ANLT5030 – Unit 4 Assignment 1 Tutorial

SAS Studio

Instructions

For this assignment, you will continue practicing with confidence intervals in a more ambiguous context. For this assignment, read Case Problem 2, Ethical Behavior of Business Students at Bayview University, on pages 452–454 of your text, and download the accompanying Bayview data set from CengageBrain. Use SAS to create the following elements in your report:

- Use descriptive statistics to summarize the data and comment on your findings.
- Develop 95% confidence intervals for the proportion of all students, the proportion of male students, and the proportion of female students who were involved in some type of cheating.
- Conduct a hypothesis test to determine if the proportion of business students at Bayview University who were involved in some type of cheating is less than that of business students at other institutions, as reported by the *Chronicle of Higher Education*.
- Conduct a hypothesis test to determine if the proportion of business students at Bayview University who were involved in some type of cheating is less than that of nonbusiness students at other institutions, as reported by the *Chronicle of Higher Education*.
- Describe the advice you would give to the dean based on your analysis of the data related to cheating at Bayview University.

Remember, to download the Bayview data set Web file from the Chapter 9 content, access the free content at CengageBrain.

Case Problem

Case Problem 2 Ethical Behavior of Business Students at Bayview University

During the global recession of 2008 and 2009, there were many accusations of unethical behavior by Wall Street executives, financial managers, and other corporate officers. At that time, an article appeared that suggested that part of the reason for such unethical business behavior may stem from the fact that cheating has become more prevalent among business students (*Chronicle of Higher Education,* February 10, 2009). The article reported that 56% of business students admitted to cheating at some time during their academic career as compared to 47% of nonbusiness students.

Cheating has been a concern of the dean of the College of Business at Bayview University for several years. Some faculty members in the college believe that cheating is more widespread at Bayview than at other universities, whereas other faculty members think that cheating is not a major problem in the college. To resolve some of these issues, the dean commissioned a study to assess the current ethical behavior of business students at Bayview. As part of this study, an anonymous exit survey was administered to a sample of 90 business students from this year's graduating class. Responses to the following questions were used to obtain data regarding three types of cheating.

During your time at Bayview, did you ever present work copied off the Internet as your own?

Yes____ No____

During your time at Bayview, did you ever copy answers off another student's exam?

Yes____ No____

During your time at Bayview, did you ever collaborate with other students on projects that were supposed to be completed individually?

Yes____ No____

Any student who answered Yes to one or more of these questions was considered to have been involved in some type of cheating. A portion of the data collected follows. The complete data set is in the DATAfile named Bayview.

DATA file

Bayview

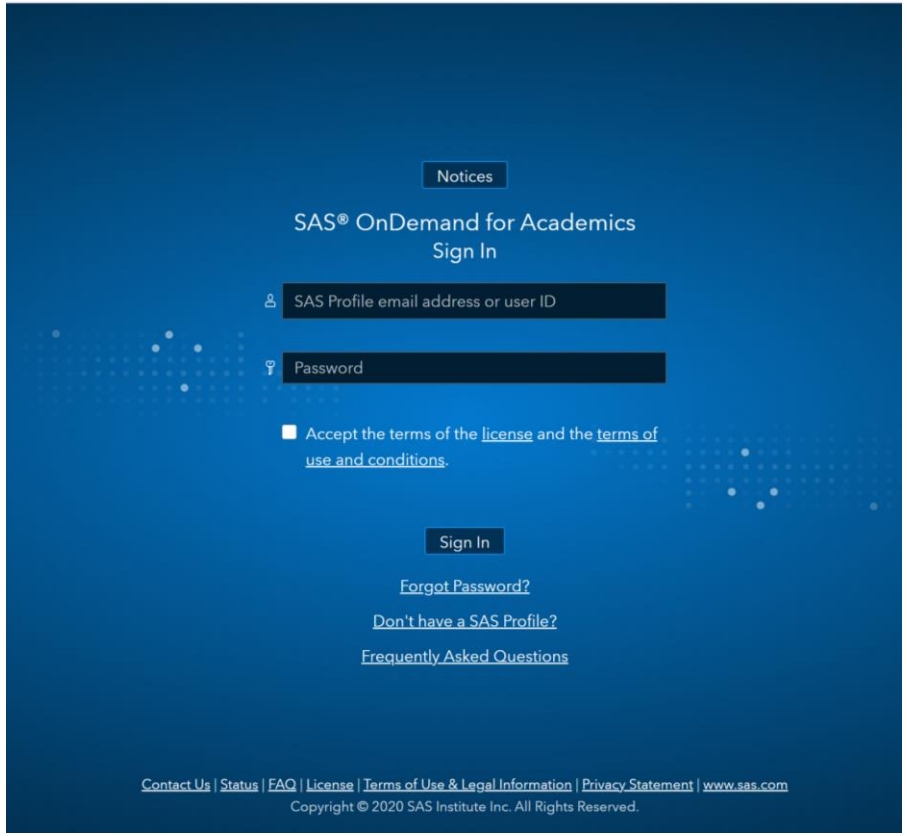
Student	Copied from Internet	Copied on Exam	Collaborated on Individual Project	Gender
1	No	No	No	Female
2	No	No	No	Male
3	Yes	No	Yes	Male
4	Yes	Yes	No	Male

Dataset

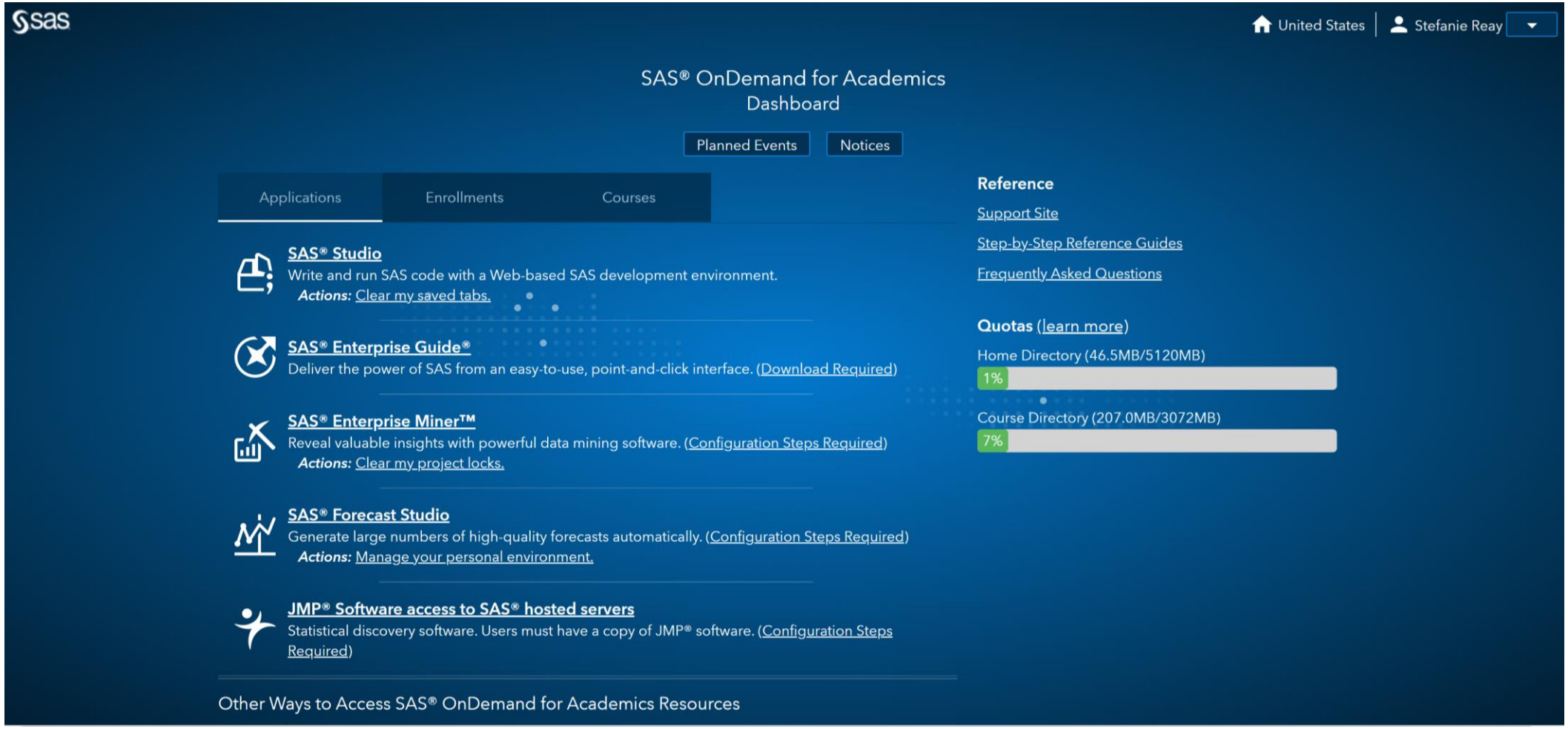
- Download the BayView.xlsx file from the course datasets or from the Unit 4 Welcome announcement in the course announcements.

