

ODS WORKSHOP: THE OUTPUT DELIVERY SYSTEM FROM BEGINNING TO END

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THE OUTPUT DELIVERY SYSTEM (ODS)

The Output Delivery System (ODS) is a component of BASE SAS which provides the capability of routing SAS Output to different external file formats and software platforms.

ODS is really a series of statements, destinations, procedures, templates and other constructs which comprise ODS.

ODS allows SAS users to format their output in common software platforms, such as WORD, EXCEL, and POWERPOINT.



What is ODS?

- ODS=Output Delivery System
- SAS procedures produce output objects
- ODS allows these objects to be wrangled, organized, and used in many ways...printing, producing graphics files, creating new data from Procedures, etc.

Summer 2009 BMTRY 789 Introduction to SAS Programming 3

ODS COMPONENTS

The Output Delivery
Systems consists of all of
these different components.

Different ODS Topics and
concepts which we'll learn
about and address in this
course.

ODS DESTINATIONS

ODS STATEMENTS

ODS OUTPUT OBJECTS

ODS STYLES

ODS TEMPLATES

ODS GRAPHICS

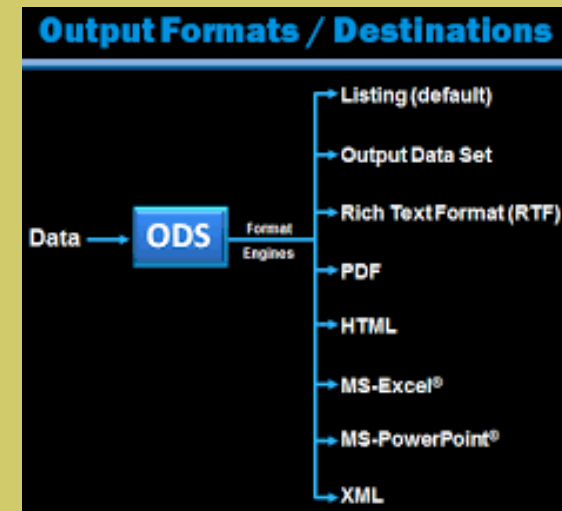
ODS has default and custom
formatting templates called
styles which can be applied
to SAS output produced
from a variety of SAS
procedures.

ODS DESTINATIONS

ODS destinations are specific software platforms and file formats which SAS output is converted to.

By default, ODS destinations are inactive, and need to be opened to make them active.

There can be multiple ODS destinations open at once.



The default destination is the LISTING destination where SAS output is generated in SAS 9.4.

ODS DESTINATIONS

ODS destinations belong to different families.

Printer Family,
Markup Family,
etc.

<u>ODS DESTINATION</u>	<u>DESCRIPTION</u>
LISTING	SENDS OUTPUT TO A LISTING OUTPUT (.LST) FILE.
HTML	SENDS OUTPUT TO AN HTML FILE
PDF	SENDS OUTPUT TO A PDF FILE
RTF	SENDS OUTPUT TO A RICH TEXT FORMAT FILE
EXCEL	SENDS OUTPUT TO AN XLSX FILE
CSV	SENDS OUTPUT TO A COMMA SEPARATED VALUES FILE
MARKUP	SENDS OUTPUT TO SAS TAGSETS / XML FILES
OUTPUT	SENDS OUTPUT TO A SAS DATA SET
DOCUMENT	SENDS OUTPUT TO DOCUMENT OUTPUT

ODS MARKUP DESTINATIONS

The ODS MARKUP destinations send output to SAS tagsets.

Tagsets are destination-specific XML files.

Examples are the ODS EXCELXP tagset.

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema attributeFormDefault="unqualified" elementFormDefault="qualified"
  xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:element name="points">
    <xs:complexType>
      <xs:sequence>
        <xs:element maxOccurs="unbounded" name="point">
          <xs:complexType>
            <xs:attribute name="x" type="xs:unsignedShort" use="required" />
            <xs:attribute name="y" type="xs:unsignedShort" use="required" />
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
</xs:schema>
```

In earlier versions of SAS, this was the only destination to route output directly to Excel.

ODS CODING

The coding of ODS Statements is relatively simple and straightforward.

ODS statements are placed around the code for a SAS procedure used to produce SAS output

ODS output-destination <options(s)>;

Opens the ODS Destination

.....<SAS procedure code>.....

.....<SAS procedure code>.....

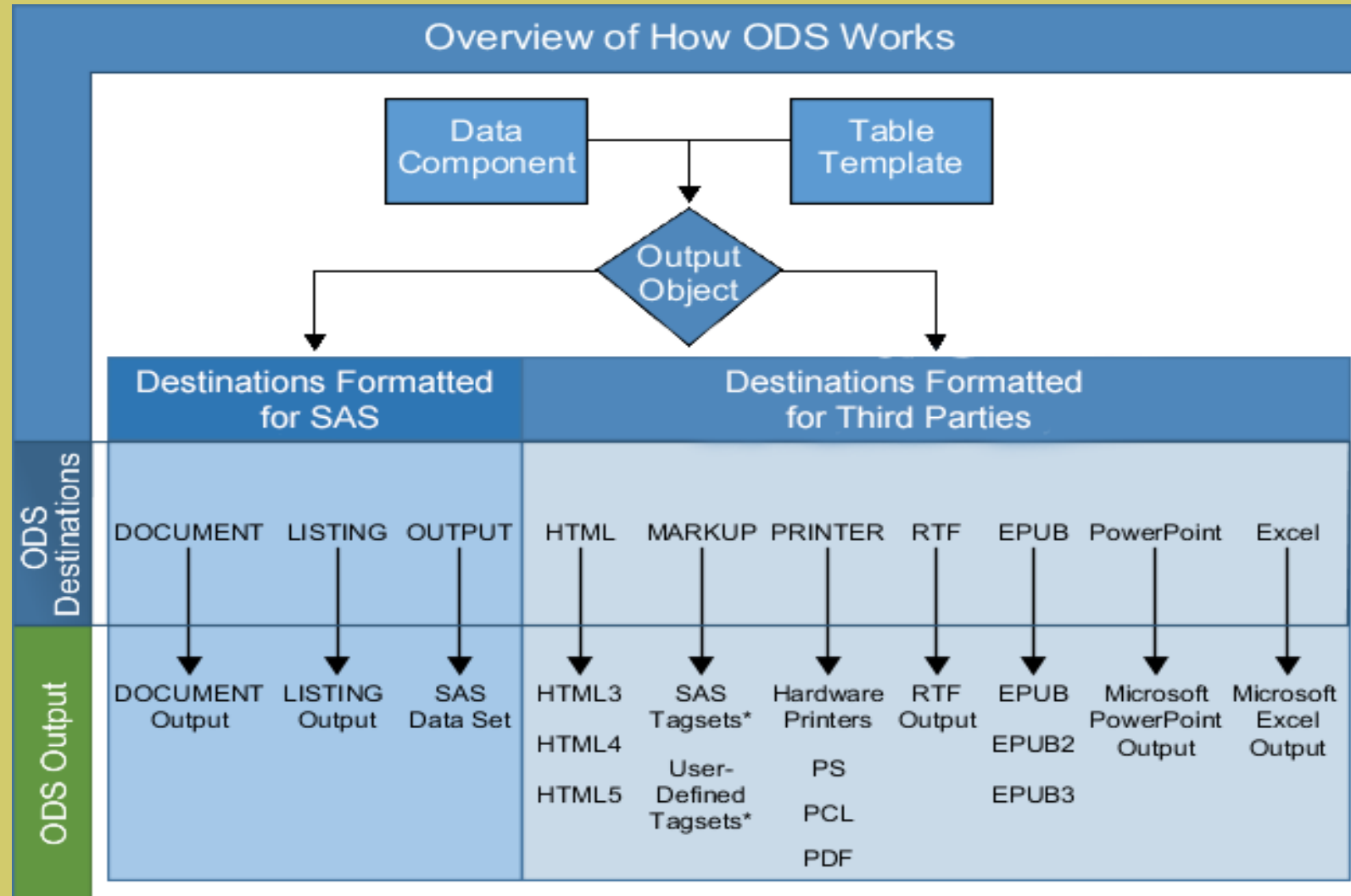
.....<SAS procedure code>.....

SAS Procedure Code;
Proc Print, etc.

ODS destination close statement;

Closes the ODS Destination

ODS PROCESS UNDER THE HOOD



THE ODS LISTING DESTINATION

In prior versions of SAS Display Manager, such as SAS V8, and Version 9.1 & 9.2, the LISTING destination was the default destination, and was open upon starting a SAS session.

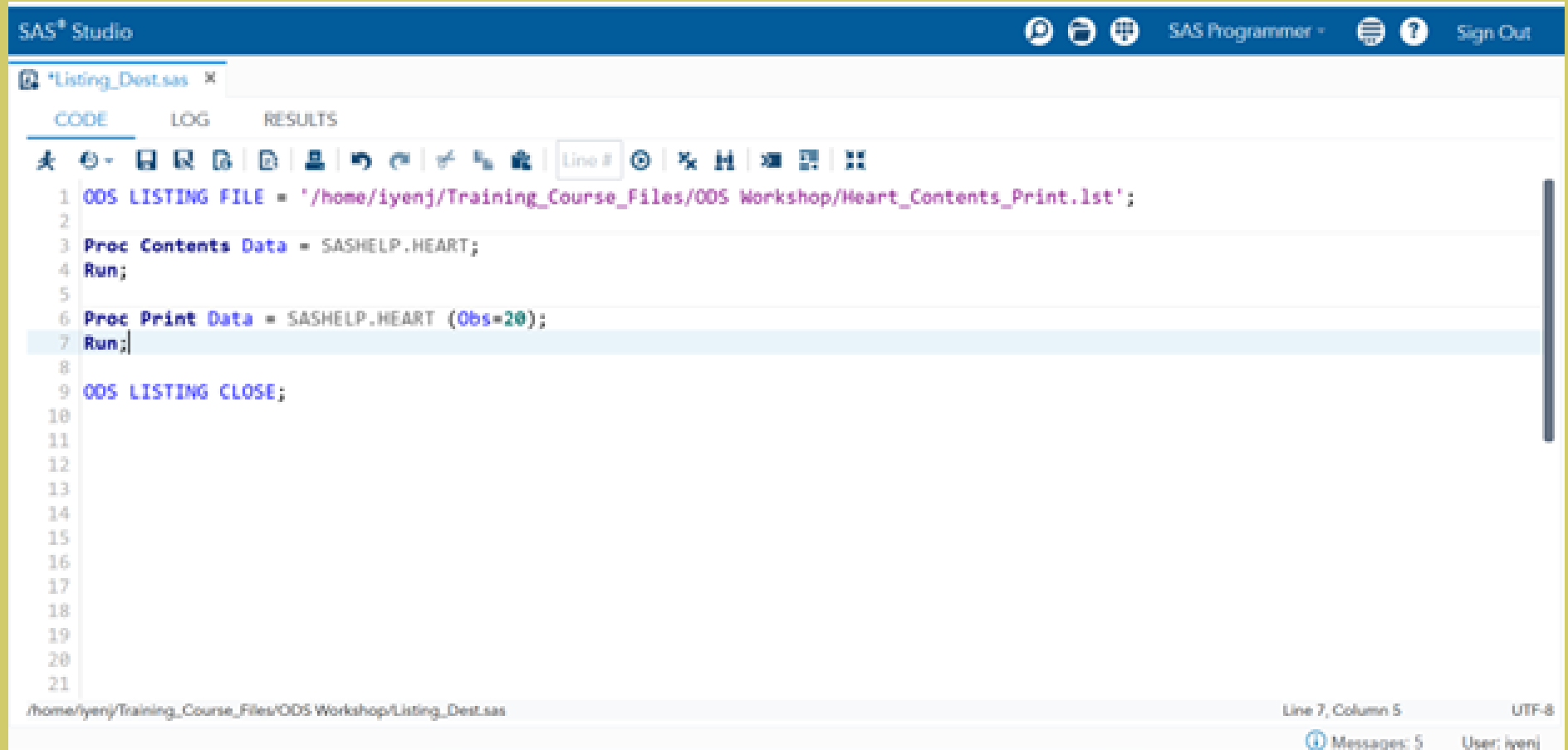
Any SAS procedure output was sent to the Output window, which contained LISTING destination output.

SAS output in the LISTING destination are saved in file formats with the .LST extension

In SAS 9.3, or 9.4, the HTML destination replaced the LISTING destination as the default destination.

In SAS Studio, The HTML5, RTF, and PDF destinations are the default open ODS destinations.

ODS LISTING – SAS EXAMPLE



The screenshot shows the SAS Studio interface. The top blue bar contains the text "SAS® Studio" on the left and several icons (refresh, save, print, etc.) followed by "SAS Programmer" and a "Sign Out" link on the right. Below the top bar is a tab labeled "*Listing_Dest.sas". Underneath the tab are three tabs: "CODE", "LOG", and "RESULTS", with "CODE" being the active tab. A toolbar with various icons is located below the tabs. The main area displays a SAS program with the following code:

```
1 ODS LISTING FILE = '/home/iyenj/Training_Course_Files/ODS Workshop/Heart_Contents_Print.lst';
2
3 Proc Contents Data = SASHELP.HEART;
4 Run;
5
6 Proc Print Data = SASHELP.HEART (Obs=20);
7 Run;
8
9 ODS LISTING CLOSE;
10
11
12
13
14
15
16
17
18
19
20
21
```

At the bottom of the window, a status bar shows the file path "/home/iyenj/Training_Course_Files/ODS Workshop/Listing_Dest.sas" on the left, "Line 7, Column 5" in the center, and "UTF-8" on the right. On the far right of the status bar, it says "Messages: 5" and "User: iyenj".

ODS LISTING OUTPUT

```
Heart_Contents_Print.lst
File Edit View
1 Status Char 5
9 Systolic Num 8
7 Weight Num 8
16 Weight_Status Char 11 Weight Status

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S m
t e
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u i
s n
s g

D A A C C W e S
e g e i S g o o B h o
a t h a y e l l P t i
t C H t H W s s m t s S t g
a d D S e e t t o D t t t
u i S a g h l l M k e e a a a
s a e r h g i i R n t o u u u
s g x t t t c c W g h l s s s

1 Dead Other . Female 29 62.50 140 78 124 121 0 55 . Normal Overweight Non-smoker
2 Dead Cancer . Female 41 59.75 194 92 144 183 0 57 181 Desirable High Overweight Non-smoker
3 Alive . Female 57 62.25 132 90 170 114 10 . 250 High High Overweight Moderate (6-15)
4 Alive . Female 39 65.75 158 80 128 123 0 . 242 High Normal Overweight Non-smoker
5 Alive . Male 42 66.00 156 76 110 116 20 . 281 High Optimal Overweight Heavy (16-25)
6 Alive . Female 58 61.75 131 92 176 117 0 . 196 Desirable High Overweight Non-smoker
7 Alive . Female 36 64.75 136 80 112 110 15 . 196 Desirable Normal Overweight Moderate (6-15)
8 Dead Other . Male 53 65.50 130 80 114 99 0 77 276 High Normal Normal Non-smoker
9 Alive . Male 35 71.00 194 68 132 124 0 . 211 Borderline Normal Overweight Non-smoker
10 Dead Cerebral Vascular Disease . Male 52 62.50 129 78 124 106 5 82 284 High Normal Normal Light (1-5)
11 Alive . Male 39 66.25 179 76 128 133 30 . 225 Borderline Normal Overweight Very Heavy (> 25)
12 Alive 57 Male 33 64.25 151 68 108 118 0 . 221 Borderline Optimal Overweight Non-smoker
13 Alive 55 Male 33 70.00 174 90 142 114 0 . 188 Desirable High Overweight Non-smoker
14 Alive 79 Male 57 67.25 165 76 128 118 15 . . Normal Overweight Moderate (6-15)
15 Alive 66 Male 44 69.00 155 90 130 105 30 . 292 High High Normal Very Heavy (> 25)
16 Alive . Female 37 64.50 134 76 120 108 10 . 196 Desirable Normal Normal Moderate (6-15)
17 Alive . Male 40 66.25 151 72 132 112 30 . 192 Desirable Normal Overweight Very Heavy (> 25)
18 Dead Cancer 56 Male 56 67.25 122 72 120 87 15 72 194 Desirable Normal Underweight Moderate (6-15)
19 Alive . Female 42 67.75 162 96 138 119 1 . 200 Borderline High Overweight Light (1-5)
20 Dead Coronary Heart Disease 74 Male 46 66.50 157 84 142 116 30 76 233 Borderline High Overweight Very Heavy (> 25)

Ln 17, Col 83 | 9,363 characters | Plain text | 100% | Unix (LF) | UTF-8
```

SAS DEMONSTRATION

Demonstration using SAS On-Demand for Academics.

ODS HTML DESTINATION

The HTML destination produces SAS output in Hypertext Markup Language Format (HTML).

HTML files can be accessed and opened in a web browser, such as Google Chrome, Microsoft Edge, etc.

There are several HTML destinations (HTML3, HTML4, and HTML5) corresponding to different versions of HTML. The HTML destination produces files in HTML 4.

In SAS 9.3/9.4, the HTML destination is the default destination.

The HTML5 destination was introduced with SAS 9.4.

In SAS Studio, the HTML5 destination is one of the default ODS destinations.

ODS HTML STATEMENT

There are two different file structures produced by the ODS HTML destination.

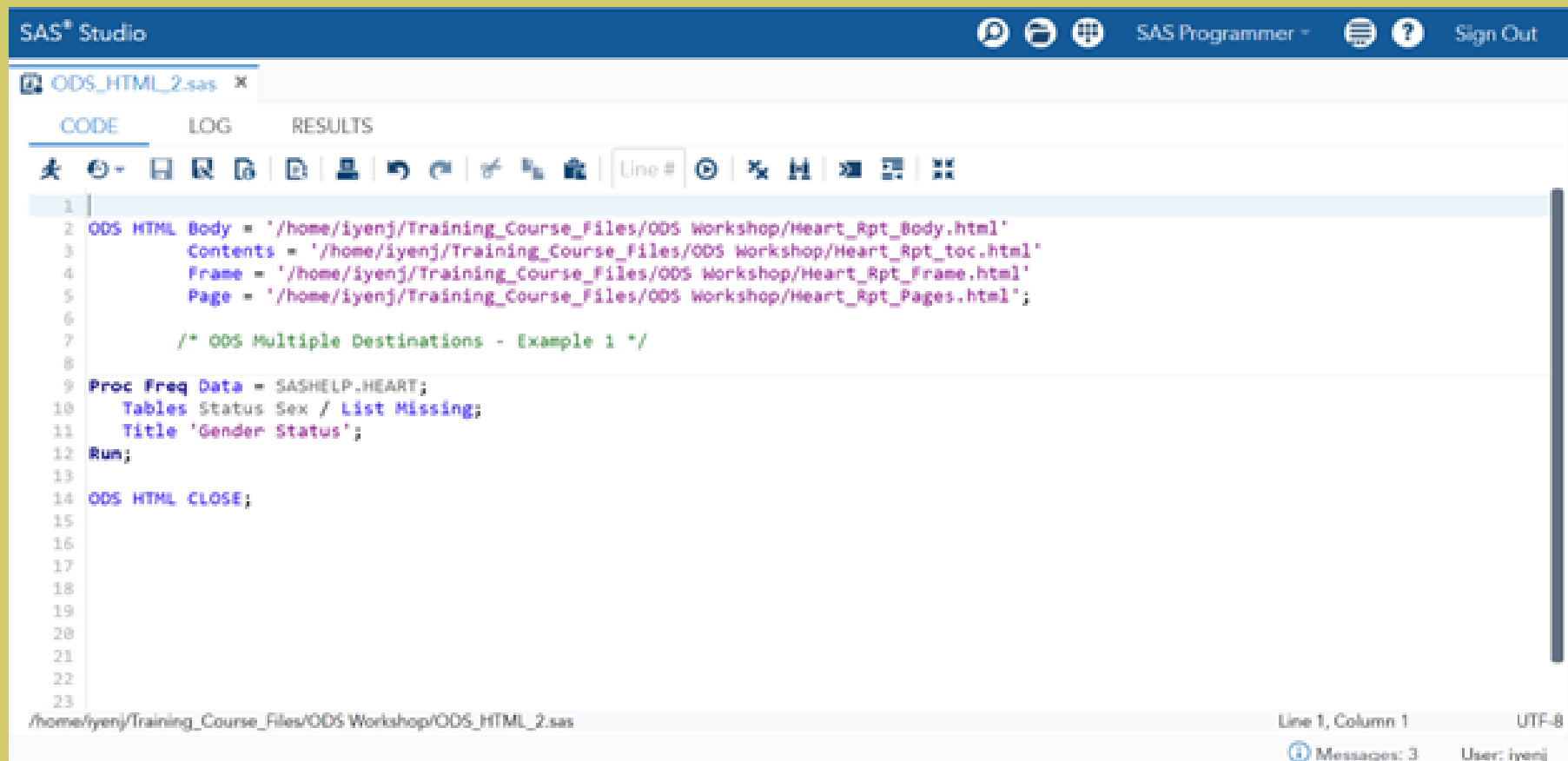
Output can be compiled into a single file, using the FILE= option.

Output can be split up into multiple files, using the BODY=, FRAME=, and CONTENTS= options which produce Body file, Frame Files and Contents Files respectively.

The Frame file integrates the Body File, Table of Contents and Table of Pages.

The Body file contains the output, while the other files create a frame which includes the table of contents, and a table of pages, which link to the contents of the body file.

ODS HTML – SAS EXAMPLE

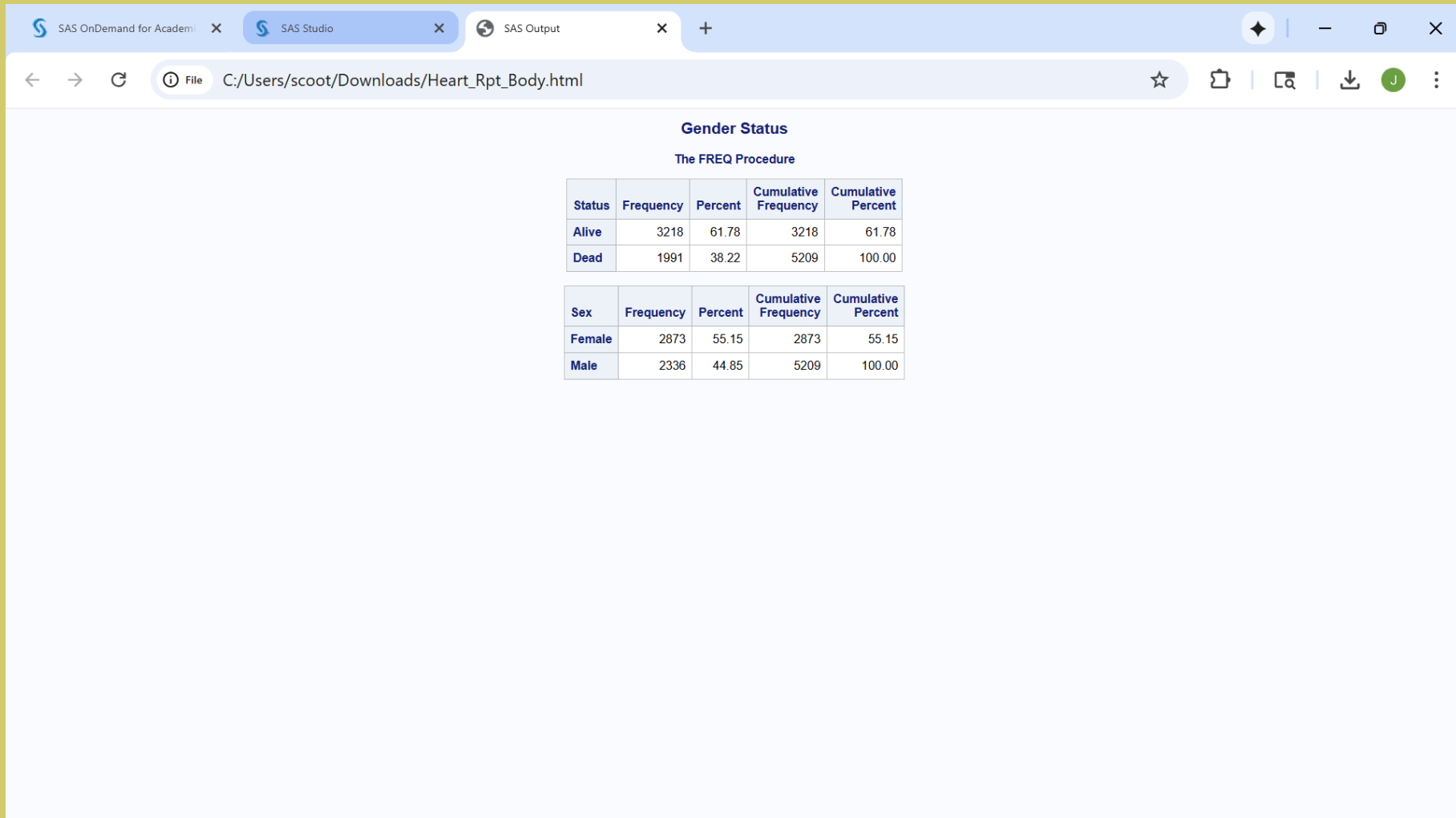


The screenshot displays the SAS Studio interface. The top blue header bar contains the text "SAS® Studio" on the left, and icons for user profile, session, and help on the right, along with the text "SAS Programmer" and a "Sign Out" link. Below the header, a tab labeled "ODS_HTML_2.sas" is active. The main workspace is divided into three panes: "CODE", "LOG", and "RESULTS". The "CODE" pane is selected and shows a SAS program with line numbers 1 through 23 on the left margin. The program code is as follows:

```
1  
2 ODS HTML Body = '/home/iyen/Training_Course_Files/ODS Workshop/Heart_Rpt_Body.html'  
3   Contents = '/home/iyen/Training_Course_Files/ODS Workshop/Heart_Rpt_toc.html'  
4   Frame = '/home/iyen/Training_Course_Files/ODS Workshop/Heart_Rpt_Frame.html'  
5   Page = '/home/iyen/Training_Course_Files/ODS Workshop/Heart_Rpt_Pages.html';  
6  
7   /* ODS Multiple Destinations - Example 1 */  
8  
9 Proc Freq Data = SASHELP.HEART;  
10   Tables Status Sex / List Missing;  
11   Title 'Gender Status';  
12 Run;  
13  
14 ODS HTML CLOSE;  
15  
16  
17  
18  
19  
20  
21  
22  
23
```

At the bottom of the interface, a status bar shows the file path "/home/iyen/Training_Course_Files/ODS Workshop/ODS_HTML_2.sas" on the left, "Line 1, Column 1" and "UTF-8" in the center, and "Messages: 3" and "User: iyenj" on the right.

ODS HTML OUTPUT



Gender Status

The FREQ Procedure

Status	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Alive	3218	61.78	3218	61.78
Dead	1991	38.22	5209	100.00

Sex	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Female	2873	55.15	2873	55.15
Male	2336	44.85	5209	100.00

SAS DEMONSTRATION

Demonstration using SAS On-Demand for Academics.

ODS RTF DESTINATION

The ODS RTF destination sends SAS output to a Rich-Text File which can be opened and accessed in Microsoft Word.

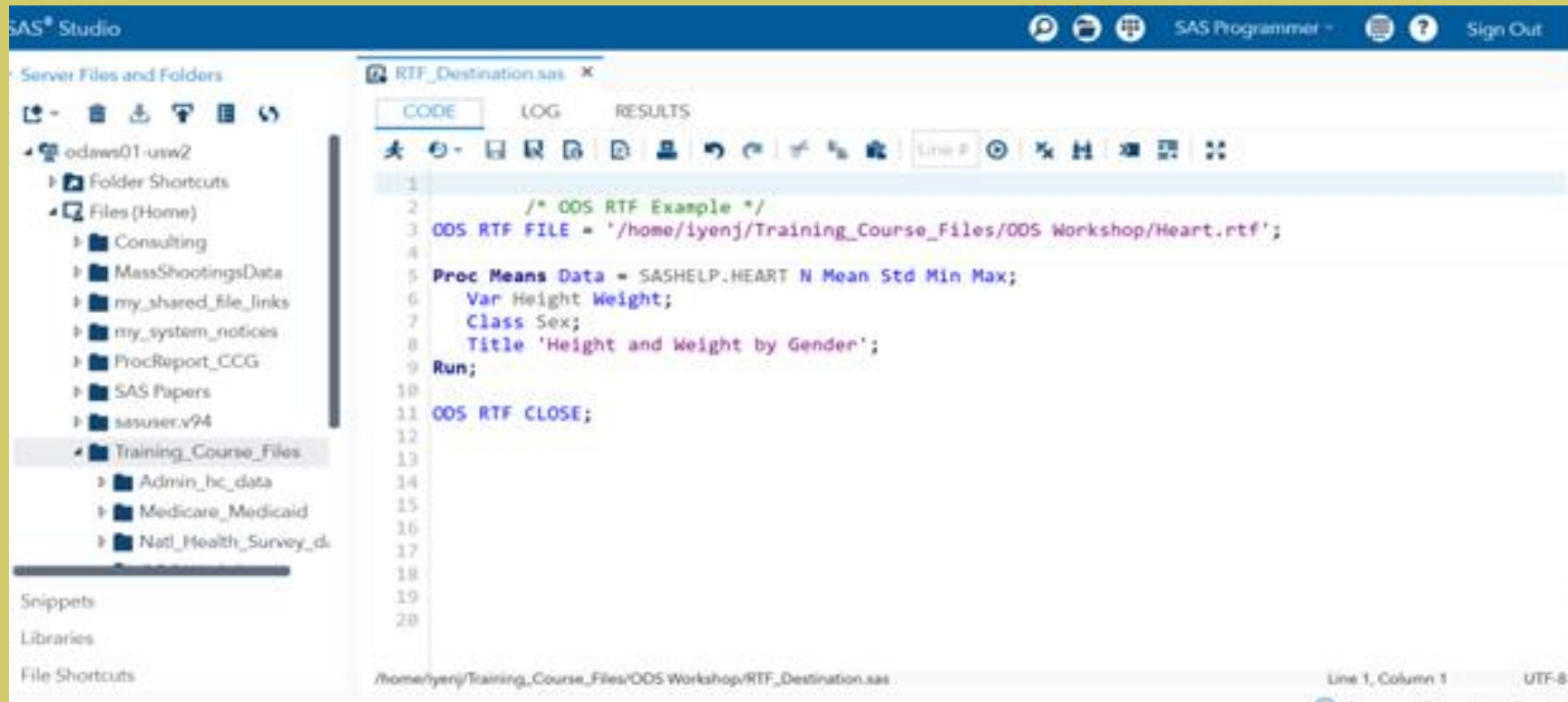
The ODS RTF destination is the primary ODS destination for Microsoft Word.

There is an ODS WORD destination, which is in pre-production mode.

There are specific formatting options for rich-text files which can be specified to change the appearance of SAS output.

The formatting options and other setting can be applied by specifying options on the ODS RTF statement

ODS RTF – SAS EXAMPLE



The screenshot displays the SAS Studio interface. On the left, the 'Server Files and Folders' pane shows a tree structure with 'Training_Course_Files' selected. The main editor window, titled 'RTF_Destination.sas', contains the following SAS code:

```
1  
2      /* ODS RTF Example */  
3      ODS RTF FILE = '/home/iyenj/Training_Course_Files/ODS Workshop/Heart.rtf';  
4  
5      Proc Means Data = SASHELP.HEART N Mean Std Min Max;  
6          Var Height Weight;  
7          Class Sex;  
8          Title 'Height and Weight by Gender';  
9      Run;  
10  
11      ODS RTF CLOSE;  
12  
13  
14  
15  
16  
17  
18  
19  
20
```

The status bar at the bottom indicates the file path as `/home/iyenj/Training_Course_Files/ODS Workshop/RTF_Destination.sas`, the cursor position as 'Line 1, Column 1', and the encoding as 'UTF-8'.

ODS RTF OUTPUT

RTF_Destination-results - Protected View • Saved ▾

Search

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Height and Weight by Gender

The MEANS Procedure

Sex	N Obs	Variable	N	Mean	Std Dev	Minimum	Maximum
Female	2873	Height	2869	62.5725863	2.4524112	51.5000000	70.7500000
		Weight	2869	141.3886372	26.2880439	67.0000000	300.0000000
Male	2336	Height	2334	67.5673736	2.7321366	56.0000000	76.5000000
		Weight	2334	167.4661525	25.2907044	99.0000000	276.0000000

Page 1 of 1 38 words Text Predictions: On

Focus 150%

SAS DEMONSTRATION

Demonstration using SAS On-Demand for Academics.

ODS PDF DESTINATION

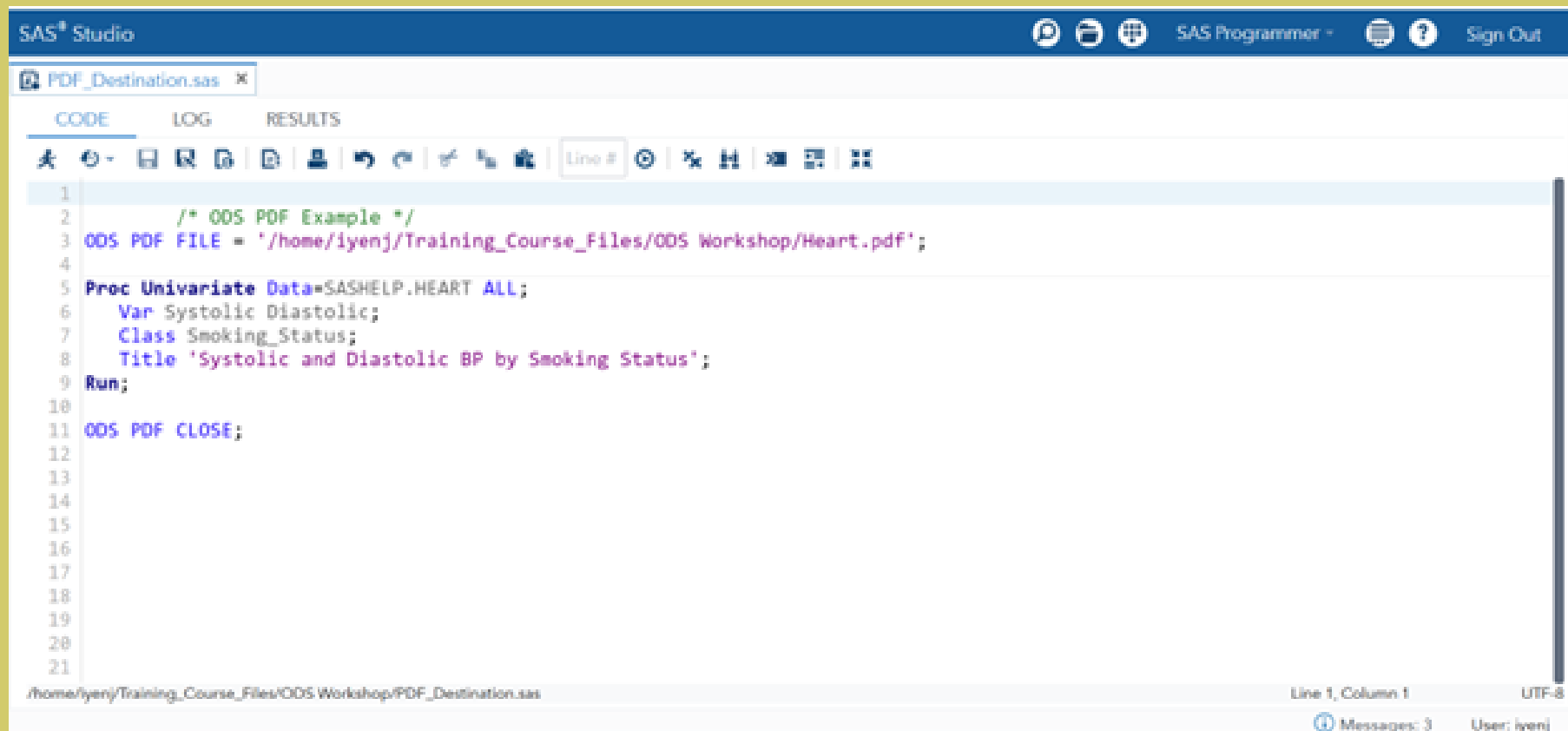
The ODS PDF destination produces SAS output in Portable Document Format.

The ODS PDF destination is part of the printer family of ODS destinations.

The other printer destinations include ODS PS and ODS PCL.

PDF files can be opened and accessed in Adobe Acrobat, and other PDF readers.

ODS PDF DESTINATION – SAS EXAMPLE



The screenshot displays the SAS Studio interface. The top navigation bar includes the 'SAS® Studio' logo, a 'Sign Out' button, and a 'SAS Programmer' role indicator. Below the navigation bar, a tab labeled 'PDF_Destination.sas' is active. The main workspace is divided into three panes: 'CODE', 'LOG', and 'RESULTS'. The 'CODE' pane is selected and shows a SAS program with the following content:

```
1  
2      /* ODS PDF Example */  
3 ODS PDF FILE = '/home/iyenj/Training_Course_Files/ODS Workshop/Heart.pdf';  
4  
5 Proc Univariate Data=SASHELP.HEART ALL;  
6   Var Systolic Diastolic;  
7   Class Smoking_Status;  
8   Title 'Systolic and Diastolic BP by Smoking Status';  
9 Run;  
10  
11 ODS PDF CLOSE;  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21
```

The status bar at the bottom of the window indicates the file path as '/home/iyenj/Training_Course_Files/ODS Workshop/PDF_Destination.sas', the current position as 'Line 1, Column 1', the encoding as 'UTF-8', and the number of messages as 'Messages: 3'. The user is identified as 'User: iyenj'.

ODS PDF OUTPUT

Systolic and Diastolic BP by Smoking Status

The UNIVARIATE Procedure
Variable: Systolic
Smoking_Status = Heavy (16-25)

Moments			
N	1046	Sum Weights	1046
Mean	133.357553	Sum Observations	139492
Std Deviation	20.2798666	Variance	411.272991
Skewness	1.57457872	Kurtosis	5.78801728
Uncorrected SS	19032092	Corrected SS	429780.275
Coeff Variation	15.2071377	Std Error Mean	0.62704578

Basic Statistical Measures			
Location		Variability	
Mean	133.3576	Std Deviation	20.27987
Median	130.0000	Variance	411.27299
Mode	120.0000	Range	181.00000
		Interquartile Range	22.00000

Modes	
Mode	Count
120	82

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	133.35755	132.12714	134.58796

SAS DEMONSTRATION

Demonstration using SAS On-Demand for Academics.

QUIZ #1

Which of the following is not a valid ODS destination?

- A. ODS DOCUMENT
- B. ODS CSV
- C. ODS TABDLM
- D. ODS EXCEL

ODS STYLES

The appearance of SAS Output is determined and controlled by ODS styles.

An ODS style is a collection of style elements and style attributes which specify the presentation and display of SAS output.

SAS contains a set of styles which are built into the SAS System.

With ODS, SAS output can use a built-in style, a modified built-in style, or a customized style which is created.

ODS STYLES

Listing of: SASHELP.TMPL_EN

Path Filter is: Styles

Sort by: PATH/ASCENDING

Obs	Path	Type
1	Styles	Dir
2	Styles.Analysis	Style
3	Styles.BarrettsBlue	Style
4	Styles.DTree	Style
5	Styles.Daisy	Style
6	Styles.Default	Style
7	Styles.Dove	Style
8	Styles.EGDefault	Style
9	Styles.Excel	Style
10	Styles.FancyPrinter	Style
11	Styles.Festival	Style
12	Styles.FestivalPrinter	Style
13	Styles.Gantt	Style
14	Styles.GrayscalePrinter	Style
15	Styles.HTMLBlue	Style
16	Styles.HTMLEncore	Style
17	Styles.Harvest	Style
18	Styles.HighContrast	Style
19	Styles.HighContrastLarge	Style
20	Styles.Ignite	Style
21	Styles.Illuminate	Style
22	Styles.Journal	Style
23	Styles.Journal1a	Style
24	Styles.Journal2	Style
25	Styles.Journal2a	Style
26	Styles.Journal3	Style
27	Styles.Journal3a	Style
28	Styles.Listing	Style
29	Styles.Meadow	Style
30	Styles.MeadowPrinter	Style

31	Styles.Minimal	Style
32	Styles.MonochromePrinter	Style
33	Styles.Monospace	Style
34	Styles.Moonflower	Style
35	Styles.Netdraw	Style
36	Styles.NoFontDefault	Style
37	Styles.Normal	Style
38	Styles.NormalPrinter	Style
39	Styles.Ocean	Style
40	Styles.Pearl	Style
41	Styles.PearlJ	Style
42	Styles.Plateau	Style
43	Styles.PowerPointDark	Style
44	Styles.PowerPointLight	Style
45	Styles.Printer	Style
46	Styles.Raven	Style
47	Styles.Rtf	Style
48	Styles.Sapphire	Style
49	Styles.SasDocPrinter	Style
50	Styles.SasWeb	Style
51	Styles.Seaside	Style
52	Styles.SeasidePrinter	Style
53	Styles.Snow	Style
54	Styles.StatDoc	Style
55	Styles.Statistical	Style
56	Styles.Word	Style
57	Styles.vaDark	Style
58	Styles.vaHighContrast	Style
59	Styles.vaLight	Style

The list of SAS supplied built-in styles

The default style for SAS output
in SAS Studio is HTMLBLUE.

APPLYING AND SPECIFYING STYLES WITH ODS

To specify a style other than the default style, use the STYLE= option in the ODS statement which opens the destination.

```
/* ODS HTML Example */
```

```
ODS HTML FILE = '/home/iyenj/Training_Course_Files/ODS Workshop/Heart.html' STYLE=BarrettsBlue;
```

```
Proc Freq Data = SASHELP.HEART;
```

```
    Tables Status Sex / List Missing;
```

```
    Title 'Gender Status';
```

```
Run;
```

```
ODS HTML CLOSE;
```

DEFAULT STYLES FOR ODS DESTINATIONS

Each ODS destinations uses a default style to produce output.

The default styles vary by ODS destination.

The table here lists the default styles for common ODS destinations.

ODS DESTINATION	DEFAULT STYLE
LISTING	Listing
HTML	HtmlBlue
HTML5	HtmlBlue
RTF	RTF
PRINTER	Pearl
EXCEL	Excel
EPUB	Daisy
POWERPOINT	PowerPointLight
EXCELPX	Default
RTF Tagset	RTF

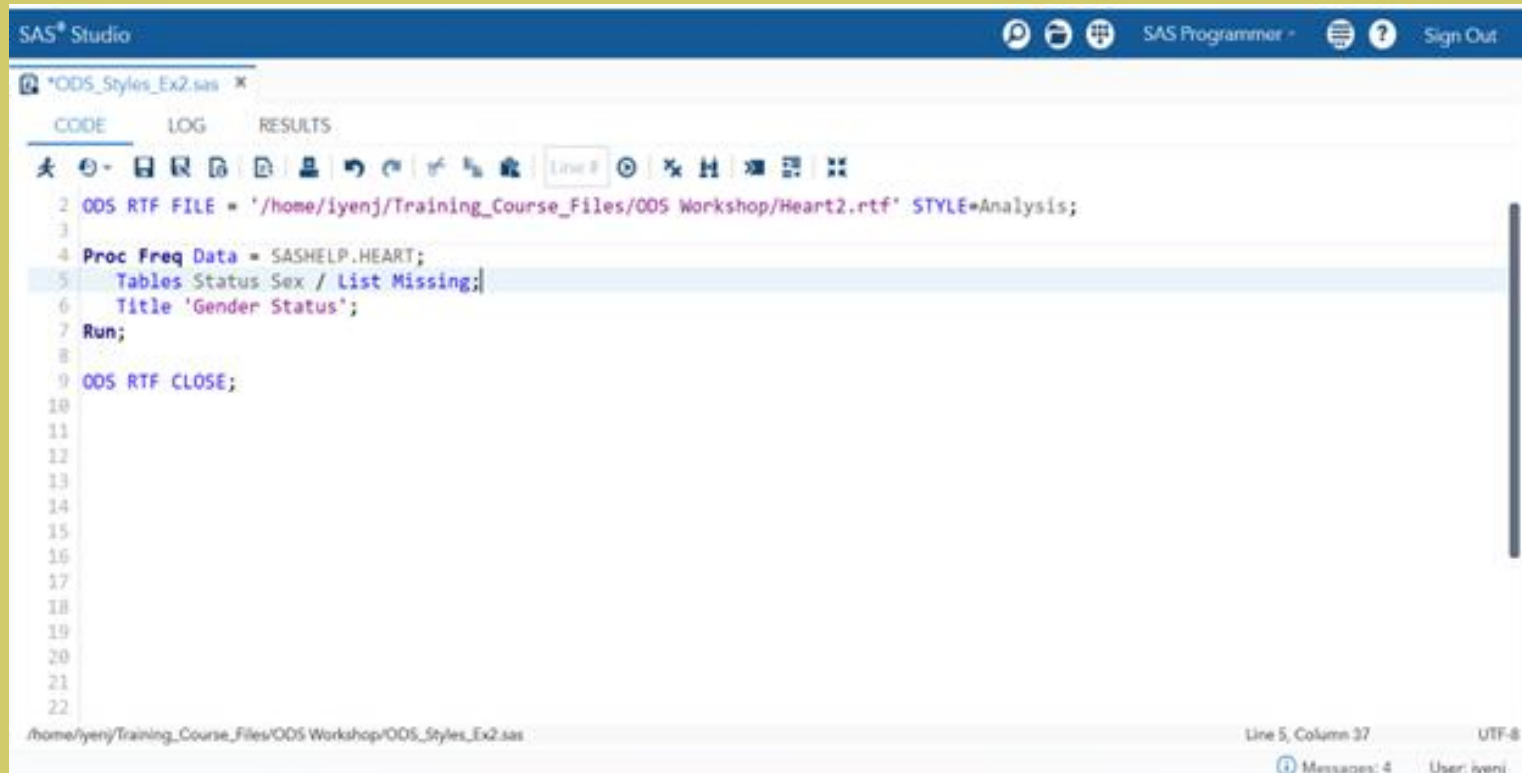
ODS RTF USING STYLES.NORMAL

```
SAS® Studio
ODS_Styles_Ex2.sas x
CODE LOG RESULTS
/* RTF Destination using Styles.Normal Style */
ODS RTF FILE = '/home/iyen/Training_Course_Files/ODS Workshop/Heart.rtf' STYLE=Normal;
Proc Freq Data = SASHELP.HEART;
  Tables Status Sex / List Missing;
  Title 'Gender Status';
Run;
ODS RTF CLOSE;
```

Sex	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Female	2873	55.15	2873	55.15
Male	2336	44.85	5209	100.00

Status	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Alive	3218	61.78	3218	61.78
Dead	1991	38.22	5209	100.00

ODS RTF USING STYLES.ANALYSIS



```
SAS® Studio
SAS Programmer
Sign Out

*ODS_Styles_Ex2.sas
CODE LOG RESULTS
Line 8
2 ODS RTF FILE = '/home/iyenij/Training_Course_Files/ODS Workshop/Heart2.rtf' STYLE=Analysis;
3
4 Proc Freq Data = SASHELP.HEART;
5   Tables Status Sex / List Missing;
6   Title 'Gender Status';
7 Run;
8
9 ODS RTF CLOSE;
10
11
12
13
14
15
16
17
18
19
20
21
22
/home/iyenij/Training_Course_Files/ODS Workshop/ODS_Styles_Ex2.sas
Line 5, Column 37 UTF-8
Messages: 4 User: iyenij
```

Sex	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Female	2873	55.15	2873	55.15
Male	2336	44.85	5209	100.00

Status	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Alive	3218	61.78	3218	61.78
Dead	1991	38.22	5209	100.00

ODS TAGSETS

ODS tagsets are used to produce markup language output, such as HTML, and XML.

Similar to table templates, tagsets enable you to modify the markup language output.

SAS comes with a variety of built-in tagsets which you can use.

You can also build and create your own tagset using PROC TEMPLATE.

Tagsets can be specified several different ways.

- 1 – Tagsets can be specified using the ODS MARKUP destination with the Tagset = option.
- 2 – Tagsets can be specified using a two-level name; ODS Tagsets.RTF File=
- 3 – Some tagsets can be specified as their own separate ODS destination.

ODS TAGSETS

The most commonly used ODS tagset is the ExcelXP tagset.

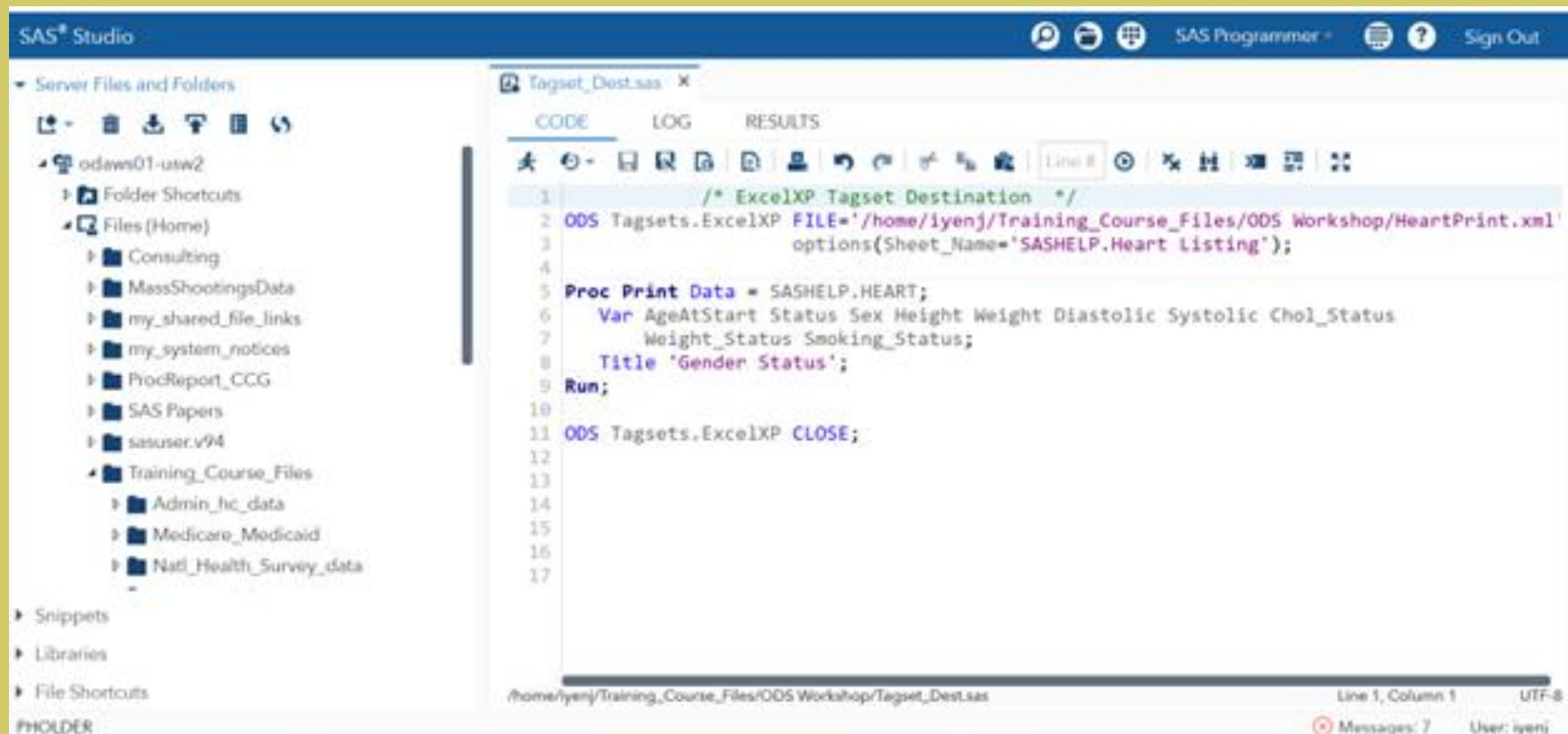
With earlier releases of SAS, it was the only ODS destination for Excel-formatted output.

Tagset	Description
CHTML	Produces Compact HTML Output
CSV	Produces Comma-Separated Values File
CSVALL	Produces a CSV file with Titles, Notes and By Lines
ExcelXP	Produces Microsoft SpreadsheetML XML which is used to import data into excel
MSOFFICE2K	Produces HTML code for Microsoft Office products.
PHTML	Produces simple HTML output with 12 style elements
RTF	Produces RTF with page annotation

This isn't an exhaustive list. There are several other tagset destinations besides what's listed here.

ODS EXCELXP TAGSET

There are about 60 options which can be specified with the ExcelXP tagset destination to format Excel Worksheets



The screenshot displays the SAS Studio interface. On the left, the 'Server Files and Folders' pane shows a project structure with folders like 'Consulting', 'MassShootingsData', and 'Training_Course_Files'. The main editor window, titled 'Tagset_Dest.sas', shows the following SAS code:

```
1 /* ExcelXP Tagset Destination */
2 ODS Tagsets.ExcelXP FILE='/home/iyen/Training_Course_Files/ODS Workshop/HeartPrint.xml'
3   options(Sheet_Name='SASHELP.Heart Listing');
4
5 Proc Print Data = SASHELP.HEART;
6   Var AgeAtStart Status Sex Height Weight Diastolic Systolic Chol_Status
7     Weight_Status Smoking_Status;
8   Title 'Gender Status';
9 Run;
10
11 ODS Tagsets.ExcelXP CLOSE;
```

The status bar at the bottom indicates the file path as '/home/iyen/Training_Course_Files/ODS Workshop/Tagset_Dest.sas', the current position as 'Line 1, Column 1', the encoding as 'UTF-8', and the user as 'User: iyenj'.

ODS EXCELXP TAGSET OUTPUT

Obs	AgeAtStart	Status	Sex	Height	Weight	Diastolic	Systolic	Chol_Status	Weight_Status	Smoking_Status
1	29	Dead	Female	62.5	140	78	124		Overweight	Non-smoker
2	41	Dead	Female	59.75	194	92	144	Desirable	Overweight	Non-smoker
3	57	Alive	Female	62.25	132	90	170	High	Overweight	Moderate (6-15)
4	39	Alive	Female	65.75	158	80	128	High	Overweight	Non-smoker
5	42	Alive	Male	66	156	76	110	High	Overweight	Heavy (16-25)
6	58	Alive	Female	61.75	131	92	176	Desirable	Overweight	Non-smoker
7	36	Alive	Female	64.75	136	80	112	Desirable	Overweight	Moderate (6-15)
8	53	Dead	Male	65.5	130	80	114	High	Normal	Non-smoker
9	35	Alive	Male	71	194	68	132	Borderline	Overweight	Non-smoker
10	52	Dead	Male	62.5	129	78	124	High	Normal	Light (1-5)
11	39	Alive	Male	66.25	179	76	128	Borderline	Overweight	Very Heavy (> 25)
12	33	Alive	Male	64.25	151	68	108	Borderline	Overweight	Non-smoker
13	33	Alive	Male	70	174	90	142	Desirable	Overweight	Non-smoker
14	57	Alive	Male	67.25	165	76	128		Overweight	Moderate (6-15)
15	44	Alive	Male	69	155	90	130	High	Normal	Very Heavy (> 25)
16	37	Alive	Female	64.5	134	76	120	Desirable	Normal	Moderate (6-15)
17	40	Alive	Male	66.25	151	72	132	Desirable	Overweight	Very Heavy (> 25)
18	56	Dead	Male	67.25	122	72	120	Desirable	Underweight	Moderate (6-15)
19	42	Alive	Female	67.75	162	96	138	Borderline	Overweight	Light (1-5)
20	46	Dead	Male	66.5	157	84	142	Borderline	Overweight	Very Heavy (> 25)
21	37	Alive	Female	66.25	148	78	110	Desirable	Overweight	Moderate (6-15)
22	45	Alive	Female	64	147	74	120	Borderline	Overweight	Light (1-5)
23	59	Alive	Female	65.75	156	74	156	Borderline	Overweight	Non-smoker
24	36	Alive	Female	63.75	122	84	132	Desirable	Normal	Non-smoker
25	50	Alive	Female	67.5	185	88	150	Borderline	Overweight	Moderate (6-15)

ODS CSVALL DESTINATION

ODS CSVALL is part of the markup family of destinations. It opens the markup destination and produces output formatted with one of the markup languages.

ODS CSVALL produces a comma-separated values (csv) file which can be accessed and opened in Microsoft Excel or other spreadsheet software.

The resulting csv file opens in Excel as tabular output with attributes; titles, notes and bylines.

ODS CSVALL DESTINATION

ODS CSVALL is useful for tasks where you need to convert SAS data sets into a text file or raw data file format.

It provides an alternative to PROC EXPORT.

```
/* ODS CSVALL EXAMPLE */
ODS CSVALL FILE='/home/iyenj/Training_Course_Files/ODS_Workshop/Heart_Listing.csv';

Proc Print Data=SASHELP.Heart;
  ID Sex;
  Var Height Weight Diastolic Systolic Cholesterol Smoking BP_Status Chol_Status Smoking_Status;
  Title1 'SASHELP.Heart SAS Dataset';
  Title2 'Heart Risk Factor Metrics';
Run;

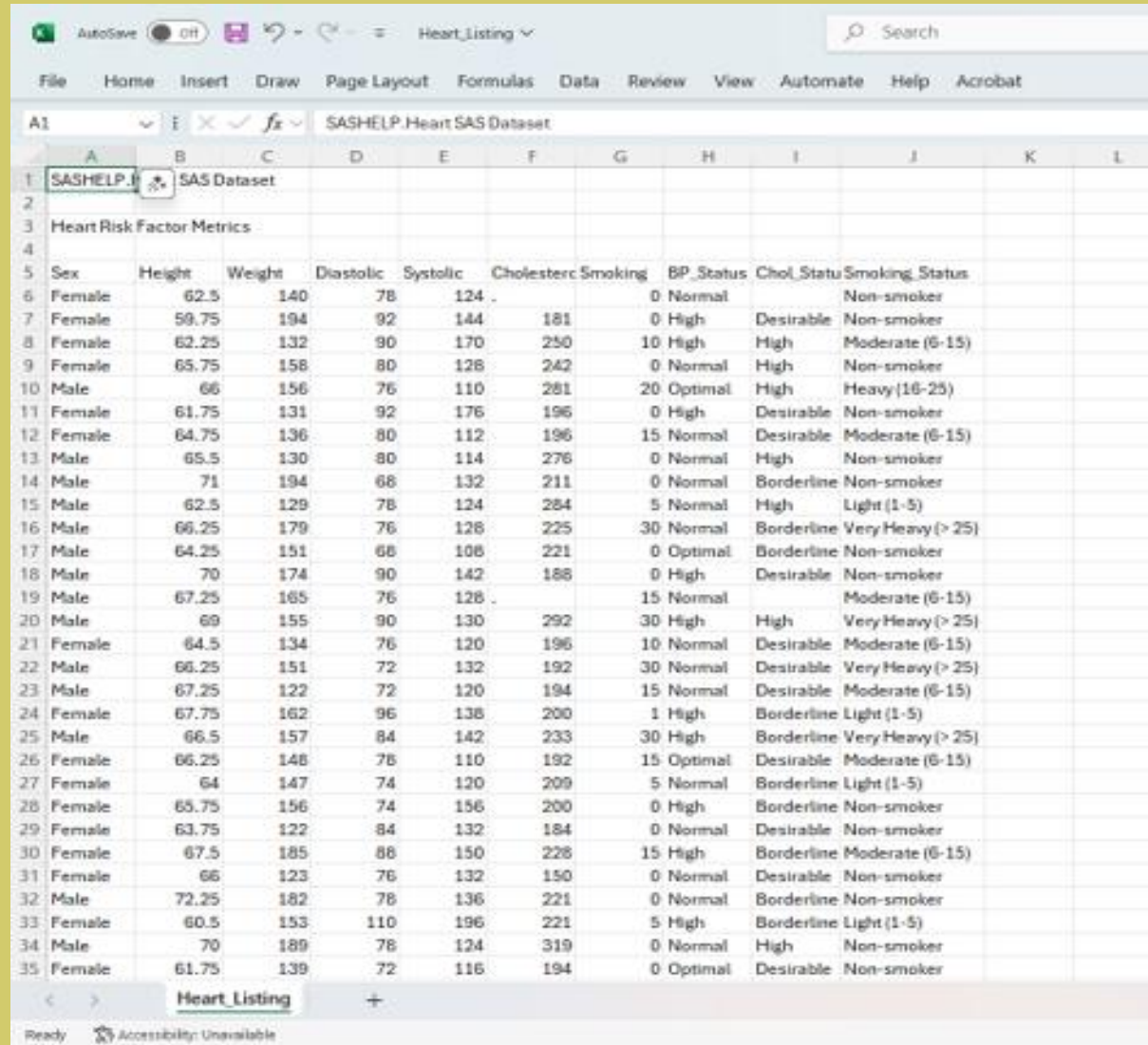
ODS CSVALL CLOSE;
```

```
1      OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;
NOTE: ODS statements in the SAS Studio environment may disable some output features.
73
74
75      /* ODS EXCEL - MULTIPLE WORKSHEETS - EXAMPLE 1 */
76      ODS CSVALL FILE='/home/iyenj/Training_Course_Files/ODS_Workshop/Heart_Listing.csv';
NOTE: Writing CSVALL Body file: /home/iyenj/Training_Course_Files/ODS_Workshop/Heart_Listing.csv
77
78      Proc Print Data=SASHELP.Heart;
79      ID Sex;
80      Var Height Weight Diastolic Systolic Cholesterol Smoking BP_Status Chol_Status Smoking_Status;
81      Title1 'SASHELP.Heart SAS Dataset';
82      Title2 'Heart Risk Factor Metrics';
83      Run;

NOTE: There were 5209 observations read from the data set SASHELP.HEART.
NOTE: PROCEDURE PRINT used (Total process time):
      real time          9.70 seconds
      user cpu time      9.54 seconds
      system cpu time    0.08 seconds
      memory             71043.84k
      OS Memory          108712.00k
      Timestamp          09/30/2025 02:58:37 AM
      Step Count                  36  Switch Count  2
```

ODS CSVALL DESTINATION

ODS CSV output opened in Excel



The screenshot shows a Microsoft Excel spreadsheet with the title bar 'Heart_Listing'. The ribbon includes 'File', 'Home', 'Insert', 'Draw', 'Page Layout', 'Formulas', 'Data', 'Review', 'View', 'Automate', 'Help', and 'Acrobat'. The active cell is A1, and the formula bar shows 'SASHELP.Heart SAS Dataset'. The spreadsheet contains the following data:

	A	B	C	D	E	F	G	H	I	J	K	L
1	SASHELP.Heart	SAS Dataset										
2												
3	Heart Risk Factor Metrics											
4												
5	Sex	Height	Weight	Diastolic	Systolic	Cholesterol	Smoking	BP_Status	Chol_Status	Smoking_Status		
6	Female	62.5	140	78	124		0	Normal		Non-smoker		
7	Female	59.75	194	92	144	181	0	High	Desirable	Non-smoker		
8	Female	62.25	132	90	170	250	10	High	High	Moderate (6-15)		
9	Female	65.75	158	80	128	242	0	Normal	High	Non-smoker		
10	Male	66	156	76	110	281	20	Optimal	High	Heavy (16-25)		
11	Female	61.75	131	92	176	196	0	High	Desirable	Non-smoker		
12	Female	64.75	136	80	112	196	15	Normal	Desirable	Moderate (6-15)		
13	Male	65.5	130	80	114	276	0	Normal	High	Non-smoker		
14	Male	71	194	68	132	211	0	Normal	Borderline	Non-smoker		
15	Male	62.5	129	78	124	284	5	Normal	High	Light (1-5)		
16	Male	66.25	179	76	128	225	30	Normal	Borderline	Very Heavy (> 25)		
17	Male	64.25	151	68	108	221	0	Optimal	Borderline	Non-smoker		
18	Male	70	174	90	142	188	0	High	Desirable	Non-smoker		
19	Male	67.25	165	76	128		15	Normal		Moderate (6-15)		
20	Male	69	155	90	130	292	30	High	High	Very Heavy (> 25)		
21	Female	64.5	134	76	120	196	10	Normal	Desirable	Moderate (6-15)		
22	Male	66.25	151	72	132	192	30	Normal	Desirable	Very Heavy (> 25)		
23	Male	67.25	122	72	120	194	15	Normal	Desirable	Moderate (6-15)		
24	Female	67.75	162	96	138	200	1	High	Borderline	Light (1-5)		
25	Male	66.5	157	84	142	233	30	High	Borderline	Very Heavy (> 25)		
26	Female	66.25	148	78	110	192	15	Optimal	Desirable	Moderate (6-15)		
27	Female	64	147	74	120	209	5	Normal	Borderline	Light (1-5)		
28	Female	65.75	156	74	156	200	0	High	Borderline	Non-smoker		
29	Female	63.75	122	84	132	184	0	Normal	Desirable	Non-smoker		
30	Female	67.5	185	88	150	228	15	High	Borderline	Moderate (6-15)		
31	Female	66	123	76	132	150	0	Normal	Desirable	Non-smoker		
32	Male	72.25	182	78	136	221	0	Normal	Borderline	Non-smoker		
33	Female	60.5	153	110	196	221	5	High	Borderline	Light (1-5)		
34	Male	70	189	78	124	319	0	Normal	High	Non-smoker		
35	Female	61.75	139	72	116	194	0	Optimal	Desirable	Non-smoker		

ODS EXCEL DESTINATION

Opens and manages the ODS EXCEL Destination which produces Excel spreadsheet files for Microsoft Office versions 2010 and later.

ODS EXCEL uses Microsoft Open Office XML Format for Office 2010 and later.

Similar to the ExcelXP destination, it produces extensible markup language (XML) files and creates Microsoft spreadsheetML XML.

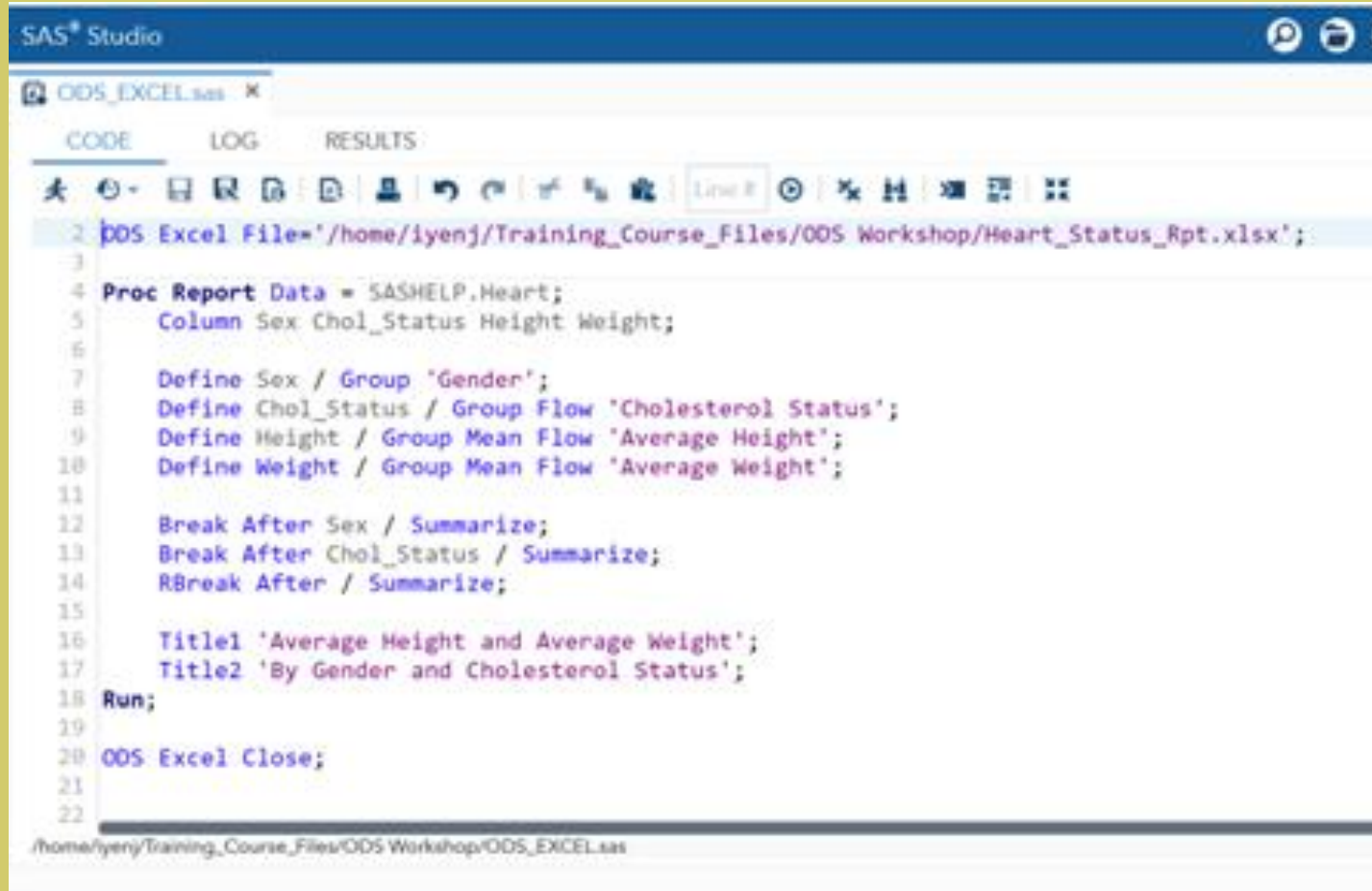
ODS EXCEL has extensive formatting capabilities.

By specifying the options option, you can apply dozens of formatting attributes to your SAS output and Excel worksheets.

ODS EXCEL FORMATTING OPTIONS

Formatting Option	Description	Options	Description	Option	Description
ABSOLUTE_COLUMN_WIDTH	Sets Column Width	FROZEN_ROWHEADERS	Freezes Rows	ROW_HEIGHTS	Sets Row Height
ABSOLUTE_ROW_HEIGHT	Set Row Height	GRIDLINES	Displays Gridlines	ROW_REPEAT	Controls repeat of row headings
AUTOFILTER	Sets Filter to Rows	HIDDEN_COLUMNS	Hides Columns	SCALE	Sets Print Scale Level
BLACKANDWHITE	Enables Black and White Printing	HIDDEN_ROWS	Hides Rows	SCREEN_RESOLUTION_SCALE_FACTOR	Sets Scale Factor
BLANK_SHEET	Creates a Blank Worksheet	INDEX	Creates Index	SHEET_INTERVAL	Defines Intervals for worksheets
CENTER_HORIZONTAL	Centers Text Horizontally	MSG_LEVEL	Suppresses Messages	SHEET_LABEL	Specifies Wksht Label
CENTER_VERTICAL	Centers Text Vertically	ORIENTATION	Portrait/Landscape	SHEET_NAME	Names Worksheet
COLUMN_REPEAT	Specifies Columns to Repeat	PAGE_ORDER_ACROSS	Sets printing order	START_AT	Specifies Cell Location
CONTENTS	Creates Table of Contents	PAGES_FITHEIGHT	Sets Pages Num down	SUPPRESS_BYLINES	Specifies ByLines Suppression
DPI	Sets Dots per Inch Resolution.	PAGES_FITWIDTH	Sets Pages Num	TAB_COLOR	Sets Wksht Color
DRAFTQUALITY	Sets Draft Quality for Printing.	PRINT_AREA	Sets Print Area	TITLE_FOOTNOTE_NOBREAK	Sets wrap text for titles, etc.
EMBEDDED_FOOTNOTES	Embeds SAS Footnotes	PRINT_FOOTER	Prints Footer	TITLE_FOOTNOTE_WIDTH	Sets Span of Titles.
EMBED_FOOTNOTES_ONCE	Controls Footnote Location	PRINT_FOOTER_MARGIN	Sets Footer Margin	ZOOM	Sets Zoom Level.
EMBEDDED_TITLES	Embeds SAS Titles	PRINT_HEADER	Sets Header Text		
EMBED_TITLES_ONCE	Controls Title Location	PRINT_HEADER_MARGIN	Sets Header Margin		
FITTOPAGE	Sizes worksheet to fit on page.	PROTECT_WORKSHEET	Encrypts Worksheet		
FLOW	Enables Wrap Text to Cells.	ROWBREAKS_COUNT	Count Rows per Page		
FORMULAS	Insert Formulas	ROWBREAKS_INTERVAL	Controls Page Breaks		
FROZEN_HEADERS	Freezes Columns	ROWCOLHEADINGS	Sets Printing of Headings		

ODS EXCEL DESTINATION

The image is a screenshot of the SAS Studio interface. At the top, the title bar says "SAS® Studio". Below it, a tab is open for "ODS_EXCEL.sas". The main window is divided into three panes: "CODE", "LOG", and "RESULTS". The "CODE" pane is active and shows a SAS program. The program starts with a comment line: "2 ODS Excel File='/home/iyen/Training_Course_Files/ODS Workshop/Heart_Status_Rpt.xlsx';". This is followed by a PROC REPORT step: "4 Proc Report Data = SASHELP.Heart;". The COLUMN statement lists "Sex", "Chol_Status", "Height", and "Weight". The DEFINE statements create groups for "Sex" (labeled "Gender"), "Chol_Status" (labeled "Cholesterol Status"), "Height" (labeled "Average Height"), and "Weight" (labeled "Average Weight"). The BREAK and RBREAK statements are used to summarize the data by these groups. The TITLE1 and TITLE2 statements are also present. The program ends with "Run;" and "ODS Excel Close;". The status bar at the bottom shows the file path: "/home/iyen/Training_Course_Files/ODS Workshop/ODS_EXCEL.sas".

```
1  
2 ODS Excel File='/home/iyen/Training_Course_Files/ODS Workshop/Heart_Status_Rpt.xlsx';  
3  
4 Proc Report Data = SASHELP.Heart;  
5   Column Sex Chol_Status Height Weight;  
6  
7   Define Sex / Group 'Gender';  
8   Define Chol_Status / Group Flow 'Cholesterol Status';  
9   Define Height / Group Mean Flow 'Average Height';  
10  Define Weight / Group Mean Flow 'Average Weight';  
11  
12  Break After Sex / Summarize;  
13  Break After Chol_Status / Summarize;  
14  RBreak After / Summarize;  
15  
16  Title1 'Average Height and Average Weight';  
17  Title2 'By Gender and Cholesterol Status';  
18 Run;  
19  
20 ODS Excel Close;  
21  
22
```

ODS EXCEL DESTINATION

	A	B	C	D	E
1	Gender	Cholesterol Status	Average Height	Average Weight	
2	Female	Borderline	62.556568	141.12722	
3	Female	Borderline	62.556568	141.12722	
4					
5		Desirable	62.933147	137.23786	
6	Female	Desirable	62.933147	137.23786	
7					
8		High	62.284012	144.35119	
9	Female	High	62.284012	144.35119	
10					
11	Female		62.566787	141.17292	
12					
13	Male	Borderline	67.664539	168.35849	
14	Male	Borderline	67.664539	168.35849	
15					
16		Desirable	67.732917	163.41167	
17	Male	Desirable	67.732917	163.41167	
18					
19		High	67.334615	169.69744	
20	Male	High	67.334615	169.69744	
21					
22	Male		67.568706	167.51512	
23			64.826374	153.0689	
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					

ODS POWERPOINT DESTINATION

ODS POWERPOINT destination produces SAS procedure output in a Powerpoint presentation file.

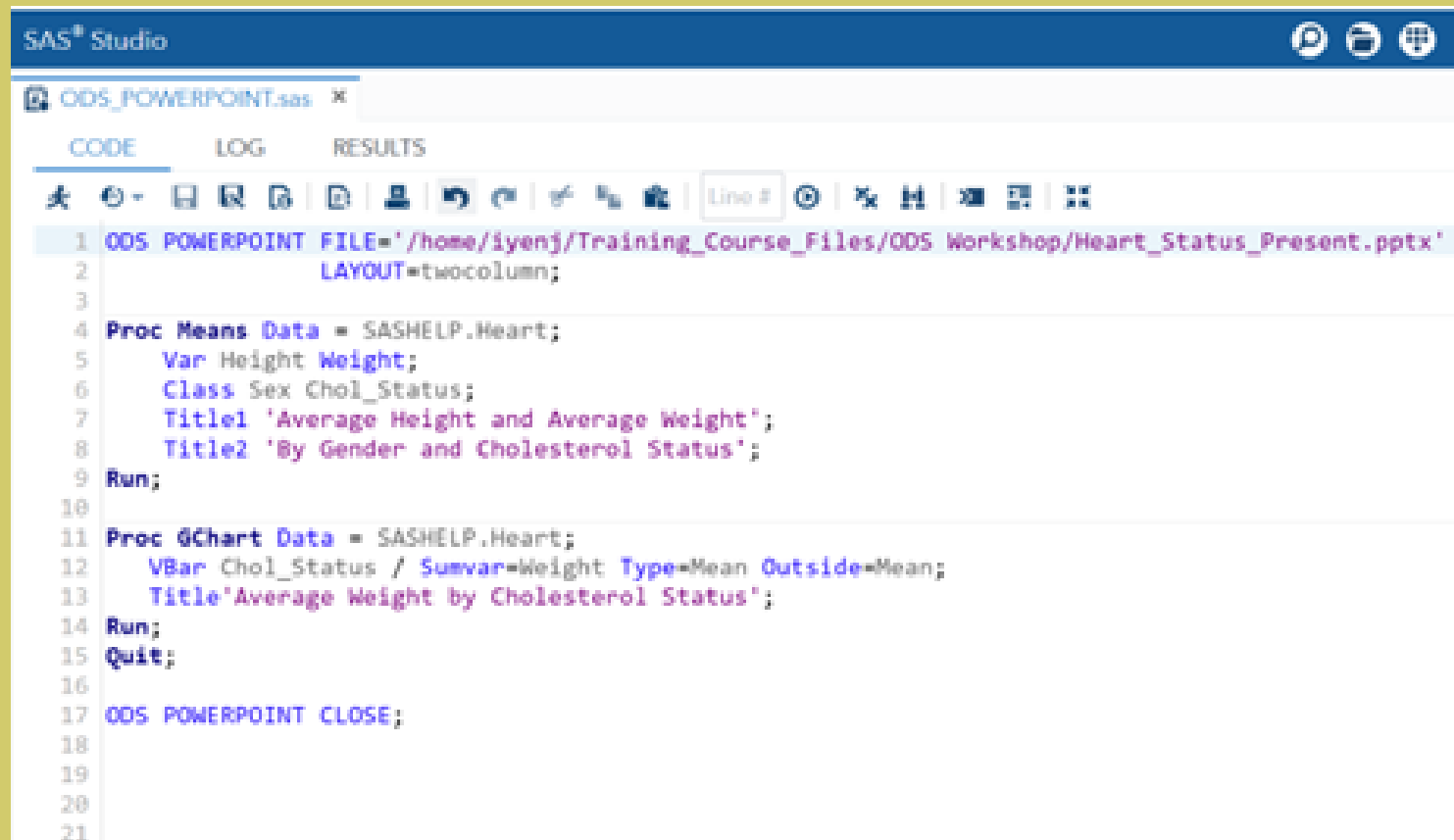
ODS POWERPOINT statement opens, closes, and manages the ODS POWERPOINT destination.

ODS POWERPOINT generates PowerPoint output with the pptx. extension.

By default, ODS POWERPOINT puts one output object on each presentation slide and centers the output.

ODS POWERPOINT DESTINATION

With LAYOUT= option, ODS POWERPOINT allows you to specify a separate layout for each individual slide.

A screenshot of the SAS Studio interface. The top bar is blue with the 'SAS Studio' logo and three icons on the right. Below the bar, a tab labeled 'ODS_POWERPOINT.sas' is open. The main area has three tabs: 'CODE', 'LOG', and 'RESULTS', with 'CODE' selected. A toolbar with various icons is below the tabs. The code editor shows the following SAS code:

```
1 ODS POWERPOINT FILE='/home/iyenj/Training_Course_Files/ODS_Workshop/Heart_Status_Present.pptx'
2   LAYOUT=twocolumn;
3
4 Proc Means Data = SASHELP.Heart;
5   Var Height Weight;
6   Class Sex Chol_Status;
7   Title1 'Average Height and Average Weight';
8   Title2 'By Gender and Cholesterol Status';
9 Run;
10
11 Proc GChart Data = SASHELP.Heart;
12   VBar Chol_Status / Sumvar=Weight Type=Mean Outside=Mean;
13   Title 'Average Weight by Cholesterol Status';
14 Run;
15 Quit;
16
17 ODS POWERPOINT CLOSE;
18
19
20
21
```

ODS POWERPOINT DESTINATION

File Home Insert Draw Design Transitions Animations Slide Show Record Review View Help Acrobat

Clipboard Styles Font Paragraph Drawing Editing Adobe Acrobat Reader Dictate Add-ins

1 Average Height and Average Weight
By Cholesterol Status
The MEANS Procedure

2

Analysis Variable : Weight

Cholesterol Status	N Obs	N	Mean	Minimum	Maximum
Borderline	1861	1860	154.3182796	67.0000000	300.0000000
Desirable	1405	1403	148.4312188	71.0000000	300.0000000
High	1791	1788	155.4082774	85.0000000	293.0000000

Click to add notes

Slide 1 of 2 Accessibility: Good to go

ODS OUTPUT OBJECTS

Each SAS procedure which produces output produces output objects.

SAS procedure output contains one or more output objects.

SAS output is composed of multiple sections. Each section of output is called an output object.

Thus, SAS output is comprised of multiple output objects, depending on the procedure used.

PROC CONTENTS – OUTPUT OBJECTS

```
Proc Contents Data = SASHELP.HEART;  
Run;
```

Each separate table in the
SAS output is an output object.

Data Set Name	SASHELP.HEART	Observations	5209
Member Type	DATA	Variables	17
Engine	V9	Indexes	0
Created	01/18/2023 07:01:35	Observation Length	168
Last Modified	01/18/2023 07:01:35	Deleted Observations	0
Protection		Compressed	NO
Data Set Type		Sorted	NO
Label	Framingham Heart Study		
Data Representation	SOLARIS_X86_64, LINUX_X86_64, ALPHA_TRU64, LINUX_IA64		
Encoding	us-ascii ASCII (ANSI)		

Engine/Host Dependent Information	
Data Set Page Size	65536
Number of Data Set Pages	14
First Data Page	1
Max Obs per Page	389
Obs in First Data Page	365
Number of Data Set Repairs	0
Filename	/pbr/sfw/sas/940/SASFoundation/9.4/sashelp/heart.sas7bdat
Release Created	9.0401M8
Host Created	Linux
Inode Number	81677950
Access Permission	rw-r--r--
Owner Name	odaowner
File Size	960KB
File Size (bytes)	983040

Alphabetic List of Variables and Attributes				
#	Variable	Type	Len	Label
12	AgeAtDeath	Num	8	Age at Death
5	AgeAtStart	Num	8	Age at Start
3	AgeCHDdiag	Num	8	Age CHD Diagnosed
15	BP_Status	Char	7	Blood Pressure Status
14	Chol_Status	Char	10	Cholesterol Status
13	Cholesterol	Num	8	
2	DeathCause	Char	26	Cause of Death
8	Diastolic	Num	8	
6	Height	Num	8	
10	MRW	Num	8	Metropolitan Relative Weight
4	Sex	Char	6	
11	Smoking	Num	8	
17	Smoking_Status	Char	17	Smoking Status
1	Status	Char	5	
9	Systolic	Num	8	
7	Weight	Num	8	
16	Weight_Status	Char	11	Weight Status

EXAMPLES OF ODS OUTPUT OBJECTS

SAS Procedure	Output Object
PROC CONTENTS	Attributes
	EngineHost
	Variables

SAS Procedure	Output Object
PROC UNIVARIATE	Moments
	BasicMeasures
	TestsForLocation
	Quantiles
	ExtremeObs
	MissingValues

SAS Procedure	Output Object
PROC PRINT	Print
PROC FREQ	OneWayFreqs
PROC MEANS	Summary
PROC TABULATE	Table
PROC REPORT	Report

ODS OUTPUT

With the ODS OUTPUT destination, you can produce an output SAS data set containing results of the procedure or procedure output.

The output SAS data set contains results for an output object, or the combined results of all output objects for the procedure.

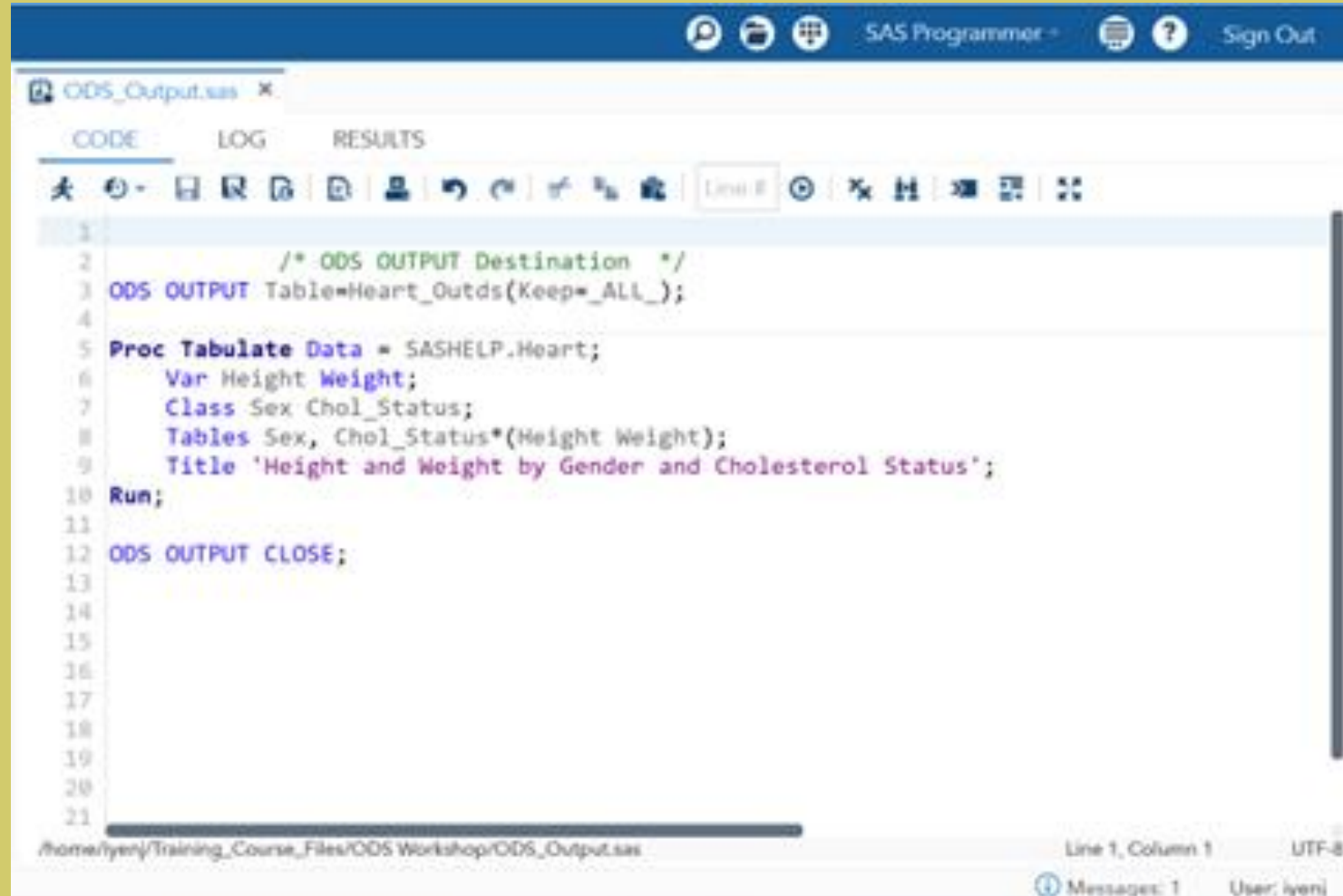
```
ODS OUTPUT OutputObject = SAS data set;
```

```
..... SAS Procedure .....
```

```
..... SAS Procedure .....
```

```
ODS OUTPUT CLOSE;
```

ODS OUTPUT

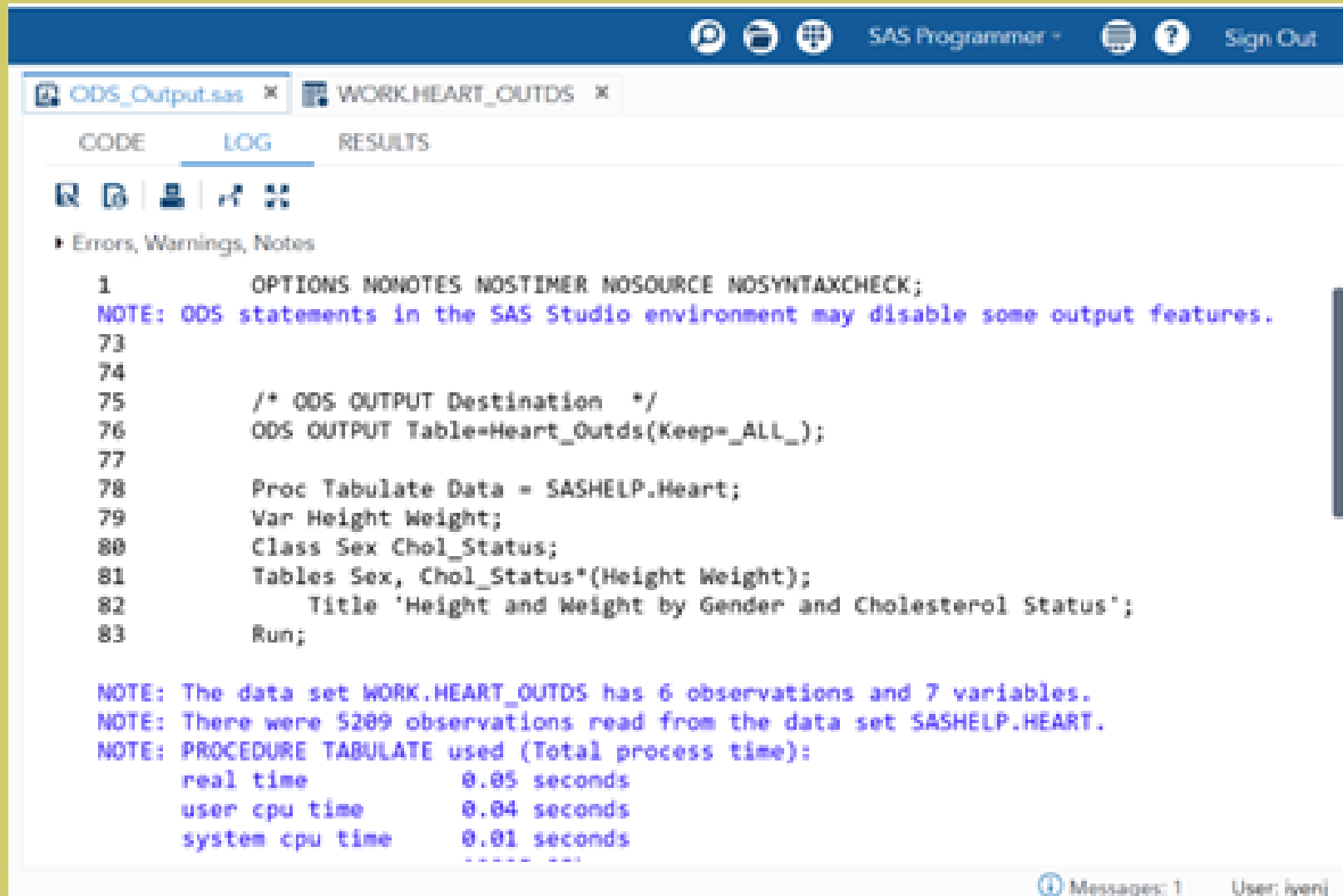


The screenshot displays the SAS Studio interface. At the top, a blue header bar contains icons for user profile, workspace, and help, along with the text 'SAS Programmer' and a 'Sign Out' link. Below the header, a tab labeled 'ODS_Output.sas' is active. The main workspace is divided into three panes: 'CODE', 'LOG', and 'RESULTS'. The 'CODE' pane is selected and shows a SAS program with the following content:

```
1  
2      /* ODS OUTPUT Destination */  
3 ODS OUTPUT Table=Heart_Outds(Keep=_ALL_);  
4  
5 Proc Tabulate Data = SASHELP.Heart;  
6   Var Height Weight;  
7   Class Sex Chol_Status;  
8   Tables Sex, Chol_Status*(Height Weight);  
9   Title 'Height and Weight by Gender and Cholesterol Status';  
10 Run;  
11  
12 ODS OUTPUT CLOSE;  
13  
14  
15  
16  
17  
18  
19  
20  
21
```

The bottom status bar shows the file path '/home/iyen/Training_Course_Files/ODS Workshop/ODS_Output.sas', the cursor position 'Line 1, Column 1', the encoding 'UTF-8', and a message count 'Messages: 1'. The user 'User: iyenj' is also logged in.

ODS OUTPUT



The screenshot displays the SAS Studio interface. At the top, a blue header bar contains icons for user profile, workspace, and navigation, along with the text "SAS Programmer" and a "Sign Out" button. Below the header, a tab bar shows two open files: "ODS_Output.sas" and "WORK.HEART_OUTDS". The "LOG" tab is selected, showing the execution log. The log content includes SAS code for PROC TABULATE and several system messages. The code sets ODS options, defines the output destination, and performs a tabulate operation on the SASHELP.HEART dataset. The messages provide details about the data set, the number of observations read, and the execution time for the PROC TABULATE procedure.

```
1      OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;
NOTE: ODS statements in the SAS Studio environment may disable some output features.
73
74
75      /* ODS OUTPUT Destination */
76      ODS OUTPUT Table=Heart_Outds(Keep=_ALL_);
77
78      Proc Tabulate Data = SASHELP.Heart;
79      Var Height Weight;
80      Class Sex Chol_Status;
81      Tables Sex, Chol_Status*(Height Weight);
82      Title 'Height and Weight by Gender and Cholesterol Status';
83      Run;
```

NOTE: The data set WORK.HEART_OUTDS has 6 observations and 7 variables.
NOTE: There were 5209 observations read from the data set SASHELP.HEART.
NOTE: PROCEDURE TABULATE used (Total process time):

real time	0.05 seconds
user cpu time	0.04 seconds
system cpu time	0.01 seconds

Messages: 1 User: lyen

SAS DEMONSTRATION

SAS Demonstration using SAS On-Demand for Academics

ODS STATEMENTS

Statement	Definition
ODS TRACE	Sends Information on Output Objects to the SAS Log.
ODS SELECT	Selects a particular Output Object.
ODS EXCLUDE	Excludes specific Output Objects.
ODS OUTPUT	Produces an output SAS data set for a given procedure
ODS GRAPHICS	Sets options for graphics and visualizations output.
ODS LAYOUT	Applies a designed layout for ODS output.
ODS SHOW	Writes the specified selection or exclusion list to the SAS log.
ODS VERIFY	Print/suppresses a warning message about style/table templates used.

ODS TRACE STATEMENT

ODS TRACE produces a list of the available output objects which are produced by a specific SAS procedure.

Prints Information about ODS output objects in the SAS Log.

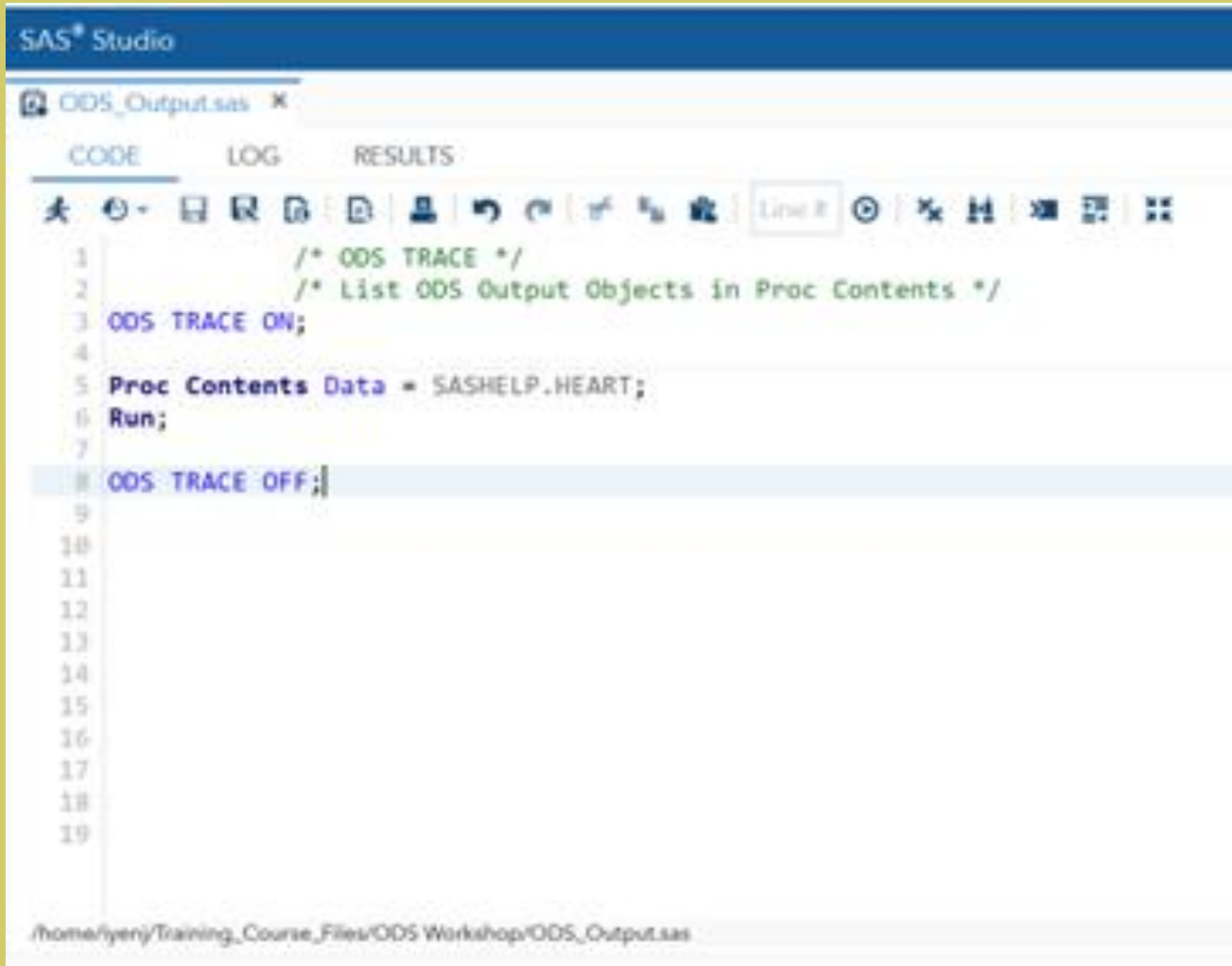
ODS TRACE ON

- Turns on the ODS Trace feature. Any SAS procedure code will print output object info in the SAS log.

ODS TRACE OFF

- Turns off the ODS Trace feature.

ODS TRACE STATEMENT



The screenshot shows the SAS Studio interface with a code editor window titled 'ODS_Output.sas'. The editor has tabs for CODE, LOG, and RESULTS. The CODE tab is active, showing the following SAS code:

```
1      /* ODS TRACE */
2      /* List ODS Output Objects in Proc Contents */
3  ODS TRACE ON;
4
5  Proc Contents Data = SASHELP.HEART;
6  Run;
7
8  ODS TRACE OFF;
9
10
11
12
13
14
15
16
17
18
19
```

The file path at the bottom is `/home/yerij/Training_Course_Files/ODS Workshop/ODS_Output.sas`.



The screenshot shows the ODS_Trace.log window in SAS Studio. It displays the output of the ODS TRACE statement, listing the output objects generated by the PROC CONTENTS procedure.

