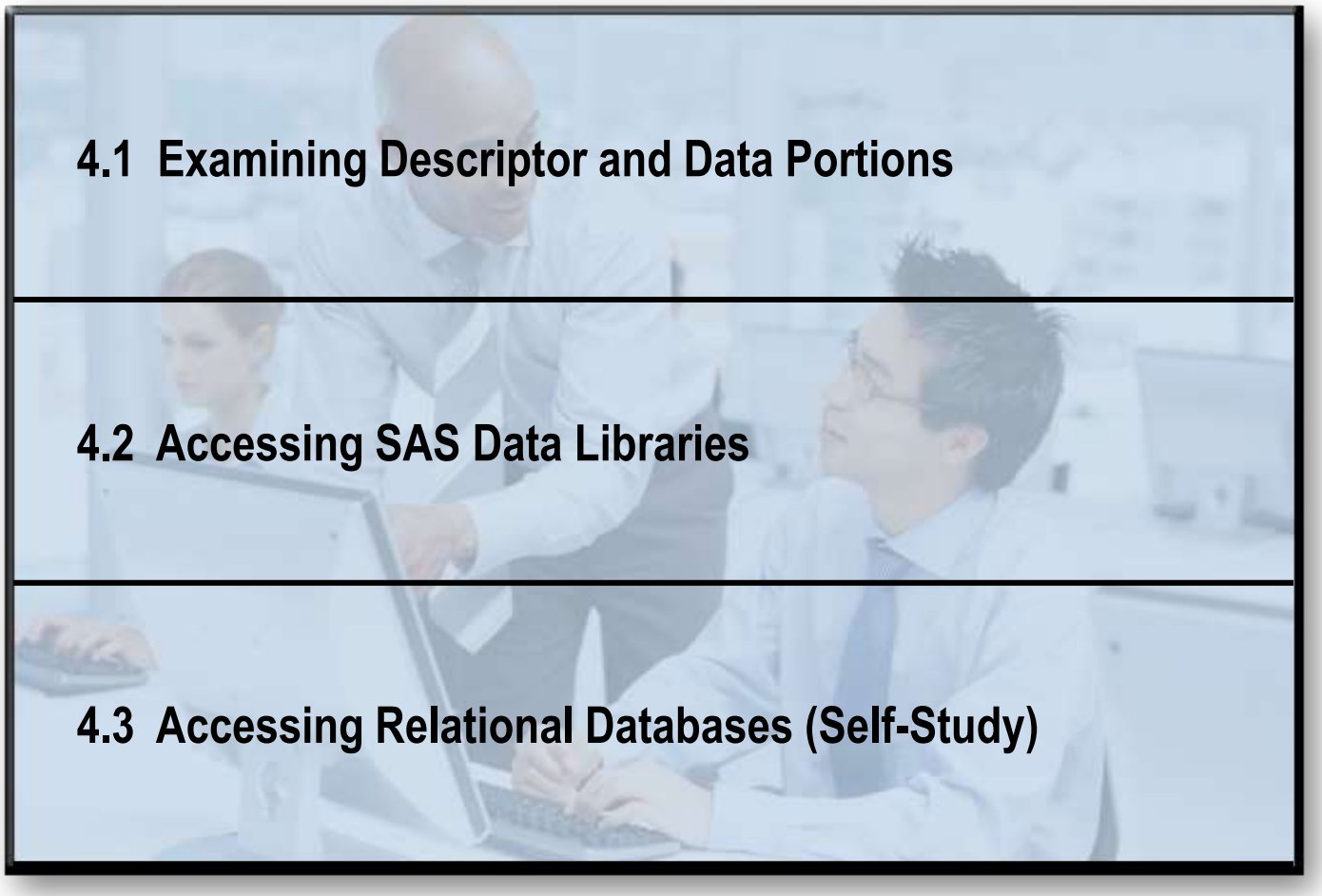
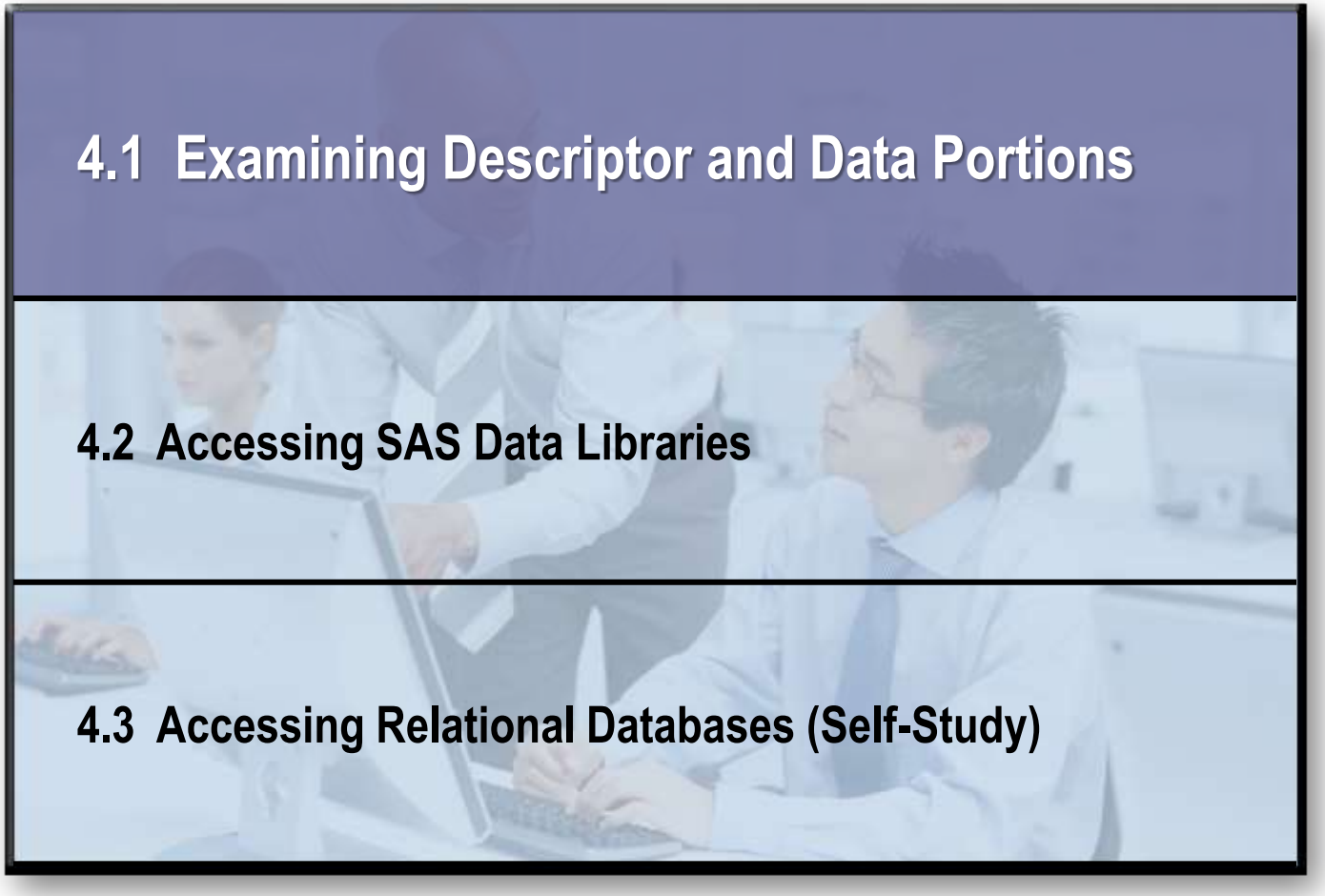
Chapter 4: Getting Familiar with SAS Data Sets



Chapter 4: Getting Familiar with SAS Data Sets



Objectives

- Define the components of a SAS data set.
- Define a SAS variable.
- Identify a missing value and a SAS date value.
- State the naming conventions for SAS data sets and variables.
- Browse the descriptor portion of SAS data sets by using the CONTENTS procedure.
- Browse the data portion of SAS data sets by using the PRINT procedure.

SAS Data Set

A *SAS data set* is a file that SAS creates and processes.

Partial `Work.NewSalesEmps`

Data Set Name	WORK.NEWSALESEMPS
Engine	V9
Created	Fri, Feb 08, 2008 01:40 PM
Observations	71
Variables	4
...	

