New Fellow Education Transfer Plan Cover Sheet

Title of ETP	Taking Excel to the Next Level for AP Statistics Students
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Sponsor Company	Intel
Name of Mentor	Tamar Warren
National Board Certificate Area	Mathematics – Adolescence and Young Adulthood

I, the IISME **Fellow** named above, affirm that the ETP I am submitting is my own work, that I acknowledged sources where appropriate, and that I avoided including any proprietary information of the Sponsor Company. By my submission I am assigning to IISME my entire copyright in the ETP. I understand IISME is simultaneously granting me a license to use the ETP for pedagogical purposes.

Signature _____ Date _____

Category	*Curriculum* Subject: **Math** Level: **High**
Objectives	Student will be able to: • Use advanced statistical functions built into Excel – Chi-square distribution, Chi-square significance testing, confidence interval construction, normal distribution, etc. • Use advanced features in Excel such as Concatenate, hyperlinking, internal document linking, external document linking, freezing panes, and grouping
Abstract (50 words or less)	Throughout the year, AP Statistics students learn about several distributions – binomial, normal, Chi-square, etc. This project will have them create a year long set of Excel files from various data and use Excel's features to perform inference and also to create a meaningful presentation. Some of the Excel files will be externally and internally linked (via sheets), thus demonstrating some of the powerful features built into the Excel package.
Describe how your ETP aligns with the National Board Standard stated in your proposal.	**NBS VII: Learning environment** – "[Accomplished mathematics teachers] create a climate in which each student learns to value mathematics and experience success in doing significant mathematics." This project allows students to apply statistical principles via experimentation and observation, analyze data with the aid of technology, and present data in a meaningful way using a commonly used real-world tool (Excel). "They provide time for students to reflect on and assimilate the mathematics they are learning." This is a project that will continue throughout the year as students

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	learn new distributions and analytical techniques. As students learn and experiment more, they will go back and improve upon their prior work. **NBS IX: Assessment** – "Teachers use a variety of assessment techniques that address various modalities and learning styles, including open-ended problems, group investigations, projects…to assess the processes as well as the products of students' mathematical explorations and problem-solving activities. This project incorporates group investigation for some of the data; the Excel file with corresponding analysis is their project.
Describe the connection between your ETP and the Summer Fellowship.	My assignment at Intel was to create a tracker (spreadsheet) that would be used globally to track the various teams' progress and accomplishments with respect to their market segments. To do this, I had to learn several new features in Excel, consider several user interface requirements, and present the data in a meaningful way by which my manager could obtain a large amount of information at a glance. Students will be doing many similar things – learning new features, understanding user interface requirements, and presenting complex data in a convenient, manageable way.
Resources Needed	Students will need to have access to computers (macs or PCs) with a current version of Excel. If teacher elects for whole-class presentation, a computer with video out and an LCD projector would be needed. (Data will come from various projects throughout the year.)
Evaluation/Assessment Measures Used	At each stage of assessment, students' Excel file will be evaluated by a rubric. The rubric will evalute students' project quality with respect to data analysis, data presentation, and proper/creative use of Excel's advanced features. A sample evaluation form will be included with this ETP.
Formatting specifications	PC __X__ or Mac__X__ **(Must be in Word or Text Format)** Software used: MS Word
Submitted Copy	Soft and hard copy due to peer coach by the end of the summer fellowship. Also, a copy of the cover sheet signed by a school site administrator submitted to IISME Oct.3, 2004 to receive $300 grant.

D4

I, the **Mentor** named above [please select one of the following],

- ❑ have read the attached ETP, and my comments, if any, appear below.
- ❑ have read the attached ETP, and, as outlined in the IISME-Company Fellowship Agreement, have reviewed it on behalf of the Sponsor Company, and have determined that the ETP does not contain any Sponsor-proprietary information. My additional comments, if any, appear below.

