Francis Howell School District
Mission Statement

Francis Howell School District is a learning community where all students reach their full potential.

Vision Statement

Francis Howell School District is an educational leader that builds excellence through a collaborative culture that values students, parents, employees, and the community as partners in learning.

Values

Francis Howell School District is committed to:

- Providing a consistent and comprehensive education that fosters high levels of academic achievement for all
- Operating safe and well-maintained schools
- Promoting parent, community, student, and business involvement in support of the school district
- Ensuring fiscal responsibility
- Developing character and leadership

Francis Howell School District Graduate Goals

Upon completion of their academic study in the Francis Howell School District, students will be able to:

1. Gather, analyze and apply information and ideas.
2. Communicate effectively within and beyond the classroom.
3. Recognize and solve problems.
4. Make decisions and act as responsible members of society.

Mathematics Graduate Goals

Upon completion of their mathematics study in the Francis Howell School District, students will be able to:

1. Communicate mathematically
2. Reason mathematically
3. Make mathematical connections
4. Use mathematical representations to model and interpret practical situations

Mathematics Rationale for Statistics

As the economics of world trade comes to depend more heavily on accurate and timely information, it becomes ever more important to have an understanding of statistics. In modern courtrooms, jurors are bombarded with language from the field of statistics. Credit, debt, sales, marketing, research, medicine, education, investments, politics, manufacturing, and other careers all make use of statistics and so, it is important to have some feel for how data is collected and how statistics are calculated and interpreted. Statistics is useful to many professions and permeates a wide variety of other areas of study. Statistics involves experiments, communication, and collaboration. The study of statistics contributes to the development of a well-rounded and informed critical thinker.

Course Description for Statistics

This course is an introduction to elementary statistics including a wide variety of applications. It is appropriate for many disciplines such as medicine, psychology, business, computer science, education, agriculture and engineering. ***TI -83 or higher graphing calculator is required***

Curriculum Team

Keith Looten
Steve Willott

Secondary Content Leader	Keiren Greenhouse
Director of Student Learning	Sharon Wall
Chief Academic Office	Dr. Pam Sloan
Superintendent	Dr. Renee Schuster

CURRICULUM MAP – CONCEPTS
STATISTICS

Chapter/Concepts	Number of Days (including review and test)
SEMESTER	
Surveys – Chapter 12 Vocabulary; random number tables; sampling variability – simple random sample, convenience sample, other sampling	4
Experiments – Chapter 13 Observations versus experiment; causation	4
Data – Chapter 2 Vocabulary	3
Categorical Data – Chapter 3 Frequency; bar chart; histogram	3
Quantitative – Chapter 4 Histogram; stem-and-leaf	4
Distributions Numerically – Chapter 5 Measures of central tendency – mean, median; box plots; variation – standard deviation, IQR	4
Standard Deviation – Chapter 6 Standardized scores – z scores; imperical rule (68 – 95 – 99.7)	5
Scatter plots, Association and Correlation – Chapter 7 Scatter plots – correlation coefficient	4
Linear Regression – Chapter 8 Least squares/line of best fit; interpretation of R^2	4
Probability and Probability Rules – Chapter 14 and Chapter 15 Vocabulary; Venn diagrams and set notation; tables; tree diagrams; addition rule; multiplication rule; complement rule; conditional probability – independent, dependent	10
Random Variables – Chapter 16 Single discrete random variables – mean, variance, standard deviation (no linear transformations)	5

Distribution Models – Chapter 18 Sampling distribution – mean, proportion; central limit theorem; standard error	4
Confidence Intervals – Chapter 19 One-proportion z-interval; margin of error; critical value; conditions for inference	4
Hypothesis Testing – Chapter 20 Alternative hypothesis; null hypothesis; one-proportion z-test; one-sided alternative; p-value; two-sided alternative	5
More about Tests – Chapter 21 Statistically significant; alpha level; significance; level; critical value	<1, often skipped or incorporated into other chapters
Comparing Two-Proportions – Chapter 22 Two-proportion z-interval; two-proportion z-test; conditions for inference	5
Inferences about Means – Chapter 23 T-distribution; degrees of freedom; one sample t-interval; one sample t-test for the mean	5

Content Area: Mathematics	Course: Statistics	Strand: Data and Probability 1
Learner Objectives: Students will obtain, organize and interpret data.		