Access the SAS OnDemand for Academics Control Center

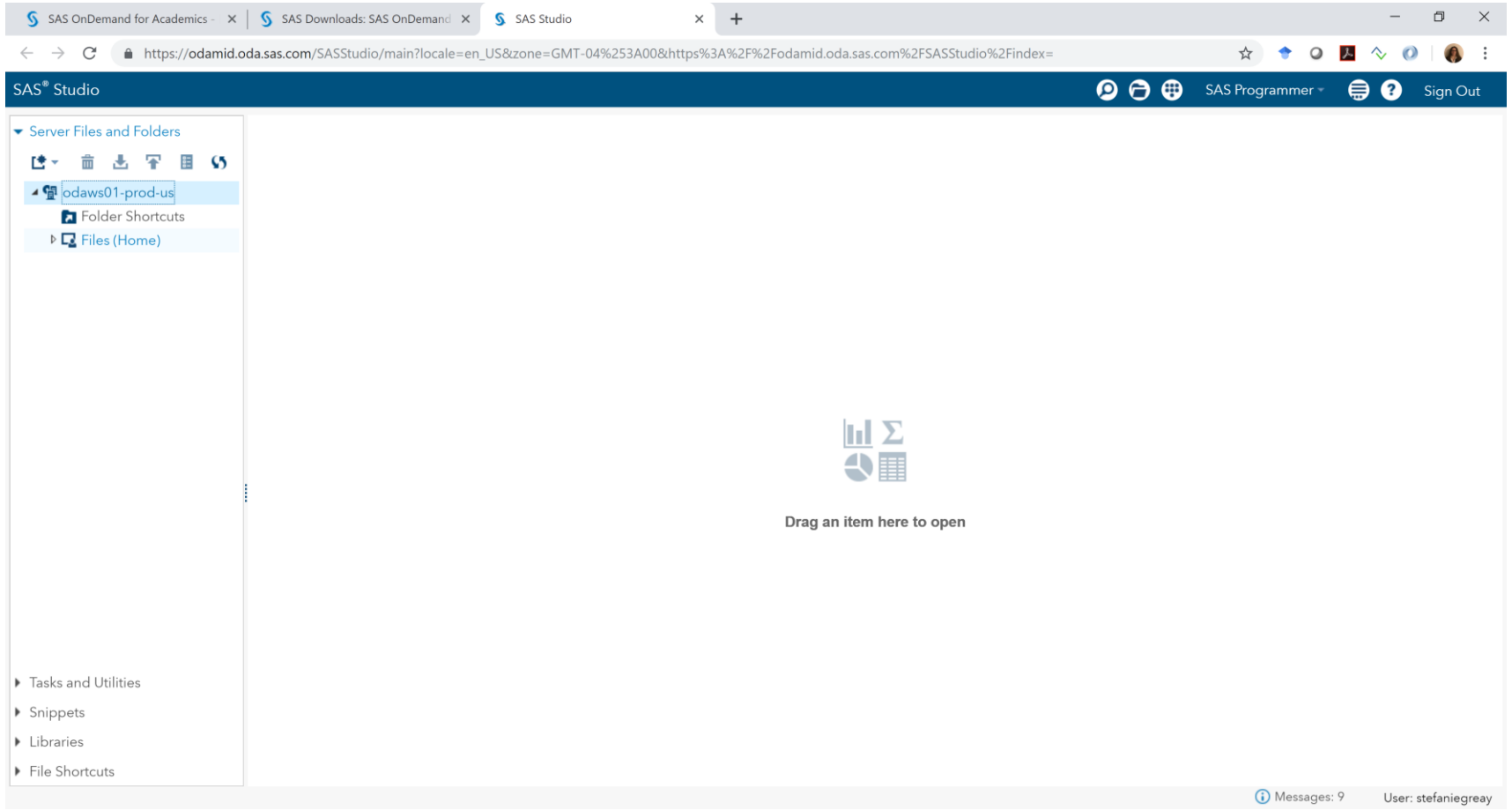
https://odamid.oda.sas.com/SASODAControlCenter



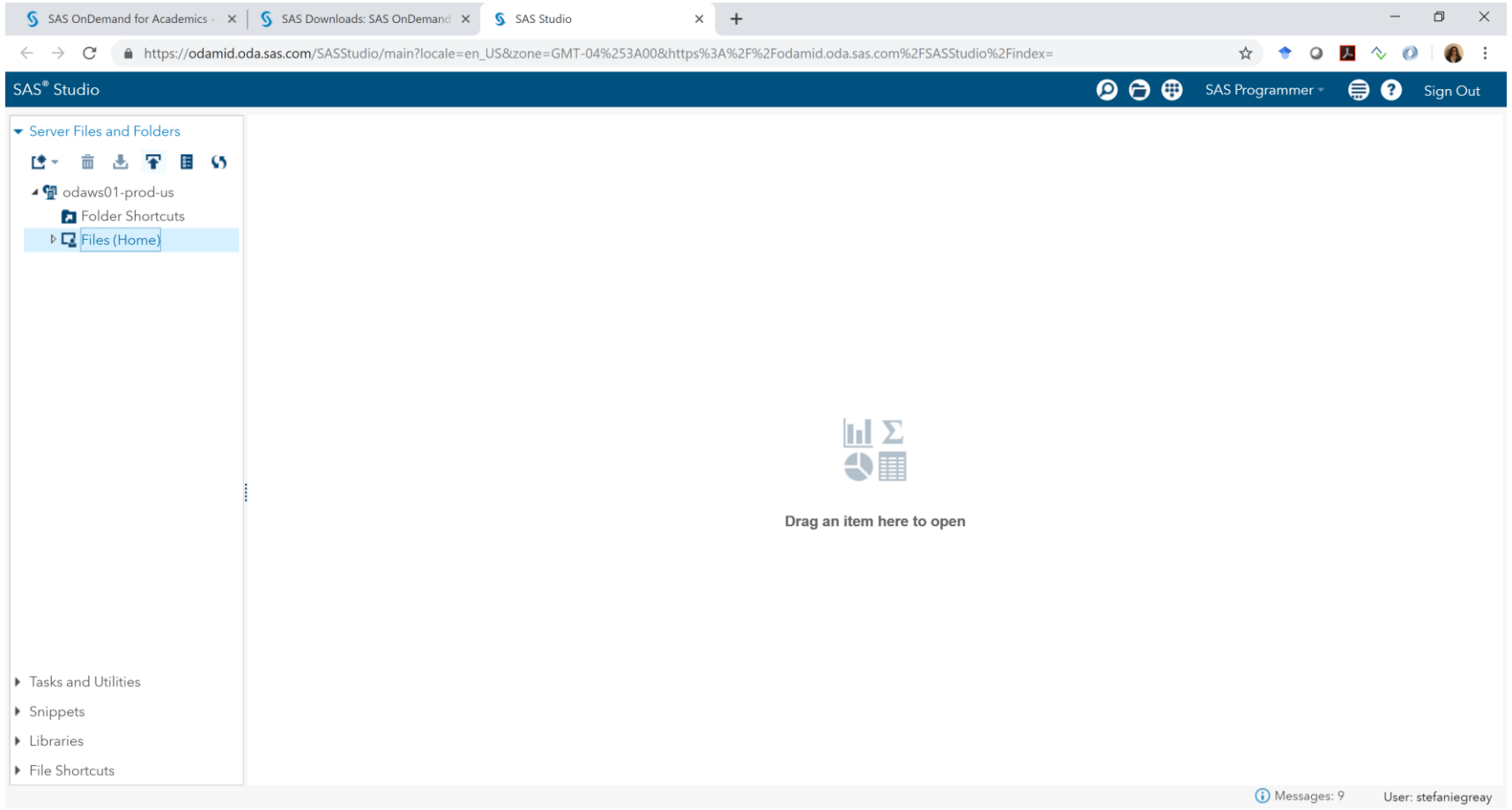
SAS OnDemand for Academics (SODA) Control Center