Comments:

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Administrator's comments:	
Signature	Date

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ETP: Taking Excel to the Next Level for AP Statistics Students

Note: These projects dovetail with the text, The Practice of Statistics by Yates, Moore, and McCabe. This is a very popular AP statistics book. Thus, the timelines provided pertain to the topic layout of that text. (For example, the normal distribution and regression are taught early in the year, while in many texts, those topics are taught later in the course.) Thus, the timeline is merely a guideline which can be altered to suit your needs. For "the time to completion," I have provided recommendations if kids are completing the work outside of class on their own computers (recommended) and recommendations if the activity is to be done as a whole group experience in a computer lab. I usually like to assign the project after the chapter is completed but before the test is taken. Also, when possible, I also prefer to give students the weekend to complete the assignment.

Intro: Using LCD projector and computer, demonstrate for students:

- Creating a new workbook in Excel
- Where to head your workbook (name, date, period)
- How to name your workbook: lastname_firstinitial_period.xls
- How "sheets" work – selecting, moving, and renaming
- How to enter in data
- How to enter in formulas
- Where to find Excel's statistical packages
- How to use Excel's chart features
- Using "Help" to get answers to questions.

Estimated time to introduce Excel: 20-30 minutes

Part I: Descriptive Statistics, histograms, and boxplots

Assign: After completion of descriptive statistics chapter
Time to Completion:

- In-class activity and demonstration of Excel features: 30 minutes
- Student completion:
  - 2-3 days if to be completed outside of class
  - 1 day if being done in computer lab

- **Activity 1 Summary:** Calculate your pulse rate. Results for the whole class will be displayed on the board to be recorded by the students. It will be noted whether the pulse was for a male or female.
- Using Excel:
  - Calculate the descriptive statistics:
    - Mean, median, standard deviation, mode, quartiles, range
      - For males and females separately
      - For the class as a whole

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- Create the histogram
    - For males and females separately
    - For the class as a whole
- **BONUS:** Create boxplot in Excel. Website: http://www.mis.coventry.ac.uk/~nhunt/boxplot.htm
    - This is a popular link on how to create boxplots in Excel. However, I have also included the page in PDF format as ExcelBoxplots.pdf
- Otherwise, use drawing tools to create.

- Analysis: Comment on the findings. Are there any ways to improve this study?
    - Use "Merge Cell" feature in Excel to create a cell to type in your analysis

Part II: Evaluating Normality of a Distribution

Assign: After completion of Normal Distribution Chapter
Time to Completion:

- In-class activity and demonstration of Excel features: 30-35 minutes
- Student completion:
    - 1-2 days if to be completed outside of class
    - 1 day if being done in computer in lab

- **Activity 2 Summary:** http://www.paly.net/~sfriedla/apstatistics/Projects/Chap2Project.htm
    - This is also included as: NormalDistActivity.pdf
- Using Excel:
    - To create a new "sheet" from previous project.
    - To answer take-home questions
    - Hand-out/link for creating a normal quantile plot in Excel is included as: NormProbPlotExcel.pdf
    - Advanced features:
        - Concatenate
        - Referencing a cell in another sheet (header from sheet 1)
        - NormDist and NormSDist functions

Part III: Evaluating Association Between SAT Math and Verbal scores; Linear Regression

Assign: After completion of Regression chapter
Time to Completion:

- In-class activity: 10-15 minutes
- Student completion:
    - 2-3 days if to be completed outside of class
    - 1 day if being done in computer lab

- **Activity 3 Summary:** (This project works best if you have multiple data sets – such as more than one period of AP statistics or you can collect data from other junior/senior level classes.) Students write down and pass in their SAT math and verbal scores anonymously on a slip of paper.

