COURSE: Statistics	GRADE: 12
UNIT 1: Analysis of Univariate Data	TIME FRAME: 15 Days

PA ACADEMIC STANDARDS FOR MATHEMATICS:

M11.D.1	**Demonstrate an understanding of patterns, relations and functions.**
M11.D.1.1	Analyze and/or use patterns or relations.
M11.D.1.1.1	Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.
M11.D.2	**Represent and/or analyze mathematical situations using numbers, symbols, words, tables and/or graphs.**
M11.D.2.1	Write, solve and/or graph linear equations and inequalities using various methods.
M11.D.2.1.2	Identify or graph functions, linear equations or linear inequalities on a coordinate plane.
M11.D.2.1.3	Write, solve and/or apply a linear equation (including problem situations).
M11.D.3	**Analyze change in various contexts.**
M11.D.3.1	Describe and/or determine change.
M11.D.3.1.1	Identify, describe and/or use constant or varying rates of change.
M11.D.3.1.2	Determine how a change in one variable relates to a change in a second variable.
M11.D.3.2	Compute and/or use the slope of a line.
M11.D.3.2.1	Apply the formula for the slope of a line to solve problems.
M11.D.3.2.2	Given the graph of the line, 2 points on the line, or the slope and a point on a line, write or identify the linear equation in point-slope, standard and/or slope-intercept form.
M11.D.3.2.3	Compute the slope and/or y-intercept represented by a linear equation or graph.
M11.E.1	**Formulate or answer questions that can be addressed with data and/or organize, display, interpret or analyze data.**
M11.E.1.1	Appropriately display and/or use data in problem-solving settings.
M11.E.1.1.1	Create and/or use appropriate graphical representations of data, including box-and-whisker plots, stem-and-leaf plots or scatter plots.
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M11.E.2.1	Use measures of central tendency to describe a set of data.
M11.E.2.1.1	Calculate or select the appropriate measure of central tendency (mean, mode or median) of a set of data given or represented on a table, line plot or stem-and-leaf plot.
M11.E.2.1.2	Calculate and/or interpret the range, quartiles and interquartile range of data.
M11.E.2.1.3	Describe how outliers affect measures of central tendency.
M11.E.3	**Understand and/or apply basic concepts of probability or outcomes.**
M11.E.3.1	Apply probability and/or odds to practical situations.
M11.E.3.1.1	Find probabilities for independent, dependent or compound events and represent as a fraction, decimal or percent.
M11.E.3.1.2	Find, convert and/or compare the probability and/or odds of a simple event.
M11.E.3.2	Apply counting techniques in problem-solving settings.
M11.E.3.2.1	Determine the number of permutations and/or combinations or apply the fundamental counting principle.
M11.E.4	**Develop and/or evaluate inferences and predictions or draw conclusions based on data or data displays.**
M11.E.4.1	Make predictions using data displays and probability.
M11.E.4.1.1	Estimate or calculate to make predictions based on a circle, line, bar graph or given situation.

M11.E.4.1.2	Use probability to predict outcomes.
M11.E.4.2	Analyze and/or interpret data on a scatter plot and/or use a scatter plot to make predictions.
M11.E.4.2.1	Draw, find and/or write an equation for a line of best fit for a scatter plot.
M11.E.4.2.2	Make predictions using the equations or graphs of best-fit lines of scatter plots.

NCTM STANDARDS:

Data Analysis and Probability

- Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
- Select and use appropriate statistical methods to analyze data.
- Develop and evaluate inferences and predictions that are based on data.
- Understand and apply basic concepts of probability.

Algebra

- Use mathematical models to represent and understand quantitative relationships.
- Analyze change in various contexts.

Communication

- Organize and consolidate their mathematical thinking through communication.
- Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.
- Analyze and evaluate the mathematical thinking and strategies of others.
- Use the language of mathematics to express mathematical ideas precisely.

Connections

- Recognize and use connections among mathematical ideas.
- Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
- Recognize and apply mathematics in contexts outside of mathematics.

Representation

- Create and use representations to organize, record, and communicate mathematical ideas.
- Select, apply, and translate among mathematical representations to solve problems.
- Use representations to model and interpret physical, social, and mathematical phenomena.