```
File Edit View
//
74      /* ODS TRACE */
75      /* List ODS Output Objects in Proc Contents */
76      ODS TRACE ON;
77
78      Proc Contents Data = SASHELP.HEART;
79      Run;
```

Output Added:

Name:	Attributes
Label:	Attributes
Template:	Base.Contents.Attributes
Path:	Contents.Dataset.Attributes

Output Added:

Name:	EngineHost
Label:	Engine/Host Information
Template:	Base.Contents.EngineHost
Path:	Contents.Dataset.EngineHost

Output Added:

Name:	Variables
Label:	Variables
Template:	Base.Contents.Variables
Path:	Contents.Dataset.Variables

NOTE: PROCEDURE CONTENTS used (Total process time):

real time	0.13 seconds
user cpu time	0.06 seconds
system cpu time	0.01 seconds
memory	4533.28k
OS Memory	29356.00k
Timestamp	09/23/2025 05:00:17 PM
Step Count	24
Page Faults	0
Page Reclaims	1181
Page Swaps	0
Unintended Context Switches	0

Ln 35, Col 15 1,829 characters Plain text

SAS DEMONSTRATION

SAS DEMONSTRATION USING SAS STUDIO / SAS ODA

ODS SELECT STATEMENT

The ODS SELECT statement selects specific output objects to send to ODS destinations.

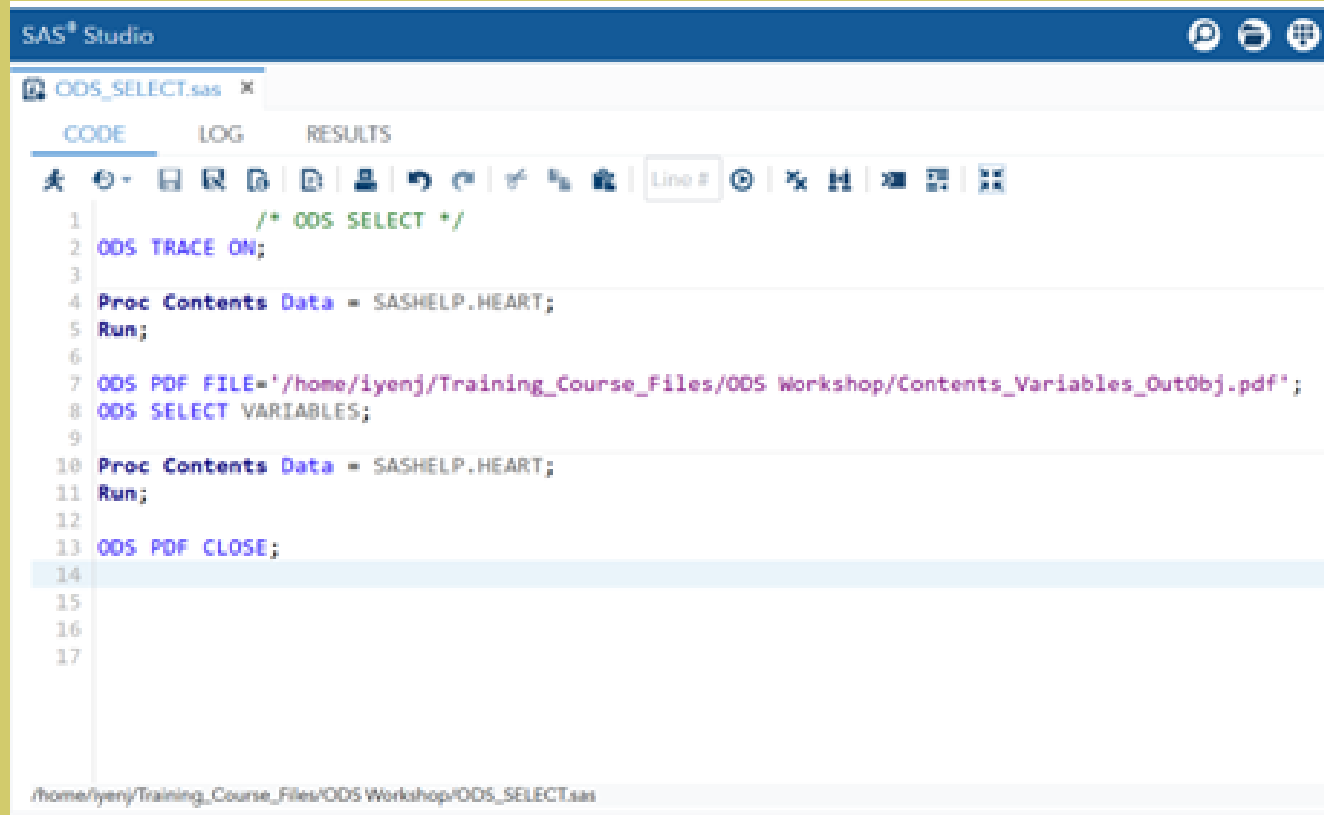
SAS maintains a selection list of output objects. By default, the selection list is set to SELECT ALL. It includes all output objects.

ODS SELECT *'Name of Output Object'*;

The ODS SELECT statement narrows the selection list to particular output objects.

ODS SELECT `_ALL_;` *Resets the selection list back to its default of all output objects.

ODS SELECT STATEMENT



```
SAS® Studio
ODS_SELECT.sas
CODE LOG RESULTS
/* ODS SELECT */
ODS TRACE ON;
Proc Contents Data = SASHELP.HEART;
Run;
ODS PDF FILE='/home/iyen/Training_Course_Files/ODS Workshop/Contents_Variables_OutObj.pdf';
ODS SELECT VARIABLES;
Proc Contents Data = SASHELP.HEART;
Run;
ODS PDF CLOSE;
```

/home/iyen/Training_Course_Files/ODS Workshop/ODS_SELECT.sas

```
79
80 ODS PDF FILE='/home/iyen/Training_Course_Files/ODS Workshop/Contents_Variables_OutObj.pdf';
NOTE: Writing ODS PDF output to DISK destination "/home/iyen/Training_Course_Files/ODS Workshop/Contents_Variables_OutObj.pdf",
      printer "PDF".
81 ODS SELECT VARIABLES;
82
83 Proc Contents Data = SASHELP.HEART;
84 Run;
```

Output Added:

Name:	Variables
Label:	Variables
Template:	Base.Contents.Variables
Path:	Contents.Dataset.Variables

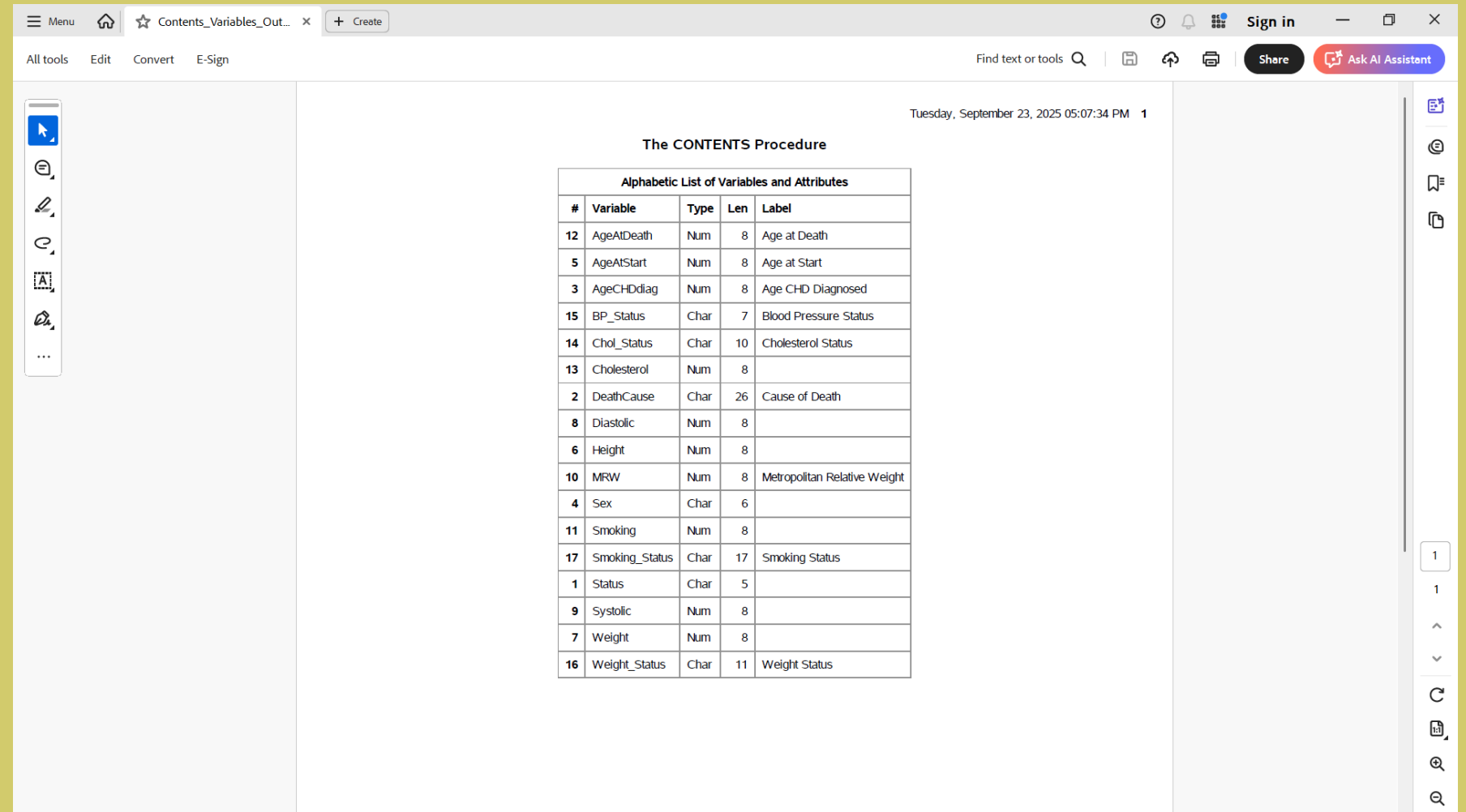
NOTE: PROCEDURE CONTENTS used (total process time):

real time	0.03 seconds	
user cpu time	0.03 seconds	
system cpu time	0.00 seconds	
memory	2462.84k	
OS Memory	33968.00k	
Timestamp	09/23/2025 10:07:34 PM	
Step Count	31	Switch Count 0
Page Faults	0	
Page Reclaims	404	
Page Swaps	0	
Voluntary Context Switches	3	
Involuntary Context Switches	4	
Block Input Operations	0	
Block Output Operations	24	

```
85
86 ODS PDF CLOSE;
NOTE: ODS PDF printed 1 page to /home/iyen/Training_Course_Files/ODS Workshop/Contents_Variables_OutObj.pdf.
87
88
89
90
^^
Ln 1, Col 1 3,054 characters Plain text
```

ODS SELECT STATEMENT – OUTPUT

Output contains only the *variables* ODS output object which was selected for the destination using ODS SELECT.



The screenshot displays the SAS Studio web interface. The browser tab is titled 'Contents_Variables_Out...'. The top navigation bar includes 'Menu', 'Contents_Variables_Out...', and a '+ Create' button. Below this, there are tabs for 'All tools', 'Edit', 'Convert', and 'E-Sign'. On the right side of the top bar, there are icons for help, notifications, and a 'Sign in' button, followed by a search bar and icons for save, share, and print. The main content area shows the output of 'The CONTENTS Procedure'. The title 'The CONTENTS Procedure' is centered above a table titled 'Alphabetic List of Variables and Attributes'. The table has five columns: '#', 'Variable', 'Type', 'Len', and 'Label'. The data is sorted alphabetically by variable name. The table is displayed in a scrollable container. On the left side of the interface, there is a vertical toolbar with icons for various actions like zoom, pan, and search. On the right side, there is a vertical toolbar with icons for zoom, pan, and search, and a small panel at the bottom right showing a list of objects with a '1' next to it.

Tuesday, September 23, 2025 05:07:34 PM 1

The CONTENTS Procedure

#	Variable	Type	Len	Label
12	AgeAtDeath	Num	8	Age at Death
5	AgeAtStart	Num	8	Age at Start
3	AgeCHDdiag	Num	8	Age CHD Diagnosed
15	BP_Status	Char	7	Blood Pressure Status
14	Chol_Status	Char	10	Cholesterol Status
13	Cholesterol	Num	8	
2	DeathCause	Char	26	Cause of Death
8	Diastolic	Num	8	
6	Height	Num	8	
10	MRW	Num	8	Metropolitan Relative Weight
4	Sex	Char	6	
11	Smoking	Num	8	
17	Smoking_Status	Char	17	Smoking Status
1	Status	Char	5	
9	Systolic	Num	8	
7	Weight	Num	8	
16	Weight_Status	Char	11	Weight Status

ODS EXCLUDE

The ODS EXCLUDE statement excludes specific output objects from being sent to ODS destinations.

SAS maintains an exclusion list of output objects. By default, the exclusion list is set to EXCLUDE ALL. It excludes all output objects.

ODS EXCLUDE *'Name of Output Object'*;

The ODS EXCLUDE statement narrows the exclusion list to particular output objects.

ODS EXCLUDE _ALL_; *Resets the selection list back to its default of excluding all output objects.

ODS EXCLUDE

```
SAS® Studio

ODS_EXCLUDE.sas x

CODE LOG RESULTS

1
2      /* ODS EXCLUDE */
3 ODS TRACE ON;
4
5 Proc Univariate Data = SASHELP.HEART;
6     Var Cholesterol Diastolic Systolic Height Weight;
7 Run;
8
9 ODS PDF FILE='/home/iyen/Training_Course_Files/ODS Workshop/Univariate_Moments_BasicMeasures.pdf';
10 ODS EXCLUDE TestsForLocation Quantiles MissingValues;
11
12 Proc Univariate Data = SASHELP.HEART;
13     Var Cholesterol Diastolic Systolic Height Weight;
14 Run;
15
16 ODS PDF CLOSE;
17
18
```

```
File Edit View

82 ODS PDF FILE='/home/iyen/Training_Course_Files/ODS Workshop/Univariate_Moments_BasicMeasures.pdf';
NOTE: Writing ODS PDF output to DISK destination
      "/home/iyen/Training_Course_Files/ODS Workshop/Univariate_Moments_BasicMeasures.pdf", printer "PDF".
83 ODS EXCLUDE TestsForLocation Quantiles MissingValues;
84
85 Proc Univariate Data = SASHELP.HEART;
86     Var Cholesterol Diastolic Systolic Height Weight;
87 Run;

Output Added:
-----
Name: Moments
Label: Moments
Template: base.univariate.Moments
Path: univariate.cholesterol.Moments

Output Added:
-----
Name: BasicMeasures
Label: Basic Measures of location and Variability
Template: base.univariate.Measures
Path: univariate.cholesterol.BasicMeasures

Output Added:
-----
Name: ExtremeObs
Label: Extreme observations
Template: base.univariate.ExtObs
Path: univariate.cholesterol.ExtremeObs

Output Added:
-----
Name: Moments
Label: Moments
Template: base.univariate.Moments
Path: univariate.diastolic.Moments

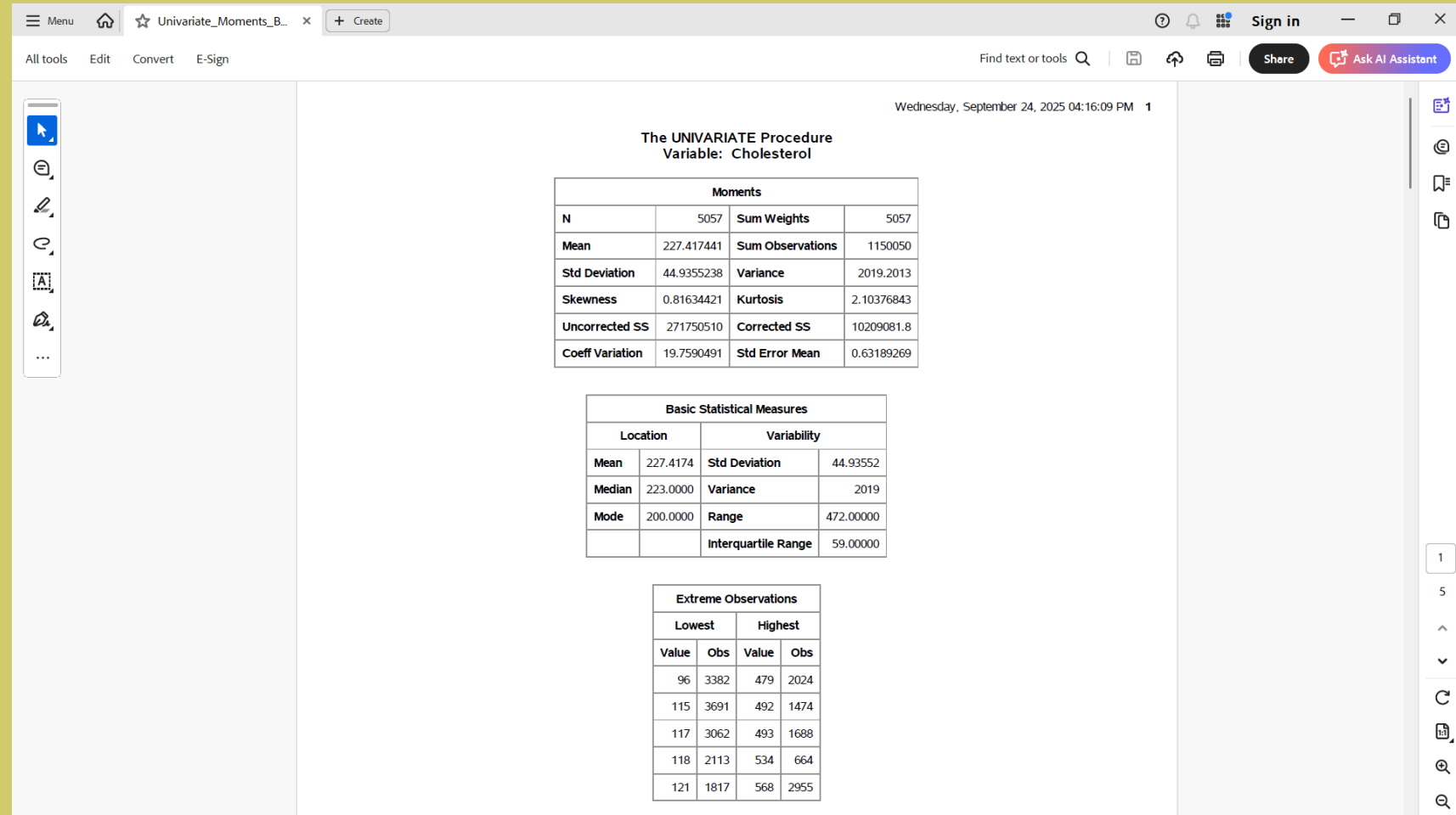
Ln 21, Col 27 4,194 characters Plain text
```

ODS EXCLUDE – OUTPUT

Output contains
Moments,
Basic Measures,
ExtremeObs output objects.

These are the objects which
were not excluded.

They are the remaining output
objects after excluding three
others.



Wednesday, September 24, 2025 04:16:09 PM 1

The UNIVARIATE Procedure
Variable: Cholesterol

Moments			
N	5057	Sum Weights	5057
Mean	227.417441	Sum Observations	1150050
Std Deviation	44.9355238	Variance	2019.2013
Skewness	0.81634421	Kurtosis	2.10376843
Uncorrected SS	271750510	Corrected SS	10209081.8
Coeff Variation	19.7590491	Std Error Mean	0.63189269

Basic Statistical Measures			
Location		Variability	
Mean	227.4174	Std Deviation	44.93552
Median	223.0000	Variance	2019
Mode	200.0000	Range	472.00000
		Interquartile Range	59.00000

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
96	3382	479	2024
115	3691	492	1474
117	3062	493	1688
118	2113	534	664
121	1817	568	2955

SAS DEMONSTRATION

SAS Demonstration Using SAS On-Demand for Academics

QUIZ #2

Which of the following SAS procedures doesn't produce output objects?

- A. Proc Freq
- B. Proc Reg
- C. Proc Sort
- D. Proc Tabulate

PROC TEMPLATE

With PROC TEMPLATE, you can define new style templates and modify existing and built-in styles.

As mentioned earlier, styles consist of style elements and style attributes.

Style elements are areas in the output where sets or collections of styles attributes are applied. They consist of collections of style attributes.

Style element names specify where collections of style attributes are used, such as column headers, report breaks, table cells, summary lines, etc.

Style attributes are properties such as font, font size, bold or italic text, background color, etc.

PROC TEMPLATE – STATEMENTS AND CODING

You'd use the following code to define a new style from scratch.

You need to use the STYLE statement to define style elements.

```
PROC TEMPLATE;  
  DEFINE STYLE <'StyleName'>;  
    STYLE <'StyleElement'> /  
      StyleAttribute1=Attribute-value  
      StyleAttribute2=Attribute-value  
      StyleAttribute3=Attribute-value;  
    STYLE <'StyleElement'> /  
      StyleAttribute1=Attribute-value  
      StyleAttribute2=Attribute-value  
      StyleAttribute3=Attribute-value;  
  END;  
RUN;
```

PROC TEMPLATE - EXAMPLE

The PROC TEMPLATE code defines a style called NewStyle1.

It consists of two style elements, Header and Data, which each contains four style attributes.

```
PROC TEMPLATE;  
  DEFINE STYLE NewStyle1;  
    STYLE Header /  
      Fontfamily=Arial  
      Fontsize=12pt  
      BackgroundColor=White  
      Color=Black;  
  
    STYLE Data /  
      Fontweight=Medium;  
      Fontsize=16pt;  
      BackgroundColor=Grey  
      Color=Blue;  
  
  END;  
RUN;
```

PROC TEMPLATE

Style elements may vary from one ODS destination to another, and from one procedure output to another. The table below lists style elements specific to the REPORT procedure (PROC REPORT).

Style Elements	Description
Header	Controls formatting of the Header section, i.e., Column Headers
Data	Formatting of column cells for detail rows of the table.
LineContent	Formatting of Added Lines inserted by LINE statements.
DataEmphasis	Formatting of Summary Rows
Table	Formatting of Report as a Whole
Footer	Formatting of Footers

ODS RTF / PROC REPORT - EXAMPLE I

```
ODS RTF FILE='/home/iyenj/Training_Course_Files/ODS Workshop/Sales_report93.rtf' Style=Journal;
```

```
/* Proc Report - Example 1 */
Proc Report Data = SASHELP.PRDSALE Split='**';
  Column Quarter Month Predict Actual;

  Where Year=1993;

  Define Quarter / Group Order=Internal Flow 'Quarter* of the Year';
  Define Month / Group Order=Internal Flow 'Month* of the Year';

  Define Predict / Analysis Sum 'Predicted* Sales Revenue';
  Define Actual / Analysis Sum 'Actual* Sales Revenue';

  Break After Quarter / Summarize Skip;
  RBreak After / Summarize;

  Compute After Quarter;
    Length TxtStr $20;
    If Actual.Sum<100000 Then TxtStr = 'Sales Below Target';
    Else If Actual.Sum>=100000 Then TxtStr='Sales At or Above Target';
    Line TxtStr $20.;
  EndComp;

  Title1'Actual Vs. Predicted Sales Revenue';
  Title2'By Quarter and Month';

  Footnote1 '1993';
Run;

ODS RTF CLOSE;
```

Quarter of the Year	Month of the Year	Predicted Sales Revenue	Actual Sales Revenue
1	Jan	\$32,385.00	\$29,813.00
	Feb	\$29,163.00	\$29,584.00
	Mar	\$31,818.00	\$29,873.00
1		\$93,366.00	\$89,270.00
		Sales Below Target	
2	Apr	\$27,429.00	\$30,581.00
	May	\$30,263.00	\$31,617.00
	Jun	\$27,634.00	\$33,605.00
2		\$85,326.00	\$95,803.00
		Sales Below Target	
3	Jul	\$33,220.00	\$33,578.00
	Aug	\$28,874.00	\$31,160.00
	Sep	\$29,470.00	\$28,696.00
3		\$91,564.00	\$93,434.00
		Sales Below Target	
4	Oct	\$30,262.00	\$31,355.00
	Nov	\$31,434.00	\$27,859.00
	Dec	\$29,258.00	\$31,956.00
4		\$90,955.00	\$91,170.00
		Sales Below Target	
		\$360,211.00	\$369,477.00

PROC TEMPLATE – EXAMPLE 1

```
/* PROC TEMPLATE - EXAMPLE 1 */
Proc Template;
  Define Style ReportStyle1;
    Style Header /
      Fontfamily=Calibri
      FontWeight=Bold
      Color=Black;

    Style Data /
      FontWeight =Light
      Color =Black
      BackgroundColor=White;

    Style DataEmphasis /
      FontStyle=Italic
      FontWeight=Bold
      Color =Blue
      BackgroundColor =Grey;

    Style LineContent /
      FontStyle =Italic
      FontWeight =Bold
      Color=DarkBlue
      BackgroundColor =Yellow;

    Style Table /
      Borderwidth=1pt
      Borderstyle=solid
      Bordercolor=Green
      Borderspacing=5pt;

    Style Footer /
      FontStyle =Italic
      FontWeight =Bold
      Color=Black
      BackgroundColor =White;

  End;
Run;
```

CODE LOG RESULTS



Errors, Warnings, Notes

```
92      Style LineContent /
93      FontStyle=Italic
94      FontWeight=Bold
95      Color=DarkBlue
96      BackgroundColor=Yellow;
97
98      Style Table /
99      Borderwidth=1pt
100     Borderstyle=solid
101     Bordercolor=Green
102     Borderspacing=5pt;
103
104     Style Footer /
105     FontStyle=Italic
106     FontWeight=Bold
107     Color=Black
108     BackgroundColor=White;
109     End;
NOTE: STYLE 'ReportStyle1' has been saved to: WORK.TEMPLAT
110     Run;
NOTE: PROCEDURE TEMPLATE used (Total process time):
      real time           0.00 seconds
      user cpu time       0.00 seconds
```

ODS RTF / PROC REPORT - EXAMPLE 2

```

SAS® Studio
ProcReport_1.sas * PROC_TEMPLATE_1.sas *
CODE LOG RESULTS
/* Proc Report - Example 1 */
Proc Report Data = SASHELP.PRODSALE Split='';
  Column Quarter Month Predict Actual;
  Where Year=1993;

  Define Quarter / Group Order=Internal Flow 'Quarter' of the Year;
  Define Month / Group Order=Internal Flow 'Month' of the Year;
  Define Predict / Analysis Sum 'Predicted' Sales Revenue;
  Define Actual / Analysis Sum 'Actual' Sales Revenue;

  Break After Quarter / Summarize Skip;
  RBreak After / Summarize;

  Compute After Quarter;
    Length TxtStr $20;
    If Actual.Sum<100000 Then TxtStr = 'Sales Below Target';
    Else If Actual.Sum>=100000 Then TxtStr='Sales At or Above Target';
    Line TxtStr $20.;
  EndComp;

  Title1 'Actual Vs. Predicted Sales Revenue';
  Title2 'By Quarter and Month';
  Footnote1 '1993';

Run;
ODS RTF CLOSE;

```

Quarter of the Year	Month of the Year	Predicted Sales Revenue	Actual Sales Revenue
1	Jan	\$32,385.00	\$29,813.00
	Feb	\$29,163.00	\$29,584.00
	Mar	\$31,818.00	\$29,873.00
1		\$93,366.00	\$89,270.00
Sales Below Target			
2	Apr	\$27,429.00	\$30,581.00
	May	\$30,263.00	\$31,617.00
	Jun	\$27,634.00	\$33,605.00
2		\$85,326.00	\$95,803.00
Sales Below Target			
3	Jul	\$33,220.00	\$33,578.00
	Aug	\$28,874.00	\$31,160.00
	Sep	\$28,470.00	\$28,696.00
3		\$90,564.00	\$93,434.00
Sales Below Target			
4	Oct	\$30,262.00	\$31,355.00
	Nov	\$31,434.00	\$27,659.00
	Dec	\$29,259.00	\$31,956.00
4		\$90,955.00	\$90,970.00
Sales Below Target			
		\$360,211.00	\$369,477.00

PROC TEMPLATE – STATEMENTS AND CODING – EXISTING STYLE

You'd use the following code to modify an existing or built-in style.

You base the new style on the existing style with the PARENT= option.

This is referred to as style inheritance.

You use the CLASS statement to define style elements.