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- Using Excel, find/create:
  - Descriptive statistics
  - Scatterplot
    - Advanced features:
      - Add Trendline
      - Display R^2
      - Referencing a series of data in another sheet
  - Residual Plots
  - Analysis:
    - Lurking Variables?
    - Outliers/Influentials?
    - Appropriateness of Regression
  - Creating Sheets of appropriate displays and having merged cell analysis underneath

Part IV: Nonlinear regression

Assign: If students have studied power and exponential regressions
Time to Completion:

- Presentation of Project Details and Excel features: 10-15 minutes
- Student completion
  - 1 week (5-7 days) if being done completely outside of class
  - 1-2 computer lab days otherwise
  - Powerpoint Presentation (optional): 1-2 in-class days

- **Activity 4 Summary:** Have students in groups of 4-5. Each student should get information from 3 local coffee shops in their area (not just Starbucks unless the Starbucks have different prices)
- Research the volume of small, medium, and large cups at the coffee shop and note the price of each size drink. We'll only be looking at standard black coffee but feel free to experiment with the parameters!
- In Excel:
  - Create scatterplots and residual plots of the data
  - Analysis: what type of regression is most appropriate here based on the displays?
  - Calculate descriptive statistics for each type of regression. Do the conclusions change?
- Advanced Excel Feature: Grouping rows and columns; Freezing Panes, LogEst; Power
- Analysis: comment on the appropriateness of the model chosen, usefulness for making predictions, lurking variables, possible improvements to research
- Note: I often require this project be done in Excel and then presented to the class in Powerpoint. This is at the discretion of the teacher.

Part V: Simulations in Excel

Assign: After students have studied simulations and table of random digits

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Time to Completion:

- Presentation of Project Details and Excel Features: 10-20 minutes
- Student completion:
  - 1 week if being done completely outside of class
  - 1-2 computer lab days otherwise

- **Activity 5 Summary:** Using different distributions students will simulate and record various outcomes and report the experimental probability
- Trial 1: (Normal) A student has a normally distributed test average of 83% with a standard deviation of 7%. Do 50 simulations of 13 tests. How often did this student have an 'A' (90%) test average? How does this compare with the theoretical value? Create the histogram of your results.
- Trial 2: Elaine is enrolled in a self-paced course that allows three attempts at passing an examination on the material. She does not study and has only a 2 out of 10 chance of passing.
  - What is Elaine's probability of passing at least one of the three attempts? (You may assume the attempts are independent since the exam is different each time.)
  - Simulate 50 repetitions. What is your estimate of Elaine's likelihood of passing the course?
- A more realistic model for Elaine is as follows: She has a 20% chance of passing the first exam, a 30% chance the second time around, and a 40% chance the third time around. She will, of course, stop taking the test as soon as she passes but she is only allowed at most three attempts at the test.
  - Explain how to simulate one repetition of Elaine's tries at the exam.
  - Simulate 50 repetitions and estimate the probability Elaine eventually passes the exam.
- Trial 3: (Binomial) Corinne is a 75% free throw shooter. In a particular game she had 12 attempts and made only 7. Simulate 50 trials of 12 shots. With what probability did she make 7 or fewer baskets? Create the histogram of your results.
- Advanced Excel Feature: Random Number Generator; Frequency; Sum

Part VI: Sampling Distributions and Central Limit Theorem

Assign: After students have learned about the normal and binomial distributions. This project can be assigned BEFORE the Central Limit Theorem is taught as a discovery activity or AFTER the Central Limit Theorem has been taught as a reinforcement activity.

Time to Completion:

- Presentation of Project Details and Excel features: 10-15minutes
- Student completion:
  - 3 days-1 week if being done outside of class
  - 2 computer lab days otherwise

- **Activity 6 Summary:** Students will explore how sampling distributions work and in the process discover the central limit theorem