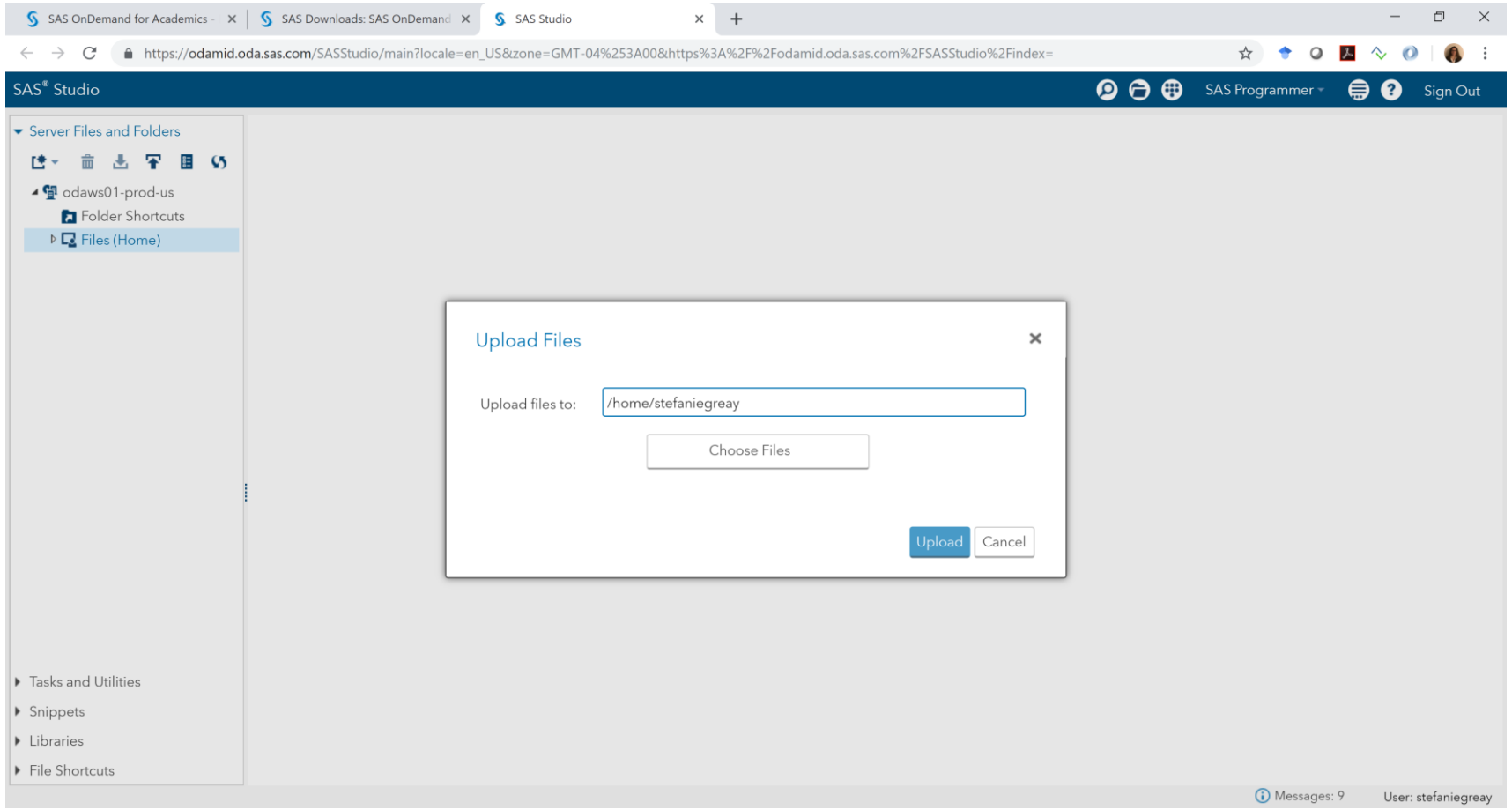
Click on Files(Home)



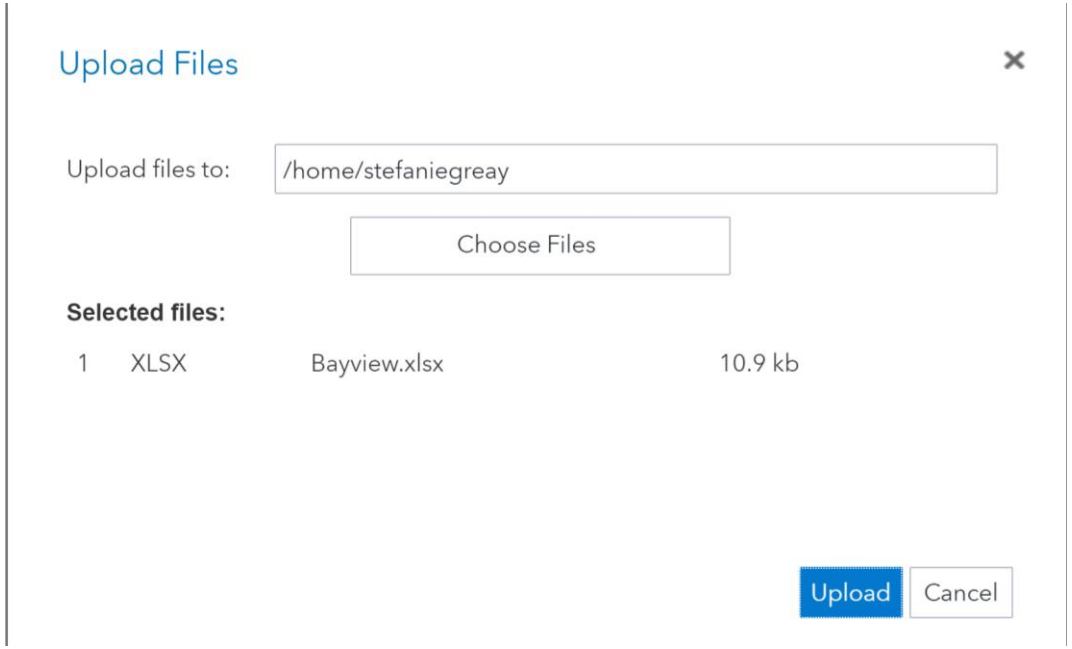
The Upload button will display in dark blue



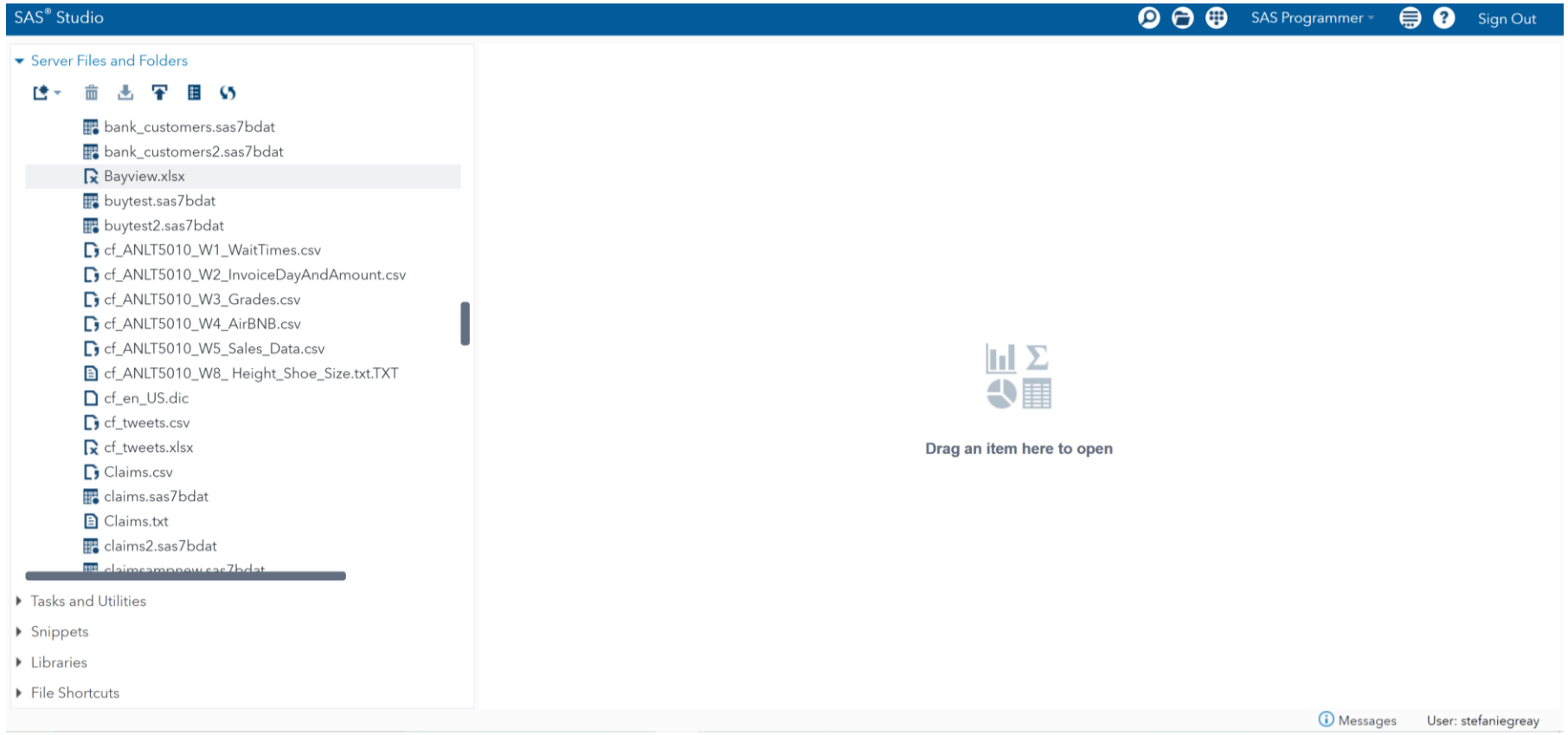
You can create a folder at this point, if you wish, or simply upload to your home directory.