First_Name $ 12	Last_Name $ 18	Job_Title $ 25	Salary N 8
Satyakam	Denny	Sales Rep. II	26780
Monica	Kletschkus	Sales Rep. IV	30890
Kevin	Lyon	Sales Rep. I	26955
Petrea	Soltau	Sales Rep. II	27440

Descriptor Portion

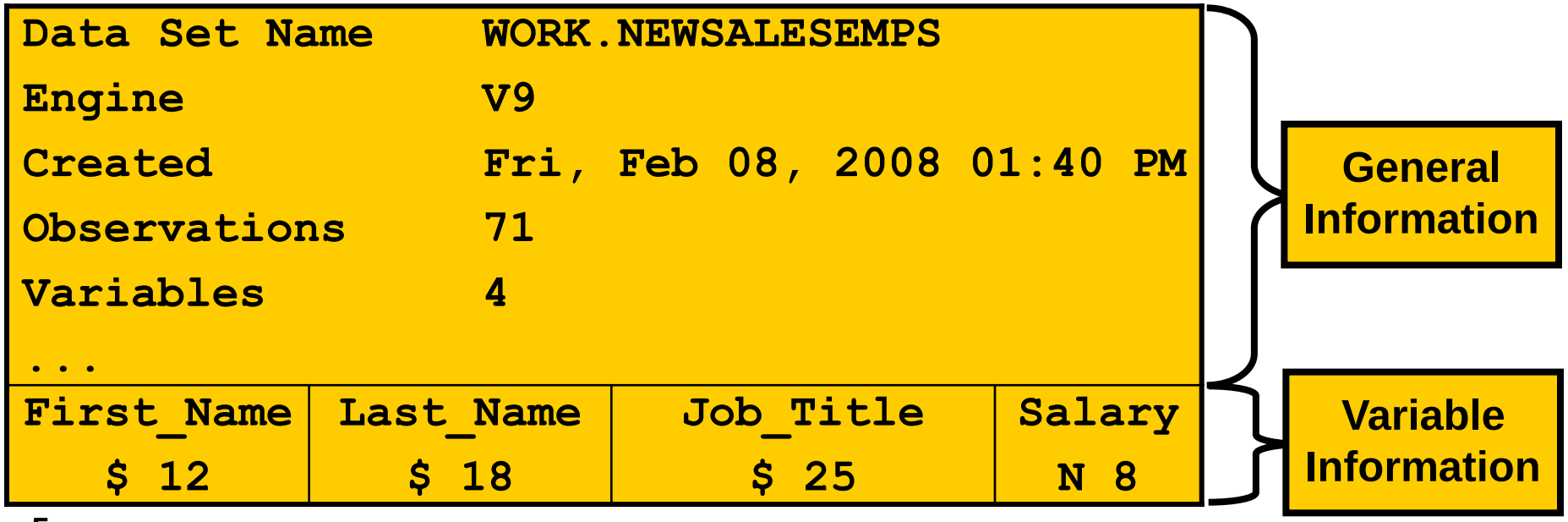
Data Portion

Descriptor Portion

The *descriptor portion* of a SAS data set contains the following:

- general information about the SAS data set (such as data set name and number of observations)
- variable information (such as name, type, and length)

Partial `Work.NewSalesEmps`



Browsing the Descriptor Portion

The *CONTENTS procedure* displays the descriptor portion of a SAS data set.

General form of the CONTENTS procedure:

PROC CONTENTS DATA=*SAS-data-set*;
RUN;

Example:

```
proc contents data=work.NewSalesEmps;
run;
```

Browsing the Descriptor Portion

Partial PROC CONTENTS Output

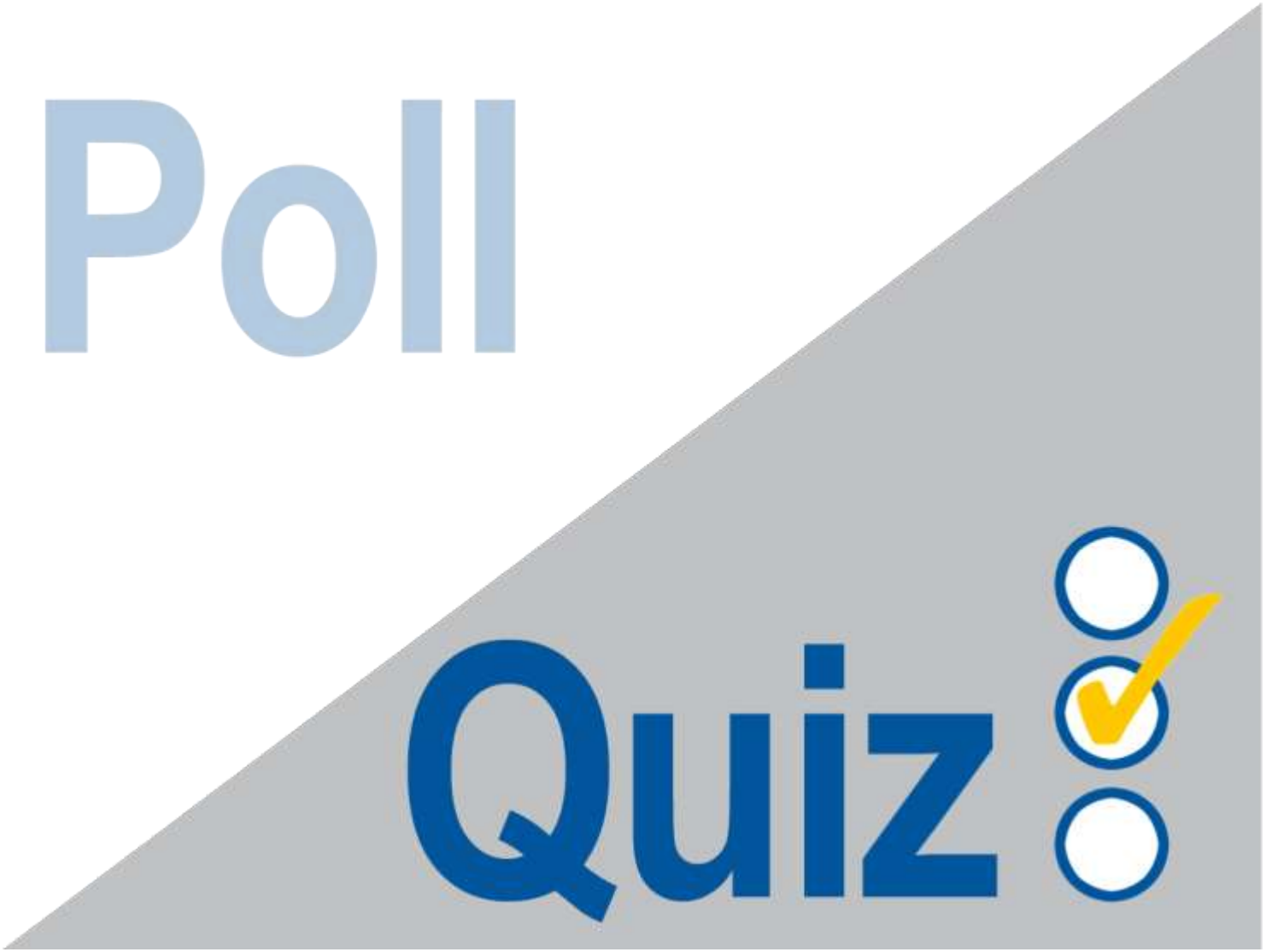
The CONTENTS Procedure

Data Set Name	WORK.NEWSALESEMPS	Observations	71
Member Type	DATA	Variables	4
Engine	V9	Indexes	0
Created	Wed, Jan 16, 2008 02:14:20 PM	Observation Length	64
Last Modified	Wed, Jan 16, 2008 02:14:20 PM	Deleted Observations	0
Protection		Compressed	NO
Data Set Type		Sorted	NO
Label			

Alphabetic List of Variables and Attributes

#	Variable	Type	Len
1	First_Name	Char	12
3	Job_Title	Char	25
2	Last_Name	Char	18
4	Salary	Num	8

Poll



4.01 Quiz

How many observations are in the data set **`Work.donations`**?

- Retrieve program **p104a01**.
- After the DATA step, add a PROC CONTENTS step to view the descriptor portion of **`Work.donations`**.
- Submit the program and review the results.

The SAS System

The CONTENTS Procedure

Data Set Name	WORK.DONATIONS	**Observations**	124
Member Type	DATA	**Variables**	6
Engine	V9	**Indexes**	0
Created	Thursday, October 03, 2013 12:20:53 PM	**Observation Length**	48
Last Modified	Thursday, October 03, 2013 12:20:53 PM	**Deleted Observations**	0
Protection		**Compressed**	NO
Data Set Type		**Sorted**	NO
Label			
Data Representation	WINDOWS_64		
Encoding	wlatin1 Western (Windows)		

4.01 Quiz – Correct Answer

How many observations are in the data set **Work.donations**?