- The height of young women is approximately normally distributed with a mean of 64.5 inches and a standard deviation of 2.5 inches.
- In Excel:
    - Simulate the heights of 100 randomly selected women from this distribution.
    - Create the histogram and describe its shape
    - How many heights should there be:
        - Within 1 standard deviations of the mean?
        - Within 2 standard deviations?
        - Within 3 standard deviations?
    - Using Excel:
        - Use the "Frequency" feature to compare the experimental values with theoretical values
        - Find descriptive statistics
        - Compare the statistics with the parameters
        - Using the random number generator feature, create 100 lists of size 100.
        - Calculate the means of each and store in a list
        - Find the descriptive statistics of new list
            - How does it compare with the parameters?
        - Create the histogram of new list
            - What do you notice about its shape?
        - Make a normal quantile plot of new list.
            - Comment on the shape
    - Analysis: The sampling distribution of $\bar{x}$ appears to be _____. What is the mean of the sampling distribution of $\bar{x}$? What is the standard deviation of the sampling distribution of $\bar{x}$?
- In the prior activity we showed that the sampling distribution of a normal distribution is still normal. But what about other distributions?
    - Suppose the true percent of frustrated shoppers in the US is 75%.
    - In Excel:
        - Simulate 100 binomial samples of size 100 with p = 0.75
        - Calculate the mean of each sample and store in a list
        - Create the histogram of the means
        - Find the descriptive statistics of the means
        - Create the normal quantile plot of the means
        - Summarize your findings about the list of means – shape/type of distribution, how sample mean compare to parameter mean, how sample standard deviation compares to parameter standard deviation.
    - Leads into discussion of Central Limit Theorem: regardless of parent distribution, with a large enough set of samples, sampling distribution will be normal with mean μ and standard deviation $\frac{\sigma}{\sqrt{n}}$

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- Can also lead into discussion that a set of averages has less variability than a set of individual observations, hence the smaller std deviation of the sampling distribution

Part VII: One-sample Inference

Assign: After students have learned about 1 sample z-confidence intervals, 1 sample z-significance tests, and power
Time to Completion:

- Presentation of Project Details and Excel Features: 15-20 minutes
- Student completion:
  - 2-3 days if being done outside of class
  - 1 computer lab day otherwise

- **Activity 7 Summary:** Have students find (or you can provide) normal data.
  - Using Excel:
    - Create a 1-sample z-confidence interval at 3 different confidence levels
    - Run a 1-sample z-test of significance at 3 different alpha levels
    - See how confidence intervals and significance tests overlap - a test value significant at the two-sided 5% level is outside the 95% confidence interval
    - Create formula to calculate sample size from a given margin of error
    - Create formula for power
      - See how power changes if you change alpha, test alternative, and sample size

Part VIII: t-distribution Inference

Assign: After students have learned about the t-distribution and its inferential procedures
Time to Completion:

- Presentation of Project Details and Excel Features: 5-10 minutes
- Student completion:
  - 2-3 days if being done outside of class
  - 1 computer lab day otherwise

- **Activity 8 Summary:** Have students find (or you can provide) data for which a z-test would be inappropriate.
  - Using Excel:
    - Create a 1-sample t-confidence interval at 3 different confidence levels
    - Run a 1-sample t-test of significance at 3 different alpha levels
    - Compare and contrast the results if using t or z distributions
    - Run a matched pairs t-procedure

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- Alter sheet for calculating power to accommodate calculating power using the t-distribution

Part IX: Two-sample Inference

Assign: After students have learned about two sample procedures and pooled procedures
Time to Completion:

- Presentation of Project Details and Excel Features: 10-15 minutes
- Student completion:
  - 2-3 days if being done outside of class
  - 1 computer lab day otherwise

- **Activity 9 Summary:** Have students find (or you can provide) two sample data.
  - Using Excel:
    - Perform two-sample t and z procedures (confidence intervals and significance tests)
    - Examine pooled (equal variance) procedures and comment on robustness

Part X: Inference for Proportions

Assign: After students have learned about inference on proportions. Note: the penny activity can be done at any time during the chapter.
Time to Completion:

- Penny Pounding activity: 25 minutes
- Compiling data on board: 10-15 minutes
- Presentation of Project Details and Excel Features: 10-15 minutes
- Student completion:
  - 2-4 days if being done completely outside of class
  - 1 computer lab day otherwise

