STATISTICS CURRICULUM

FARMINGDALE UFSD

FARMINGDALE HIGH SCHOOL

MATHEMATICS DEPARTMENT

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I. Introduction/Statement of Purpose

In keeping with the New York State Learning Standards for Mathematics and the National Council of Teachers of Mathematics (NCTM) Learning Standards, Farmingdale High School Mathematics Department offers a half-year (one semester) course in Statistics.

The general goals of this course are to promote Mathematics as problem solving, communication, reasoning, and a means of connecting ideas. In addition, this course addresses the NCTM Grades 9-12 Standard 10 in particular. That is, this curriculum includes the continued study of data analysis and statistics so that all students can:

Construct and draw inferences from charts, tables, and graphs that summarize data from real-world situations.
Use curve fitting to predict from data;
Understand and apply measures of central tendency, variability, and correlation;
Understand sampling and recognize its role in statistical claims;
Design a statistical experiment to study a problem, conduct the experiment, and interpret and communicate the outcomes;
Analyze the effects of data transformations on measures of central tendency and variability;
Transform data to aid in data interpretation and prediction;
Test hypotheses using appropriate statistics.

The concepts of this Statistics Course will be taught using supplementary materials in conjunction with technology, reading/writing, manipulatives, career/real life examples, interdisciplinary connections, and research as vehicles to aid and enhance student understanding.

This project was initiated in order to update the use of technology in the curriculum. Over the last ten years computer and calculator software has greatly expanded statistical capabilities for the beginning statistics student. Textbooks have finally incorporated these capabilities in a useful way.

II. Goals and Objectives

The goals of this curriculum writing project are to design and develop a scope and sequence (including content outline, skills and concepts), units of instruction (including learning activities and suggested timeline), materials and resources, and evaluation and assessment.

III. Assessment and Evaluation

According to educational research it is commonly believed that:

- Instruction and assessment are closely linked
- Good teachers constantly assess students informally
- Assessments embedded in instruction are important sources of information for instructional decision made by teachers
- Students must be part of goal setting and evaluation, with self-assessment a vital part of learning
- Formal assessments are stronger if they relate closely to the content and form of classroom instruction

Through this curriculum writing students will be evaluated in many different ways: observations, one on one interviews with the teacher, portfolios, research projects, conferences, open ended questions, multiple choice responses, mastery of algorithms, cooperative learning experiences, anecdotal records, and prompts for writing in student journals as well as “paper and pencil” tests. Teachers will strive to make “connections” between topics, real life applications, and career opportunities for statistics.

TOPIC: Chapter 1 - Getting Started

OBJECTIVE: Students will be able to understand what Statistics is, when and where it is used, and how the calculator and computer aid in statistical analysis.

Lesson Number	Topic	Text Pages	Supplementary Materials
1	Orientation		A1, A2
2	What is Statistics?	2-12	A3
3	What is a truly random sample?	13-22	A4
4	What is experimental design?	22-37	

TOPIC: Chapter 2 - Organizing Data

OBJECTIVE: Students will be able to read and generate graphs, histograms, frequency distributions, and stem and leaf plots.

Lesson Number	Topic	Text Pages	Supplementary Materials
5	How do bar graphs, circle graphs, And other graphs help to organize data?	38-52	B1
6	How do histograms organize data?	52-74	B2
7	How do stem and leaf plots organize data?	74-84	B3
8	Summary and Review	57-62	
9	Test		B4, B5

TOPIC: Chapter 3 - Averages and Variations

OBJECTIVE: Students will be able to calculate mode, median, and mean; measures of variation; mean and standard deviation of grouped data; and percentiles and box and whisker plots.

Lesson Number	Topic	Text Pages	Supplementary Materials
10	What are measures of central tendency?	96-110	C1
11	What are measures of variance?	111-118	C2
12	What are coefficients of Variance and Chebyshev's Theorem?	118-127	C3
13	How do we calculate mean and standard deviation for grouped data?	127-134	C4
14	How do box and whisker plots organize data?	134-147	C5
15	Summary and review	147-157	
16	Test		C6, C7

TOPIC: Chapter 4 - Elementary Probability Theory

OBJECTIVE: Students will be able to understand what probability is, when and where it is used, and how the calculator and computer aid in analysis.

Lesson Number	Topic	Text Pages	Supplementary Materials
17	What is probability?	160-174	D1
18-19	What are the rules of probability?	174-194	D2

20-21	How do we calculate probability using trees and counting techniques?	195-199	D3,D4
21	How do we use the Multiplication Rule?	200-209	D5,6,7,8,9
22	Summary and Review	209-215	
23	Test		D10, D11

TOPIC: Chapter 5 - The Binomial Distribution

OBJECTIVE: Students will be able to understand what the binomial, geometric, and poisson distributions are, when and where they are used, and how the calculator and computer aid in analysis.

Lesson Number	Topic	Text Pages	Supplementary Materials
24	Introduction to random variables and probability distribution.	216-232	
25	What are the characteristics and parameters of the binomial distribution?	232-247	E1
26	What are the properties of the binomial distribution?	248-260	E2
27	What are the geometric and poisson distributions?	261-279	E3, E4
28	Summary and Review	279-289	
29	Test		E5, E6

TOPIC: Chapter 6 - Normal Distributions

OBJECTIVE: Students will be able to understand what the normal distribution is, when and where it is used, how to use the area under the normal curve, and how the calculator and computer aid in analysis.