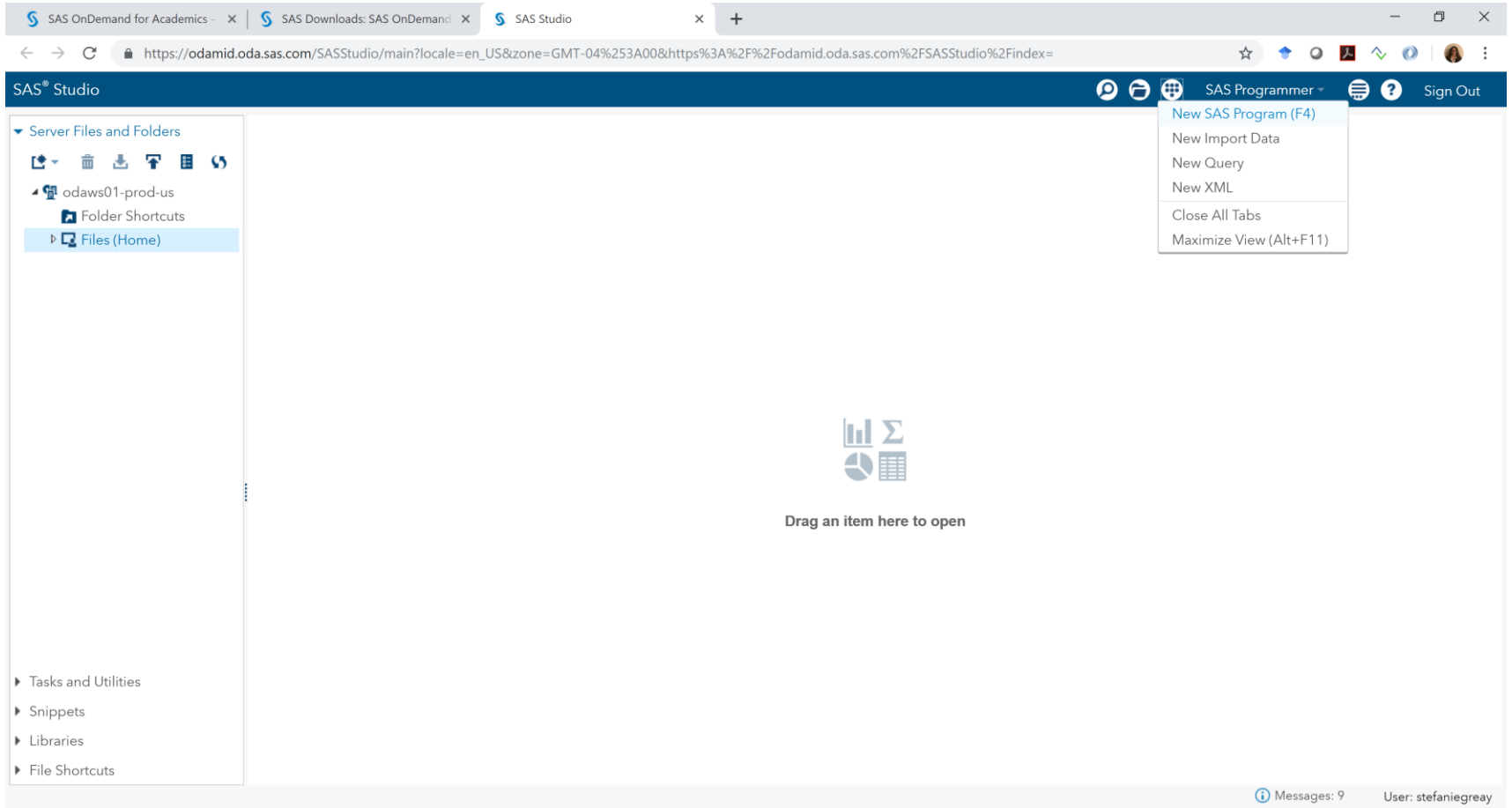
Select “Choose Files” to browse your computer for the dataset you want to upload. Once the dataset has been selected, click “Upload.”



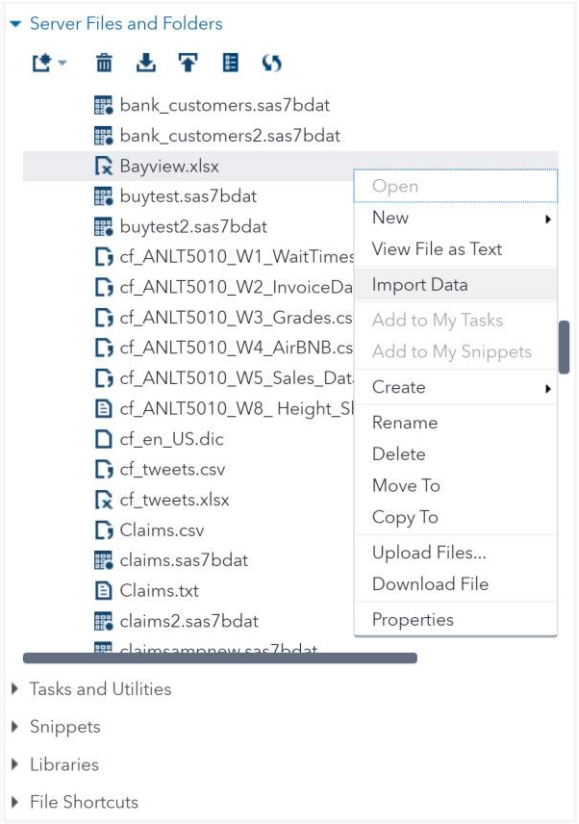
You will be able to view your files by clicking on “Files(Home)” to verify that your file successfully uploaded.



