Psych 240 Lab 4

The purpose of this assignment is to show you how you can use R to calculate the proportion of scores above a value, below a value, or between two values on the normal distribution.

Setup Instructions (please complete these steps before the TA begins their presentation for the day)

1) Log on to your lab computer with your OIT username and password. Alert the TA if you have any trouble with this.

2) Go to the course Moodle page. In the "Labs" section, click on the file called "Lab4". In the dialog box that opens, select "Save File" and hit OK. If you are asked to select a directory, choose the "Downloads" folder. If you are not asked to select a directory, the file should automatically be saved in "Downloads".

3) On the Start Menu, select "All Programs" – "Statistics" – "R" – "R x64 3.1.0". You should see R launch on your computer screen.

4) In the R console, type the following text: setwd("C:/Users/*your-OIT-username*/Downloads"). For example, if your OIT username is "astudent", you would type in setwd("C:/Users/astudent/Downloads").

5) Next, enter this at the R console: source("Lab4.txt"). If all goes correctly, you should be asked to enter your student ID number. If you get a "file not found" message, then you either didn't save the Lab2 file from Moodle in the Downloads directory or didn't set R to your Downloads directory. You can get help from the TA or another student.

6) If you see a prompt that says "Student ID not found", check your ID number and try to enter it again. If it won't work after several tries, you can just enter 0 instead of your ID and the program will let you continue. If you do this, you will not get a completion code at the end of the assignment, so you have to show the TA your R screen after you complete the assignment and before you leave.

7) Wait for further instruction from the TA.

Lab Demonstration

The TA will guide you through this section. Please wait until you are asked to begin and follow along with the TA.

1) R has a function that will return the proportion of scores below a cutoff value on a normal distribution. This is known as the cumulative distribution function. We'll explore some different ways to use this function today.

2) The function is called pnorm – "p" because it returns a proportion and "norm" because it is based on a normal (Gaussian) distribution. This function takes three arguments: the cutoff score that you want to get the proportion below, the mean of the normal distribution, and the standard deviation of the normal distribution. If you don't supply the mean and standard deviation, it defaults to a mean of 0 and a standard deviation of 1 (like a distribution of z scores). For example, type in "pnorm(-2)" and hit ENTER. This gives the proportion of scores below -2 on a z-score distribution. We learned in class that about 2% of scores are beyond 2 standard deviations away from the mean, so you should get a value around .02.

3) Now type in "pnorm(-2,1,1)" and hit ENTER, then "pnorm(-2,-1,1)" and hit ENTER. Which number was higher? Why is this?

4) Now type in "pnorm(-2,0,1)" and hit ENTER, then "pnorm(-2,0,2)" and hit ENTER. Which number was higher? Why is this?

5) When you are asked to find the proportion of scores below a cutoff value in a normal distribution, you can just use pnorm directly. For example, men's hat size is normally distributed with a mean of 26 inches and a standard deviation of 1.5 inches. What proportion of men have hat sizes below 24 inches? To answer this, you would just type in "pnorm(24,26,1.5)" and hit ENTER. The value returned by R is the answer. Draw a rough picture of this distribution with a line at the cutoff value, and shade the region with scores that are included in your proportion.

6) When you are asked to find the proportion of scores above a cutoff value, you subtract the value returned by pnorm from 1. This makes sense if you think about it. If you ask what proportion of the scores are above OR below a cutoff value, then this includes all of the scores. (In a continuous distribution like a normal, the probability that a score would be EXACTLY one value is effectively zero). Including all of the scores gives a proportion of 1. If we want just the scores above a cutoff, then we want all of the scores minus the scores that are below the cutoff. If .5 of the scores are below the cutoff, then .5 must be above. If .3 are below the cutoff, then .7 must be above. And so forth. So say we want to know what proportion of men have hat sizes above 24 inches. Type in "1 – pnorm(24,26,1.5)" and you should have your answer. If you add this to the answer from Step 5, you should get 1. Draw a rough picture of this distribution with a line at the cutoff value, and shade the region with scores that are included in your proportion.

7) When you have to find the proportion of scores between two cutoff values, you subtract the pnorm for the lower value from the pnorm of the higher value. This should make sense too. The

pnorm for the higher value gives you the proportion of scores below this value. Some of these scores don't fall in your target region, though, because they are also below the lower value (so they aren't between the two values). Subtracting the pnorm for the lower value lets you get rid of the scores that are too low for your target region. For example, say we wanted to know what proportion of men have hat sizes between 24 and 28 inches. Type in "pnorm(28,26,1.5) – pnorm(24,26,1.5)" and hit ENTER. Draw a rough picture of this distribution with a line at the two cutoff values, and shade the region with scores that are included in your proportion.

8) Now say we want to know what proportion of men have hat sizes between 23 and 25 inches. Type in "pnorm(25,26,1.5) – pnorm(23,26,1.5)" and hit ENTER. Draw a rough picture of this distribution with a line at the two cutoff values, and shade the region with scores that are included in your proportion.

Lab Assignment

The TA will give you the questions for this week's lab assignment. Complete this section on your own. You can ask the TA for help. Record all of your answers on a sheet of paper with your first and last name on the top. The correct answers are different for each student. R will tell you whether or not your answer is correct, as detailed below. When you enter all of the correct answers, R will tell you that you are finished and give you your completion code to write on your answer sheet. You can either leave when you are finished, but I encourage you to please use any extra time to get help on your homework or the lecture content from the TA.

1) See handout

[Type in "q1(*your-answer-here*)" and hit ENTER to see if you are correct. For example, if you thought the answer was 12, you would type in "q1(12)".]

2) See handout

[Type in "q2(*your-answer-here*)" and hit ENTER to see if you are correct.]

3) See handout

[Type in "q3(*your-answer-here*)" and hit ENTER to see if you are correct.]

4) See handout

[Type in "q4(*your-answer-here*)" and hit ENTER to see if you are correct.]

5) See handout

[Type in “q5(*your-answer-here*)” and hit ENTER to see if you are correct.]