- **Activity 10 Summary:** Using the penny experiment http://www.paly.net/~sfriedla/apstatistics/APStatProjChap12.htm**,** students will look at the 1-sample confidence interval and significance tests with proportions by creating macros in Excel (Excel does not have a test for proportions built-in)
  - Penny Experiment is as follows: stand pennies on their edge (you'll need to find some nice, flat surfaces in the classroom if their desks aren't). Pound your fist on the desk and watch the pennies fall. Students note whether the pennies fell as "heads" or "tails." You want to get as big a sample as possible. Then compile the results on the board for the students to copy. The null hypothesis here is that it's 50-50 but you'll soon see that it's not.
  - A brief outline of instructions is included as: PennyActivity.pdf
  - Using Excel
    - Students will perform various inferential procedures by creating a formula to calculate confidence and p-value for proportions

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- Students will build in the formula to calculate sample size from a desired margin of error for proportions

Part XI: Chi-Square Exploration

Assign: After students have learned about the Chi-Square distribution
Time to Completion:

- Presentation of Project Details and Excel Features: 10-15 minutes
- Student Completion:
  - 1-2 days if being done outside of class
  - 1 computer lab day otherwise

- **Activity 11 Summary:** Have students find (or you can provide) categorical data.
  - Using Excel
    - Explore the three Chi-square features built into Excel in order to calculate Chi-Square values and run a Chi-Square test of significance

The following files were copied from PDFs for the aforementioned activities. Some formatting errors may occur because of their being copied. Files in their original PDF format may be obtained from Scott Friedland's Palo Alto High School Website.

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Boxplots in Excel

by Neville Hunt, Coventry University

Acknowledgements

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I am grateful to Rodney Carr for greatly simplifying my original method.

Introduction

A boxplot, or box and whisker diagram, provides a simple graphical summary of a set of data. It shows a measure of central location (the median), two measures of dispersion (the range and inter-quartile range), the skewness (from the orientation of the median relative to the quartiles) and potential outliers (marked individually). Boxplots are especially useful when comparing two or more sets of data. Regrettably, there is currently no boxplot facility in Microsoft Excel. For simplicity, many recent statistics textbooks (for example, Daly et al, 1995) omit the *fences* used to identify possible outliers. These simplified boxplots, displaying most of the important features, can be drawn quite easily in Excel. In the absence of any fences (see Devore and Peck (1990) for a definition), a simple rule is that a whisker which is longer than three times the length of the box probably indicates an outlier.

Method

Suppose we have data from three groups, A, B and C. Calculate the statistical functions QUARTILE(,1), MIN, MEDIAN, MAX and QUARTILE(,3) **in that order** for each data set. Arrange the results on an Excel worksheet as shown below.

Statistic	Group A	Group B	Group C
q1	20	22	30
min	10	15	18
median	40	45	50
max	100	110	90
q3	70	75	57

In Excel 5/95:

Highlight the whole table, including figures and series labels.

Use **Chart-Wizard - Line - Option 7 - Data in Rows - Finish** to produce something like the chart below. Option 7 plots all the series as symbols without connecting lines, but also includes high-low lines which connect the maximum and minimum points for each group.

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Now activate the chart and select **Format - Chart Type - Options - Options - Up-Down Bars - OK**
The outcome should be a set of boxplots, as shown below. The essential feature of updown
bars is that they connect the first and last **series** - hence the rather strange ordering of the statistics in the table!
In Excel 97/2000:
Highlight the whole table, including figures and series labels, then click on the **Chart Wizard**.
Select a **Line Chart**.
At **Step 2** plot by **Rows**, (the default is Columns), then **Finish**.
Select each data series in turn and use **Format Data Series** to remove the connecting lines.
Select any of the data series and **Format Data Series**; select the **Options** tab and switch on the checkboxes for **High-Low** lines and **Up-Down** bars.
References
Daly, F, Hand, D J, Jones, M C, Lunn A D and McConway, K J (1995). *Elements of Statistics*. Addison
Wesley / The Open University.
Devore, J and Peck, R (1990). *Introductory Statistics*. West Publishing Co.
This page is maintained by Neville Hunt.
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AP Stat Project 2 ≠ Chapter 2 ≠ Are We Normal?

