Unit 3

Randomness in Data

Probability

In-Class Activities

There are no in-class activities that require the use of SPSS Statistics.

Exercises

Exercise 11-18

- a. Generate the 1000 ice cream prices as follows:
 - Open a new Data view. Select File > Open > Syntax and open the SPSS syntax file CreateID.SPS. Highlight all the lines in the file and run it by clicking on the green right pointing arrow. This creates a new Data view with 1000 cases in it. The variable IDs is a dummy variable that just tells SPSS that there are 1000 cases.
 - 2. Select Transform > Compute Variable to open the dialog box shown below. Make the Target Variable RV. Select Random Numbers in the Function group box. Select Rv.Uniform in the Functions and Special Variables box and move it to the Numeric Expression box. Make the Numeric Expression box contain Rv.Uniform(0,6). Click OK to make a variable containing randomly generated values equally spread out over the range 0 to 6. Make sure the measure of this variable is scale.
 - 3. Select **Transform > Compute Variable** and enter **Toss1** in the **Target Variable** box. Enter 1+(RV>=1)+(RV>=2)+(RV>=3)+(RV>=4)+(RV>=5). Click **OK** to create the results of the first toss. Make sure the measure of this variable is scale.
 - 4. Repeat part 2. When asked if you want to change the existing variable, click Yes.
 - 5. Repeat part 3 entering *Toss2* in the **Target Variable** box. Make sure the measure of this variable is scale.
 - 6. Select **Transform > Compute Variable**. Enter *Price* in the **Target Variable** box and enter (*Toss1 > Toss2*)*(*10*Toss1+Toss2*) + (*Toss1 <= Toss2*)*(*10*Toss2 + Toss1*). This variable contains the ice cream price. Make sure the measure of this variable is scale.

Compute Variable <u>Target Variable:</u> HospitalA = Type & Label	Num <u>e</u> ric Expression: RV.BINOM(10,25)	
RV.E Bino prob	+ > 7 8 9 + > 7 8 9 - = 2 3 10 10 * = = 1 2 3 it = = 1 0 . it = 0 . . . it 0 it 0 INOM(n, prob). Numeric. Returns a random value from a ability parameter. INOM(n, prob). Numeric. Returns a random value from a ability parameter. 	56

- 7. Use the Chart Builder to draw a histogram of *Price*. Make the vertical axis be percents.
- b. The mean *Price* appears with the histogram. Is the average price close to the expected value? Should it be? Explain.

Exercise 11-19: Hospital Births

Generate the 365 days of births for the two hospitals requested in part a as follows.

- Open a new Data view. Select File > Open > Syntax and open the SPSS syntax file CreateID.SPS. In the line LOOOP ID = 1 TO 1000. change the 1000 to 365. Highlight all the lines in the file and run it by clicking the right pointing green arrow. This creates a new Data view with 365 cases. The variable ID is a dummy variable used to set the number of cases.
- 2. Select **Transform > Compute Variable** to open the dialog box shown below.
- 3. Enter *HospitalA* in the **Target Variable** box.
- 4. Select Random Numbers in the Function group box.
- 5. Move **Rv.Binom** to the **Numeric Expression** box.
- 6. Make the numeric expression be Rv.Binom(10,.25) as shown above.
- 7. Click **OK** to create a variable containing the births at Hospital A. Make sure the measure of this variable is scale

- 8. Repeat parts 2-7 to create a variable containing the births at Hospital B. Enter *HospitalB* in the **Target Variable** box and enter *Rv.Binom*(50,.25) in the **Numeric Expression** box. Make sure the measure of this variable is scale.
- 9. Use the Chart Builder to create the histograms that are requested in part a.

+ > 7 8 9 - - 2 3 Date Creation Date Extraction - - 1 2 3 Missing Values - - - - - Missing Values - - - - - - Missing Values - - - - - - - Missing Values - <th>Target Variable: HospitalA Type & Label</th> <th>Numeric Expression: = RV.BINOM(10, 25)</th> <th></th>	Target Variable: HospitalA Type & Label	Numeric Expression: = RV.BINOM(10, 25)	
ff (optional case selection condition) Rv.Halfnrm	(optional case select	+ > 7 9 - = > 4 5 6 + = 1 2 3 1 0 . + - () Delete Image: Comparison of the second of the	Function group: Date Creation Date Extraction Inverse DF Miscellaneous Missing Values PDF & Noncentral PDF Random Numbers Functions and Special Variables: Rv.Bernoulli Rv.Beta Rv.Binom Rv.Cauchy Rv.F Rv.F Rv.Geom Rv.Halfnrm

Complete parts b-e as requested in your main textbook.

Exercise 11-21: Runs and "Hot" Streaks

Complete part a as directed in your main textbook. For part b proceed as follows:

- 1. Open a new Data view and create an empty variable *Long_Run*.
- 2. Select **Utilities > Run Script** to open the dialog box shown below.
- 3. Locate and highlight the SPSS script file **Runs.SBS** and click **Run**.

Run Script		x
Look in: 🕕	Scripts 🔹 🖻 🔯 🔢 🗉	
BinSampl Change_a Change_s Ciprop.St Ciprop.SB Ciprop.SB Ciprop15.5 Ciprop15.5	a. SBS 10 ice_cream_sim.SBS mounts.SBS ample.SBS 3S 10 sample.SBS .SBS 10 test2prop.SBS S 10 test2prop.SBS SBS 10 testprop.SBS SBS 10 testprop.SBS	
File name:	runs.SBS	Run
Files of type:	Basic (wwd;sbs)	Cancel

The output from the script contains enough information to complete parts c-g.

Normal Distributions

In-Class Activities

Activity 12-3: Blood Pressure and Pulse Rate Measurements

Complete parts a and b as directed in your main textbook. Follow the instructions below to have SPSS create the requested normal probability plots.

