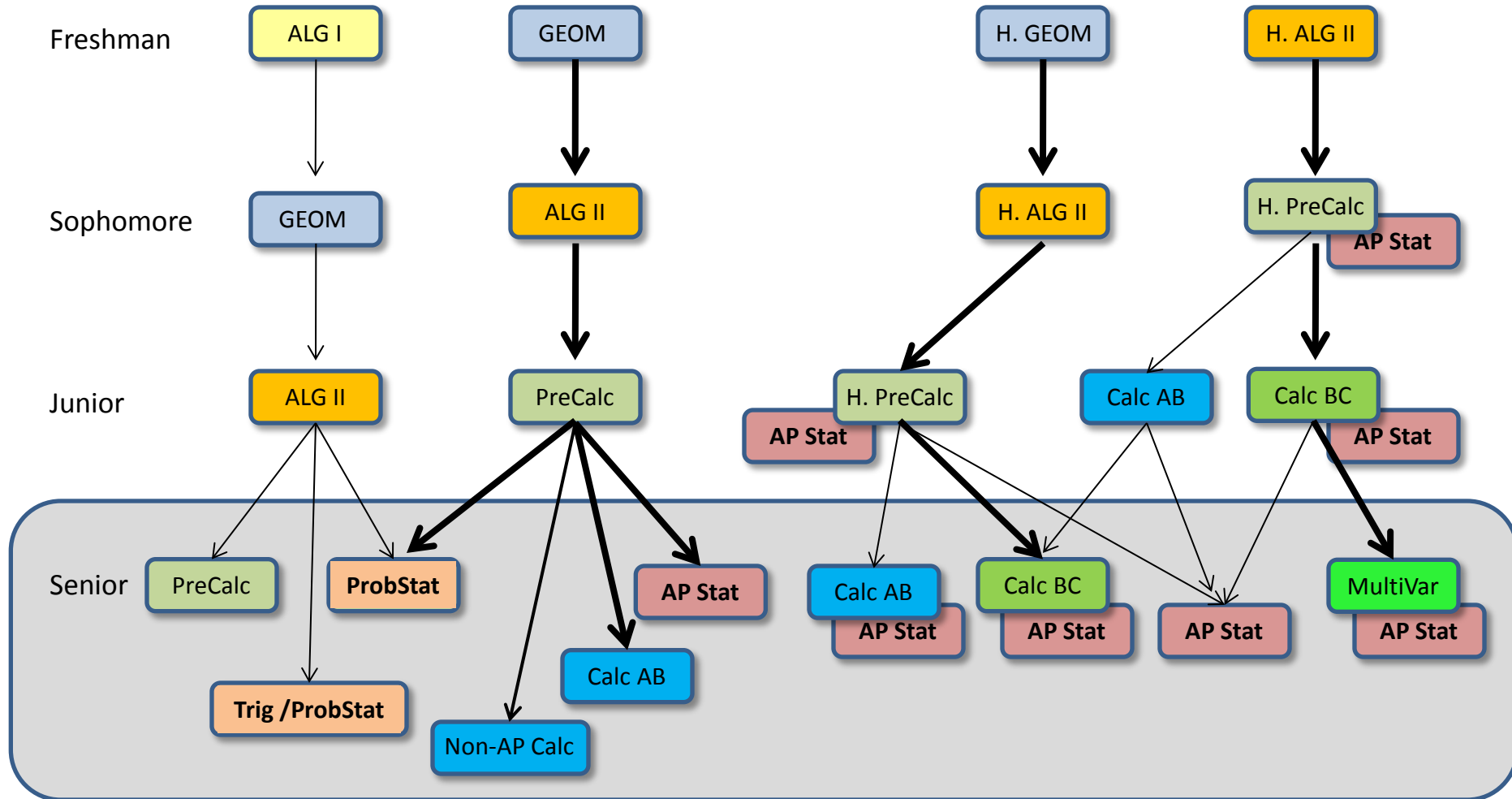
"I took AP Stat because I heard that the things you learn are interesting and useful in life, unlike many other upper level math courses. It's not an easy class, but if you work hard and read you will be fine. Take it because it's interesting, not because you want an easy grade."

"I took AP Stat because it coincides with other interests such as psychology, medicine, and engineering. Knowing statistics is like having a super power - you can do things that other people can't do."

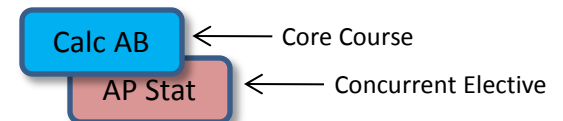
Typical Math Course / Pre-Requisite Flows

(Where the Statistics Courses Fit In)

Year



NOTE: Completing Prob/Stat does not prepare students for AP Statistics. Prob/Stat graduates who lack the "Honors" skill level, discipline, & work ethic have generally not been successful taking AP Statistics.



Thank You for Your Time,
And for Your Support in Helping Your Child
Plan for a Happy & Successful Future!

Questions? Contact:

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