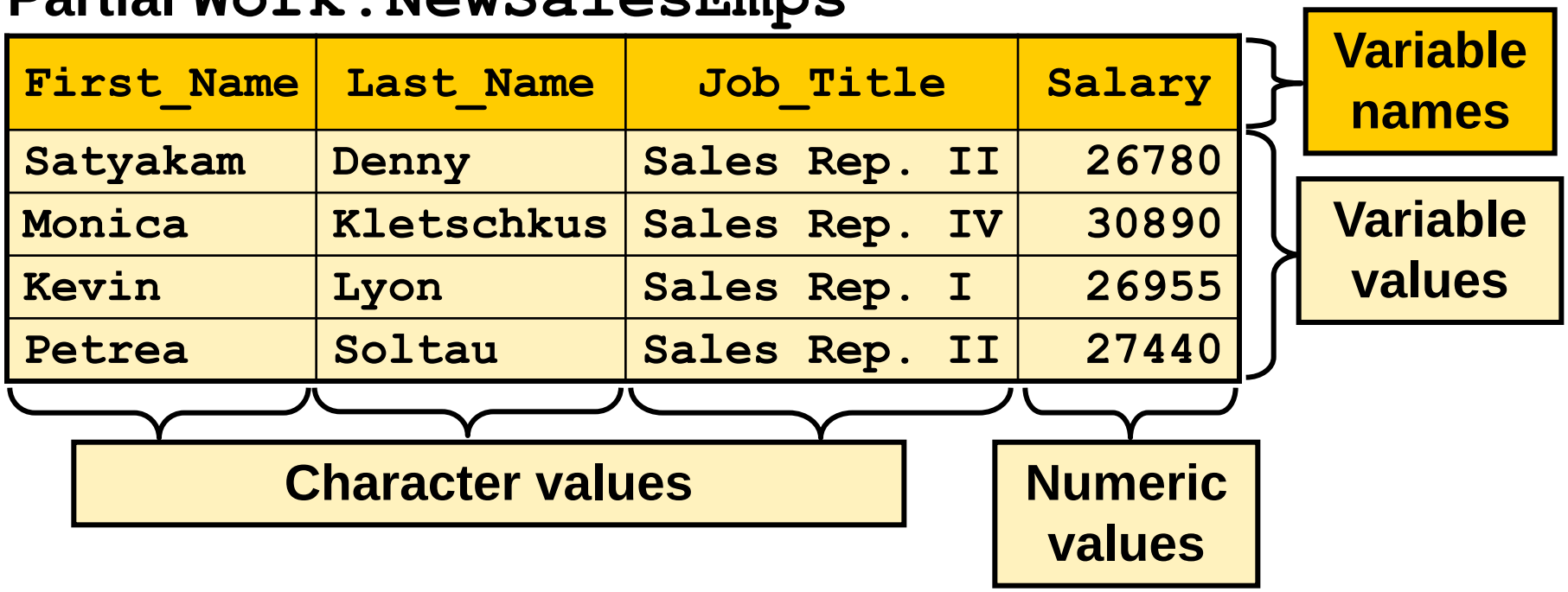
124 observations

```
data work.donations;
   infile 'donation.dat';
   input Employee_ID Qtr1 Qtr2 Qtr3 Qtr4;
   Total=sum(Qtr1,Qtr2,Qtr3,Qtr4);
run;

proc contents data=work.donations;
run;
```

Data Portion

The *data portion* of a SAS data set is a rectangular table of character and/or numeric data values.

Partial `Work.NewSalesEmps`



The data values are organized as a table of observations (rows) and variables (columns).

SAS Variable Values

There are two types of variables:

character	Contain any value: letters, numbers, special characters, and blanks. Character values are stored with a length of 1 to 32,767 bytes. One byte equals one character.
numeric	Stored as floating point numbers in 8 bytes of storage by default. Eight bytes of floating point storage provide space for 16 or 17 significant digits. You are not restricted to 8 digits.


Poll
Quiz

4.02 Multiple Choice Poll

Which variable type do you think SAS uses to store date values?

a. character
b. numeric

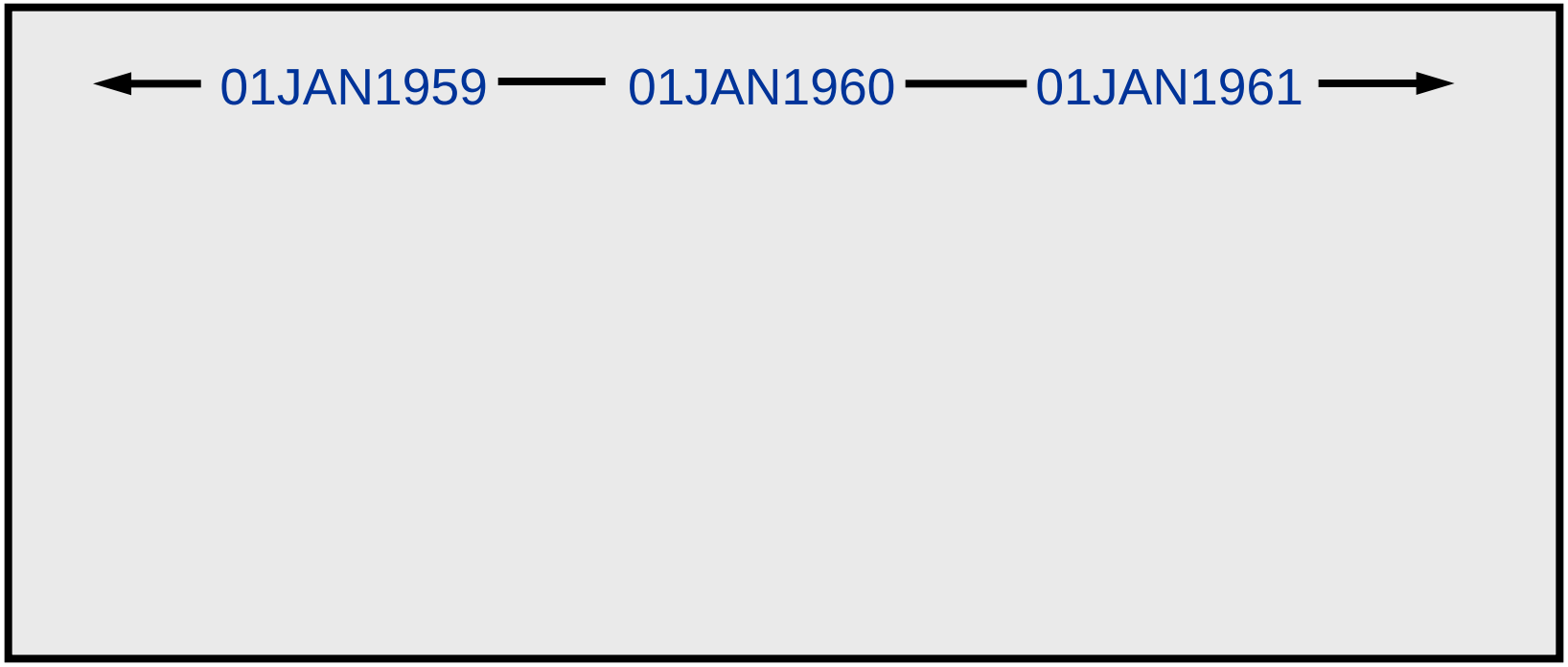
4.02 Multiple Choice Poll – Correct Answer

Which variable type do you think SAS uses to store date values?

a. character
b. numeric

SAS Date Values

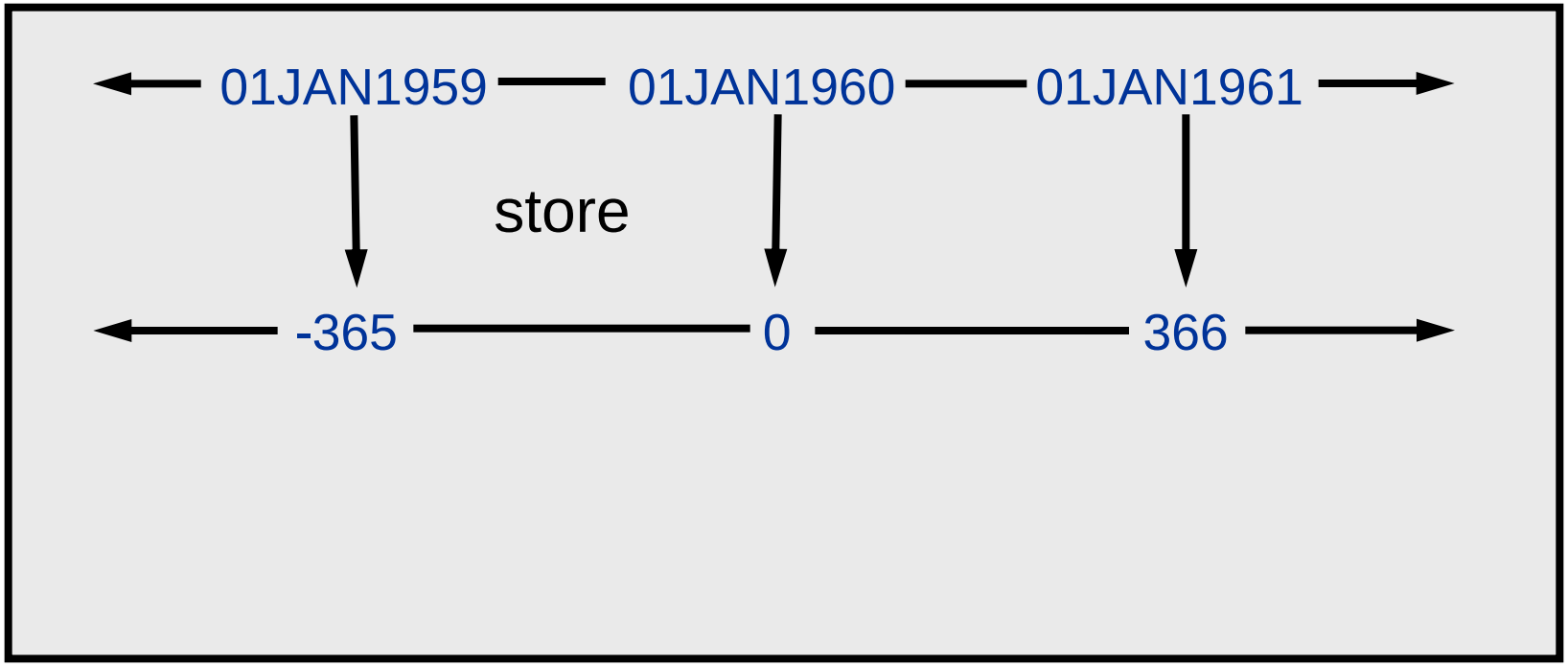
SAS stores date values as numeric values.