Objective: Use what weπve learned about the normal distribution to determine of the distribution of our heights can be approximated by a normal curve.

Materials: Measuring tape or meter stick.

Procedure: First, weπre going to break off into groups of 5. Measure the height of each group member (in inches) and record in a table. Keep track of which group members were which height.

Person 1 Name:_____ Height: _____
Person 2 Name:_____ Height: _____
Person 3 Name:_____ Height: _____
Person 4 Name:_____ Height: _____
Person 5 Name:_____ Height: _____

Questions:

1. Find the descriptive statistics for your group.
2. Is the data approximately normal? Explain clearly.

Whole Group Activity:

Now weπre going to aggregate the data from all of our groups.

Take-home Questions: (Remember, this document is posted online.)

3. Find the descriptive statistics for the whole class.
4. Choose and create appropriate display(s) for this data.
5. Is this data approximately normal? Explain clearly.
6. How do the whole class results compare with the single group results?
7. What are some of possible causes of error in this project?
8. Find the probability of randomly selecting someone:

a. 6 feet tall b. 5 feet tall c. 5π6≤ tall
d. Taller than 6 feet e. Shorter than 5 feet
f. How tall is someone 2 standard deviations above the mean?
g. How tall is someone 3 standard deviations below the mean?

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Recording Macros in Excel

A Normal Probability Plot is a graphical means of assessing whether or not a sample could have come from a
normally distributed population. The ordered sample values are plotted against the expected ordered values
from a standard normal distribution (Normal Scores). If the sample is likely to have come from a normally distributed population then one should see points on the plot in a straight line.
JMP has an option for a Normal Quantile Plot in its Distribution platform. Excel does not make Normal Probability Plots automatically, but Excel has enough built-in functions to make construction of such a plot possible. This exercise takes you through the process of recording a macro in Excel that can be used to construct Normal Probability Plots for samples of size 30.

1. Open a new \workbook" in Excel. By default, new workbooks contain 3 \Sheets" (spread sheets). We want someone to be able to enter the 30 sample values in Sheet1, run the macro, and see the plot on Sheet1. All the behind-the-scenes work will be done on Sheet2.
2. Put some simple instructions like \Enter your 30 observations in column A, rows 3 through 32." in cell A1 of Sheet1. Also, put instructions for running the macro in cell A2 of Sheet1. Something like \Then select Tools - Macro - Macros and run the MakeNPP macro to get a Normal Probability Plot."
3. Turn to Sheet2 by clicking on Sheet2 at the bottom of the Excel window. We will want columns to contain the original data, the numbers 1-30,k the Normal Scores, and the sorted data.
4. Type \Original Data" in A1 of Sheet2 and expand the column. To get a copy of the data to Sheet2, enter

=Sheet1!A3

in cell A2 of Sheet2. Then Copy/Paste this entry into cells A3:A31 of Sheet2.
5. Leave column B blank. Column C should contain the numbers 1 to 30. Type the number 1 in C2 and the number 2 in C3. Then select both cells and drag (by placing the cursor over the lower right corner of cell C3) down to C31.
6. Type Normal Scores in E1 and expand the column. To get one version of Normal Scores, enter

=NORMSINV((C2-0.5)/30)

in E2 and Copy/Paste this cell to E3:E31.
7. Type Sorted Data in cell D1. The macro will Copy/Paste the data to this column and then sort the data before making the plot.
8. This workbook will serve as our template for making Normal Probability Plots. Return to Sheet1 and enter the following data into A3:A32. These are times spent at the Lied Recreation Center by 30 undergraduate students.