UNIT OBJECTIVES:

1.1 Compare and contrast qualitative and quantitative variables.

1.2 Display data using bar graphs, pie charts, dot plots, frequency tables, histograms, stem and leaf plots, and box plots, using pencil and paper and graphing utility.

1.3 Interpret data displays.

1.4 Compute measures of central tendency and variability.

1.5 Identify outliers and determine their relevance.

1.6 Standardize values using z-scores.

1.7 Use the 68-95-99.7 Rule for Normal Distributions.

ACTIVITIES:

Teacher directed differentiated instructional activities are ongoing and based on student need.

M&M's Statistics Project (univariate)

Water, Water Everywhere!

Case Study: Can Magnets Help Reduce Pain?

Case Study: Nielsen Ratings

Activity 1A: How fast is your heart beating?

Activity 1B: The One-variable Statistical Calculator

Activity 1C: The Mean and Median Applet

Activity 2A: A Fine Grained Distribution

Activity 2B: Roll a Normal Distribution

Activity 2C: The Normal Curve Applet

RESOURCES:

The Practice of Statistics: Third Edition 2008
Daniel Yates, David Moore, Daren Starnes

Stats: Modeling the World 2007
Bock, Velleman, De Veaux

Statistics in Practice: Second Edition 1998
Blaisdell

www.act.org
www.us.mensa.org

ASSESSMENTS:

- Observation and questioning
- Discussions
- Projects and investigations
  M & M's Statistics Project
- Mathematical writing
- Homework
- Tests

REMEDIATION:

Prentice Hall Algebra 2 Resources

College Board: So Much Data,
So Little Time
Pren Hall Alg 2, Chapter 12

ENRICHMENT:

AP Resources
www.apcentral.collegeboard.com

AP Statistics Course Description

College Board: Related Articles

Technology Toolbox: Normal Probability Plots on the TI84

Revised 8/08

COURSE: Statistics	GRADE: 12
UNIT 2: Analysis of Bivariate Data	TIME FRAME: 15 Days

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UNIT OBJECTIVES:

2.1 Construct scatter plots using pencil and paper and graphing utility.

2.2 Determine strength and direction of correlation.

2.3 Compute and interpret correlation coefficient, r.

2.4 Use graphing utility to compute linear regression equation and graph line of best fit.

2.5 Differentiate between correlation and causation.

2.6 Predict using linear regression model.

ACTIVITIES:

Teacher directed differentiated instructional activities are ongoing and based on student need.

Linear Regression Project
Linear Correlation Video
Case Study: Are Baseballs "juiced"?

Activity 3A: CSI Stats - The Case of the Missing Cookies

Activity 3B: Correlation and Regression Applet

Activity 3C: Investigating properties of the least-squares regression line

RESOURCES:

The Practice of Statistics: Third Edition 2008
Daniel Yates, David Moore, Daren Starnes

Stats: Modeling the World 2007
Bock, Velleman, De Veaux

Statistics in Practice: Second Edition 1998
Blaisdell

United Streaming (Linear Correlation)

ASSESSMENTS:

- Observation and questioning
- Discussions
- Projects and investigations
  Linear Regression Project
- Mathematical writing
- Homework
- Tests

REMEDIATION:

Prentice Hall Algebra 2 Resources

www.stat.uiuc.edu/courses/stat100/cuwu/Games.html

www.ruf.rice.edu/~lane/stat_sim/reg_by_eye/

ENRICHMENT:

AP Resources
www.apcentral.collegeboard.com

AP Statistics Course Description

College Board Related Articles

The Practice of Statistics: Third Edition 2008
Daniel Yates, David Moore, Daren Starnes

Chapter 4: More about Relationships between Two Variables

COURSE: Statistics	GRADE: 12
UNIT 3: Probability	TIME FRAME: 30 Days

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UNIT OBJECTIVES:

3.1 Use counting techniques to compute probabilities.

3.2 Recognize random outcomes in a real-world situation.

3.3 Compare and contrast odds and probability of an event.

3.4 Determine sample space for an event.

3.5 Compute experimental and theoretical probability of an event and use the Law of Large Numbers.

3.6 Compute conditional probability.

3.7 Recognize independent events.

3.8 Compute Binomial probabilities using formula and graphing utility.

3.9 Find the probability model for a discrete random variable.

ACTIVITIES:

Teacher directed differentiated instructional activities are ongoing and based on student need.