A *SAS date value* is stored as the number of days between January 1, 1960, and a specific date.

SAS Date Values

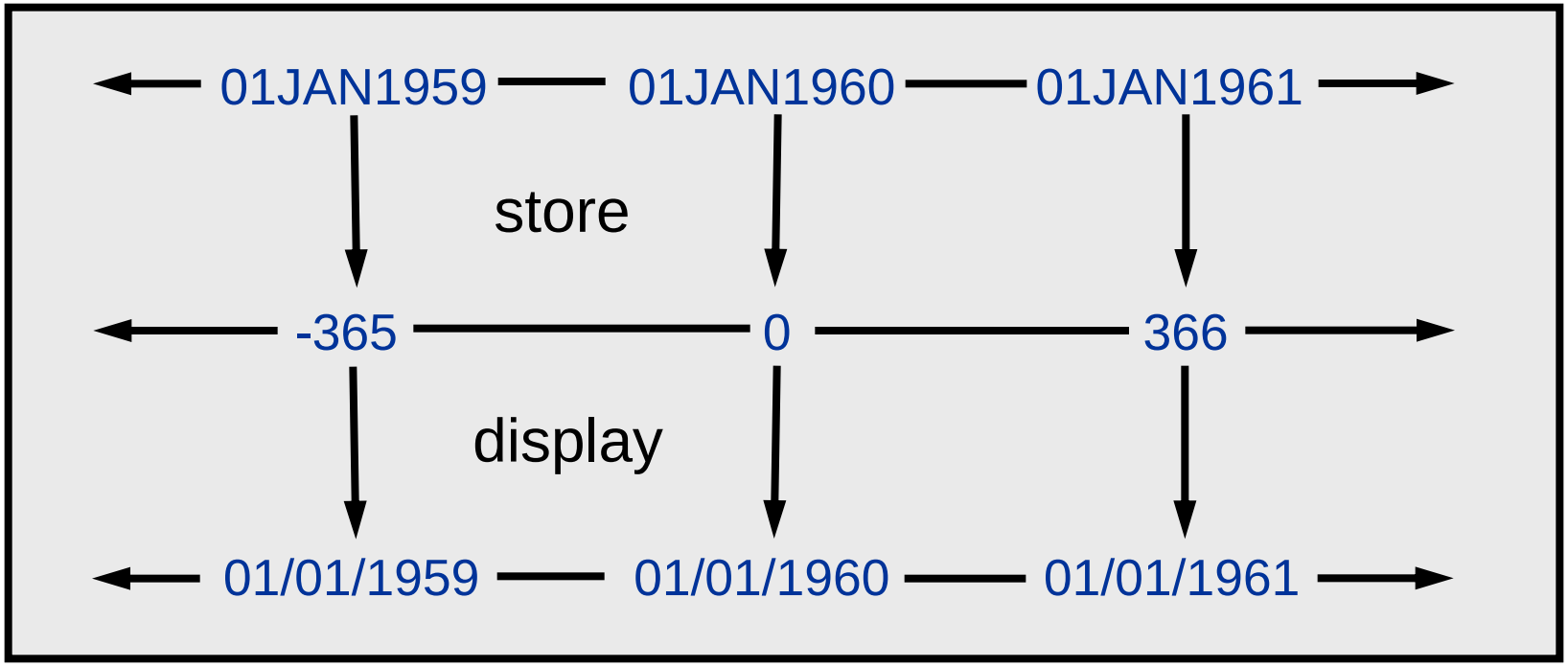
SAS stores date values as numeric values.



A *SAS date value* is stored as the number of days between January 1, 1960, and a specific date.

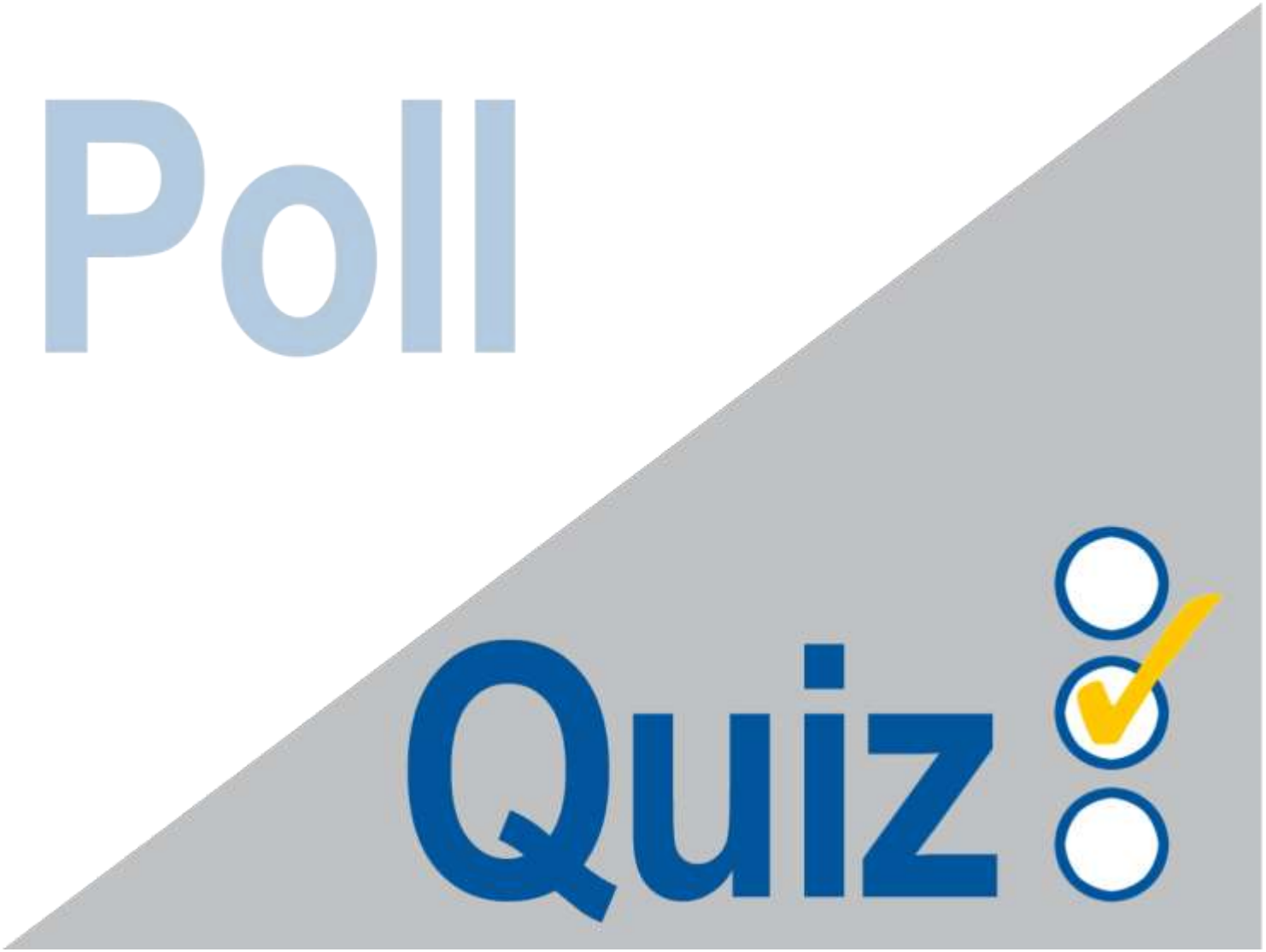
SAS Date Values

SAS stores date values as numeric values.



A *SAS date value* is stored as the number of days between January 1, 1960, and a specific date.

Poll



4.03 Quiz

What is the numeric value for today's date?

- Submit program **p104a02**.
- View the output to retrieve the current date as a numeric value referencing January 1, 1960.

4.03 Quiz – Correct Answer

What is the numeric value for today's date?

The answer depends on the current date.

Example:

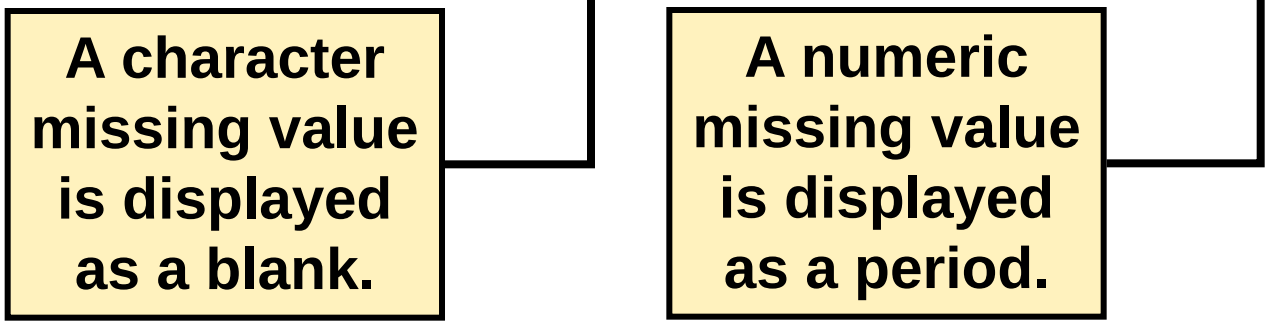
If the current date is February 1, 2008, the numeric value is 17563.