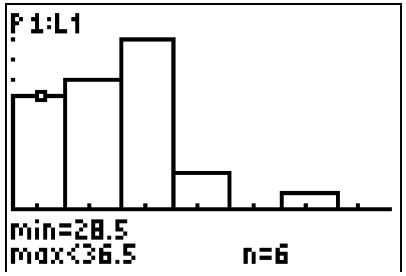
Concepts:
A: Classify and organize data
B: Represent and interpret data
C: Describe and analyze data

Students Should Know	Students Should Be Able to
• Identify different shapes of distributions • Identify differences between observational studies and experiments • Classify between categorical and quantitative data	• Identify appropriate measure of center and spread for each distribution shape (MA 3, 3.2, DOK 2) • Describe a simulation so others can repeat the simulation (MA 3, 3.5, DOK 2)

Instructional Support

Student Essential Vocabulary					
Data	Skew	Quantitative Variable	Distribution	Bar Chart	Matched Pairs
Pie Chart	Cluster	Conditional Distribution	Histogram	Stem-and-Leaf	Confounding
Categorical Variable	Symmetric	Outliers	Random	Simulation	Placebo Effect
Population	Sample	Sampling Frame	Census	Survey	Placebo
Statistic	Bias	Response Bias	Non-response Bias	Stratified	Double Blind
Systematic	Convenience	Variability	Observational Study	Prospective	Single Blind
Experiment	Factor	Level	Response Variable	Statistically Significant	Blinding
Marginal Distribution	Mean	Median	Mode	Range	Standard Deviation
Interquartile Range (IQR)	Spread	5 Number Summary	Variance	Box Plot	

Sample Learning Activities	Sample Assessments
Learning Activity #1 : The data gives the total length in minutes of 25 music CDs. 42.1 33.6 45.0 38.2 56.7 51.3 36.0 39.2 48.6 40.0 28.5 32.5 52.3 46.2 37.1 45.0 29.4 38.6 52.9 76.3 42.1 34.9 47.1 49.2 50.0 ● Find the mean, median, standard deviation, and IQR of the length of the music CD's. ● Determine any outliers. ● Create a histogram or stem and leaf plot of the data. ● Which measures of center and spread are appropriate? Solution: ● mean = 43.7, median = 42.1, standard deviation = 10.21, IQR = 13.05 ● 76.3 is an outlier ○ IQR = 49.6-36.55 = 13.05 ○ (13.05)(1.5) = 19.6 ○ Q3 + 19.6 = 49.6 + 19.6 = 69.2 ○ 76.3 > 69.2	**Assessment #1:** The data gives a list of 30 heights of mathematics students. 70 72 71 70 69 73 69 68 70 71 67 71 70 74 69 68 71 71 71 72 69 71 68 67 73 74 70 71 69 68 ● Find the mean, median, standard deviation, and IQR of the length of the music CD's. ● Determine any outliers. ● Create a histogram or stem and leaf plot of the data. ● Which measures of center and spread are appropriate? Solution ● mean = 70.23, median = 70, standard deviation = 1.89, IQR = 2 ● There are no outliers ○ IQR = 71 - 69 = 2 ○ (2)(1.5) = 3 ○ Q3 + 3 = 71 + 3 = 74 ○ 74 ≤ 74 ○ & Q1 – 3 = 69 -3 = 66 ○ 66 ≤ 67

- 

, or other appropriate graph.
- Mean and standard deviation because the overall pattern is symmetric

Or

- Median and IQR because the overall pattern is skewed

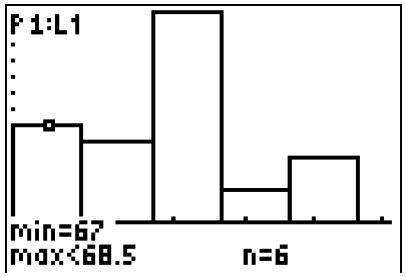
Activity's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.8 Organize data and ideas 3.2 Apply others' strategies
DOK	2
INSTRUCTIONAL STRATEGIES	Nonlinguistic representation Organizing ideas

Learning Activity #2:

A baseball pitcher throws 60% strikes. Explain how you could use a table of random numbers to simulate what his first batter faced. Determine whether he throws 3 strikes before he throws 4 balls (non-strikes).

Solution: Answers will vary but will have certain commonalities.