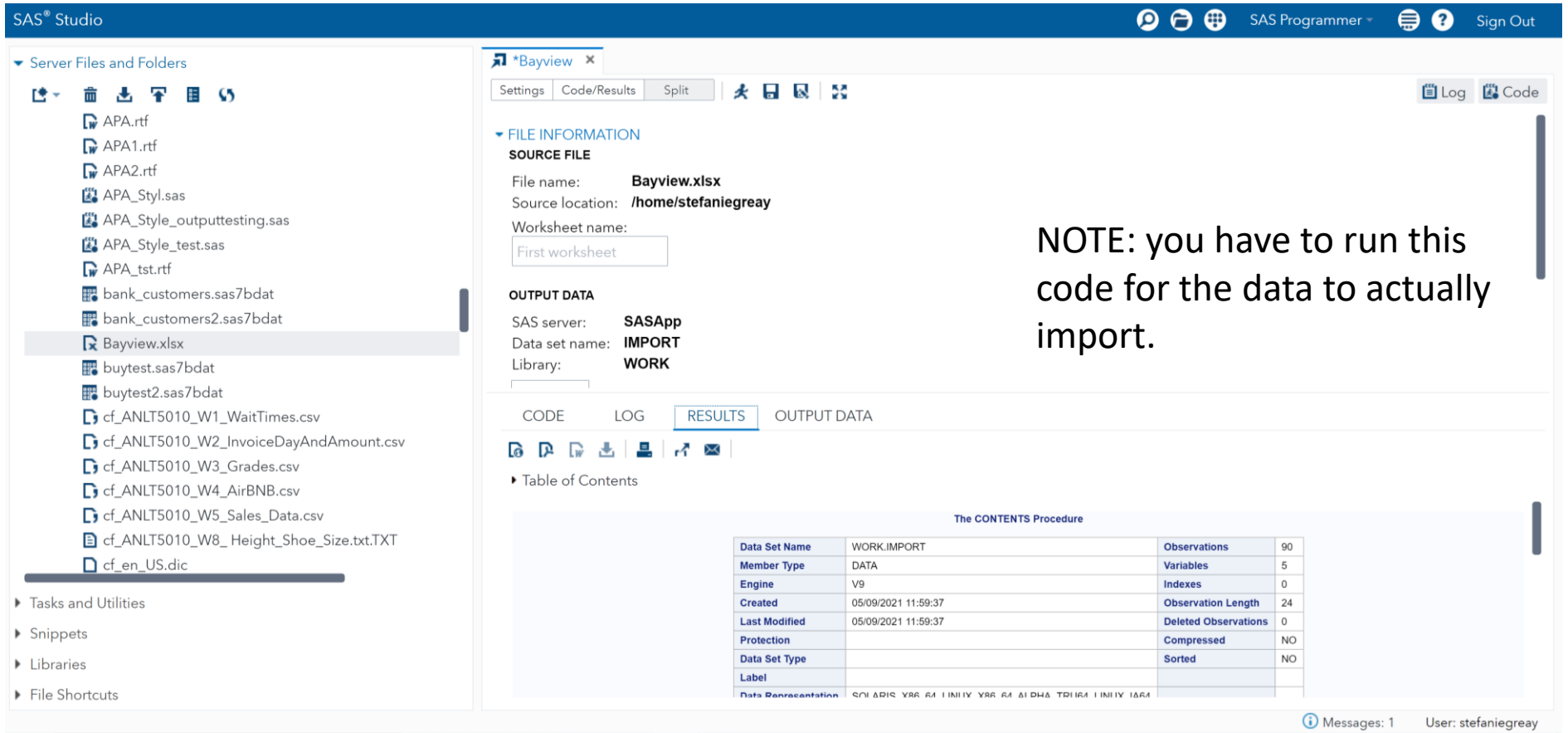
To get started with the SAS portion of the Unit 3 Assignment 1 assignment, start a new SAS program.



Import the dataset into a SAS dataset format (from the current xlsx format)

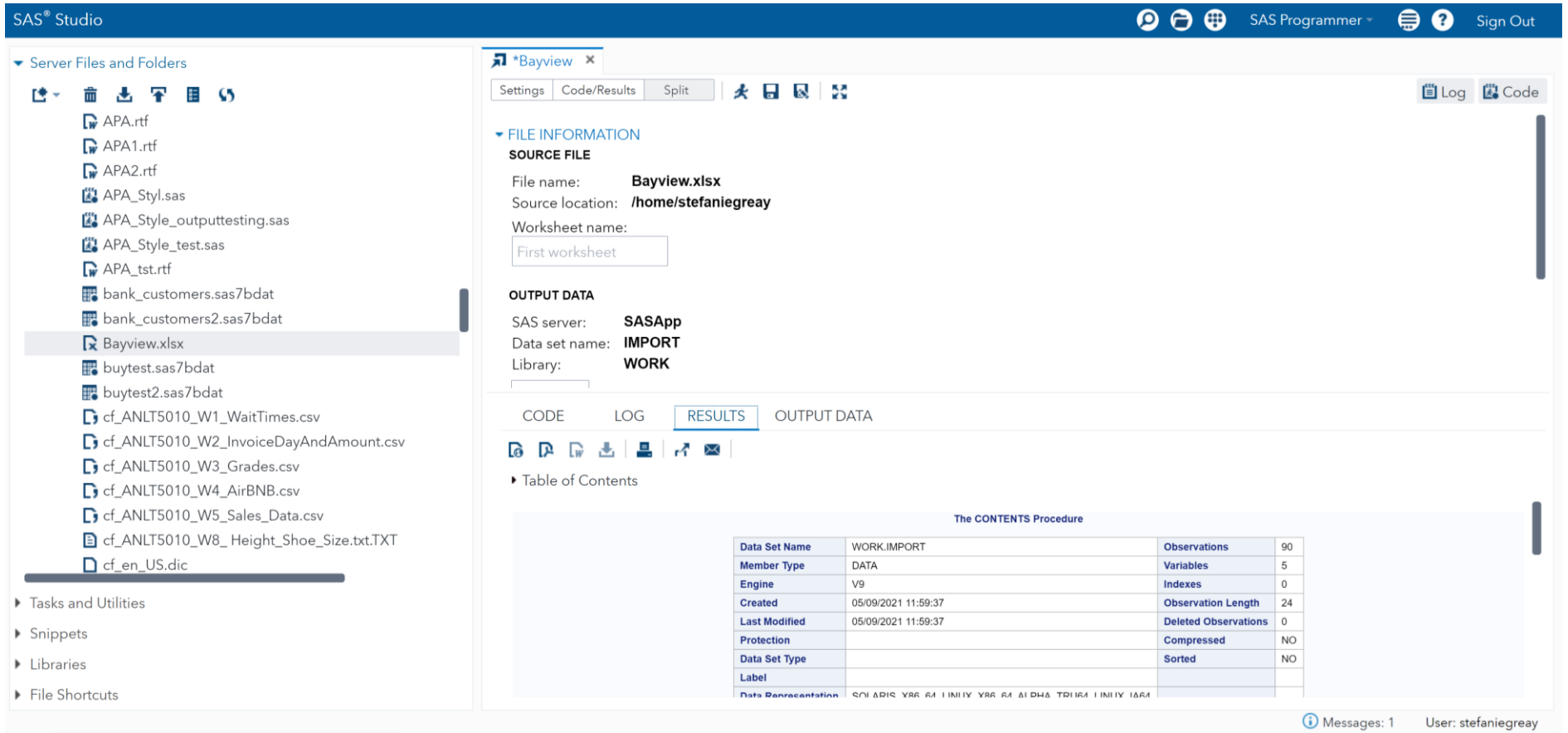


The Proc Import code will be written for you (save this as a template to use for future imports!)