Missing Data Values

A value must exist for every variable for each observation. Missing values are valid values in a SAS data set.

Partial `Work.NewSalesEmps`

First_Name	Last_Name	Job_Title	Salary
Satyakam	Denny	Sales Rep. II	26780
Monica	Kletschkus	Sales Rep. IV	.
Kevin	Lyon	Sales Rep. I	26955
Petrea	Soltau		27440



SAS Data Set and Variable Names

SAS names have these characteristics:

- can be 32 characters long.
- must start with a letter or underscore. Subsequent characters can be letters, underscores, or numerals.
- can be uppercase, lowercase, or mixed case.
- are not case sensitive.


Poll
Quiz

4.04 Multiple Answer Poll

Which variable names are valid?

a. `data5mon`
b. `5monthsdata`
c. `data#5`
d. `five months data`
e. `five_months_data`
f. `FiveMonthsData`

4.04 Multiple Answer Poll – Correct Answer

Which variable names are valid?

a. `data5mon`
b. `5monthsdata`
c. `data#5`
d. `five months data`
e. `five_months_data`
f. `FiveMonthsData`

SAS Data Set Terminology

Comparable Terminology:

SAS Data Set	⟷	Table
Observation	⟷	Row
Variable	⟷	Column

- The terminology of data set, observation, and variable is specific to SAS.
- The terminology of table, row, and column is common among databases.

Browsing the Data Portion

The *PRINT procedure* displays the data portion of a SAS data set.

By default, PROC PRINT displays the following:

- all observations
- all variables
- an Obs column on the left side

Browsing the Data Portion

General form of the PRINT procedure:

PROC PRINT DATA=*SAS-data-set*;
RUN;

Example:

```
proc print data=work.NewSalesEmps;
run;
```

Browsing the Data Portion

Partial PROC PRINT Output

Obs	First_Name	Last_Name	Job_Title	Salary
1	Satyakam	Denny	Sales Rep. II	26780
2	Monica	Kletschkus	Sales Rep. IV	30890
3	Kevin	Lyon	Sales Rep. I	26955
4	Petrea	Soltau	Sales Rep. II	27440
5	Marina	Iyengar	Sales Rep. III	29715
6	Shani	Duckett	Sales Rep. I	25795
7	Fang	Wilson	Sales Rep. II	26810
8	Michael	Minas	Sales Rep. I	26970
9	Amanda	Liebman	Sales Rep. II	27465
10	Vincent	Eastley	Sales Rep. III	29695
11	Viney	Barbis	Sales Rep. III	30265
12	Skev	Rusli	Sales Rep. II	26580
13	Narelle	James	Sales Rep. III	29990
14	Gerry	Snellings	Sales Rep. I	26445
15	Leonid	Karavdic	Sales Rep. II	27860

Browsing the Data Portion

Options and statements can be added to the PRINT procedure.

```
PROC PRINT DATA=SAS-data-set NOOBS;
        VAR variable(s);
RUN;
```

- The NOOBS option suppresses the observation numbers on the left side of the report.
- The VAR statement selects variables that appear in the report and determines their order.

Browsing the Data Portion

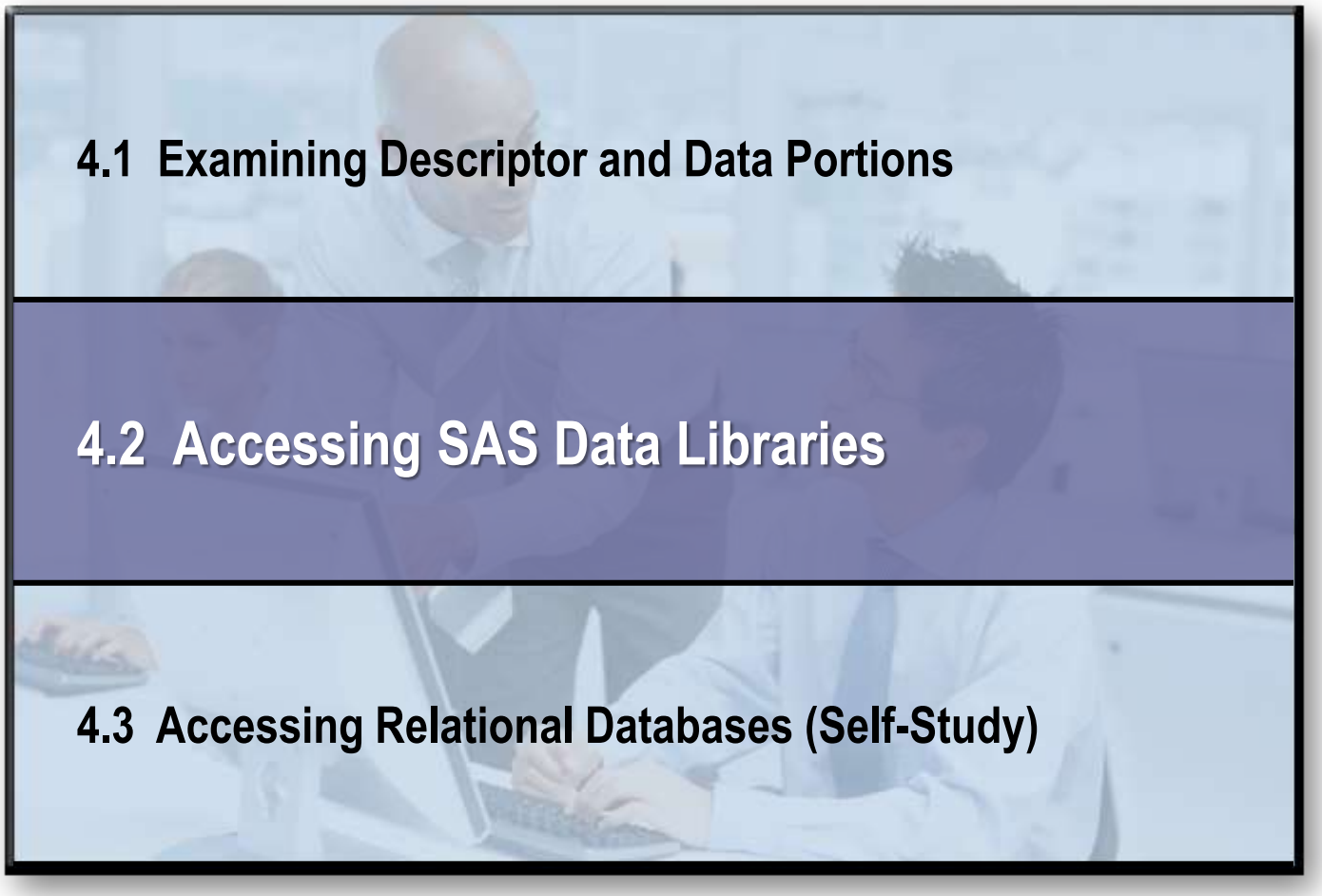
```
proc print data=work.NewSalesEmps noobs;
    var Last_Name First_Name Salary;
run;
```

Partial PROC PRINT Output

Last_Name	First_Name	Salary
Denny	Satyakam	26780
Kletschkus	Monica	30890
Lyon	Kevin	26955
Soltau	Petrea	27440
Iyengar	Marina	29715
Duckett	Shani	25795
Wilson	Fang	26810
Minas	Michael	26970
Liebman	Amanda	27465
Eastley	Vincent	29695


Question
&
Answer

Chapter 4: Getting Familiar with SAS Data Sets



Objectives

- Explain the concept of a SAS data library.
- Assign a library reference name to a SAS data library by using the LIBNAME statement.
- State the difference between a permanent library and a temporary library.
- Browse the contents of a SAS data library by using the SAS Explorer window.
- Investigate a SAS data library by using the CONTENTS procedure.