```
PROC TEMPLATE;  
  DEFINE STYLE <'StyleName'>;  
    PARENT=<'Styles.StyleName'>;  
    CLASS <'StyleElement'> /  
      StyleAttribute1=Attribute-value  
      StyleAttribute2=Attribute-value  
      StyleAttribute3=Attribute-value;  
    CLASS <'StyleElement'> /  
      StyleAttribute1=Attribute-value  
      StyleAttribute2=Attribute-value  
      StyleAttribute3=Attribute-value;  
  END;  
RUN;
```

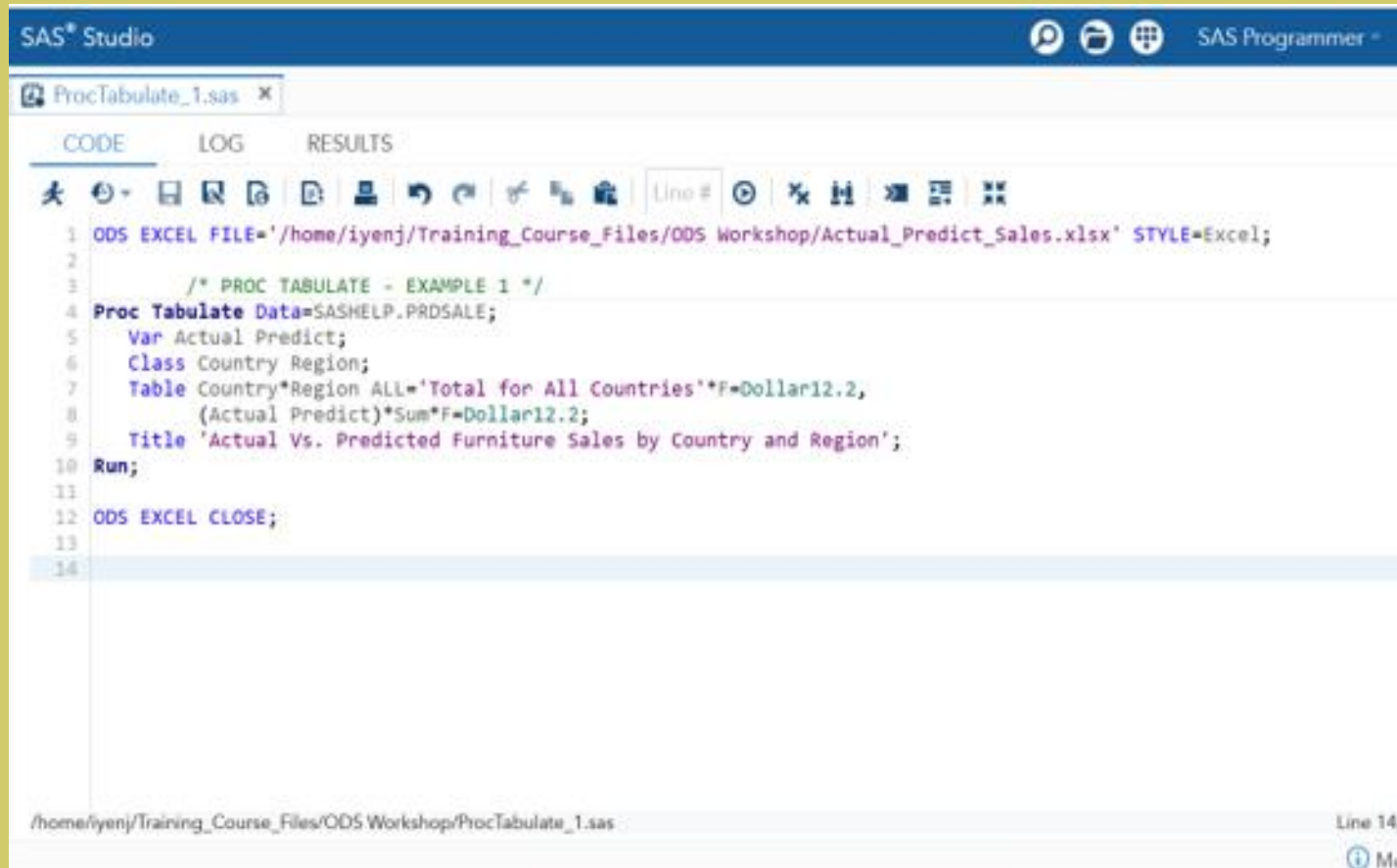
PROC TEMPLATE - EXAMPLE

The example references an existing style called HTMLBlue

It creates a new style, called ReportStyle1, based on the existing style.

```
PROC TEMPLATE;  
  DEFINE STYLE ReportStyle1;  
    PARENT=Styles.HTMLBlue;  
    CLASS Header /  
      BackgroundColor=colors("Medium")  
      Font=fonts("Arial")  
      Fontsize=3;  
    CLASS CellContents /  
      Color=colors("dark")  
      Borderspacing=5  
      Borderwidth=10;  
  
  END;  
RUN;
```

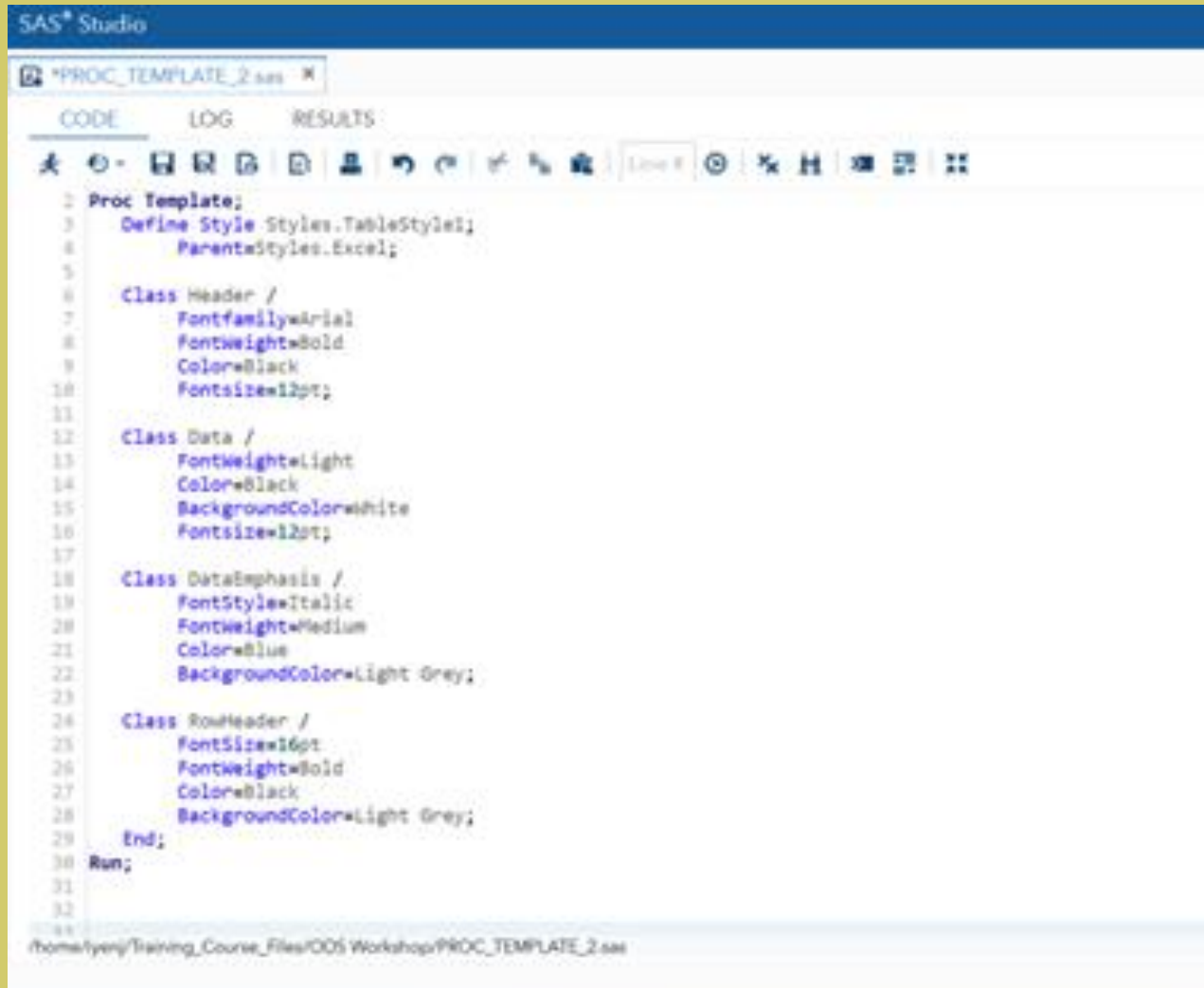
PROC TEMPLATE – PROC TABULATE EX I



```
1 ODS EXCEL FILE='/home/iyenj/Training_Course_Files/ODS Workshop/Actual_Predict_Sales.xlsx' STYLE=Excel;
2
3      /* PROC TABULATE - EXAMPLE 1 */
4 Proc Tabulate Data=SASHELP.PRDSALE;
5   Var Actual Predict;
6   Class Country Region;
7   Table Country*Region ALL='Total for All Countries'*F=Dollar12.2,
8         (Actual Predict)*Sum*F=Dollar12.2;
9   Title 'Actual Vs. Predicted Furniture Sales by Country and Region';
10 Run;
11
12 ODS EXCEL CLOSE;
13
14
```

		Actual Sales	Predicted Sales
		Sum	Sum
Country	Region		
CANADA	EAST	\$127,485.00	\$120,646.00
	WEST	\$119,505.00	\$112,373.00
GERMANY	EAST	\$124,547.00	\$117,579.00
	WEST	\$121,451.00	\$113,975.00
U.S.A.	EAST	\$118,229.00	\$120,587.00
	WEST	\$119,120.00	\$121,135.00
Total for All Countries		\$730,337.00	\$706,295.00

PROC TEMPLATE – MODIFYING AN EXISTING STYLE



```
1 Proc Template;
2   Define Style Styles.TableStyle1;
3     Parent=Styles.Excel;
4
5   Class Header /
6     Fontfamily=Arial
7     FontWeight=Bold
8     Color=Black
9     Fontsize=12pt;
10
11  Class Data /
12    FontWeight=Light
13    Color=Black
14    BackgroundColor=White
15    Fontsize=12pt;
16
17  Class DataEmphasis /
18    FontStyle=Italic
19    FontWeight=Medium
20    Color=Blue
21    BackgroundColor=Light Grey;
22
23  Class RowHeader /
24    FontSize=16pt
25    FontWeight=Bold
26    Color=Black
27    BackgroundColor=Light Grey;
28  End;
29 Run;
```

```
1  OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;
2
3  /* PROC TEMPLATE - EXAMPLE 1 */
4  Proc Template;
5    Define Style Styles.TableStyle1;
6    Parent=Styles.Excel;
7
8    Class Header /
9      Fontfamily=Arial
10     FontWeight=Bold
11     Color=Black
12     Fontsize=12pt;
13
14    Class Data /
15      FontWeight=Light
16      Color=Black
17      BackgroundColor=White
18      Fontsize=12pt;
19
20    Class DataEmphasis /
21      FontStyle=Italic
22      FontWeight=Medium
23      Color=Blue
24      BackgroundColor=Light Grey;
25
26    Class RowHeader /
27      FontSize=16pt
28      FontWeight=Bold
29      Color=Black
30      BackgroundColor=Light Grey;
31  End;
32
33 NOTE: STYLE 'Styles.TableStyle1' has been saved to: WORK\TEMPLAT
34 Run;
35
36 NOTE: PROCEDURE TEMPLATE used (Total process time):
37
38    real time      0.00 seconds
39    user cpu time  0.00 seconds
40    system cpu time 0.00 seconds
41    memory         234.53k
42    OS Memory      28588.00k
43    Timestamp      09/29/2025 12:50:11 AM
```

PROC TEMPLATE – PROC TABULATE EX 2

```
SAS® Studio
ProcTabulate_1.sas
CODE LOG RESULTS
1 ODS EXCEL FILE='/home/iyen/Training_Course_Files/ODS Workshop/Actual_Predict_Sales.xlsx' STYLE=TableStyle1;
2
3 /* PROC TABULATE - EXAMPLE 1 */
4 Proc Tabulate Data=SASHELP.PRDSALE;
5   Var Actual Predict;
6   Class Country Region;
7   Table Country*Region ALL='Total for All Countries'*F=Dollar12.2,
8         (Actual Predict)*Sum*F=Dollar12.2;
9   Title 'Actual Vs. Predicted Furniture Sales by Country and Region';
10 Run;
11
12 ODS EXCEL CLOSE;
13
14
```

		Actual Sales	Predicted Sales
		Sum	Sum
CANADA	EAST		
	WEST	\$127,485.00	\$120,646.00
GERMANY	EAST	\$119,505.00	\$112,373.00
	WEST	\$124,547.00	\$117,579.00
U.S.A.	EAST	\$121,451.00	\$113,975.00
	WEST	\$118,229.00	\$120,587.00
Total for All Countries		\$119,120.00	\$121,135.00
		\$730,337.00	\$706,295.00

PROC TEMPLATE – VIEWING STYLE ELEMENTS/ATTRIBUTES

To view the underlying style elements and style attributes of an existing built-in style, use the SOURCE statement. It will print a listing to the SAS log.

```
Proc Template;  
    Source Styles.Journal;  
Run;
```

```
1  OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;  
72  
73  Proc Template;  
74  Source Styles.Journal;  
define style Styles.Journal;  
parent = styles.default;  
style fonts /  
  'docFont' = ("<sans-serif>, Helvetica, Helv",2)  
  'headingFont' = ("<sans-serif>, Helvetica, Helv",2,italic)  
  'headingEmphasisFont' = ("<sans-serif>, Helvetica, Helv",2,bold italic)  
  'FixedFont' = ("<monospace>, Courier",2)  
  'BatchFixedFont' = ("SAS Monospace, <monospace>, Courier, monospace",2)  
  'FixedHeadingFont' = ("<monospace>, Courier",2,italic)  
  'FixedStrongFont' = ("<monospace>, Courier",2,bold)  
  'FixedEmphasisFont' = ("<sans-serif>, Helvetica, Helv",2,bold italic)  
  'EmphasisFont' = ("<sans-serif>, Helvetica, Helv",2,italic)  
  'StrongFont' = ("<sans-serif>, Helvetica, Helv",2,bold italic)  
  'TitleFont' = ("<sans-serif>, Helvetica, Helv",2,bold italic)  
  'TitleFont2' = ("<sans-serif>, Helvetica, Helv",2,bold italic)  
  'SASTitleFont' = ("<sans-serif>, Helvetica, Helv",2,bold italic);  
class GraphFonts /  
  'NodeDetailFont' = ("<sans-serif>, <MTsans-serif>",7pt)  
  'NodeInputLabelFont' = ("<sans-serif>, <MTsans-serif>",9pt)  
  'NodeLabelFont' = ("<sans-serif>, <MTsans-serif>",9pt)  
  'NodeTitleFont' = ("<sans-serif>, <MTsans-serif>",9pt)  
  'GraphTitleFont' = ("<sans-serif>, <MTsans-serif>",11pt)  
  'GraphTitle1Font' = ("<sans-serif>, <MTsans-serif>",14pt)  
  'GraphFootnoteFont' = ("<sans-serif>, <MTsans-serif>",10pt)  
  'GraphLabel2Font' = ("<sans-serif>, <MTsans-serif>",10pt)  
  'GraphLabelFont' = ("<sans-serif>, <MTsans-serif>",10pt)  
  'GraphUnicodeFont' = ("<MTsans-serif-unicode>",9pt)  
  'GraphValueFont' = ("<sans-serif>, <MTsans-serif>",9pt)  
  'GraphDataFont' = ("<sans-serif>, <MTsans-serif>",7pt)  
  'GraphAnnoFont' = ("<sans-serif>, <MTsans-serif>",10pt);  
class colors /  
  'fg' = cx000000  
  'fg2' = cx000000  
  'fgA1' = cx000000  
  'bgA1' = cxFFFFFF  
  'bg2' = cxFFFFFF  
  'fg3' = cx000000  
  'bg3' = cxFFFFFF  
  'fg4' = cx000000  
  'bg4' = cxFFFFFF
```

SAS DEMONSTRATION

SAS Demonstration using SAS On-Demand for Academics

ODS GRAPHICS

ODS GRAPHICS *<options>*;

Enables ODS GRAPHICS processing and sets graphics environment options.

ODS GRAPHICS settings are applied to template-based graphics only, produced by ODS GRAPHICS PROCEDURES.

ODS GRAPHICS settings do not affect SAS/GRAPH Procedure output which uses device-based graphics.

ODS GRAPHICS ON; - Turns on ODS GRAPHICS

ODS GRAPHICS OFF; - Turns off ODS GRAPHICS

ODS GRAPHICS SETTINGS.

There are many ODS GRAPHICS settings. The following list is a sample of ODS GRAPHICS options

SETTING	DESCRIPTION
BORDER	Specifies the Border for a Graph.
HEIGHT	Sets the Graph Height.
OUTPUTFMT	Specifies the Output Format for Image Files.
GROUPEMAX	Sets the Maximum Number of Group Values to be shown in any graph.
RESET	Resets one or more graphics options.
WIDTH	Sets the Graph Width.

ODS GRAPHICS PROCEDURES

Procedure	Description
PROC SGPLOT	Creates simple graphics and statistical graphics
PROC SGPIE	Creates Pie Charts and Donut Charts
PROC SGPANEL	Creates a panel of graphs based on the values of one or more classification variables
PROC SGSCATTER	Creates a paneled graph of scatter plots.
PROC SGRENDER	Produces statistical graphics from templates created with the graph template language (GTL).
PROC SGDESIGN	Produces graphics with the user-defined ODS Graphics Designer file in SAS 9.4M7

PROC SGPLOT

PROC SGPLOT produces single and multiple plots and overlays them on a single set of axes. It produces simple graphics, as well as statistical graphics

PROC SGPLOT can produce Vertical and Horizontal Line Graphs, Vertical and Horizontal Bar Charts, Box Plots, Histograms, Scatter Plots, Stacked Bar Charts, 3-dimensional charts and much more.

With many options for annotating graphs and charts, you can add legends, multiple y-axes, reference lines, and axis titles.

PROC SGPLOT – SAS CODING

```
PROC SGPLOT DATA = <'SAS data set'> OPTIONS;
```

```
    VBAR <variable> / Response= <variable>;  
    HBAR <variable>;
```

```
    VLINE <variable> / Response= <variable>;  
    HLINE <variable>;
```

```
    VBOX <variable> / Category= <variable>;  
    HBOX <variable>;
```

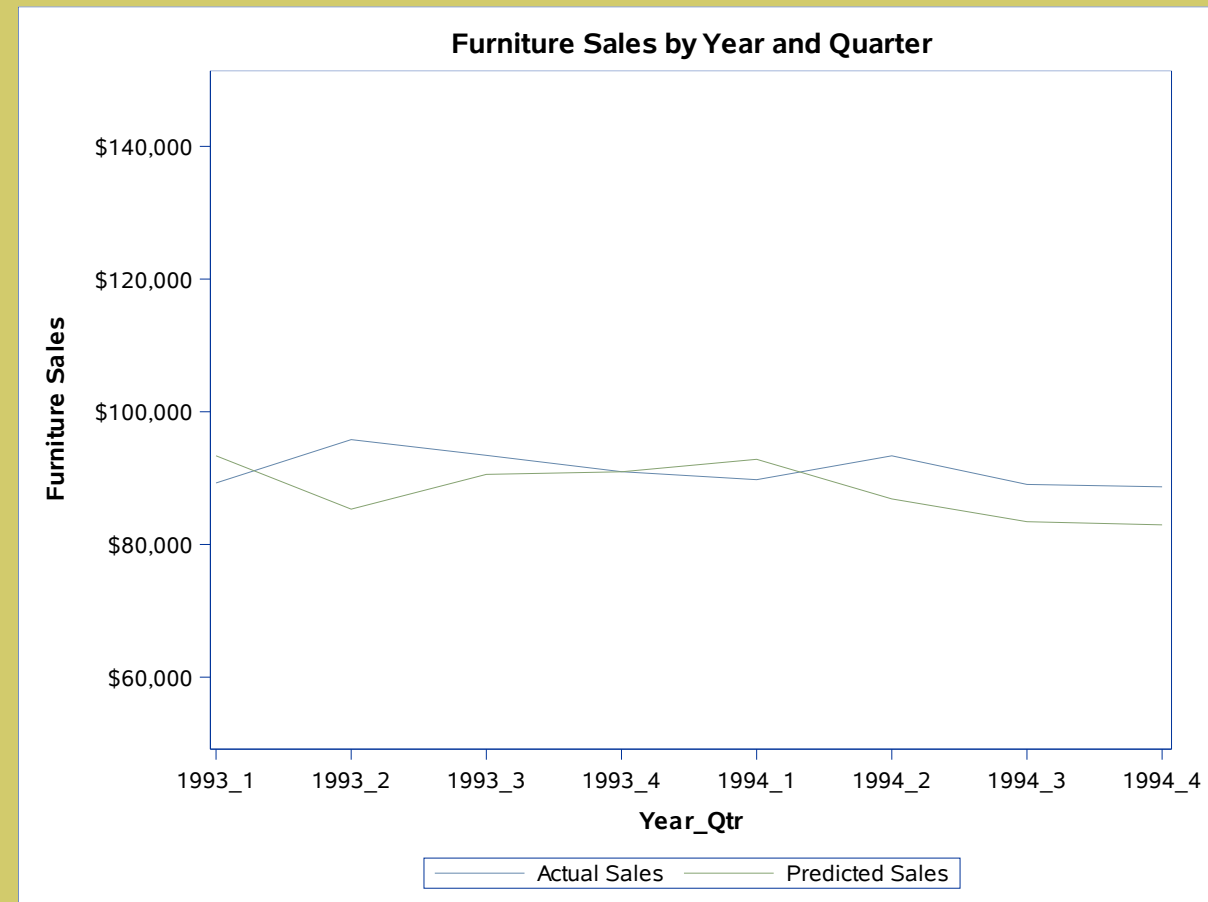
```
    SERIES X=<variable> Y=<variable> / ;
```

```
Run;
```

PROC SGPLOT – VERTICAL LINE CHARTS

To produce a vertical line graph use the VLINE statement

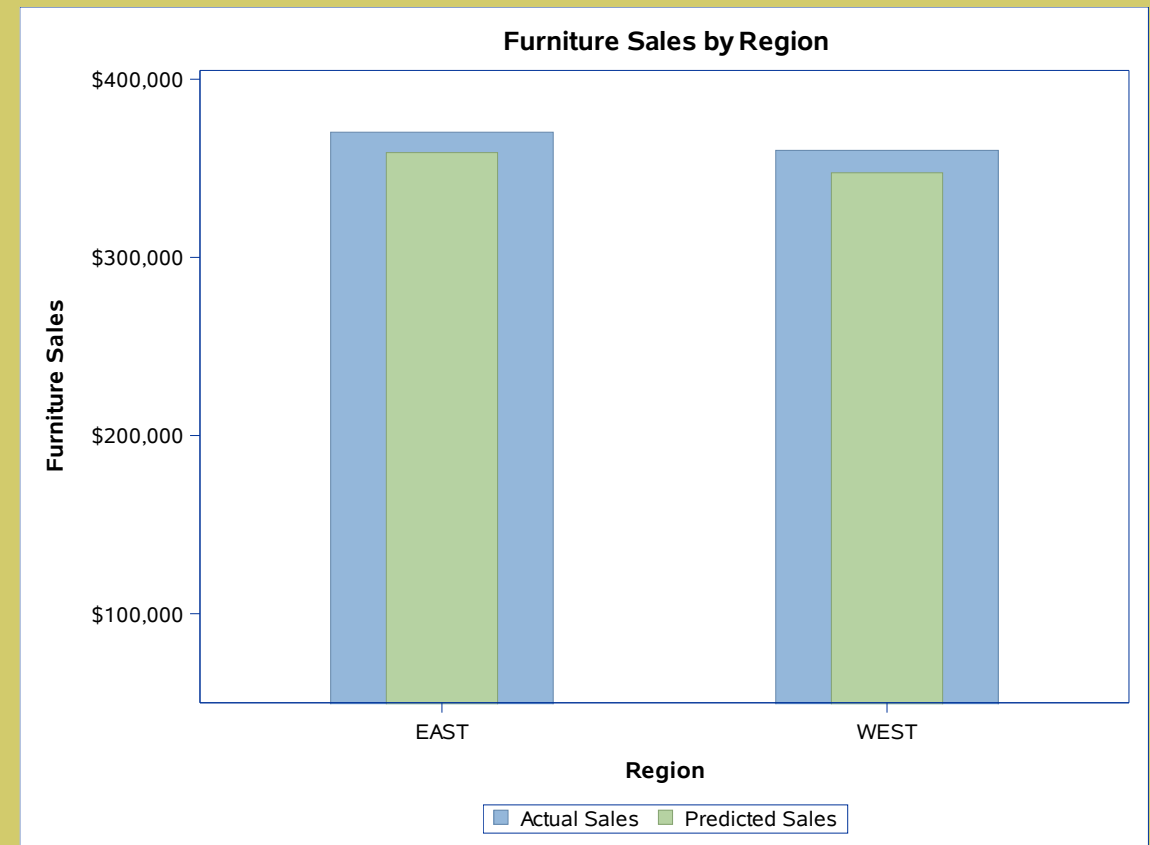
```
12 Proc SGPLOT Data=PRDSALE;  
13   VLine Year_Qtr / Response=Actual;  
14   VLine Year_Qtr / Response=Predict;  
15   YAxis Label='Furniture Sales' Min=50000 Max=150000;  
16   Title 'Furniture Sales by Year and Quarter';  
17 Run;
```



PROC SGPLOT – VERTICAL BAR CHART

To produce a vertical bar chart, use the VBAR statement.