- 1. Open the SPSS data file BloodPressures.SAV.
- 2. Select **Analyze > Descriptive Statistics > Q-Q Plots** to open the dialog box shown below.

Variables:	Test Distribution
Transform Natural log transform Standardize values	Location: 0 Scale: 1 Proportion Estimation Formula
Difference: 1 Seasonally difference: 1 Current Periodicity: None	-Rank Assigned to Ties @ Mean ○ High ○ Low ○ Break ties arbitrarily

- 3. Move the three variables to the **Variables** box.
- 4. Click **OK** and the normal probability plots will be drawn in an Output window.

Exercises

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Exercise 12-19: Body Temperatures
12-1, 12-19, 14-3, 14-18, 15-9, 19-7, 19-8, 20-11, 22-10, 23-3
```

Use SPSS to produce the histograms and normal probability plots requested in parts a and b. The data are stored in the SPSS file BodyTemps.SAV. To create separate graphs for men and women you will need to split the file. Follow the instructions given below.

1. Select **Data > Split File** to open the dialog box shown below.

g Split File	
🛷 Body Temp (BodyTe	 Analyze all cases, do not create groups Compare groups Organize output by groups
	Groups Based on:
	Cender [Gender]
	Sort the file by grouping variables
	Eile is already sorted
Current Status: Analysis by	groups is off.
OK Past	te Reset Cancel Help

- 2. Click **Organize output by groups** and move the variable *Gender* to the **Groups Based on** box.
- 3. Click **OK** and all subsequent analysis will be done separately for men and for women.
- 4. If you want late to analyze the whole file return to the **Split File** dialog box and click **Analyze all cases, do not create groups** and click **OK**.

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Exercise 12-20: Natural Selection 10-1, 10-6, 10-7, 12-20, 22-21, 23-3
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Use SPSS to create the normal probability plots requested in part a. See Exercise 12-19 for instructions on splitting the file. The data are stored in the SPSS file Bumpus.SAV.

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Exercise 12-21: Honda Prices
7-10, 10-19, 12-21, 28-14, 28-15, 29-10, 29-11
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Use SPSS to create the requested normal probability plots. The data are stored in the SPSS file HondaPrices.SAV.

Sampling Distributions: Proportions

There are no activities in this topic that require the use of SPSS statistics. You can use the Reeses Pieces applet for those parts that tell you to use technology. Just disregard the candy context of the applet.

Sampling Distributions: Means

In-Class Activities

Activity 14-1: Coin Ages 12-16, 14-1, 14-2, 19-15

- h. Enter the data into SPSS and use SPSS to compute the mean and standard deviation.
- j. Use SPSS to produce the requested dotplot.

Exercises

Exercise 14-5: Heart Rates

Use SPSS to draw the normal probability plot requested in part b. See Activity 12-3 for instructions. The data are stored in the SPSS file HeartRate.SAV.

Use the SPSS script Sample.SBS to draw the samples requested in parts c and e.

1. Select **Utilities > Run Script** to open the dialog box shown below.

🗟 Run Script		-	x
Look in: 🕕	icripts 💌	2 G H E	
 BinSample change_s c2prop.S c2prop15 c2prop15. c2prop15. c2prop15. 	ISBS Ib ice_cream_sim.SBS nounts.SBS nuns.SBS IS Is sample.SBS SBS Ib test2prop.SBS SBS Ib test2prop.ISBS IBS Ib test2prop.ISBS IBS Ib test2prop.ISBS IBS Ib test2prop.ISBS IBS Ib testprop.ISBS	8	
File name: Files of type:	sample SBS Basic (wwd;sbs)	The second secon	n :el

- 2. Highlight *sample.SBS* and click **Run**.
- 3. Enter the desired number of samples (1000) and the desired sample size (3 in part c and 10 in part e)
- 4. Click **OK** to run the script. Be patient. It will take some time to complete.

Central Limit Theorem and Statistical Inference

In-Class Activities

There are no in-class activities that require the use of SPSS Statistics.

Exercises 15-9: Body Temperatures 12-1, 12-19, 14-3, 14-18, 15-9, 19-7, 19-8, 20-11, 22-10, 23-3

Use SPSS to create the graphical displays requested in part a and to compute the mean and standard deviation requested in part b.

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Exercise 15-13: Distinguishing Colas 13-13, 15-13, 17-24, 18-9
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Do the following to simulate the samples requested in part c.

- 1. Open a new Data view.
- 2. Run the syntax file CreateID.SPS. See Activity 11-18 for instructions.
- 3. Select **Transform > Compute Variable** to open the dialog box shown below.
- 4. Enter *Proportion* in the **Target Variable** box.
- 5. Highlight Random Numbers in the Function group box.
- 6. Select *Rv.Binom* in the **Functions and Special Variables** box and move it to the **Numeric Expression** box.
- Replace the first question mark with 30, and replace the second question mark with 2/3. Divide by 30. The Numeric Expression box should contain *Rv.Binom*(30,2/3)/30.
- 8. Click **OK**. This produces a variable *Sample* containing the proportion of correct guesses out of 30 for a subject that can guess the correct cola two-thirds of the time.

Compute Variable		
Target Variable: Proportion Type & Label	Numeric Expression: RV.BINOM(30,2/3)/30	
Coptional case selection	+ > 7 8 9 - <	Function group: Date Creation Date Extraction Inverse DF Miscellaneous Missing Values PDF & Noncentral PDF Random Numbers Functions and Special Variables: Rv.Bernoulli Rv.Beta Rv.Binom Rv.Cauchy Rv.Chisq Rv.F Rv.Geom Rv.Halfnrm Rv.Hyper

Use SPSS to create the histogram requested in part d.