Survey Project

Activities:

Activity 6A: Austin and Sara's Game
Activity 6B: Is this Discrimination?
Activity 6C: The Spinning Wheel
Activity 6D: The proportion of heads versus count of heads
Activity 7A: The Game of Craps
Activity 7B: Means of Random Variables
Activity 8A: Everyone's Worse Nightmare

RESOURCES:

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ASSESSMENTS:

- Observation and questioning
- Presentations and discussions
- Projects and investigations
- Mathematical writing
- Homework
- Tests

REMEDIATION:

Prentice Hall Algebra 2 Resources

TI84 Calculator APPS: ProbSim
Activity Probability Simulation

ENRICHMENT:

AP Resources
www.apcentral.collegeboard.com

AP Statistics Course Description

College Board Related Articles

College Board Sampling Distributions Special Focus

Activity 8B: Mrs. Hathaway's homework offer

COURSE: Statistics	GRADE: 12
UNIT 4: Statistical Inference	TIME FRAME: 30 Days

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UNIT OBJECTIVES:

4.1 Compute margin of error and interpret its relevance.

4.2 Determine sample size necessary to meet given conditions.

4.3 Construct confidence intervals for population mean and proportion.

4.4 Test hypotheses using several methods, including tables and graphing utility.

ACTIVITIES:

Teacher directed differentiated instructional projects and activities are ongoing and based on student need.

Skittles Project

Case Study: Need Help? Give us a call!
Activity 10A: Read Any Good Books Lately?
Activity 10B: Confidence Interval Applet
Activity 10C: Comparing the z and t distributions

RESOURCES:

The Practice of Statistics: Third Edition 2008
Daniel Yates, David Moore, Daren Starnes

Stats: Modeling the World 2007
Bock, Velleman, De Veaux

Statistics in Practice: Second Edition 1998
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ASSESSMENTS:

- Observation and questioning
- Presentations and discussions
- Projects and investigations
- Mathematical writing
- Homework
- Quizzes
- Tests

REMEDIATION:

Prentice Hall Algebra 2 Resources

ENRICHMENT:

AP Resources
www.apcentral.collegeboard.com

College Board Special Focus Materials: Inference

College Board Related Articles

AP Statistics Course Description

Name________________________________ M & M's Statistics Project

A. From your bag of M & M's:

1. Total number of candies:
2. Red %
3. Blue %
4. Green %
5. Brown %
6. Yellow %
7. Orange %
8. Bar chart for color using percentages
   i. Your sample
   ii. Class sample
   iii. Manufacturer's data

B. Class Statistics

Total	Red %	Blue %	Green %	Yellow %	Brown %	Orange %

C. Statistical Calculations

1. Create a frequency table and a histogram for total per bag
2. Compute mean and standard deviation of total number per bag
3. *Writing: What do the mean and standard deviation tell you? How does this relate to the manufacturing process of M & M's candy?
4. Compute mean and standard deviation of percentage of each color
5. *Writing: What do the mean and standard deviation tell you? How does this relate to the manufacturer process of M & M's candy?

Manufacturer's Statistics

Red	20%
Blue	10%
Green	10%
Yellow	20%
Orange	10%
Brown	30%

6. Assuming that the distribution of M&M's is approximately normal, find the probability of bag having

a) more than _____ M & M's
b) less than _____ M & M's
c) between _____ and _____ M & M's

7. Assuming that the distribution of each color is approximately normal, find the probability of a bag having

a) more than _____% of _____ M & M's
b) less than _____% of _____ M & M's
c) between _____% and _____% of _____ M & M's

D) Analysis and Conclusions

- Writing: Summarize the procedures used in this project and the statistical significance of conducting such an experiment. Please give your narrative as a well-constructed three paragraph essay. Be sure to answer all of the following questions within your summary:

1. Where do you think variability in the M & M packages comes from?
2. Why is it important to be able to measure variability in a process?
3. Why is it important to find methods to reduce variability in a process?