```
SAS® Studio
OOS_SGPLOT_1.sas
CODE LOG RESULTS
/* PROC SGPlot - Example 1 */
Proc SGPlot Data=SASHELP.PROSALE;
  YAxis Label='Furniture Sales' Min=50000;
  VBar Region / Response=Actual Barwidth=0.5;
  VBar Region / Response=Predict Barwidth=0.25;
  Title 'Furniture Sales by Region';
Run;
```



PROC SGPLOT – VERTICAL BOX PLOT

```
SAS® Studio

ODS_SGPLOT_3.sas x
CODE LOG RESULTS
/* PROC SGPlot - Example 3 */
/* Vertical Box Plots */
Proc SGPlot Data=SASHELP.ORDSALES;
  VBox Quantity / Category=Product_Line;
  YAxis Label='Quantity Sold' Min=0 Max=10000;
  Title 'Department Store Sales by Product Line';
Run;
```

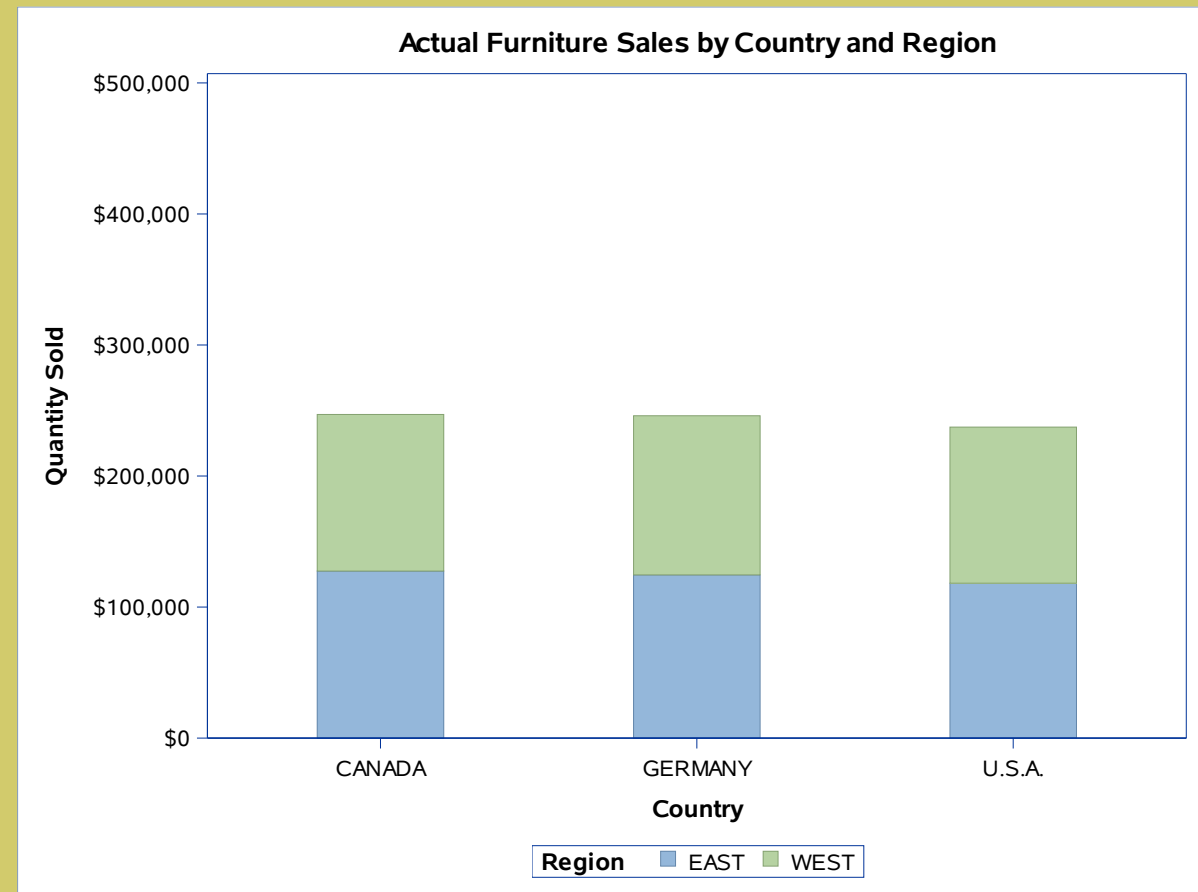
/home/yeri/Training_Course_Files/ODS Workshop/ODS_SGPLOT_3.sas



PROC SGPLOT – GROUPED VERTICAL BAR CHART

Stacked Vertical Bar Chart

```
SAS® Studio
ODS_SGPLOT_4.sas
CODE LOG RESULTS
/* PROC SGPlot - Example 3 */
/* Stacked Vertical Bar Charts */
Proc SGPlot Data=SASHELP.PRDSALE;
  VBar Country / Response=Actual Group=Region BarWidth=.4;
  YAxis Label='Quantity Sold' Min=0 Max=500000;
  Title 'Actual Furniture Sales by Country and Region';
Run;
```



SAS DEMONSTRATION

SAS Demonstration using SAS On-Demand for Academics

PROC SGPANEL

PROC SGPANEL produces plots, charts and graphs just like PROC SGPLOT.

It produces the same types of plots and charts, such as vertical and horizontal bar charts, line graphs, histograms, box plots, etc. It also overlays multiple plots, and produces several types of layouts.

However, PROC SGPANEL produces multiple charts or graphs in a panel-like format, based on the values of a classification variable. One graph is generated for each distinct value of the classification variable.

PROC SGPANEL is really effective for visualizing how data distributions vary across classification variables.

PROC SGPANEL – SAS CODING

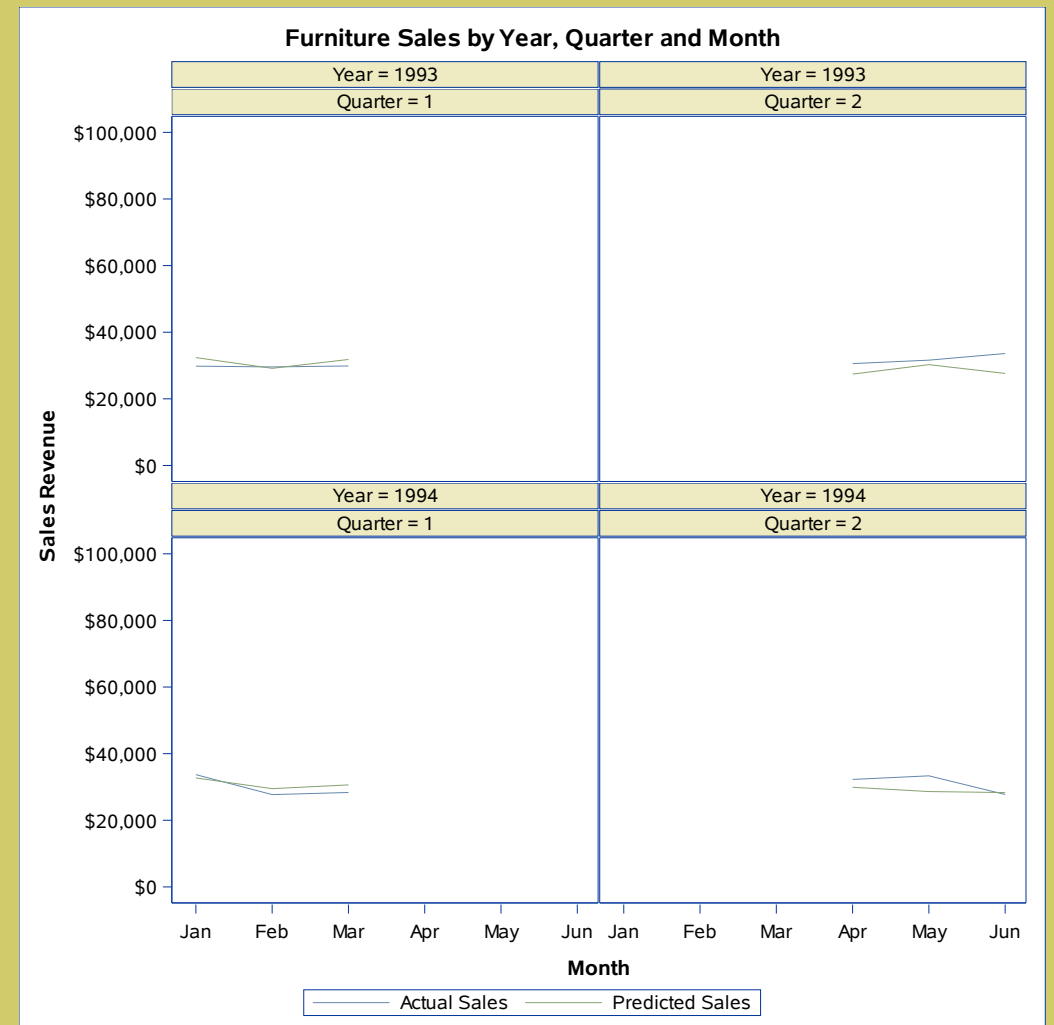
PROC SGPANEL shares many of the same statements of PROC SGPLOT

```
PROC SGPANEL DATA = <SAS-data-set>;  
    PANELBY variable-1 variable-2....variable-n / LAYOUT=;  
    VBAR <variable> / RESPONSE=<variable>;  
    VLINE <variable> / RESPONSE=<variable>;  
    VBOX <variable>;  
    HISTOGRAM <variable>;  
    DENSITY <variable>;  
RUN;
```

PROC SGPanel – LINE GRAPHS

```
SAS® Studio
OOS_SGPANEL_2.sas
CODE LOG RESULTS
/* Vertical Line Graph */
Proc SGPanel Data=SASHELP.PRDSALE;
  Where Quarter in (1 2);
  PanelBy Year Quarter;
  VLine Month / Response=Actual;
  VLine Month / Response=Predict;
  RowAxis Label='Sales Revenue' Min=0 Max=100000;
  Title'Furniture Sales by Year, Quarter and Month';
Run;
```

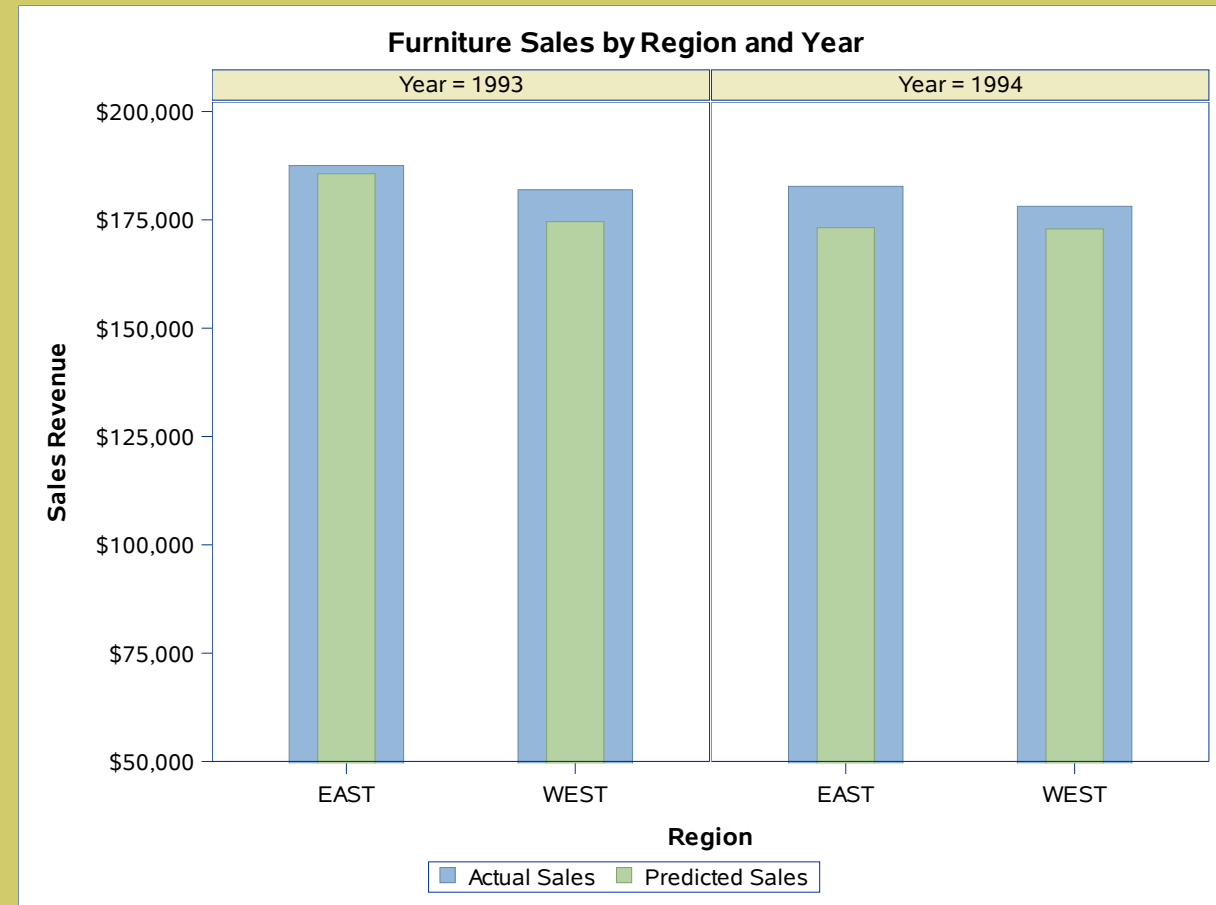
/home/nyer/Training_Course_Files/OOS Workshop/OOS_SGPANEL_2.sas



PROC SGPanel – BAR CHARTS

```
SAS® Studio
ODS_SGPANEL_1.sas * ODS_SGPANEL_2.sas * ODS_SGPLOT_2.sas *
CODE LOG RESULTS
/* PROC SGPanel - Example 1 */
Proc SGPanel Data=SASHELP.PRDSALE;
  Panelby Year;
  VBar Region / Response=Actual Barwidth=0.5;
  VBar Region / Response=Predict Barwidth=0.25;
  RowAxis Label='Sales Revenue' Min=50000 Max=200000;
  Title 'Furniture Sales by Region and Year';
Run;
```

/home/yeri/Training_Course_Files/ODS Workshop/ODS_SGPANEL_1.sas



SAS DEMONSTRATION

SAS Demonstration using SAS On-demand for Academics

QUIZ #3

Which type of data visualization is PROC SGPLOT not capable of producing?

- A. Vertical Bar Charts
- B. Horizontal Line Graphs
- C. Pie Charts
- D. Horizontal Box Plots

PROC SGPIE

PROC SGPIE is another statistical graphics (SG) procedure which is primarily used to produce Pie charts and graphs. Its also capable of producing donut charts.

Both Pie and Donut Charts are useful in comparing how values of a variable contribute to the whole, and for a quick comparison of the values of several variables.

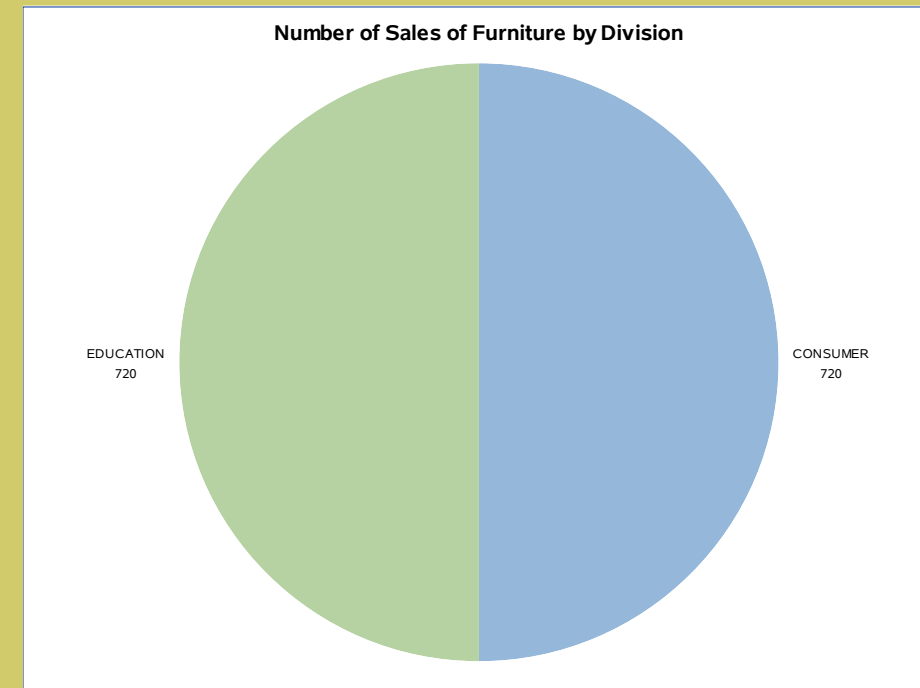
In SAS 9.4 M6, PROC SGPIE was a pre-production procedure. This means it hasn't been fully developed and tested. It may be a production procedure in M7 or M8.

PROC SGPIE

Simple Pie chart.

The Graphs displays the frequency for values of the variable specified in the **PIE** statement.

```
/* PROC SGPIE - Example 1          */  
/* PIE and DONUT Charts */  
Proc SGPie Data=SASHELP.PRDSALE;  
  Pie Division / Datalabelloc=outside;  
  Title'Number of Sales of Furniture by Division';  
Run;
```

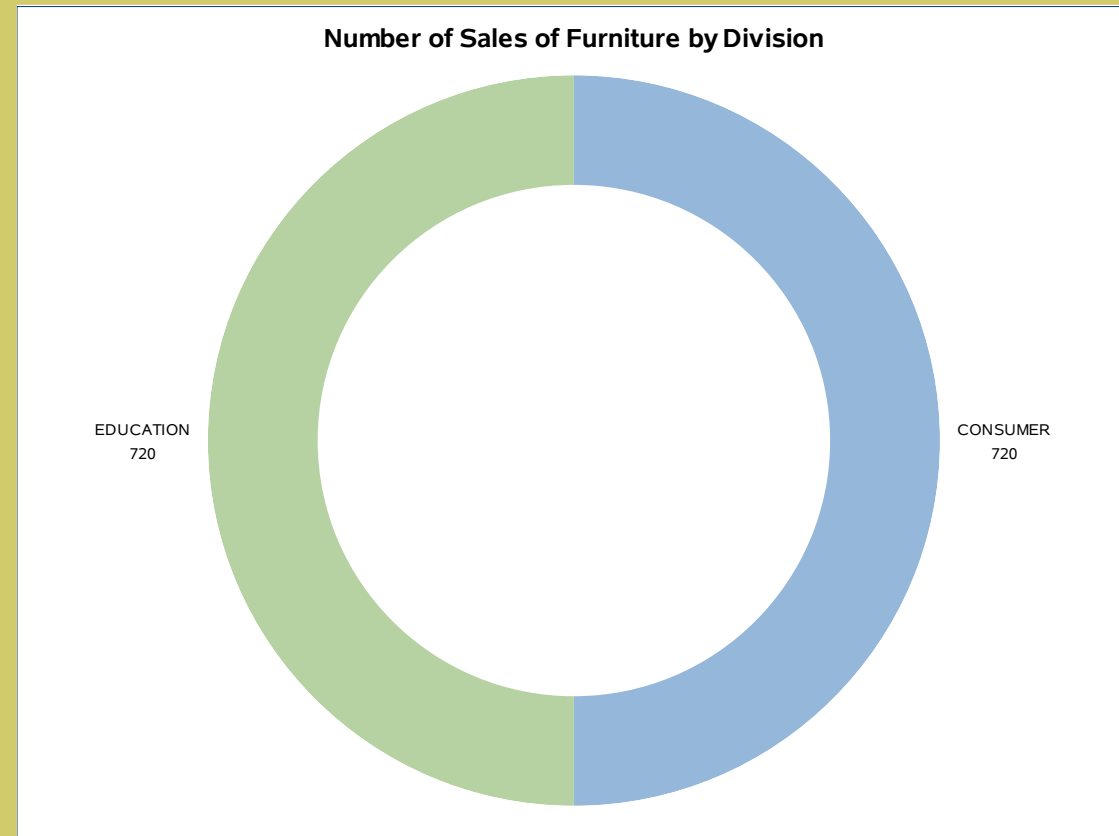


PROC SGPIE

Simple Donut Chart.

The graph displays the frequency for values of the variable specified in the DONUT statement.

```
/* PROC SGPIE - Example 2 */  
/* Donut Chart */  
Proc SGPie Data=SASHELP.PRDSALE;  
    Donut Division / Datalabelloc=outside;  
    Title'Number of Sales of Furniture by Division';  
Run;
```



ODS EXCEL – PRACTICAL PROJECTS

With ODS EXCEL, many of the same formatting options are available as you have working with MS Excel session.

Some of the options are specifying separate worksheets of an Excel workbook for different SAS output, changing orientation from portrait to landscape, and freezing row and column headers

These examples illustrate using several different options to send different types of SAS output to individual worksheets within a workbook.

ODS EXCEL - PROJECT EXAMPLES

To create a separate Excel worksheet for each By Group, use the SHEET_INTERVAL Options option on the ODS EXCEL statement.

```
Proc Sort Data = SASHELP.PRDSALE Out=PRDSALE;
  By Year;
Run;

          /* ODS EXCEL - MULTIPLE WORKSHEETS - EXAMPLE 1 */
ODS EXCEL FILE='/home/iyenj/Training_Course_Files/ODS Workshop/Sales_Listing.xlsx'
          Options(Sheet_Interval='BYGROUP') STYLE=Excel;

Proc Print Data=PRDSALE;
  ID Quarter;
  Var Month Country Region Division ProdType Product Actual Predict;
  By Year;
  Sum Actual Predict;
  Format Actual Predict Dollar12.;
  Title1 'Furniture Sales Records Listing';
  Title2 'By Year';
Run;

ODS EXCEL CLOSE;
```

ODS EXCEL - PROJECT EXAMPLES

Year=1993

QUARTER	MONTH	COUNTRY	REGION	DIVISION	PROTOTYPE	PRODUCT	ACTUAL	PREDICT
1	Jan	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$925	\$850
1	Feb	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$999	\$297
1	Mar	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$608	\$846
2	Apr	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$642	\$533
2	May	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$556	\$646
2	Jun	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$948	\$486
3	Jul	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$612	\$717
3	Aug	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$114	\$564
3	Sep	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$665	\$230
4	Oct	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$657	\$494
4	Nov	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$608	\$903
4	Dec	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$353	\$266
1	Jan	CANADA	EAST	EDUCATION	FURNITURE	BED	\$220	\$585
1	Feb	CANADA	EAST	EDUCATION	FURNITURE	BED	\$444	\$267
1	Mar	CANADA	EAST	EDUCATION	FURNITURE	BED	\$178	\$487
2	Apr	CANADA	EAST	EDUCATION	FURNITURE	BED	\$756	\$764
2	May	CANADA	EAST	EDUCATION	FURNITURE	BED	\$329	\$312
2	Jun	CANADA	EAST	EDUCATION	FURNITURE	BED	\$910	\$531
3	Jul	CANADA	EAST	EDUCATION	FURNITURE	BED	\$530	\$536
3	Aug	CANADA	EAST	EDUCATION	FURNITURE	BED	\$101	\$773
3	Sep	CANADA	EAST	EDUCATION	FURNITURE	BED	\$515	\$143
4	Oct	CANADA	EAST	EDUCATION	FURNITURE	BED	\$730	\$126
4	Nov	CANADA	EAST	EDUCATION	FURNITURE	BED	\$993	\$862
4	Dec	CANADA	EAST	EDUCATION	FURNITURE	BED	\$954	\$754
1	Jan	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$688	\$209
1	Feb	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$544	\$51
1	Mar	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$954	\$135
2	Apr	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$445	\$47
2	May	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$829	\$379
2	Jun	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$464	\$758
3	Jul	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$968	\$475
3	Aug	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$842	\$343
3	Sep	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$721	\$507
4	Oct	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$966	\$269

ByGroup 1 - 1993 ByGroup 2 - 1994

Year=1994

QUARTER	MONTH	COUNTRY	REGION	DIVISION	PROTOTYPE	PRODUCT	ACTUAL	PREDICT
1	Jan	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$107	\$190
1	Feb	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$394	\$139
1	Mar	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$101	\$217
2	Apr	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$553	\$560
2	May	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$877	\$148
2	Jun	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$431	\$762
3	Jul	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$511	\$457
3	Aug	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$157	\$532
3	Sep	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$520	\$629
4	Oct	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$114	\$491
4	Nov	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$277	\$0
4	Dec	CANADA	EAST	EDUCATION	FURNITURE	SOFA	\$561	\$979
1	Jan	CANADA	EAST	EDUCATION	FURNITURE	BED	\$267	\$410
1	Feb	CANADA	EAST	EDUCATION	FURNITURE	BED	\$347	\$701
1	Mar	CANADA	EAST	EDUCATION	FURNITURE	BED	\$991	\$204
2	Apr	CANADA	EAST	EDUCATION	FURNITURE	BED	\$923	\$509
2	May	CANADA	EAST	EDUCATION	FURNITURE	BED	\$437	\$378
2	Jun	CANADA	EAST	EDUCATION	FURNITURE	BED	\$737	\$507
3	Jul	CANADA	EAST	EDUCATION	FURNITURE	BED	\$104	\$49
3	Aug	CANADA	EAST	EDUCATION	FURNITURE	BED	\$840	\$876
3	Sep	CANADA	EAST	EDUCATION	FURNITURE	BED	\$704	\$66
4	Oct	CANADA	EAST	EDUCATION	FURNITURE	BED	\$889	\$819
4	Nov	CANADA	EAST	EDUCATION	FURNITURE	BED	\$107	\$351
4	Dec	CANADA	EAST	EDUCATION	FURNITURE	BED	\$571	\$201
1	Jan	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$255	\$497
1	Feb	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$506	\$44
1	Mar	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$585	\$522
2	Apr	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$634	\$378
2	May	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$662	\$688
2	Jun	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$783	\$90
3	Jul	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$796	\$720
3	Aug	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$710	\$343
3	Sep	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$950	\$457
4	Oct	CANADA	EAST	EDUCATION	OFFICE	TABLE	\$274	\$947

ByGroup 1 - 1993 ByGroup 2 - 1994

ODS EXCEL - PROJECT EXAMPLES

Specify the Excel worksheet name using the SHEET_NAME Options option on the ODS EXCEL statement.