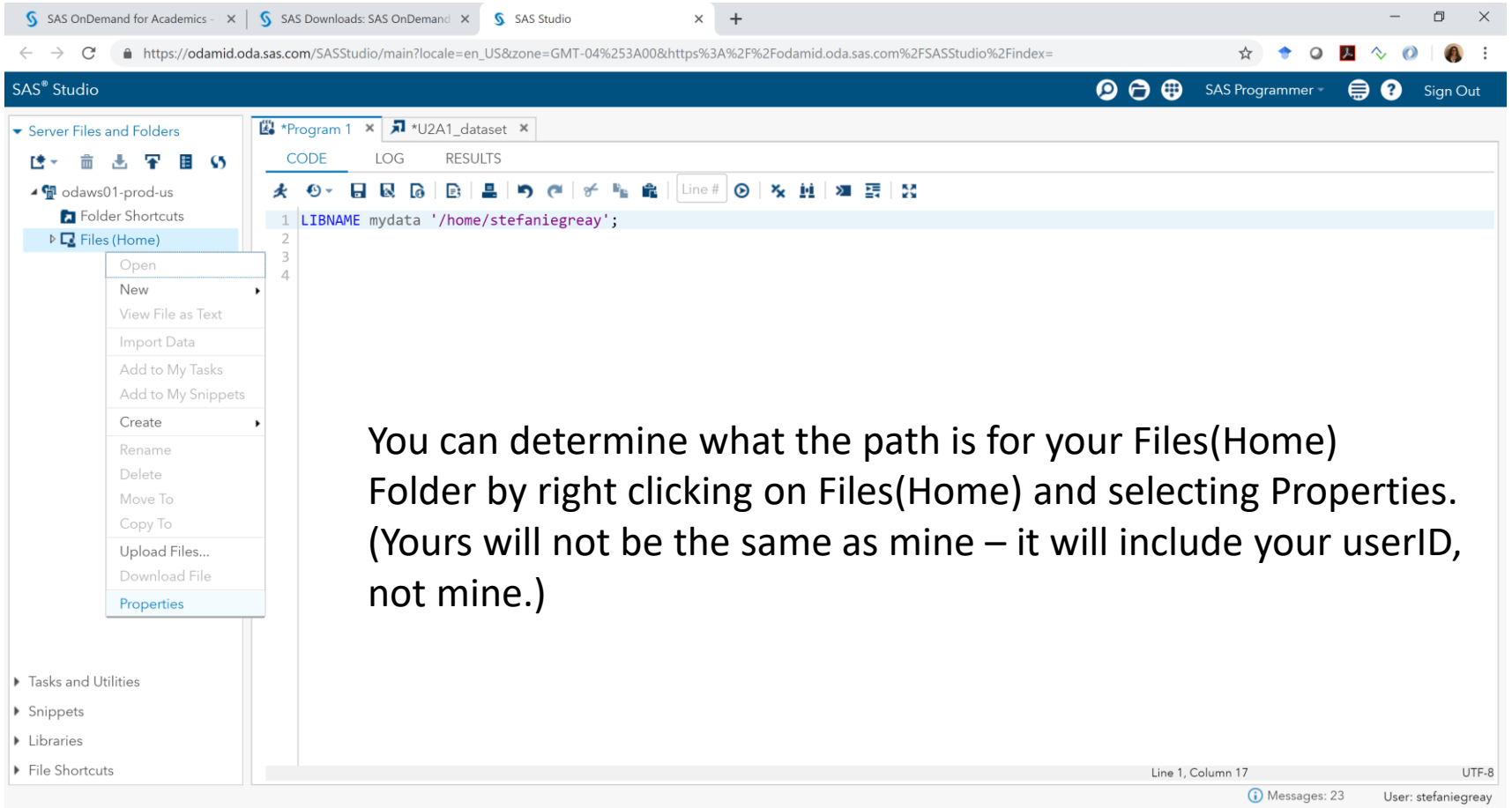


NOTE: you have to run this code for the data to actually import.

To run the code, click the icon that looks like a guy running.

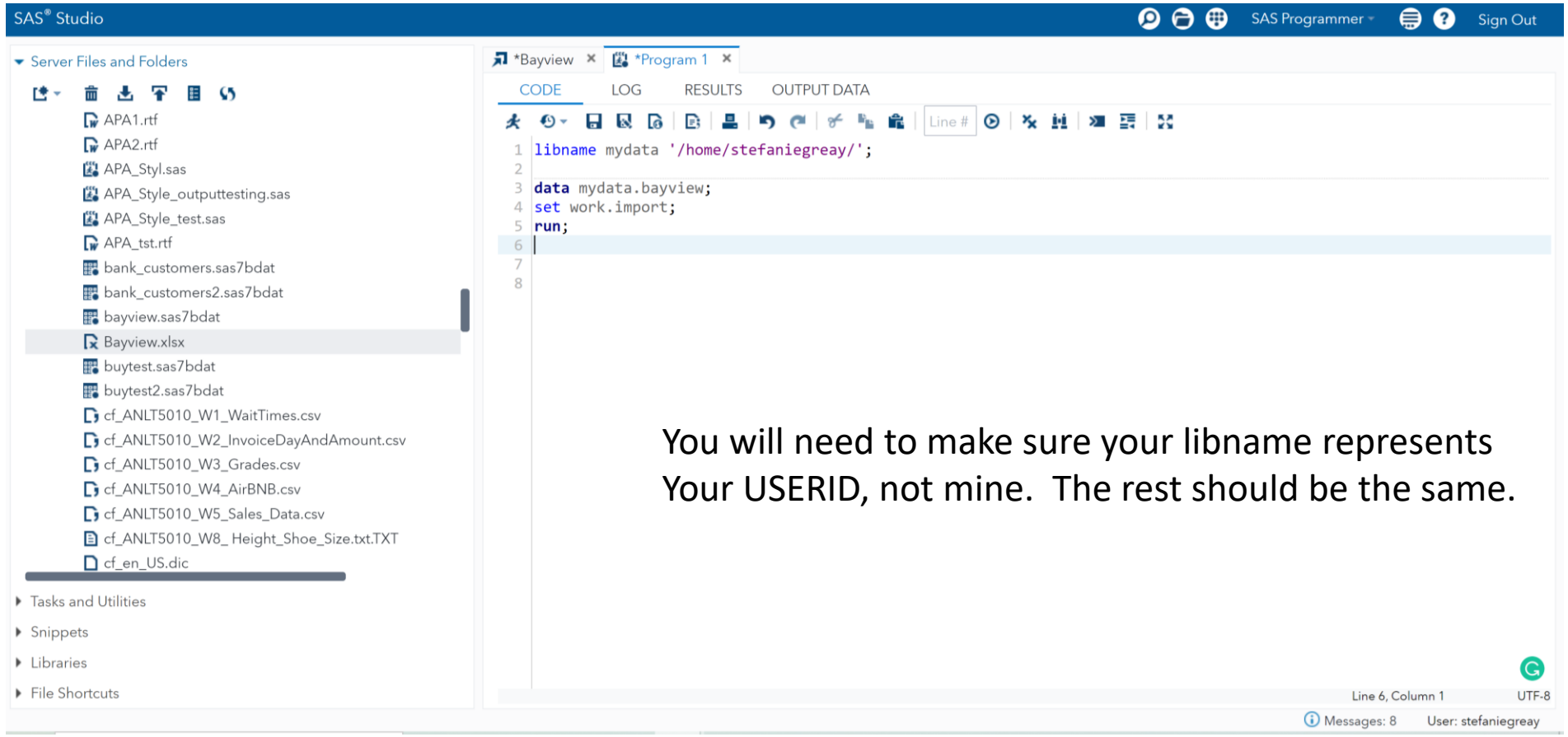


To create a SAS Library for your Files(Home) folder, you need to use a libname statement



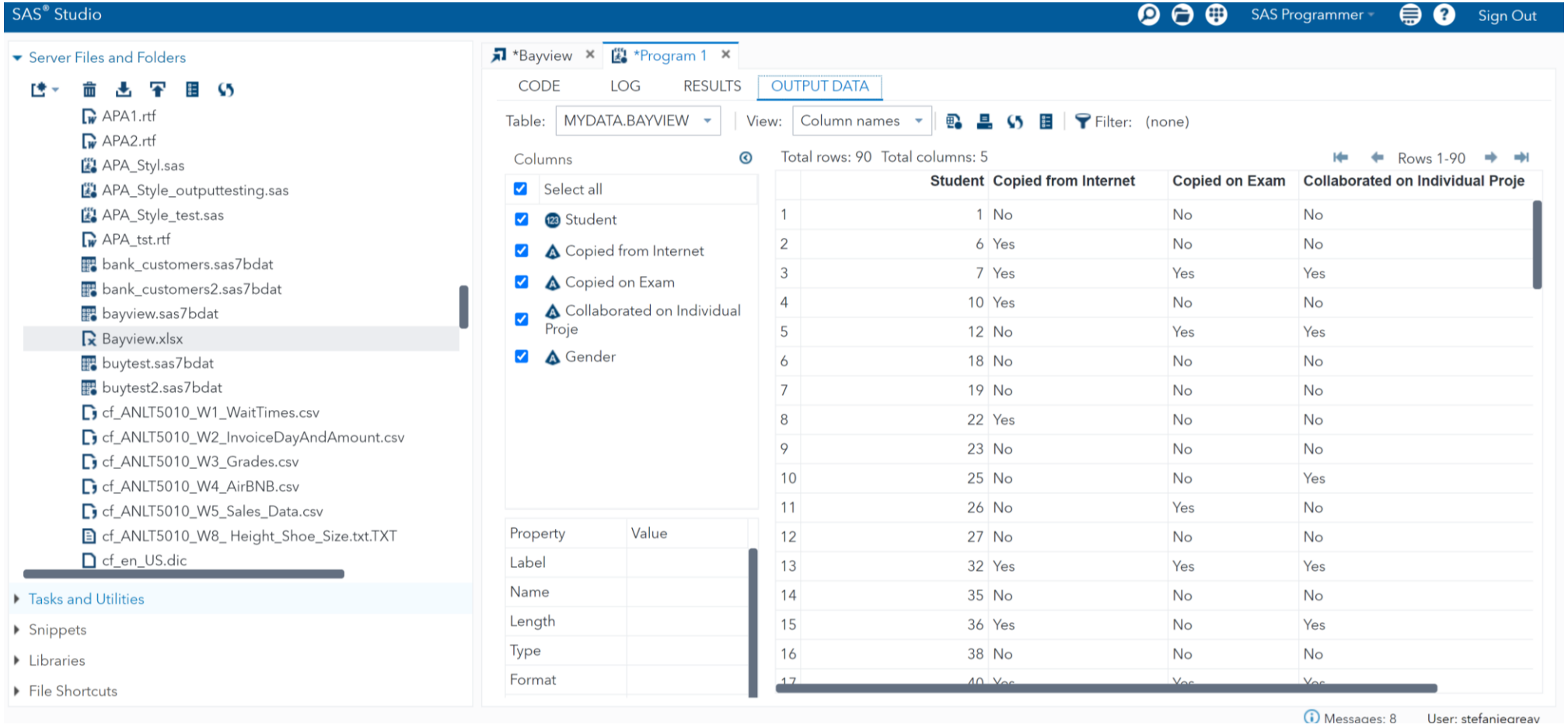
You can determine what the path is for your Files(Home) Folder by right clicking on Files(Home) and selecting Properties. (Yours will not be the same as mine – it will include your userID, not mine.)