Student must have a numbering scheme that represents 60% of the possible numbers as strikes and 40% as non-strikes. (i.e., 0-5 = strike and 6-9 = non-strike).
Students must have a stopping rule. (i.e. stating that they draw numbers from the table until they reach 3 strikes or 4 non-strikes.)
Students must correlate the values in the table to the outcomes (i.e. strikes or non-strikes)

- 

, or other appropriate graph.
- Mean and standard deviation because the overall pattern is symmetric

Or

- Median and IQR because the overall pattern is skewed

Assessment's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.8 Organize data and ideas 3.2 Apply others' strategies
DOK	2
LEVEL OF EXPECTATION	Mastery Level – 85%

Assessment #2:

A student decides to guess on a 10 question multiple choice quiz with 5 choices per question. Explain how you could use a table of random numbers to simulate his score on this quiz. Calculate his percentage correct.

Solution: Answers will vary but will have certain commonalities.

Student must have a numbering scheme that represents 20% of the possible numbers as being correct answers and 80% as incorrect answers. (i.e., 1 = correct answer and 2-5 = incorrect answer).
Students must have a stopping rule. (i.e. stating that they draw numbers from the table until they have 10 valid numbers)
Students must correlate the values in the table to the outcomes (i.e. correct versus incorrect answers)

Students must state a conclusion in context. (i.e. "My simulation indicates that the batter struck out." Or "My simulation indicates that the batter walked.")

In situations where a simulation is used to estimate a mean or probability, students must also calculate the appropriate statistic. (i.e. the mean or proportion)

Example using line 1 in Stats: Modeling the World

"I choose 0-5 = strike and 6-9 = non-strike. And I'll pick numbers until the batter gets 3 strikes or 4 non-strikes.
9 6 2 9 9 0 7 1 9 6
NNSNN |
Therefore, this batter walked, based on my simulation."

Activity's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	3.2 Apply others' strategies 3.5 Reason logically (inductive/deductive)
DOK	2
INSTRUCTIONAL STRATEGIES	Generating and testing hypotheses

Students must state a conclusion in context. (i.e. "My simulation indicates the student got 3 out of 10 correct or 30% correct")

Example using line 1 in Stats: Modeling the World

"I choose 1 = Correct answer and 2-5 = Incorrect answers. I will ignore all digits 6-9 & 0, and will allow repeats. And I'll pick numbers until I've chosen 10 valid numbers.
9 6 2 9 9 0 7 1 9 6 9 8 6 4 2 2 0 6 3 9 2 3 1 8 5
N N I N N N N C N N N N N I I I N N I N I I C N I |
Therefore, this student got 2 out of 10 or 20% on the quiz, based on my simulation."

Assessment's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	3.2 Apply others' strategies 3.5 Reason logically (inductive/deductive)
DOK	2
LEVEL OF EXPECTATION	Mastery Level – 70%

Student Resources	Teacher Resources
Pearson/Addison Wesley; Stats: Modeling the World; © 2003, Bock, Velleman, DeVeaux; ISBN # 0-13-187621-X Chapter 1 – Stats Starts Here Chapter 2 – Data Chapter 3 – Displaying and Describing Categorical Data Chapter 4 – Displaying Quantitative Data Chapter 5 – Describing Distributions Numerically Chapter 12 – Sample Surveys Chapter 13 – Experiments and Observational Studies	Pearson/Addison Wesley; Stats: Modeling the World; © 2003, Bock, Velleman, DeVeaux

Identity Equity and Readiness			
Gender Equity		Technology Skills	
Racial/Ethnic Equity		Research/Information	
Disability Equity		Workplace/Job Prep	

Content Area: Mathematics	**Course: Statistics**	**Strand: Data and Probability 2**
Learner Objectives: Students will analyze and summarize data.		

Concepts:
- A: Describe and analyze data
- B: Represent and interpret data
- C: Represent data algebraically
- D: Analyze basic statistical techniques

Students Should Know	Students Should Be Able to
● Understand properties of a normal model ● Represent and describe the relationship between bivariate data ● Know central limit theorem is used to describe the sampling distribution of the mean ● Know what a probability distribution is	● Compute summary statistics for quantitative data (MA 3, 3.3, DOK 2) ○ Measures of central tendency ○ Measures of spread ○ Correlation ● Calculate (MA 3, 1.6, DOK 2)

	○ the z-score of an observation ○ normal probabilities ○ parameters for the sampling distribution of the mean ○ mean and standard deviation of a probability distribution