Name_____ Skittles Project (Small Sample)

C. From your bag of Skittles:

1. Total number of candies:
2. Red
3. Yellow
4. Green
5. Purple
6. Orange

D. Class Statistics

Total	Red	Green	Yellow	Purple	Orange

C. Statistical Calculations

1. Compute mean and standard deviation of total number per bag.

2. What do the mean and standard deviation tell you? How does this relate to the manufacturing process of Skittles candy?

3. Compute mean and standard deviation of the number of each color.

4. What do the mean and standard deviation tell you? How does this relate to the manufacturing process of Skittles candy?

5. Assuming that the distribution of M&M's is approximately normal, find a 95% confidence interval for the mean number of Skittles in each bag.

6. Assuming that the distribution of each color is approximately normal, construct 90% confidence intervals for the mean number of each color of Skittles in the bag.

Red

Green

Purple

Yellow

Orange

Statistics

Guidelines for Chapter 3 Linear Regression Project

1. Find a suitable bivariate data set with at least 15 values.
2. Enter the data into EXCEL and create a scatter plot. (Highlight the data and go to insert chart). Title and Label the plot and adjust the scale so you can see the plot well. Determine whether the data appears to have a linear relationship.
3. Find the regression equation for the line of best fit. (Right click on a point in your plot and choose add trendline. Go to options and choose display equation and rsquared value). Also, find the value of r, the correlation coefficient. Interpret its value.
4. Are there any points that are outliers? How do they affect the line of best fit?
5. You will summarize your findings in writing. The following items should be included in your paper:
    a. Where did the data come from and what is it?
    b. Why did you choose the data?
    c. How strong is the correlation between the data? Does this surprise you? Why or why not? Comment on the presence of outliers, if they exist.
    d. What is the model for the data (regression equation)? Is the model reliable? For what values is the model good?
    e. Interpret the slope and y – intercept. Comment on their purpose.
6. Use the regression equation to make predictions for the trend in your data. You should do two predictions, one with a known x value and the other with a known y value. Do you think your predictions are reliable? Why, in your case, would a model of the data be helpful?

Your document should be done in Microsoft Word, with the EXCEL file copy and pasted into it. You should have a title page with your name, date period and Title for your project. Save and submit either via email or by printing a hard copy.

Chapter 4 Project

I. You will develop a simple survey from which you can collect raw data. Your survey must include at least five questions asking respondents about a certain event. You are free to decide how you wish to develop the questions. For example, you may give choices, ranking scales, short answer, etc… We will collect the data and analyze it using probability techniques. You must have at least 30 people respond to your survey. You may use all members of the Statistics class as respondents.

II. After designing and administering your survey, you will compile your results. You will need:

1. The total number of respondents
2. The total number of responses to each question
3. Two sets of "and" responses. For example count the number of surveys on which the respondent answered yes to question 1 and 5.

III. Once you have compiled your results, you will compute the following:

1. The probability of one event for each question
2. Two "or" probabilities
3. Two "and" probabilities
4. Two "conditional" probabilities
5. Identify any pairs of mutually exclusive events
6. Identify any pairs of independent events (back up mathematically)

IV. You will now create a product or service that corresponds to your survey and use the results to your survey as "market research."

1. You will need a name for your product or service
2. An ad or logo for your product or service
3. An explanation about how your survey helped you decide how to market your good or service. What should you do based on the probabilities you calculated?

Statistics Final Project

You and your team are working for a marketing company that specializes in sales of electronic devices. A leading cell phone company has just decided to begin selling a new product. They need a company to help market their product in order to maximize their profits. Your job is to interpret the data in order to create the best sales pitch for the phone. Good Luck!

Things to consider in order to be successful:

1. Demographic of target consumers (who, what?)
2. Features available on phone (which ones do you focus on?)
3. Price (what are people willing to spend?)
4. Marketing Media (radio, TV, internet, billboards, etc…)

You must prepare a marketing pitch for the cell phone company. Your goal is to be hired to market the new product. Your presentation must include the following:

1. At least one frequency table or histogram
2. At least one pie chart or bar graph
3. At least one set of "one variable statistics" with interpretation, including a box plot for the five number summary
4. At least one linear regression (with correlation coefficient and prediction)
5. At least two confidence interval estimates
6. At least one sample size calculation (for further research)

Your "marketing team" will have 10 – 12 minutes to convince the cell phone company that you have done your homework and have worked out the best marketing strategy to maximize their profits. Be prepared for a question and answer session after your presentation. "Interviews" will begin _____.