```
/* ODS EXCEL - MULTIPLE WORKSHEETS - EXAMPLE 1 */
ODS EXCEL FILE='/home/iyenj/Training_Course_Files/ODS_Workshop/Sales_Table_Graph.xlsx'
      Options(Sheet_Name='Sales_Table') STYLE=Excel;

Proc Tabulate Data=SASHELP.PRDSALE;
  Var Actual Predict;
  Class Year Month;
  Table Year*Month ALL='Total for Both Years'*F=Dollar12.2,
        (Actual Predict)*Sum*F=Dollar12.2;
  Title 'Actual Vs. Predicted Furniture Sales by Year and Month';
Run;

ODS EXCEL Options(Sheet_Name='Sales_Graph');

Proc SGPlot Data=SASHELP.PRDSALE;
  VBar Month / Response=Actual Barwidth=0.5;
  VLine Month / Response=Predict Y2Axis;

  Where Year=1993;

  YAxis Label='Actual Furniture Sales' Min=5000;
  Y2Axis Label='Predicted Furniture Sales' Min=5000;

  Title1'Furniture Sales by Month';
  Title2'1993';
Run;

ODS EXCEL CLOSE;
```

ODS EXCEL - PROJECT EXAMPLES

AutoSave OFF Sales_Table_Graph - Saved to this PC

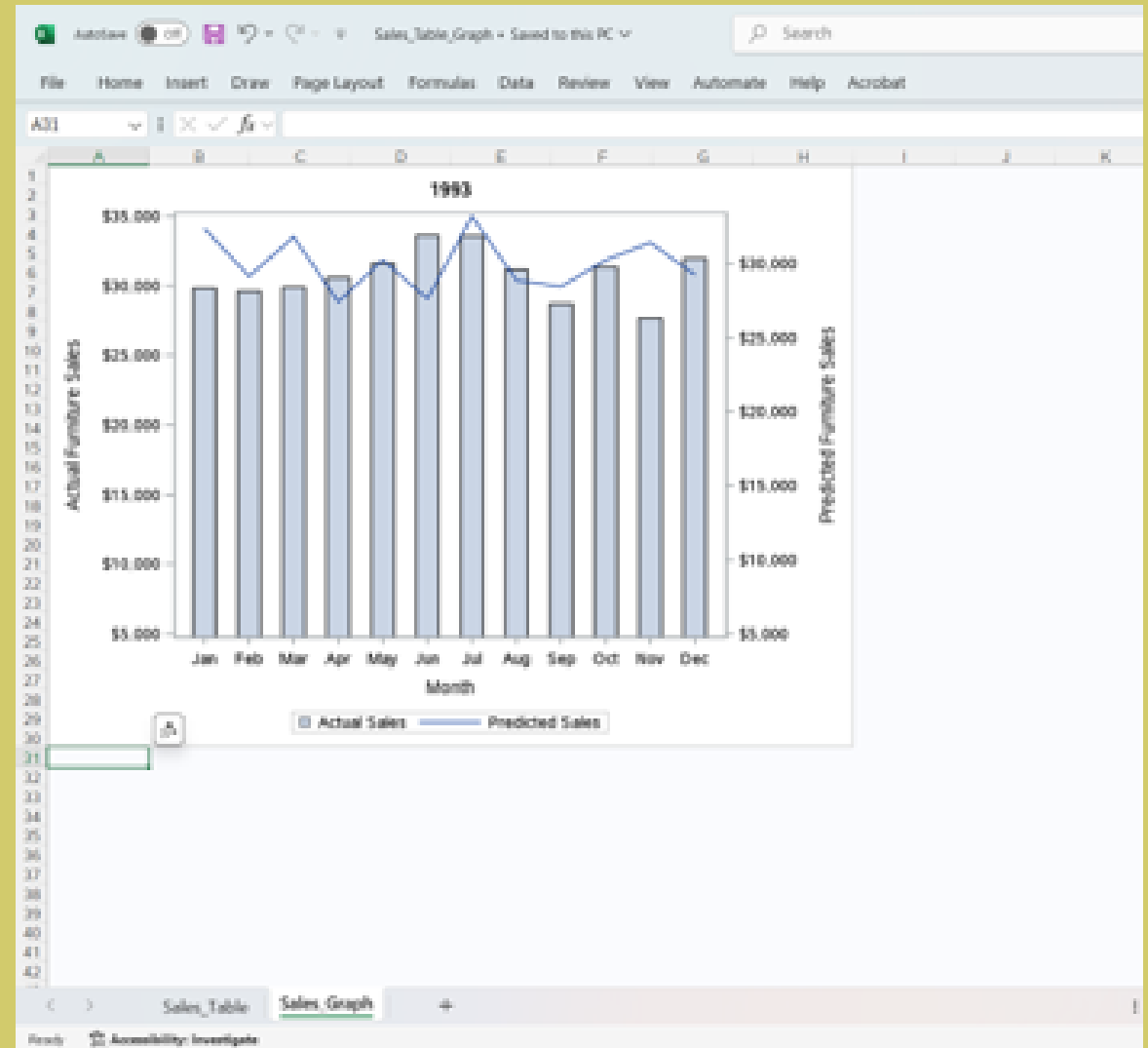
File Home Insert Draw Page Layout Formulas Data Review View Automate Help Acrobat

C18 1 X ✓ fx 28346

		Actual Sales Sum	Predicted Sales Sum
Year	Month		
1993	Jan	\$29,813.00	\$32,385.00
	Feb	\$29,584.00	\$29,163.00
	Mar	\$29,873.00	\$31,818.00
	Apr	\$30,581.00	\$27,429.00
	May	\$31,617.00	\$30,263.00
	Jun	\$33,605.00	\$27,634.00
	Jul	\$33,578.00	\$33,220.00
	Aug	\$31,160.00	\$28,874.00
	Sep	\$28,696.00	\$28,470.00
	Oct	\$31,355.00	\$30,262.00
	Nov	\$27,659.00	\$31,434.00
	Dec	\$31,956.00	\$29,259.00
1994	Jan	\$33,704.00	\$32,713.00
	Feb	\$27,713.00	\$29,497.00
	Mar	\$28,346.00	\$30,625.00
	Apr	\$32,269.00	\$29,910.00
	May	\$33,346.00	\$28,627.00
	Jun	\$27,744.00	\$28,327.00
	Jul	\$28,606.00	\$29,893.00
	Aug	\$30,801.00	\$29,020.00
	Sep	\$30,042.00	\$24,519.00
	Oct	\$25,372.00	\$28,711.00
	Nov	\$31,394.00	\$26,534.00
	Dec	\$31,923.00	\$27,708.00
Total for Both Years		\$730,337.00	\$706,295.00

Sales_Table Sales_Graph +

Ready Accessibility: Investigate



SAS DEMONSTRATION

SAS DEMONSTRATION USING SAS STUDIO

SENDING OUTPUT TO MULTIPLE DESTINATIONS

The output delivery system provides the capability of having multiple output destinations open at the same time.

The same SAS procedure output can be delivered to multiple destinations and format files simultaneously.

In many situations, It would be desirable to produce and receive the same report in RTF and EXCEL formats, for example.

MULTIPLE ODS DESTINATIONS – TWO DESTINATIONS

```
ODS RTF FILE = '/home/iyenj/Training_Course_Files/ODS Workshop/Autos_Rpt.rtf';
ODS EXCEL FILE = '/home/iyenj/Training_Course_Files/ODS Workshop/Autos_Rpt.xlsx';
```

```
/* ODS Multiple Destinations - Example 1 */
Proc Print Data=SASHELP.Cars (Obs=50);
  ID Make;
  Var Model Type Origin DriveTrain MSRP Invoice MPG_City MPG_Highway;
  Title1 'Automobile Data Listing';
  Title2 'Auto Make, Model, MSRP, MPG';
Run;

Proc Freq Data = SASHELP.Cars;
  Tables Make Type Origin / List Missing;
  Title1 'Automobile Frequency Counts';
  Title2 'Make, Type and Origin of Vehicle';
Run;

Proc Means Data = SASHELP.Cars Mean Std Min Max;
  Var MSRP;
  Class Make Type;
  Title1 'Automobile MSRP Descriptive Statistics';
  Title2 'By Make and Type';
Run;

ODS RTF CLOSE;
ODS EXCEL CLOSE;
```

```
1      OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;
NOTE: ODS statements in the SAS Studio environment may disable some output features.
73
74      ODS RTF FILE = '/home/iyenj/Training_Course_Files/ODS Workshop/Autos_Rpt.rtf';
NOTE: Writing RTF Body file: /home/iyenj/Training_Course_Files/ODS Workshop/Autos_Rpt.rtf
75      ODS EXCEL FILE = '/home/iyenj/Training_Course_Files/ODS Workshop/Autos_Rpt.xlsx';
76
77      /* ODS Multiple Destinations - Example 1 */
78      Proc Print Data=SASHELP.Cars (Obs=50);
79          ID Make;
80          Var Model Type Origin DriveTrain MSRP Invoice MPG_City MPG_Highway;
81          Title1 'Automobile Data Listing';
82          Title2 'Auto Make, Model, MSRP, MPG';
83      Run;
```

NOTE: There were 50 observations read from the data set SASHELP.CARS.

NOTE: PROCEDURE PRINT used (Total process time):

real time	0.21 seconds
user cpu time	0.20 seconds
system cpu time	0.01 seconds

```
84
85      Proc Freq Data = SASHELP.Cars;
86          Tables Make Type Origin / List Missing;
87          Title1 'Automobile Frequency Counts';
88          Title2 'Make, Type and Origin of Vehicle';
89
90      Run;
91      ODS RTF CLOSE;
92      ODS EXCEL CLOSE;
NOTE: Writing EXCEL file: /home/iyenj/Training_Course_Files/ODS Workshop/Autos_Rpt.xlsx
```

ODS RTF Output

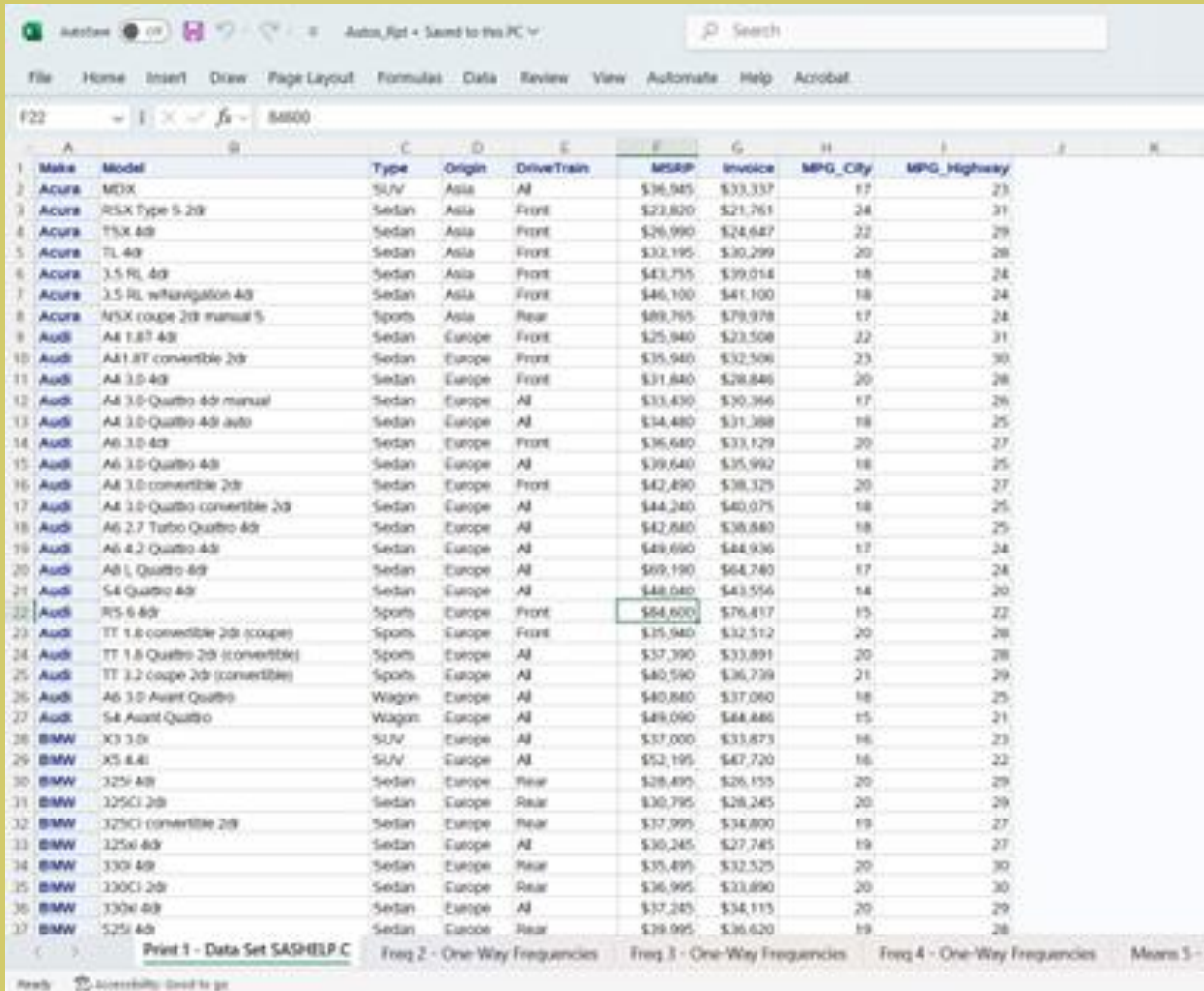
Tuesday, September 30, 2020 10:10:52 AM E

Automobile Data Listing
Auto Make, Model, MSRP, MPG

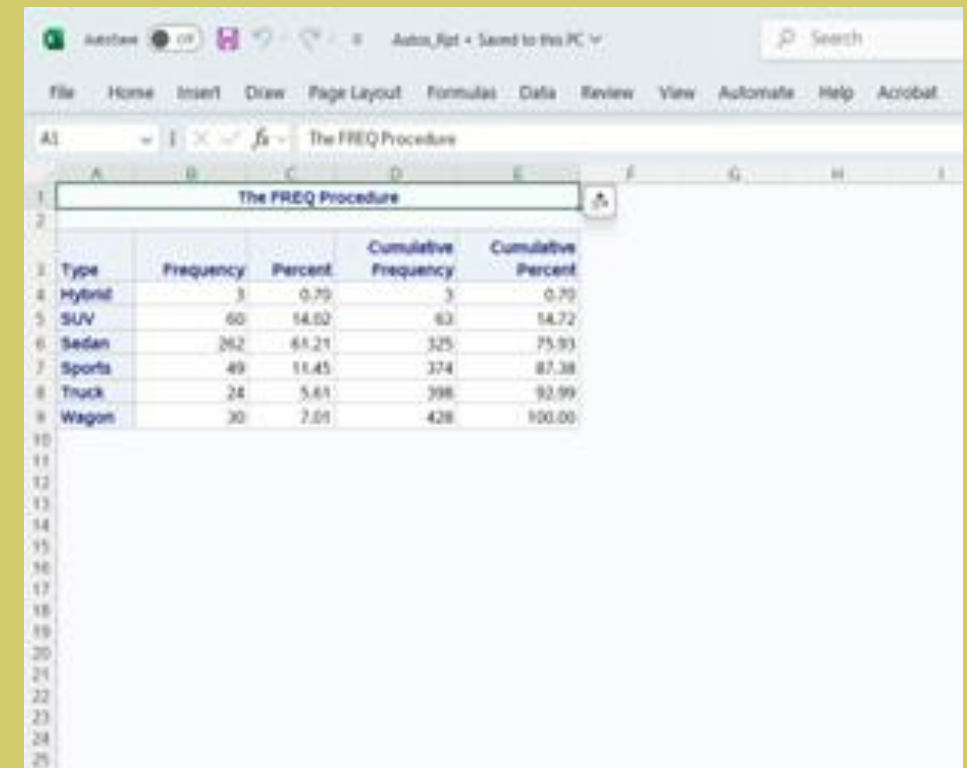
Make	Model	Type	Origin	DriveTrain	MSRP	Invoiced	MPG_City	MPG_Highway
Acura	MDX	SUV	Asia	AE	\$36,945	\$33,337	17	23
Acura	NSX Type S 2dr	Sedan	Asia	Front	\$23,820	\$21,761	24	31
Acura	TSX 4dr	Sedan	Asia	Front	\$28,990	\$24,647	22	29
Acura	TL 4dr	Sedan	Asia	Front	\$33,100	\$30,299	20	28
Acura	3.5 RL 4dr	Sedan	Asia	Front	\$43,715	\$39,014	18	24
Acura	3.5 RL w/Navigation 4dr	Sedan	Asia	Front	\$46,100	\$41,100	18	24
Acura	NSX coupe 2dr manual S	Sports	Asia	Rear	\$89,785	\$78,878	17	24
Audi	A4 1.8T 4dr	Sedan	Europe	Front	\$25,940	\$23,508	22	31
Audi	A4 1.8T convertible 2dr	Sedan	Europe	Front	\$35,940	\$32,506	23	30
Audi	A4 3.0 4dr	Sedan	Europe	Front	\$31,840	\$28,840	20	28
Audi	A4 3.0 Quattro 4dr manual	Sedan	Europe	AE	\$33,430	\$30,366	17	26
Audi	A4 3.0 Quattro 4dr auto	Sedan	Europe	AE	\$34,490	\$31,388	18	27
Audi	A6 3.0 4dr	Sedan	Europe	Front	\$36,640	\$33,129	20	27
Audi	A6 3.0 Quattro 4dr	Sedan	Europe	AE	\$39,640	\$35,992	18	25
Audi	A4 3.0 convertible 2dr	Sedan	Europe	Front	\$42,490	\$38,325	20	27
Audi	A4 3.0 Quattro convertible 2dr	Sedan	Europe	AE	\$44,240	\$40,075	18	25
Audi	A6 2.7 Turbo Quattro 4dr	Sedan	Europe	AE	\$42,840	\$38,840	18	25
Audi	A6 4.2 Quattro 4dr	Sedan	Europe	AE	\$49,690	\$44,916	17	24
Audi	A8 L Quattro 4dr	Sedan	Europe	AE	\$69,100	\$64,740	17	24
Audi	S4 Quattro 4dr	Sedan	Europe	AE	\$48,040	\$43,556	14	20

MULTIPLE ODS DESTINATIONS - PROJECT EXAMPLE

ODS EXCEL Output



Make	Model	Type	Origin	DriveTrain	MSRP	Invoice	MPG_City	MPG_Highway
Acura	MDX	SUV	Asia	All	\$36,945	\$33,337	17	23
Acura	RSX Type S 2dr	Sedan	Asia	Front	\$22,820	\$21,761	24	31
Acura	TSX 4dr	Sedan	Asia	Front	\$26,990	\$24,647	22	29
Acura	TL 4dr	Sedan	Asia	Front	\$32,195	\$30,299	20	26
Acura	3.5 RL 4dr	Sedan	Asia	Front	\$43,735	\$39,014	18	24
Acura	3.5 RL with navigation 4dr	Sedan	Asia	Front	\$46,100	\$41,100	18	24
Acura	NSX coupe 2dr manual 5	Sports	Asia	Rear	\$89,765	\$79,978	17	24
Audi	A4 1.8T 4dr	Sedan	Europe	Front	\$25,940	\$23,508	22	31
Audi	A4 1.8T convertible 2dr	Sedan	Europe	Front	\$35,940	\$32,506	23	30
Audi	A4 3.0 4dr	Sedan	Europe	Front	\$31,840	\$28,846	20	26
Audi	A4 3.0 Quattro 4dr manual	Sedan	Europe	All	\$33,430	\$30,366	17	26
Audi	A4 3.0 Quattro 4dr auto	Sedan	Europe	All	\$34,480	\$31,388	18	25
Audi	A6 3.0 4dr	Sedan	Europe	Front	\$36,640	\$33,129	20	27
Audi	A6 3.0 Quattro 4dr	Sedan	Europe	All	\$39,640	\$35,992	18	25
Audi	A4 3.0 convertible 2dr	Sedan	Europe	Front	\$42,490	\$38,325	20	27
Audi	A4 3.0 Quattro convertible 2dr	Sedan	Europe	All	\$44,240	\$40,075	18	25
Audi	A6 2.7 Turbo Quattro 4dr	Sedan	Europe	All	\$42,640	\$38,880	18	25
Audi	A6 4.2 Quattro 4dr	Sedan	Europe	All	\$49,690	\$44,936	17	24
Audi	A8 L Quattro 4dr	Sedan	Europe	All	\$69,190	\$64,740	17	24
Audi	S4 Quattro 4dr	Sedan	Europe	All	\$48,040	\$43,556	14	20
Audi	RS 6 4dr	Sports	Europe	Front	\$64,600	\$76,417	15	22
Audi	TT 1.8 convertible 2dr (coupe)	Sports	Europe	Front	\$35,940	\$32,512	20	26
Audi	TT 1.8 Quattro 2dr (convertible)	Sports	Europe	All	\$37,390	\$33,891	20	26
Audi	TT 3.2 coupe 2dr (convertible)	Sports	Europe	All	\$40,590	\$36,739	21	29
Audi	A6 3.0 Avant Quattro	Wagon	Europe	All	\$40,840	\$37,060	18	25
Audi	S4 Avant Quattro	Wagon	Europe	All	\$49,090	\$44,886	15	21
BMW	X3 3.0i	SUV	Europe	All	\$37,000	\$33,873	16	23
BMW	X5 4.4i	SUV	Europe	All	\$52,195	\$47,720	16	22
BMW	325i 4dr	Sedan	Europe	Rear	\$28,495	\$26,155	20	29
BMW	325Ci 2dr	Sedan	Europe	Rear	\$30,795	\$28,245	20	29
BMW	325Ci (convertible) 2dr	Sedan	Europe	Rear	\$37,995	\$34,800	19	27
BMW	325xi 4dr	Sedan	Europe	All	\$30,245	\$27,745	19	27
BMW	330i 4dr	Sedan	Europe	Rear	\$35,495	\$32,525	20	30
BMW	330Ci 2dr	Sedan	Europe	All	\$36,995	\$33,890	20	30
BMW	330xi 4dr	Sedan	Europe	All	\$37,245	\$34,115	20	29
BMW	525i 4dr	Sedan	Europe	Rear	\$39,995	\$36,620	19	28



Type	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Hybrid	3	0.79	3	0.79
SUV	60	14.62	63	14.72
Sedan	262	61.21	325	75.93
Sports	49	11.45	374	87.38
Truck	24	5.61	398	92.99
Wagon	30	7.01	428	100.00

MULTIPLE ODS DESTINATIONS – THREE DESTINATIONS

Output is sent to
three ODS
destinations;

HTML4
PDF
POWERPOINT

```
ODS HTML4 FILE = '/home/iyenj/Training_Course_Files/ODS Workshop/Autos_Rpt.htm';
ODS PDF FILE = '/home/iyenj/Training_Course_Files/ODS Workshop/Autos_Rpt.pdf';
ODS POWERPOINT FILE = '/home/iyenj/Training_Course_Files/ODS Workshop/Autos_Rpt.ppt'
    LAYOUT=_Null_;

/* ODS Multiple Destinations - Example 1 */
Proc Print Data=SASHELP.Cars (Obs=50);
    ID Make;
    Var Model Type Origin DriveTrain MSRP Invoice MPG_City MPG_Highway;
    Title1 'Automobile Data Listing';
    Title2 'Auto Make, Model, MSRP, MPG';
Run;

ODS POWERPOINT LAYOUT=_Null_;

Proc Freq Data = SASHELP.Cars;
    Tables Make Type Origin / List Missing;
    Title1 'Automobile Frequency Counts';
    Title2 'Make, Type and Origin of Vehicle';
Run;

ODS POWERPOINT LAYOUT=_Null_;

Proc Means Data = SASHELP.Cars Mean Std Min Max;
    Var MSRP;
    Class Make Type;
    Title1 'Automobile MSRP Descriptive Statistics';
    Title2 'By Make and Type';
Run;

ODS POWERPOINT CLOSE;
ODS PDF CLOSE;
ODS HTML CLOSE;
```

MULTIPLE ODS DESTINATIONS - PROJECT EXAMPLE

ODS PDF Output

Menu Autos_Rpt.pdf x Create

All tools Edit Convert E-Sign Find text or tools Sign in Share Ask AI Assistant

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**Automobile MSRP Descriptive Statistics
By Make and Type**

The MEANS Procedure

Analysis Variable : MSRP

Make	Type	N Obs	Mean	Std Dev	Minimum	Maximum
Acura	SUV	1	36945.00	.	36945.00	36945.00
	Sedan	5	34772.00	9899.63	23820.00	46100.00
	Sports	1	89765.00	.	89765.00	89765.00
Audi	Sedan	13	41107.69	10773.01	25940.00	69190.00
	Sports	4	49630.00	23394.13	35940.00	84600.00
	Wagon	2	44965.00	5833.63	40840.00	49090.00
BMW	SUV	2	44597.50	10744.49	37000.00	52195.00
	Sedan	13	43379.62	14222.08	28495.00	73195.00
	Sports	4	44932.50	9722.77	33895.00	56595.00
	Wagon	1	32845.00	.	32845.00	32845.00
Buick	SUV	2	32220.00	8025.66	26545.00	37895.00
	Sedan	7	30057.14	6494.82	22180.00	40720.00
Cadillac	SUV	2	49895.00	4101.22	46995.00	52795.00
	Sedan	4	43707.50	8835.52	30835.00	50595.00
	Sports	1	76200.00	.	76200.00	76200.00
	Truck	1	52975.00	.	52975.00	52975.00
Chevrolet	SUV	4	33687.50	10556.01	20255.00	42735.00
	Sedan	15	20486.67	5390.41	11690.00	27995.00
	Sports	2	48035.00	4949.75	44535.00	51535.00
	Truck	5	31501.00	11146.46	18760.00	41995.00
	Wagon	1	22225.00	.	22225.00	22225.00

Bookmarks

- The Print Procedure
 - Data Set SASHELP.CARS
- The Freq Procedure
 - Table Make
 - One-Way Frequencies
- Table Type
 - One-Way Frequencies
- Table Origin
 - One-Way Frequencies
- The Means Procedure
 - Summary statistics

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MULTIPLE ODS DESTINATIONS - PROJECT EXAMPLE

ODS POWERPOINT Output

The screenshot shows a PowerPoint presentation with the following content:

Automobile Frequency Counts

Make, Type and Origin of Vehicle
The FREQ Procedure

Make	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Acura	7	1.64	7	1.64
Audi	19	4.44	26	6.07
BMW	20	4.67	46	10.75
Buick	9	2.10	55	12.85
Cadillac	8	1.87	63	14.72
Chevrolet	27	6.31	90	21.03
Chrysler	15	3.50	105	24.53
Dodge	13	3.04	118	27.57

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Accessibility: Unavailable

SAS DEMONSTRATION

SAS DEMONSTRATION USING SAS STUDIO

CONCLUSION / SUMMARY

The Output Delivery System is a versatile BASE SAS reporting tool.

We've covered the following topics in this course.

ODS DESTINATIONS – LISTING, HTML, RTF, PDF, TAGSET, MARKUP, EXCEL, POWERPOINT, CSVALL

ODS STYLES

ODS OUTPUT OBJECTS – ODS TRACE, ODS SELECT, ODS EXCLUDE

PROC TEMPLATE – CREATING A NEW STYLE FROM SCRATCH, STYLE INHERITANCE

ODS GRAPHICS – PROC SGPLOT, PROC SGPANEL, PROC SGPIE

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THANKS FOR REGISTERING AND ATTENDING.