Instructional Support

Student Essential Vocabulary					
Center	Midrange	Median	Mean	Spread	Range
Interquartile Range (IQR)	Quartile	Percentile	Parameter	Statistic	Variance
Standard Deviation	Box Plot	Mode	Standardized Value	Z Score	Normal
68-95-99.7 Rule	Normal Probability Plot	Scatter Plot	Form	Direction	Strength
Outlier	Influential Point	Explanatory	Response	Correlation	Model
Causation	Regression	Association	Prediction	Residual	Residual Plot
Line of Best Fit	Slope	R^2	Extrapolation	Continuous	Discrete
Probability Model	Probability Distribution	Expected Value	Proportion	Sampling Distribution	Central Limit Theorem
Standard Error	5 Number Summary				

Sample Learning Activities	**Sample Assessments**
Learning Activity #1 : The data gives the total length in minutes of 25 music CDs. 42.1 33.6 45.0 38.2 56.7 51.3 36.0 39.2 48.6 40.0 28.5 32.5 52.3 46.2 37.1 45.0 29.4 38.6 52.9 76.3 42.1 34.9 47.1 49.2 50.0 ● Find the mean, median, mode, range, standard deviation, 5 number summary, and IQR of the length of the music CD's. ● Determine any outliers.	**Assessment #1:** The data gives the number of wild turkeys in neighborhoods around a large urban area. 1 2 5 11 16 43 ● Find the mean, median, mode, range, standard deviation, 5 number summary, and IQR of the length of the wild turkeys. ● Determine any outliers. ● What effect does the outlier have on the mean, median, and mode of this data? Solution:

- What effect does the outlier have on the mean, median, and mode of this data?

Solution:

- mean = 43.7, median = 42.1, mode = 42.1 and 45 (bimodal), range = 47.8, standard deviation = 10.21, IQR = 13.05, 5 number summary: min= 28.5, Q1 = 36.55, median = 42.1, Q3 = 49.6, max = 76.3
- 76.3 is an outlier
  - IQR = 49.6-36.55 = 13.05
  - (13.05)(1.5) = 19.6
  - Q3 + 19.6 = 49.6 + 19.6 = 69.2
  - 76.3 > 69.2
- Data without outlier:
  - mean = 42.4; The outlier increased the mean by 1.3 min.
  - median = 42.1; The outlier had no effect.
  - mode = 42.1 and 45; The outlier had no effect

Activity's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	3.2 Apply others' strategies 3.3 Apply one's own strategies
DOK	2
INSTRUCTIONAL STRATEGIES	Homework and practice Skills and processes

Learning Activity #2:

- mean = 13, median = 8, mode = NO MODE, range = 42, standard deviation = 15.76, IQR = 14, 5 number summary: min = 1, Q1 = 2, median = 8, Q3 = 16, max = 43
- 43 is an outlier
  - IQR = 16 – 2 = 14
  - (14)(1.5) = 21
  - Q3 + 21 = 16 + 21 = 37
  - 43 > 37
- Data without outlier:
  - mean = 7; The outlier increased the mean by 6.
  - median = 5; The outlier increased the median by 3.
  - mode = NO MODE; The outlier had no effect

Assessment's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	3.2 Apply others' strategies 3.3 Apply one's own strategies
DOK	2
LEVEL OF EXPECTATION	Mastery Level – 80%

Assessment #2:

The table below lists the number of registered automatic weapons (in thousands), along with the murder rate (in murders per 100,000), for 8 randomly selected states from the United States. Use the data to answer the following questions.

Automatic Weapons (x)	11.6	8.3	3.6	0.6	6.9	2.5	2.4	2.6
Murder Rate (y)	13.1	10.6	10.1	4.4	11.5	6.6	3.6	5.3

a. What is the correlation coefficient?
b. What is the linear regression equation?

Solution:
a. r = 0.885
b. equation: murder rate = 4.047 + 0.853 (automatic weapons)

Activity's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.6 Discover/evaluate relationships
DOK	2
INSTRUCTIONAL STRATEGIES	Identifying similarities and differences

Learning Activity #3

The mean IQ is normally distributed with a mean of 100 and a standard deviation of 15.

a. What is the z-score for an individual with an IQ of 105?
b. What is the probability of getting an individual with an IQ above 105?

The table below lists the number of packs of cigarettes smoked, along with the life span (in years) from 8 randomly selected men from the United States. Use the data to answer the following questions.