When you meet with the cell phone company, the only thing they give you is this printout of data that they gathered from a recent survey…

Key:

S – Student
CS – College Student
H – Stay at Home
P – Professional

Price:
A: $0 to $49.99 B: $50 to $99.99 C: $100 to $149.99 D: $150 to $199.99
E: over $200

The Data:

Age of Person	Job	Total mins. per month	Text msgs per month	Pic msgs per month	Games	Internet access	Music dwnld	Blue tooth	Price
13	S	600	200	50	N	N	N	N	A
14	S	550	175	25	N	N	N	N	A
15	S	750	100	15	N	N	N	N	A
15	S	900	300	50	Y	N	Y	N	B
17	S	950	350	20	N	N	Y	N	B
17	S	875	600	10	Y	Y	N	N	A
18	S	1050	550	10	Y	N	Y	Y	C
18	CS	1200	825	20	Y	Y	Y	N	C
20	CS	950	750	0	N	N	N	N	A
21	CS	1100	400	15	Y	N	Y	N	B
21	CS	1250	600	25	Y	Y	Y	Y	C
22	CS	1400	350	10	Y	Y	Y	N	D
24	P	1200	400	5	Y	N	N	N	C
24	P	950	200	0	Y	N	N	N	B
25	H	700	175	40	N	N	N	Y	A
26	P	1200	200	5	N	Y	Y	Y	C
26	H	800	75	0	N	N	N	N	A
27	H	875	100	0	N	Y	N	N	B
28	P	1400	400	15	Y	Y	Y	Y	E
29	P	1350	250	5	N	N	Y	Y	C
30	P	900	300	50	Y	N	N	Y	B
32	P	1325	175	15	N	Y	N	Y	C
35	H	850	50	10	N	N	N	N	A
36	H	750	100	0	N	N	N	N	A
36	H	1000	225	30	N	N	Y	N	B
36	P	1275	100	10	N	Y	Y	Y	D
37	P	1075	75	5	N	N	N	N	C
38	H	650	50	0	N	N	N	N	A
40	H	400	25	0	N	N	N	N	A
40	P	900	75	5	N	N	N	N	A
41	P	875	100	10	Y	N	N	N	A
42	P	1200	375	0	Y	Y	Y	Y	C
44	P	1075	200	15	N	Y	N	Y	B
45	H	550	100	10	N	N	N	N	A
46	H	300	0	0	N	N	N	N	A
46	H	700	25	1	N	N	N	N	B
50	P	1125	100	5	Y	Y	N	Y	D

Name_____ Combinations and Permutations

Combination Formula: $C(n,r) = \dfrac{n!}{r!(n-r)!}$

Use the combination formula BY HAND to evaluate the expressions.

1. C(12, 8)

2. C(5, 3)

3. C(15, 8)

4. C(10, 10)

5. C(8, 1)

6. C(11, 6)

Solve the problem using the multiplication rule or combination formula or both.

1. A pizza shop sells a super combo that consists of any 5 different ingredients. If the shop offers a choice of 13 ingredients, in how many ways can one order a super combo?

2. A landscaper is going to plant four evergreens that will be located in the front, in the back, and on each side of a house. On his truck there are a Douglas fir, a Frazier fir, a blue spruce, and a scotch pine. In how many different arrangements can the four trees be planted?

3. Three couples have purchased six adjoining seats at a football game.
   a. In how many different ways can they be seated if there are no restrictions on their placement?

   b. In how many ways can they be seated if the three guys want to sit together and the three women want to sit together?

4. An investment club consists of 11 men and 9 women. Five members will be selected at random from the 20.

   a. In how many ways can the sample be selected?

   b. In how many ways can the sample be selected so that it consists of 3 men and 2 women?

   c. Find the probability that the sample of 5 will consist of 3 men and 2 women.