Save the temporary SAS dataset created by the import to your library using the following sample code.

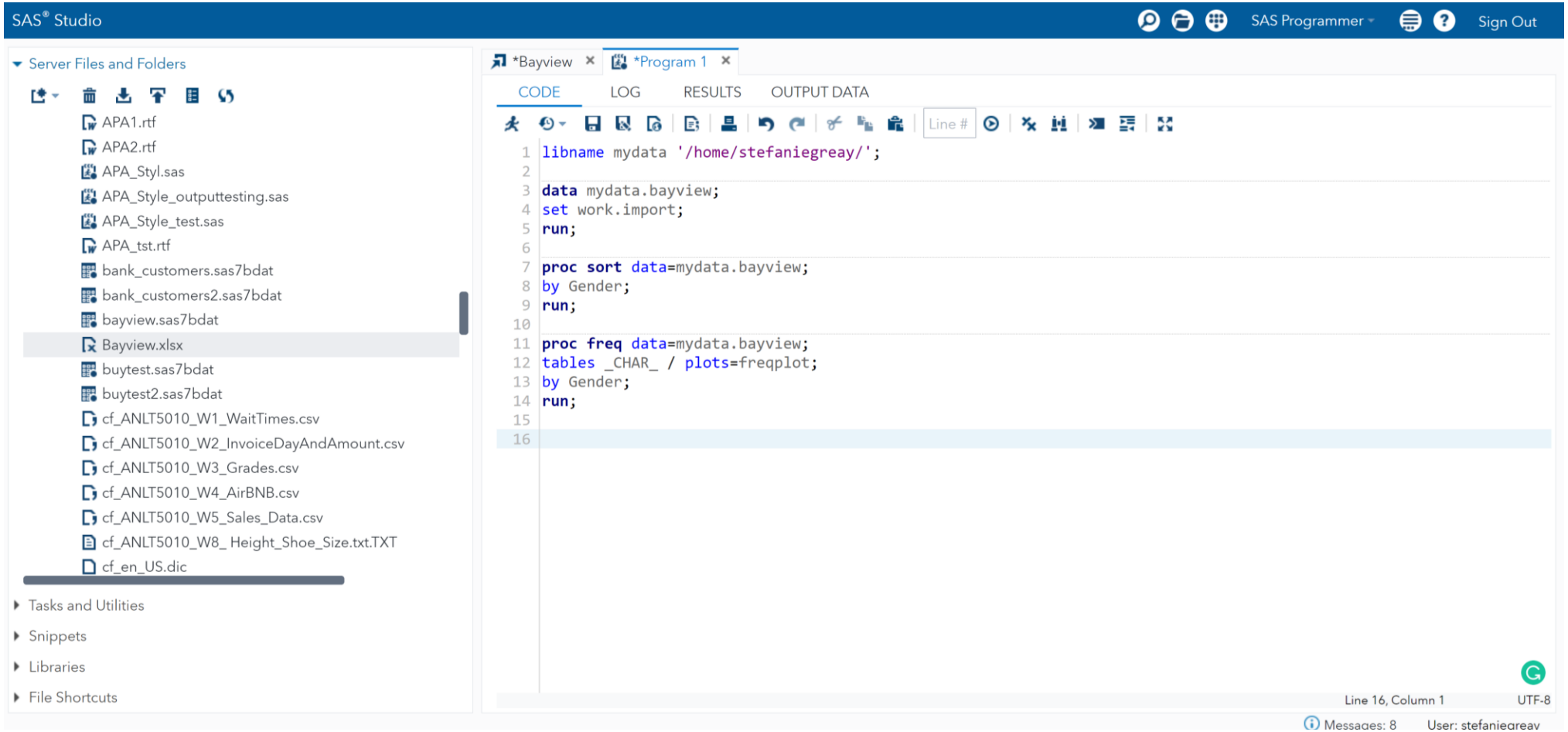


You will need to make sure your libname represents Your USERID, not mine. The rest should be the same.

When you run the code, you will see the dataset in the ouput data window and can verify its success.



You can now run any procedures against that dataset via the code window.



Sample Code for the descriptive portion of this assignment

```
libname mydata '/home/stefaniegreay/';

data mydata.bayview;
set work.import;
run;

proc sort data=mydata.bayview;
by Gender;
run;

proc freq data=mydata.bayview;
tables _CHAR_ / plots=freqplot;
by Gender;
run;
```

Note that proc freq uses the lowest level for confidence interval and hypothesis test output. This code helps adjust so that it uses the correct level.

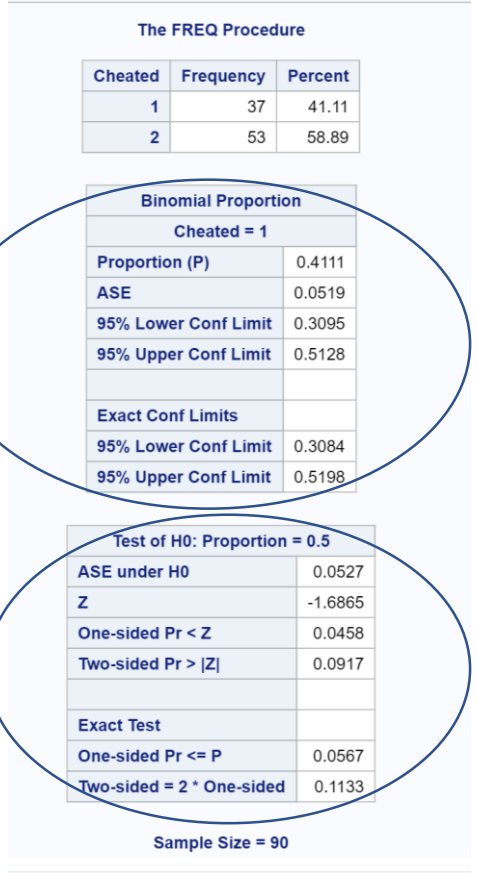
```
data mydata.bayview2;
set mydata.bayview;
CfI=2;
CoE=2;
CoIP=2;
Cheated=2;
if 'Copied from Internet'n = 'Yes' then CfI=1;
if 'Copied on Exam'n = 'Yes' then CoE=1;
if 'Collaborated on Individual Proje'n = 'Yes' then CoIP=1;
if ('Copied from Internet'n = 'Yes'
          or 'Copied on Exam'n = 'Yes'
          or 'Collaborated on Individual Proje'n = 'Yes' ) then Cheated=1;
run;
```

Reference:

https://www.lexjansen.com/phuse/2013/sp/SP05.pdf

Once you run the code shown below (and on the previous slides), you can review the results to see the confidence intervals and hypothesis test output.

```
proc freq data=mydata.bayview2;
tables Cheated / nocum norow binomial;
exact binomial;
run;
```



The FREQ Procedure

Cheated	Frequency	Percent
1	37	41.11
2	53	58.89

Binomial Proportion	
Cheated = 1	
Proportion (P)	0.4111
ASE	0.0519
95% Lower Conf Limit	0.3095
95% Upper Conf Limit	0.5128
Exact Conf Limits	
95% Lower Conf Limit	0.3084
95% Upper Conf Limit	0.5198

Test of H0: Proportion = 0.5	
ASE under H0	0.0527
Z	-1.6865
One-sided Pr < Z	0.0458
Two-sided Pr > |Z|	0.0917
Exact Test	
One-sided Pr <= P	0.0567
Two-sided = 2 * One-sided	0.1133

Sample Size = 90

Confidence Interval Numeric Results (Normal approximation on top and then exact Binomial below that)

Hypothesis Test Numeric Results (Normal approximation on top and then exact Binomial below that)

Sample Code for the confidence interval portion of this assignment

```
proc freq data=mydata.bayview2;
tables Cheated / nocum norow binomial;
 exact binomial;
 run;

proc sort data=mydata.bayview2;
by Gender;
run;


proc freq data=mydata.bayview2;
tables Cheated / nocum norow binomial;
by Gender;
exact binomial;
run;
```

Interpreting Confidence Intervals

Example interpretation of a confidence interval for a 95% confidence interval for the average age of students currently enrolled at college ABCD that results in a point estimate of 20 with a margin of error of 2:

- “We are 95% confident that the true average/mean age of students currently enrolled at college ABCD is 20 years old, with a margin of error of 2 years.”