Packs Smoked	4.6	3.8	3.6	0.6	6.9	2.5	2.4	2.6
Life Span	48.3	54.8	53.9	63.1	50.8	58.3	57.7	56.0

a. What is the correlation coefficient?
b. What is the linear regression equation?

Solution:
a. r = -0.873
b. equation: life expectancy = 62.638 + -2.156 (packs smoked)

Assessment's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.6 Discover/evaluate relationships
DOK	2
LEVEL OF EXPECTATION	Mastery Level – 90%

Assessment #3

Corn production in a certain state is normally distributed with a mean of 13.7 million bushels a year and a standard deviation of 1.8 million bushels.

a. What is the z-score for an individual year with a production level of 15 million bushels?

c. Using the Central Limit Theorem, what are the mean and standard deviation for IQ of a group of 50 people?

Solution:

a. z = (105-100)/15 = 0.33333333333333

b. Using the calculator or table of standard normal probabilities, the probability is 0.3694

c. Mean is 100, standard deviation is $\frac{15}{\sqrt{50}}$ = 2.121

Activity's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.10 Apply information, ideas and skills 3.7 Evaluate strategies
DOK	2
INSTRUCTIONAL STRATEGIES	Summarizing and note taking

Learning Activity #4

Find the mean and standard deviation for the following probability distribution:

X	P(x)
2	.33
5	.21
8	.15
12	.31

Solution:

By hand or from calculator: Mean= 6.63 and standard deviation = 4.105

b. What is the probability of getting an individual with a production level of over 15 million bushels?

c. Using the Central Limit Theorem, what are the mean and standard deviation for corn production for a group of 5 years?

Solution:

a. z = (15-13.7)/1.8 = 0.72

b. Using the calculator or table of standard normal probabilities, the probability is 0.2351

c. Mean is 13.7, standard deviation is $\frac{1.8}{\sqrt{5}}$ =0.805

Assessment's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.10 Apply information, ideas and skills 3.7 Evaluate strategies
DOK	2
LEVEL OF EXPECTATION	Mastery Level – 80%

Assessment #4

Find the mean and standard deviation for the following probability distribution:

X	P(x)
3	.33
6	.21
9	.12
13	.31

Solution:

By hand or from calculator: Mean= 7.59 and standard deviation = 4.161

Activity's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.10 Apply information, ideas and skills
DOK	2
INSTRUCTIONAL STRATEGIES	Homework and practice

Assessment's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.10 Apply information, ideas and skills
DOK	2
LEVEL OF EXPECTATION	Mastery Level – 75%

Student Resources	Teacher Resources
Pearson/Addison Wesley; Stats: Modeling the World; © 2003, Bock, Velleman, DeVeaux; ISBN # 0-13-187621-X Chapter 6 – The Standard Deviation as a Ruler and the Normal Model Chapter 7 – Scatter Plots, Association, and Correlation Chapter 16 – Random Variables Chapter 18 – Sampling Distribution Models	Pearson/Addison Wesley; Stats: Modeling the World; © 2003, Bock, Velleman, DeVeaux

Identity Equity and Readiness			
Gender Equity		Technology Skills	
Racial/Ethnic Equity		Research/Information	
Disability Equity		Workplace/Job Prep	

Content Area: Mathematics	Course: Statistics	Strand: Data and Probability 3
Learner Objectives: Students will draw conclusions based on a statistical model.		

Concepts:
A: Formulate questions
B: Represent and interpret data
C: Represent data algebraically
D: Develop and evaluate inferences

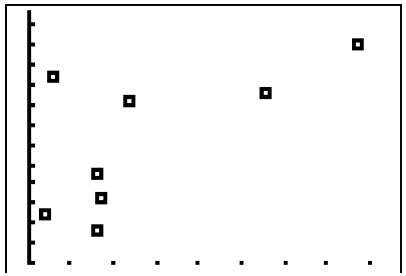
Students Should Know	Students Should Be Able to
● Know that they cannot fit linear models to a relationship between variables that are not linear ● Know that a confidence interval is an estimate of a population parameter ● Identify and use the alternative hypothesis when testing hypotheses	● Use regression to predict a value of *y* for a given *x* (MA 3, 3.5, DOK 2) ● Construct a confidence interval for (MA 3, 3.1, DOK 2) ○ population mean ○ population proportion ○ difference of 2 proportions ● Calculate the margin of error or necessary sample size (MA 3, 3.1, DOK 2) ● Perform a hypothesis test for (MA 3, 1.7, DOK 2) ○ one proportion ○ mean ○ two proportion