SAS Data Libraries

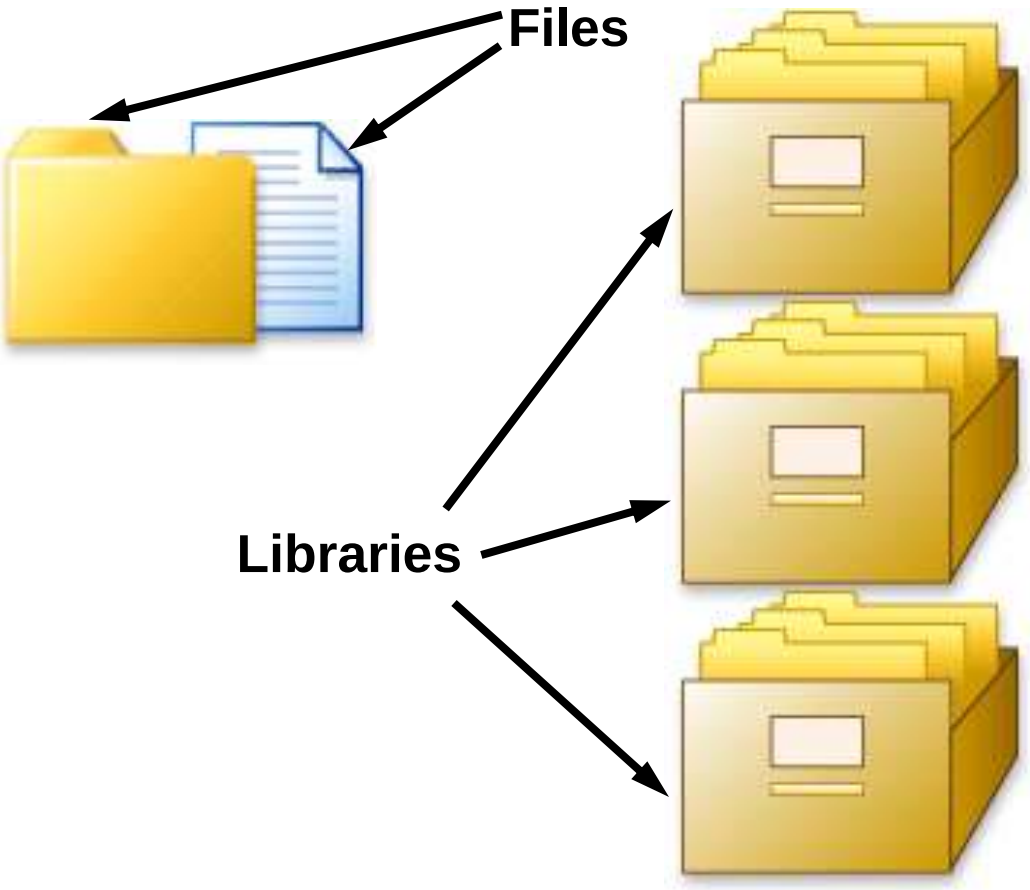
A *SAS data library* is a collection of SAS files that are recognized as a unit by SAS.

Directory-based System	A SAS data library is a directory.
Windows Example:	`s:\workshop`
UNIX Example:	`/users/userid`

z/OS (OS/390)	A SAS data library is an operating system file.
z/OS (OS/390) Example:	`userid.workshop.sasdata`

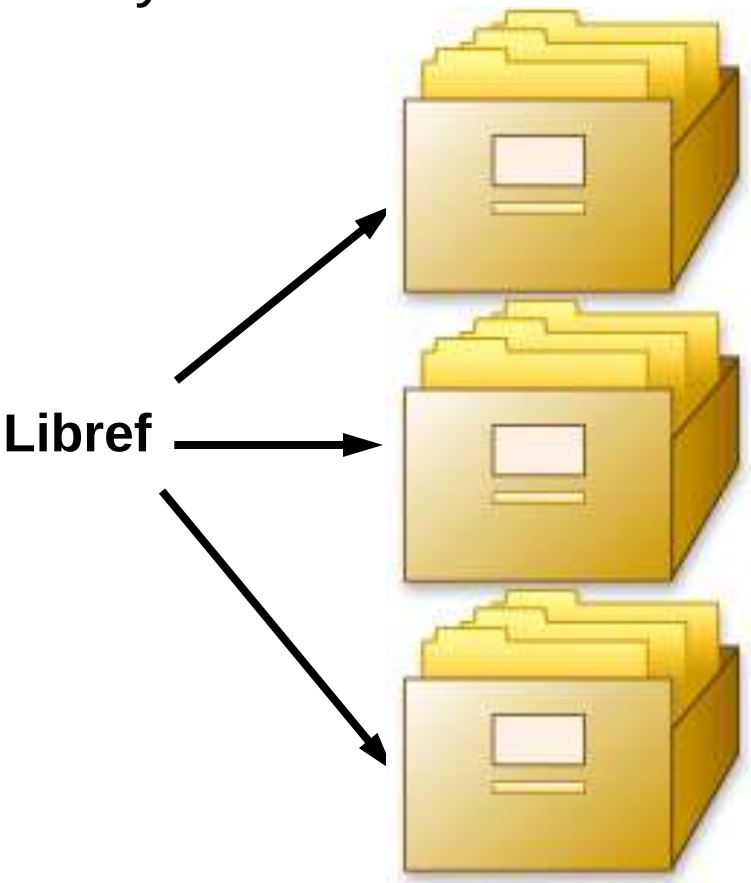
SAS Data Libraries

You can think of a SAS data library as a drawer in a filing cabinet and a SAS data set as one of the file folders in the drawer.



Assigning a Libref

Regardless of which host operating system you use, you identify SAS data libraries by assigning a *library reference name (libref)* to each library.



SAS Data Libraries

When a SAS session starts, SAS automatically creates one temporary and at least one permanent SAS data library that you can access.

Work **– temporary library**

Sasuser **– permanent library**

SAS Data Libraries

You can also create and access your own permanent libraries.

`orion` – permanent library

Assigning a Libref

You can use the *LIBNAME statement* to assign a library reference name (libref) to a SAS data library.

General form of the LIBNAME statement:

LIBNAME *libref* '*SAS-data-library*' <*options*>**;**

Rules for naming a libref:

- The name must be 8 characters or less.
- The name must begin with a letter or underscore.
- The remaining characters must be letters, numerals, or underscores.

Assigning a Libref

Examples:

Windows

```
libname orion 's:\workshop';
```

UNIX

```
libname orion '/users/userid';
```

z/OS (OS/390)

```
libname orion 'userid.workshop.sasdata';
```

Making the Connection

When you submit the LIBNAME statement, a connection is made between a libref in SAS and the physical location of files on your operating system.


```
C:\Users\kinchelf\Documents\SASUniversityEdition\myfolders\prg1
        /folders/myfolders/prg1
        userid.workshop.sasdata
```


Poll
Quiz

4.05 Poll

During an interactive SAS session, every time that you submit a program you must also resubmit the LIBNAME statement.

- True
- False

4.05 Poll – Correct Answer

During an interactive SAS session, every time that you submit a program you must also resubmit the LIBNAME statement.

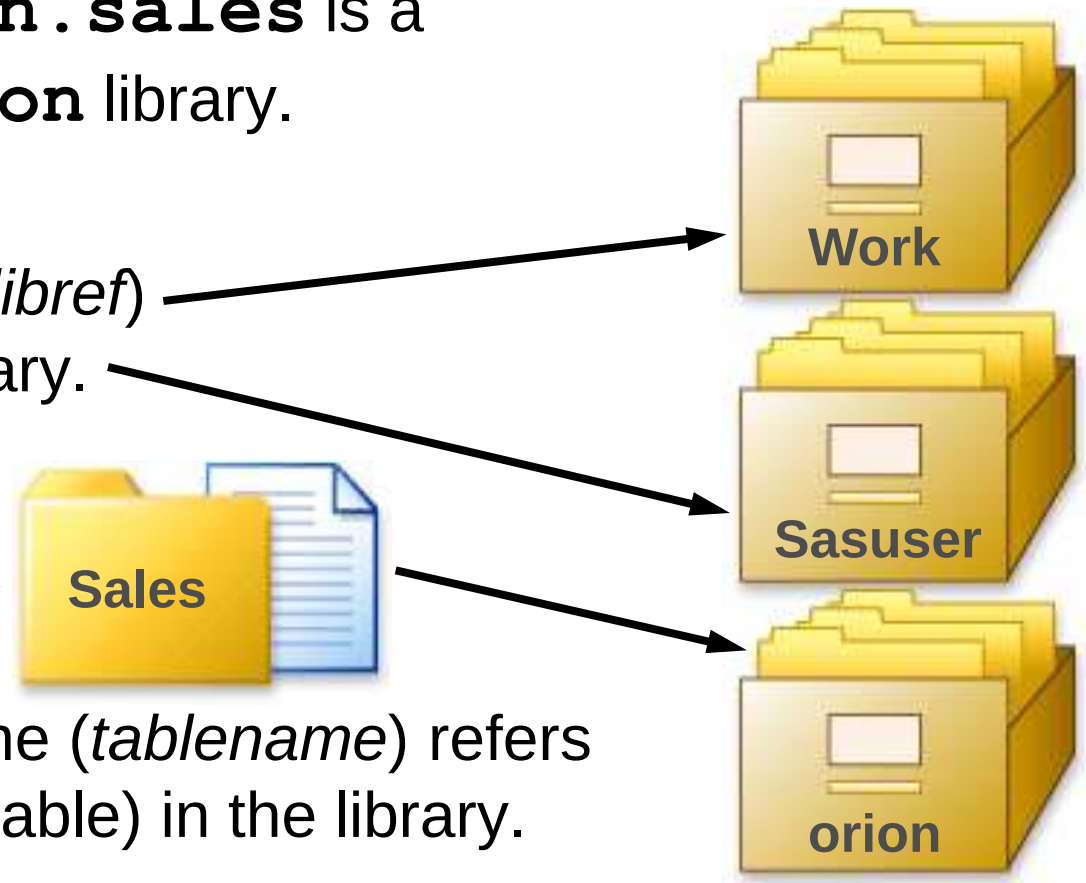
- ❍ True
- ❍ False

The LIBNAME statement remains in effect until canceled, changed, or your SAS session ends.