OR

- “We are 95% confident that the true average/mean age of students currently enrolled at college ABCD is between 18 and 22 years old.”

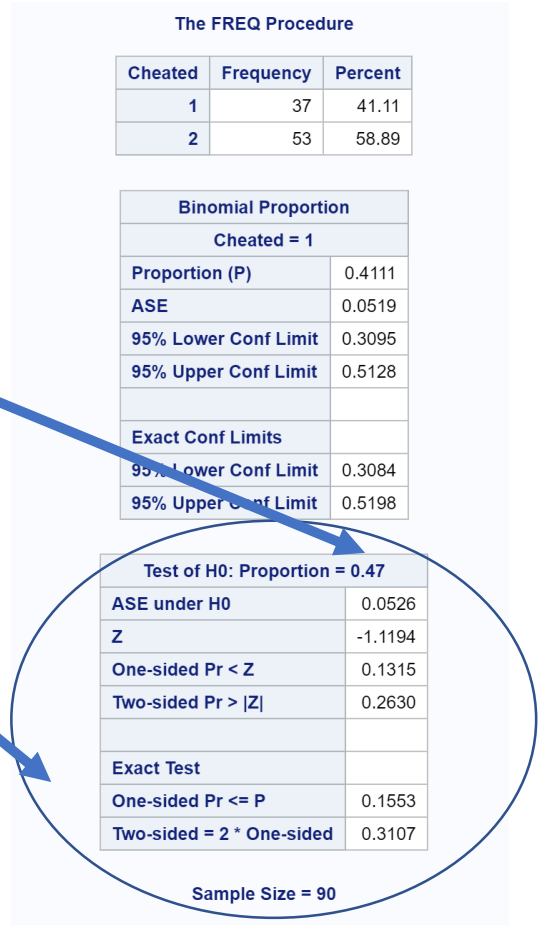
Sample Code for the hypothesis test portion of this assignment

```
proc freq data=mydata.bayview2;
tables Cheated / nocum norow binomial(p=.56);
 exact binomial;
 run;

proc freq data=mydata.bayview2;
tables Cheated / nocum norow binomial(p=.47);
 exact binomial;
 run;
```

Once you run the code shown on the previous slide, you can review the results to see the hypothesis test output.

```
proc freq data=mydata.bayview2;
tables Cheated / nocum norow
binomial(p=.47);
 exact binomial;
 run;
```



The FREQ Procedure

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Binomial Proportion	
Cheated = 1	
Proportion (P)	0.4111
ASE	0.0519
95% Lower Conf Limit	0.3095
95% Upper Conf Limit	0.5128
Exact Conf Limits	
95% Lower Conf Limit	0.3084
95% Upper Conf Limit	0.5198

Test of H0: Proportion = 0.47	
ASE under H0	0.0526
Z	-1.1194
One-sided Pr < Z	0.1315
Two-sided Pr > |Z|	0.2630
Exact Test	
One-sided Pr <= P	0.1553
Two-sided = 2 * One-sided	0.3107

Sample Size = 90

Hypothesis Test Numeric Results (Normal approximation on top and then exact Binomial below that)

Hypothesis Test Numeric Results (Normal approximation on top and then exact Binomial below that)

Assumptions for Normal Approximation to Binomial Hypothesis tests (for one proportion)

Parameter	Assumption
P	1) Sample is taken via a SRS or data is from a randomized experiment 2) $n*p \geq 10$ AND $n*(1-p) \geq 10$ 3) The sampled values are independent of each other

5 Steps of a Hypothesis Test

- Hypotheses
  - (null and alternative hypothesis)
- Test Statistic
  - (from software output)
- P-value (or Rejection Region)
  - (from software output)
- Result
  - (reject or fail to reject the null hypothesis)
- Conclusion
  - (result written in terms of claim)

Step 1: Hypotheses

- H_o: parameter = null value
- H_a: parameter > null value *(one-tailed test)*
  parameter < null value *(one-tailed test)*
  parameter ≠ null value *(two-tailed test)*

- Choices for parameters for one sample/population hypothesis test:
  p (proportion) or μ (mean)

(for our case, we are dealing with a proportion, so the parameter will be p)

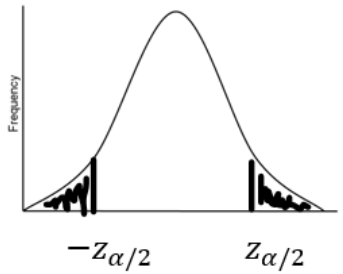
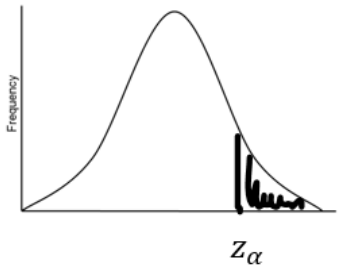
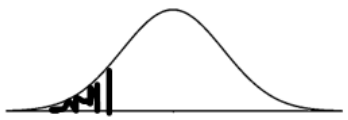
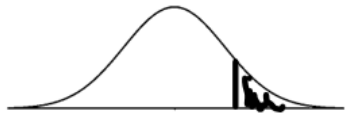
- The null value comes from the claim we are testing.

Step 2: Test Statistic

Parameter	Null Value	Test Statistic
P	p_0	$Z^* = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 (1 - p_0)}{n}}}$
μ	μ_0	$t^* = \frac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}}$

Step 3: P-value

p-value and rejection region depend on direction of alternative hypothesis

Alternative Hypothesis Symbol	Ha: Parameter < null value	Ha: Parameter ≠ null value	Ha: Parameter > null value
p-value parameter = p parameter = μ	$P(Z \le Z^*)$ $P(T \le t^*)$	$2*P(Z \ge \lvert Z^* \rvert)$ $2*P(T \ge \lvert t^* \rvert)$	$P(Z \ge Z^*)$ $P(T \ge t^*)$
Rejection Region (shaded area) parameter = p	 $-z_\alpha$	 $-z_{\alpha/2}$ $z_{\alpha/2}$	 z_α
parameter = μ	 $-t_{\alpha,df}$ df=n-1	 $-t_{\frac{\alpha}{2},df}$ $t_{\frac{\alpha}{2},df}$ df=n-1	 $t_{\alpha,df}$ df=n-1

Step 4: Result

p-value comparison	Result
If $p \leq \alpha$	Reject Ho
If $p > \alpha$	Fail to Reject Ho

Step 5: Conclusion

Result	Evidence in favor of Ha/claim?	Statistical Significance
Reject Ho	Sufficient Evidence (to suggest claim shown in Ha may be valid)	Statistically Significant
Fail to Reject Ho	Insufficient Evidence (or not sufficient evidence) (to suggest claim shown in Ha may be valid)	Statistically Insignificant (or not statistically significant)

Example (not one of the assignment tests)

If we wanted to test whether or not less than half of the students at Bayview cheated, using an exact binomial test…

- Step 1: H_o: p = 0.5 H_a: p < 0.5
- Step 2: test statistic *(no test statistic with exact test)*
- Step 3: p-value: 0.0567
- Step 4: result (tested at alpha=0.05)
  - P-value > alpha
  - 0.0567 > 0.05 => Fail to Reject H_o
- Step 5: conclusion
  - There is insufficient evidence to suggest that the proportion of Bayview students who cheated is significantly less than half.

The FREQ Procedure

Cheated	Frequency	Percent
1	37	41.11
2	53	58.89

Binomial Proportion	
Cheated = 1	
Proportion (P)	0.4111
ASE	0.0519
95% Lower Conf Limit	0.3095
95% Upper Conf Limit	0.5128
Exact Conf Limits	
95% Lower Conf Limit	0.3084
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Test of H0: Proportion = 0.5	
ASE under H0	0.0527
Z	-1.6865
One-sided Pr < Z	0.0458
Two-sided Pr > |Z|	0.0917
Exact Test	
One-sided Pr <= P	0.0567
Two-sided = 2 * One-sided	0.1133

Sample Size = 90

Normal approx. test output

Binomial exact test output