Instructional Support

Student Essential Vocabulary					
Scatter Plot	Form	Direction	Strength	Outlier	Influential Point
Explanatory	Response	Correlation	Model	Causation	Regression
Association	Prediction	Residual	Residual Plot	Line of Best Fit	Slope
R^2	Extrapolation	Proportion	Confidence	Margin of Error	Critical Value
Independence	Confidence Level	Retain	Reject	Hypothesis	Null
P Value	One-sided	Two-sided	Test Statistic	Alternative	Statistically Significant
Significance Level	Alpha	Type I Error	Type II Error	Power	Comparing Two Proportions

Interval	Test	T-Distribution	Degrees of Freedom	Standard Error	

Sample Learning Activities	Sample Assessments
Learning Activity #1 : 1. The table below lists the number of registered automatic weapons (in thousands), along with the murder rate (in murders per 100,000), for 8 randomly selected states from the United States. Use the data to answer the following questions. Automatic Weapons: 11.6, 8.3, 3.6, 0.6, 6.9, 2.5, 2.4, 2.6 Murder Rate: 13.1, 10.6, 10.1, 4.4, 11.5, 6.6, 3.6, 5.3 a. Which of the variables is explanatory and which is the response? b. Create a scatter plot for the data. Make sure to label your axes. c. What is the correlation coefficient? d. Based on the results for b & c, would a linear model be a good fit? Explain. e. What is the linear regression equation? f. Using the equation in (e), what is your prediction for murder rate for a state with 10 thousand registered automatic weapons? Solution: a. Automatic weapons is the explanatory variable and the murder rate is the response variable.	**Assessment #1:** The table below lists the number of packs of cigarettes smoked, along with the life span (in years) from 8 randomly selected men from the United States. Use the data to answer the following questions. Packs Smoked: 4.6, 3.8, 3.6, 0.6, 6.9, 2.5, 2.4, 2.6 Life Span: 48.3, 54.8, 53.9, 63.1, 50.8, 58.3, 57.7, 56.0 a. Which of the variables is explanatory and which is the response? b. Create a scatter plot for the data. Make sure to label your axes. c. What is the correlation coefficient? d. Based on the results for b & c, would a linear model be a good fit? Explain. e. What is the linear regression equation? f. Using the equation in (e), what is your prediction for life expectancy for someone who smokes 3 packs a day? Solution: a. Packs smoked is the explanatory variable and the life expectancy is the response variable.



b. with x-axis labeled accordingly for the data concerning automatic weapons, and the y-axis labeled accordingly for the murder rate.

c. r = 0.885

d. Answers may vary. i.e. Yes, a linear model would be a good fit because the scatter plot is relatively linear and r is fairly strong.

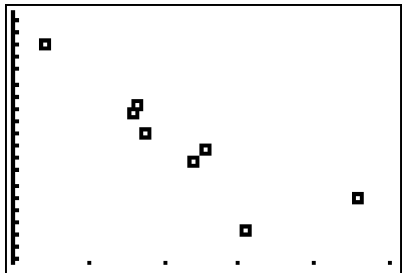
OR

No, a linear model would not be a good fit either because the scatter plot does not look linear enough, r is not strong enough, or both.

e. murder rate = 4.047 + 0.853 (automatic weapons)

f. murder rate = 4.047 + 0.853(10) = 12.57

Activity's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.10 Apply information, ideas, and skills 3.5 Reason logically (inductive/deductive)



b. with x-axis labeled accordingly for the data concerning the smoking rate and the y-axis labeled accordingly for the life expectancy.

c. r = -0.873

d. Answers may vary. i.e. Yes, a linear model would be a good fit because the scatter plot is relatively linear and r is fairly strong.

OR

No, a linear model would not be a good fit either because the scatter plot does not look linear enough, r is not strong enough, or both.

e. packs smoked = 62.638 + - 2.156 (life expectancy)

f. packs smoked = 62.638 = -2.156(3) = 56.171

Assessment's Alignment	
CONTENT	MA 3 Data analysis

DOK	2
INSTRUCTIONAL STRATEGIES	Nonlinguistic representations

Learning Activity #2:

Of 92 adults selected randomly from one town, 68 have health insurance. Find a 90% confidence interval for the true population proportion of adults in town who have health insurance.