52, 63, 75, 74, 32, 86, 68, 53, 49, 73
39, 56, 93, 77, 41, 45, 87, 67, 49, 72
53, 51, 65, 84, 65, 54, 66, 56, 69, 62

9. Verify that the data has been carried over to Sheet2.

Return to Sheet1 to begin recording the macro

1
Select Tools - Macro - Record New Macro . . . and name the macro \MakeNPP". When you click OK, Excel
begins recording your actions. Follow the steps below.

_ Go to Sheet2 by clicking on Sheet2 at the bottom of the Excel Window.
_ Select A2:A31 and Edit - Copy.
_ Click on cell D2.
_ Use Edit - Paste Special . . . to paste just the values (not the formulas).
_ D2:D31 should be still selected. Click on sort (A to Z).
_ Select both columns D and E, (D2:E31) and click the chart \Wizard" button to make the chart.
_ Choose an XY (Scatter) plot (_rst subtype). Use Next to advance through the construction of the chart. Some of the things you will want to change are

{ Titles: Chart Title - Normal Probability Plot, X axis - Data Values, Y axis - Normal Scores
{ Gridlines: uncheck the Major gridlines
{ Legends: uncheck Show legend

Opt to have the chart placed As object in: Sheet1 After you click Finish, you will be taken to Sheet1

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with the chart.
_ Go to Tools - Macro - Stop Recording.

Return to Sheet1 to run the macro

Choose Tools - Macro - Macros - Run Macro. Select MakeNPP (this should be your only choice). If the macro runs successfully, choose Tools - Macro - Macros - Edit to see the program that Excel has generated.

Homework 8, Spring 2003

For three di_erent data sets of size 30, use your macro to generate Normal Probability Plots. Use Excel's random number generators to create your data sets. To do this use Tools - Data Analysis - Random Number
Generation. Enter 1 for Number of Variables, 30 for Number of Random Numbers and select the Output Range, usually A3:A32 of Sheet1. The three data sets you should create are
_ 30 values from a Normal distribution with mean 0 and standard deviation 1.
_ 30 values from a Uniform distribution between _3 and 3.
_ 30 values from an exponential distribution. To do this, generate 30 values from a Uniform distribution between 0 and 1. Transform each value, U, by the formula X=_LOG(1_U). The X values will be 30 random values from an exponential distribution with mean 1. You should choose a di_erent Output Range for the generation of the Uniform values. That way you can perform the transformation and Copy/Paste Special the transformed values into A3:A32 of Sheet1.
For each data set turn in a copy of the Excel Sheet1 that has the data and the Normal Probability Plot. Use Print Preview to make sure the Normal Probability Plot _ts on the one page.
2

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CHAPTER 12 PROJECT ≠ PENNIES FROM HEAVEN!

Period 1 Data: (# heads out of 20 pennies) 24 data points	Period 2 Data: (# heads out of 20 pennies) 21 data points
10	11
14	9
17	11
19	11
10	9
16	10
16	8
16	10
17	15
15	16
18	14
17	11
17	13
14	17
19	17
13	14
12	14
17	12
17	13
15	18
12	13
15	
13	
12	

NOTE: ONLY USE THE DATA FROM YOUR PERIOD!

Project Instructions:

1. **Using a random number table or the random integer feature on your calculator, pick ONE (1) data point at random. Construct a 90% confidence interval and perform a significance test.**

Remember, you still need to check assumptions, state conclusions, etc. like you always would!

2. **Now pick FIVE (5) data points at random. Add up the number of heads in those five data points and construct a new 90% confidence interval and perform a significance test.**

3. **Now pick TEN (10) data points at random. Add up the number of heads in those 10 data points and construct a new 90% confidence interval and perform a significance test.**

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4. **Now use ALL the data points from your period. Construct the 90% confidence interval and perform the significance test.**

5. **Compare and contrast your answers from steps 1-4. What conclusions can we draw?**

DUE MONDAY!!! DOES NOT HAVE TO BE TYPED BUT MUST BE NEAT AND ORGANIZED!

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