Two-Level SAS Filenames

Every SAS file has a two-level name: *libref.tablename*

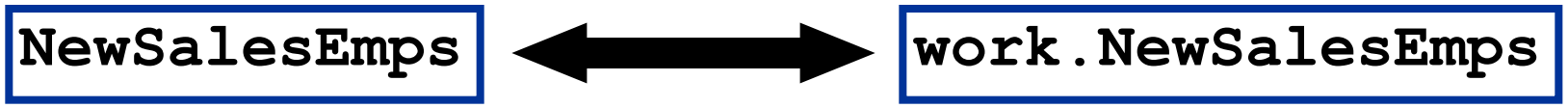
The data set **`orion.sales`** is a SAS file in the **`orion`** library.



- The first name (*libref*) refers to the library.
- The second name (*tablename*) refers to the data set (table) in the library.

Temporary SAS Filename

The default libref is Work if the libref is omitted.




```
data NewSalesEmps;
   length First_Name $ 12
          Last_Name $ 18 Job_Title $ 25;
   infile 'newemps.csv' dlm=',';
   input First_Name $ Last_Name $
         Job_Title $ Salary;
run;

proc print data=work.NewSalesEmps;
run;
```

Browsing a SAS Data Library

The *SAS Explorer* enables you to manage your files in the windowing environment.

In the SAS Explorer, you can do the following:

- view a list of all the libraries available during your current SAS session
- navigate to see all members of a specific library
- display the descriptor portion of a SAS data set

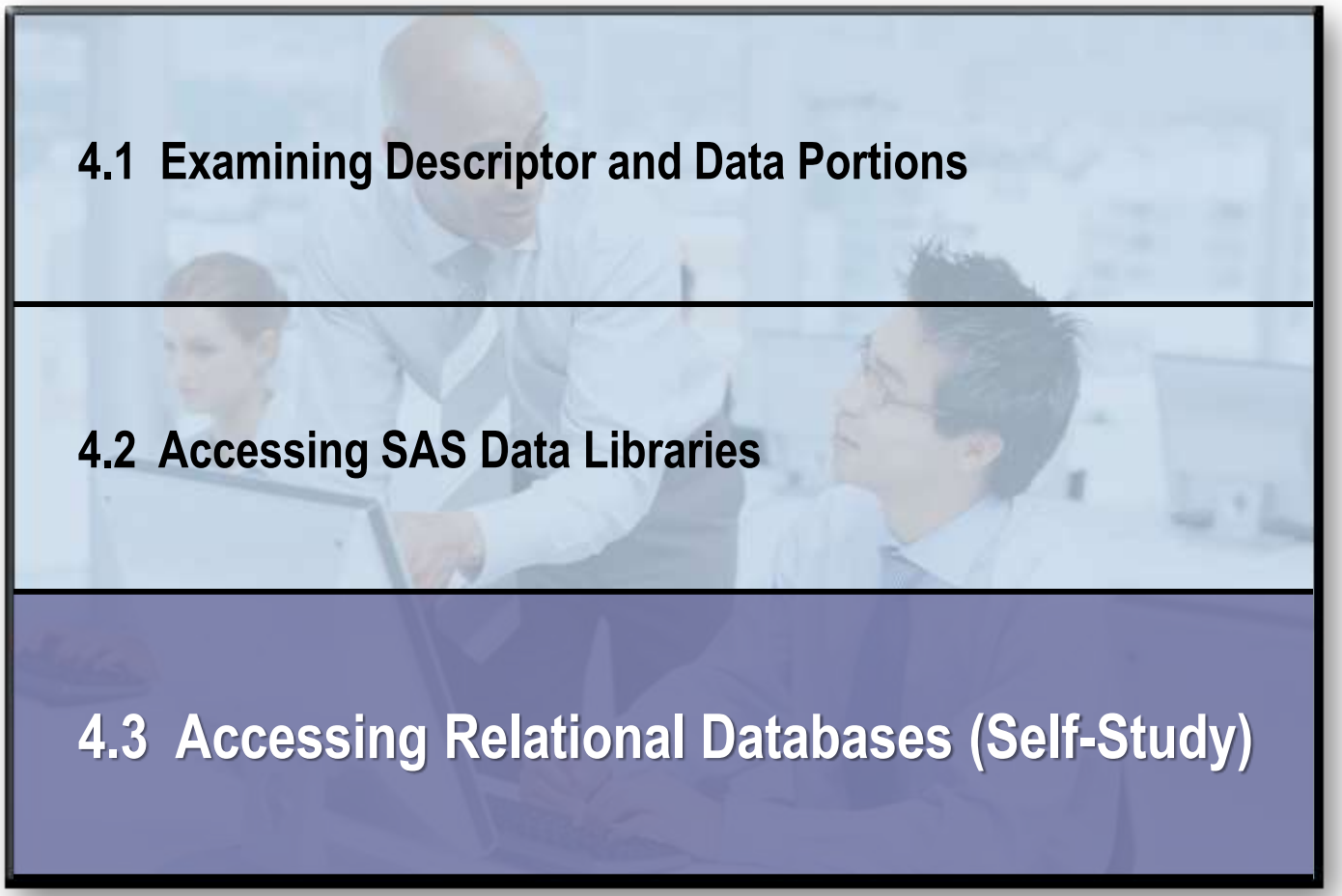
Browsing a SAS Data Library

The CONTENTS procedure with the _ALL_ keyword produces a list of all the SAS files in the data library.

```
PROC CONTENTS DATA=libref._ALL_ NODS;
RUN;
```

- The NODS option suppresses the descriptor portions of the data sets.
- NODS is only used in conjunction with the keyword _ALL_.

Chapter 4: Getting Familiar with SAS Data Sets



Objectives

- Assign a library reference name to a relational database by using the LIBNAME statement.
- Reference a relational database table using a SAS two-level name.

The LIBNAME Statement (Review)

The *LIBNAME statement* assigns a library reference name (libref) to a SAS data library.

General form of the LIBNAME statement:

LIBNAME *libref* '*SAS-data-library*' <*options*>**;**

The SAS/ACCESS LIBNAME Statement

The *SAS/ACCESS LIBNAME statement* assigns a library reference name (libref) to a relational database.

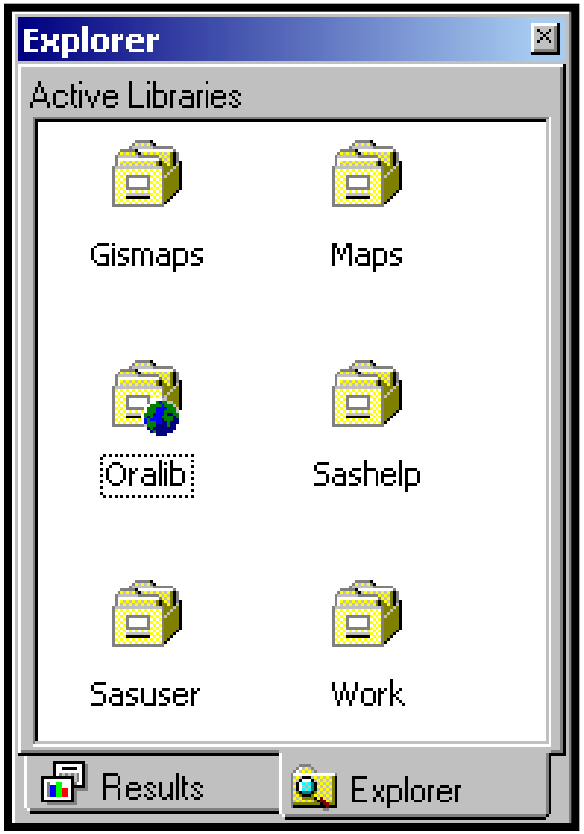
General form of the SAS/ACCESS LIBNAME statement:

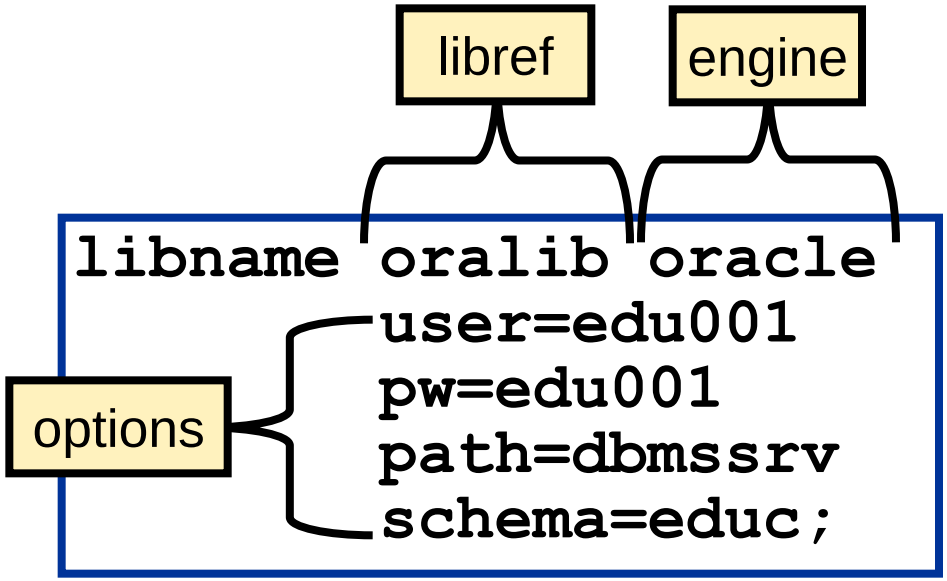
LIBNAME *libref engine-name <SAS/ACCESS-options>*;

After a database is associated with a libref, you can use a SAS two-level name to specify any table in the database and then work with the table as you would with a SAS data set.