Solution: (0.664, 0.814) and the sample proportion is 0.739, with margin of error 0.075.

Activity's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.10 Apply information, ideas, and skills 3.1 Identify and define problems 3.3 Apply one's own strategies
DOK	2
INSTRUCTIONAL STRATEGIES	Generating hypotheses

Learning Activity #3

A survey of shoppers is planned to see what percentage use credit cards. Find the minimum sample size you should use to have a confidence level of 95% and a margin of error of 0.02.

a. Assume a prior study suggests 61% of shoppers use credit cards.
b. Assume we have no idea what percentage of shoppers might use credit cards.

Solution:

PROCESS	1.10 Apply information, ideas, and skills 3.5 Reason logically (inductive/deductive)
DOK	2
LEVEL OF EXPECTATION	Mastery Level – 75%

Assessment #2:

Of 182 students selected randomly from one school, 130 drive. Find a 98% confidence interval for the true population proportion of students in school who drive.

Solution: (0.636, 0.792) and the sample proportion is 0.714, with margin of error 0.078.

Assessment's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.10 Apply information, ideas, and skills 3.1 Identify and define problems 3.3 Apply one's own strategies
DOK	2
LEVEL OF EXPECTATION	Mastery Level - 75%

Assessment #3

A survey of shoppers is planned to see what percentage use coupons. Find the minimum sample size you should use to have a confidence level of 95% and a margin of error of 0.03.

a. Assume a prior study suggests 48% of shoppers use coupons.
b. Assume we have no idea what percentage of shoppers might use coupons.

a. n = 2285
b. n = 2401

Activity's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.10 Apply information, ideas, and skills 3.1 Identify and define problems 3.3 Apply one's own strategies
DOK	2
INSTRUCTIONAL STRATEGIES	Cooperative learning

Learning Activity #4

Tests on 12 television stands were originally tested and found to have a mean failure weight of 313 lbs with a standard deviation of 11 lbs. At the 0.01 significance level, test the manufacturers claim that their stands can hold more than 300 lbs.

Solution:
Ho: mu = 300
Ha: mu > 300
Right tailed t = 4.094 or suitable sketch of symmetric density curve
p-value = 0.0009
p<alpha, so we reject Ho.

Solution:

a. n = 1066
b. n = 1068

Assessment's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.10 Apply information, ideas, and skills 3.1 Identify and define problems 3.3 Apply one's own strategies
DOK	2
LEVEL OF EXPECTATION	Mastery Level - 90%

Assessment #4

SAT scores of 31 students with ESL are normally distributed with a mean of 898 and a standard deviation of 125. At the 0.05 significance level, test the claim that their scores are different from the mean of 925 the rest of those taking the test receive.

Solution:
Ho: mu = 925
Ha: mu ≠ 925
Two tailed t = -1.203 or suitable sketch of symmetric density curve
p-value = 0.239

The manufacturer's claim seems to be appropriate. (Or other non-definitive statement that one should believe that the stand should hold at least 300 lbs.)

Activity's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.3 Design/conduct investigations 1.5 Comprehend/evaluate resources 1.7 Evaluate information 3.3 Apply one's own strategies 3.5 Reason logically (inductive/deductive)
DOK	3
INSTRUCTIONAL STRATEGIES	Identifying similarities and differences

p>alpha, so we fail to reject Ho.
There is not enough evidence to conclude that their scores are significantly different. (Or other non-definitive statement that one should believe that their scores do NOT vary significantly from the general population.)

Assessment's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.3 Design/conduct investigations 1.5 Comprehend/evaluate resources 1.7 Evaluate information 3.3 Apply one's own strategies 3.5 Reason logically (inductive/deductive)
DOK	3
LEVEL OF EXPECTATION	Mastery Level - 70%

Student Resources	Teacher Resources
Pearson/Addison Wesley; Stats: Modeling the World; © 2003, Bock, Velleman, DeVeaux; ISBN # 0-13-187621-X Chapter 8 – Linear Regression Chapter 19 – Confidence Intervals for Proportions Chapter 20 – Testing Hypotheses About Proportions	Pearson/Addison Wesley; Stats: Modeling the World; © 2003, Bock, Velleman, DeVeaux