Lesson Number	Topic	Text Pages	Supplementary Materials
30	What are the graphs of normal probability distributions?	290-298	F1
31	What are control charts?	298-308	
32-33	What is the area under the standard normal curve?	308-322	F2
34-35	What is the area under any normal curve?	322-335	
36	How do we approximate the binomial distribution with the normal distribution?	336-341	F3
37	Summary and review	344-354	
38	Test		F4, F5

TOPIC: Chapter 7 - Introduction to Sampling Distributions

OBJECTIVE: Students will be able to understand what sampling distributions and the Central Limit Theorem are, when they are used, and how the calculator and computer aid in analysis.

Lesson Number	Topic	Text Pages	Supplementary Materials
39	What are sampling distributions?	358-365	G1
40	What are sample mean and sample standard deviation?	366-368	
41	What is the Central Limit Theorem?	368-369	G2

TOPIC: Chapter 8 - Estimation

OBJECTIVE: Students will be able to estimate sample mean with large and small samples, known and unknown standard deviations, the probability of success in the Binomial Distribution, to choose a sample size, and how the calculator and computer aid in analysis.

Lesson Number	Topic	Text Pages	Supplementary Materials
42-43	How do we estimate ample mean when standard deviation is known?	398-412	H1
44	How do we estimate sample mean when standard deviation is unknown?	412-425	H2
45	How do we estimate probability in the binomial distribution?	425-436	
46	How do we determine the sample size?	436-445	H3
47	How do we estimate the difference of 2 means?	445-466	H4
48	How do we estimate the difference of 2 probabilities?	445-466	
82-89	Summary and review		
51	Test		H5, H6

TOPIC: Chapter 9 - Hypothesis Testing

OBJECTIVE: Students will be able to understand what Hypothesis Testing is, when and where it is used, and how the calculator and computer aid in analysis.

Lesson Number	Topic	Text Pages	Supplementary Materials
52-53	Introduction to statistical testing	480-497	I-1
54	How do we test the sample mean?	498-516	I-2
55	How do we test a proportion?	519-525	I-3
56	How do we test paired differences for dependent samples?	526-541	I-4
57	How do we test paired differences for independent samples?	541-565	
58-59	Summary and review	565-575	
60	Test		I-5, I-6

TOPIC: Chapter 10 - Regression and Correlation

OBJECTIVE: Students will be able to understand what Linear Regression and Linear Correlation are, when and where paired data is used, and how the calculator and computer aid in analysis.

Lesson Number	Topic	Text Pages	Supplementary Materials
61	How does a linear regression relate to a scatter plot?	581-602	J1
62	What are linear regression and coefficient of determination?	602-620	
63-64	What are inferences for correlation and regression?	621-639	J2
65	How do we calculate multiple linear regression?	639-655	
66	Summary and review	565-575	

67	Test	J3, J4

TOPIC: Chapter 11 - Chi-Square and F Distribution

OBJECTIVE: Students will be able to understand what the chi-square and F distributions are, when and where they are used, and how the calculator and computer aid in analysis.

Lesson Number	Topic	Text Pages	Supplementary Materials
68	Introduction to chi-squared distribution	668-671	K1
69-70	How do we use the chi-squared distribution to test for independence?	671-685	
71	Was John Cameron's premise in the movie *Titanic* correct?		K2
72	How do we use the chi-squared distribution to test for goodness of fit?	685-696	K3
73-74	How do we test and estimate single variance and standard deviation?	696-709	K4
75	How do we use the F distribution to test two variances?	709-719	K5
76	What is one-way ANOVA?	720-738	
77-78	What is two-way ANOVA?	738-751	
79-80	Summary and review	751-759	
81	Test		K6, K7
82-89	Review for Final Exam		
	Final Exam		L1, L2

TOPIC: Special Projects

OBJECTIVE: Students will be able to apply the theory that they learned in one or more disciplines to interesting projects.

Topic	Supplementary Materials
Group Projects	End of every chapter in text
Writing Projects	End of every chapter in text
Data Collection	M-1
History of Mathematics	M-2
How To Lie With Statistics	M-3
Freakonomics	M4

History of Mathematics Project

Research and write a ten-sentence essay about a Mathematician whose work was in the area of Probability or Statistics. Tell something about his/her personal life, contribution to Mathematics, how he/she is like you, how he/she is different from you, and what you liked about this Mathematician. Tell his/her country and year of birth, about the times he/she lived in, and other interesting facts. Finally, include a Statistics problem you think your Mathematician would enjoy solving, and solve it.

Suggested Mathematicians

Etienne Pascal
Pierre Fermat
Chevalier de Mere
Marguis Pierre-Simon de Laplace
Lord Keynes
Howard Jeffreys
Joseph-Louis Lagrange
R.R. Wilcox
Sir Francis Galton
H.B. Mann
D.R. Whitney
R. C. Blair

J.J. Higgins
J. H. Lambert
William Playfair
E. F. Schumacher

or
American Statistical Association