Chapter 21 – More About Tests Chapter 22 – Comparing Two Proportions	

Identity Equity and Readiness			
Gender Equity		Technology Skills	
Racial/Ethnic Equity		Research/Information	
Disability Equity		Workplace/Job Prep	

Content Area: Mathematics	**Course: Statistics**	**Strand: Data and Probability 4**
Learner Objectives: Students will apply rules of probability		

Concepts: A: Apply basic concepts of probability
B: Use and describe compound events

Students Should Know	Students Should Be Able to
● Know basic definitions and rules of probability ● Know when events are disjoint or independent	● Apply (MA 3, 3.5, DOK 2) o addition rule o multiplication rule o complement rule ● Calculate conditional probability (MA3, 3.5, DOK 2)

Instructional Support

Student Essential Vocabulary					
Event	Disjoint (Mutually Exclusive)	Independence	Probability	Expected Value	Discrete Random Variable
Complement	Addition Rule	Multiplication Rule	Venn Diagram	Tree Diagram	Continuous Random Variable

Sample Learning Activities	Sample Assessments
Learning Activity #1 : a. Based on the table above, what is the probability of choosing someone who has taken a placebo or was in the control group? b. Based on the table above, what is the probability of choosing someone who had a headache, given that they used Seldane?	**Assessment #1:** The probability of owning a television is 82%, the probability of owning a car is 78%, while the probability of owning both is 67%. a. What is the probability of owning neither a TV nor a car? b. What is the probability of owning both a TV and a car? c. What is the probability of owning a television but no car? d. Given that a person owns a car, what is the probability that they also own a TV?

	Seldane	Placebo	Control Group	Total
Headache	49	49	24	122
No Headache	732	616	602	1950
Total	781	665	626	2072

Solution:

a. probability = 0.6231
b. probability = 0.0627

Activity's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.10 Apply information, ideas and skills 3.3 Apply one's owns strategies 3.5 Reason logically (inductive/deductive) 3.7 Evaluate strategies
DOK	2
INSTRUCTIONAL STRATEGIES	Cooperative learning

Learning Activity #2:

a. What is the probability of getting the first 3 questions correct by guessing on a multiple choice test with 5 choices for each question?
b. If a coin is bent and the probability of flipping a head is 7/9, what's the probability that someone flips a tail on that coin?

Solution**:**

a. probability = 0.008
b. probability = 2/9

Activity's Alignment	
CONTENT	MA 3 Data analysis

e. Are owning a TV and car independent of each other? Explain.

Solution:

a. probability = 0.07
b. probability = 0.93
c. probability = 0.15
d. probability = 0.8590
e. No. (0.82)(0.78) ≠ 0.67 or some other suitable explanation

Assessment's Alignment	
CONTENT	MA 3 Data analysis
PROCESS	1.10 Apply information, ideas and skills 3.3 Apply one's owns strategies 3.5 Reason logically (inductive/deductive) 3.7 Evaluate strategies
DOK	3
LEVEL OF EXPECTATION	Mastery Level – 70%

Assessment #2:

a. Assuming the probability of having a boy is actually 51% rather than 50%, what is the probability of getting four boys in a row?
b. The probability of rolling a 7 or 11 in a craps game is 2/9. What is the probability of not rolling a 7 or 11?

Solutions:

a. probability = 0.1327
b. probability = 7/9

Assessment's Alignment

PROCESS	1.10 Apply information, ideas and skills 3.3 Apply one's owns strategies 3.5 Reason logically (inductive/deductive) 3.7 Evaluate strategies
DOK	2
INSTRUCTIONAL STRATEGIES	Homework and practice

CONTENT	MA 3 Data analysis
PROCESS	1.10 Apply information, ideas and skills 3.3 Apply one's owns strategies 3.5 Reason logically (inductive/deductive) 3.7 Evaluate strategies
DOK	2
LEVEL OF EXPECTATION	Mastery Level – 85%

Student Resources	Teacher Resources
Pearson/Addison Wesley; Stats: Modeling the World; © 2003, Bock, Velleman, DeVeaux; ISBN # 0-13-187621-X Chapter 11 – Understanding Randomness Chapter 14 – From Randomness to Probability Chapter 15 – Probability Rules	Pearson/Addison Wesley; Stats: Modeling the World; © 2003, Bock, Velleman, DeVeaux

Identity Equity and Readiness			
Gender Equity		Technology Skills	
Racial/Ethnic Equity		Research/Information	
Disability Equity		Workplace/Job Prep	