Oracle Example

This example uses the LIBNAME statement as supported in the SAS/ACCESS interface to Oracle.

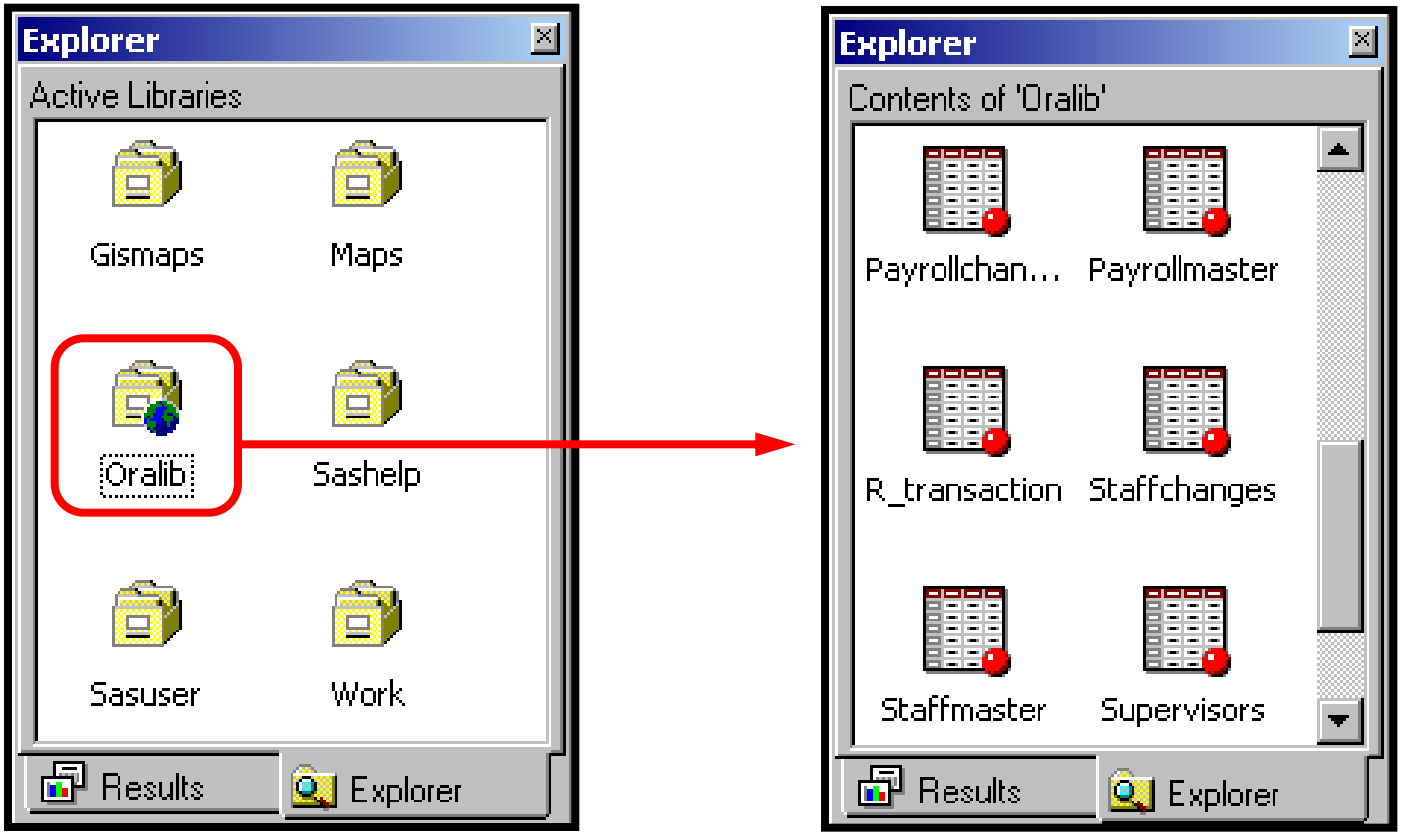




p104d05

Oracle Example

Any table in this Oracle database can be referenced using a SAS two-level name.



Oracle Example

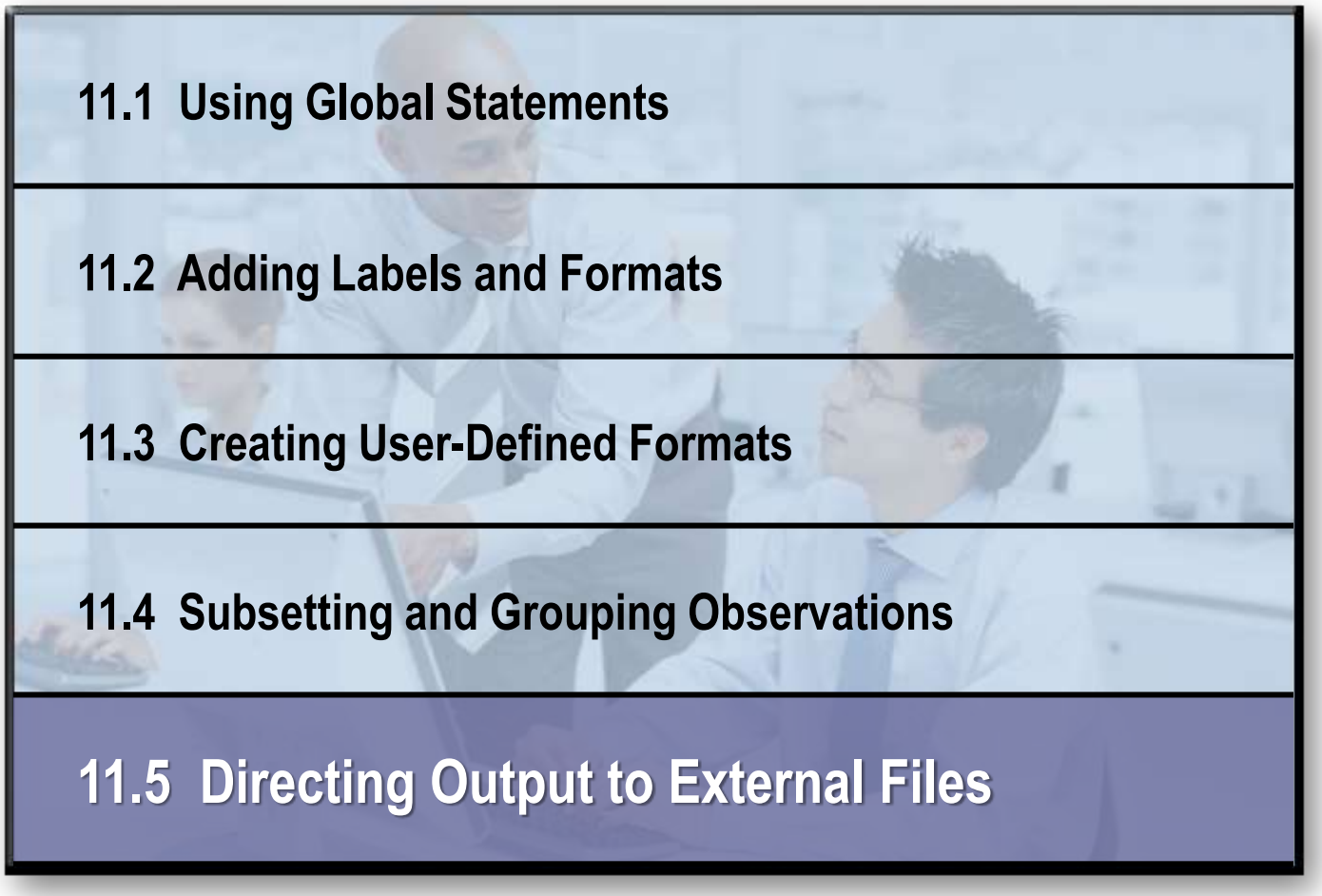
```
libname oralib oracle
        user=edu001 pw=edu001
        path=dbmssrv schema=educ;

proc print data=oralib.supervisors;
run;

data work.staffpay;
   merge oralib.staffmaster
         oralib.payrollmaster;
   by empid;
run;

libname oralib clear;
```

SQL Server Example

```
libname sqllib oledb
        init_string="Provider=SQLOLEDB;
        password=edu01;
        Persist Security Info=True;
        initial catalog=mydata;
        User ID=dal;
        data source=edserver"
        schema=dbo
        IGNORE_READ_ONLY_COLUMNS=YES;
```


Question
&
Answer

Chapter 11: Enhancing Reports

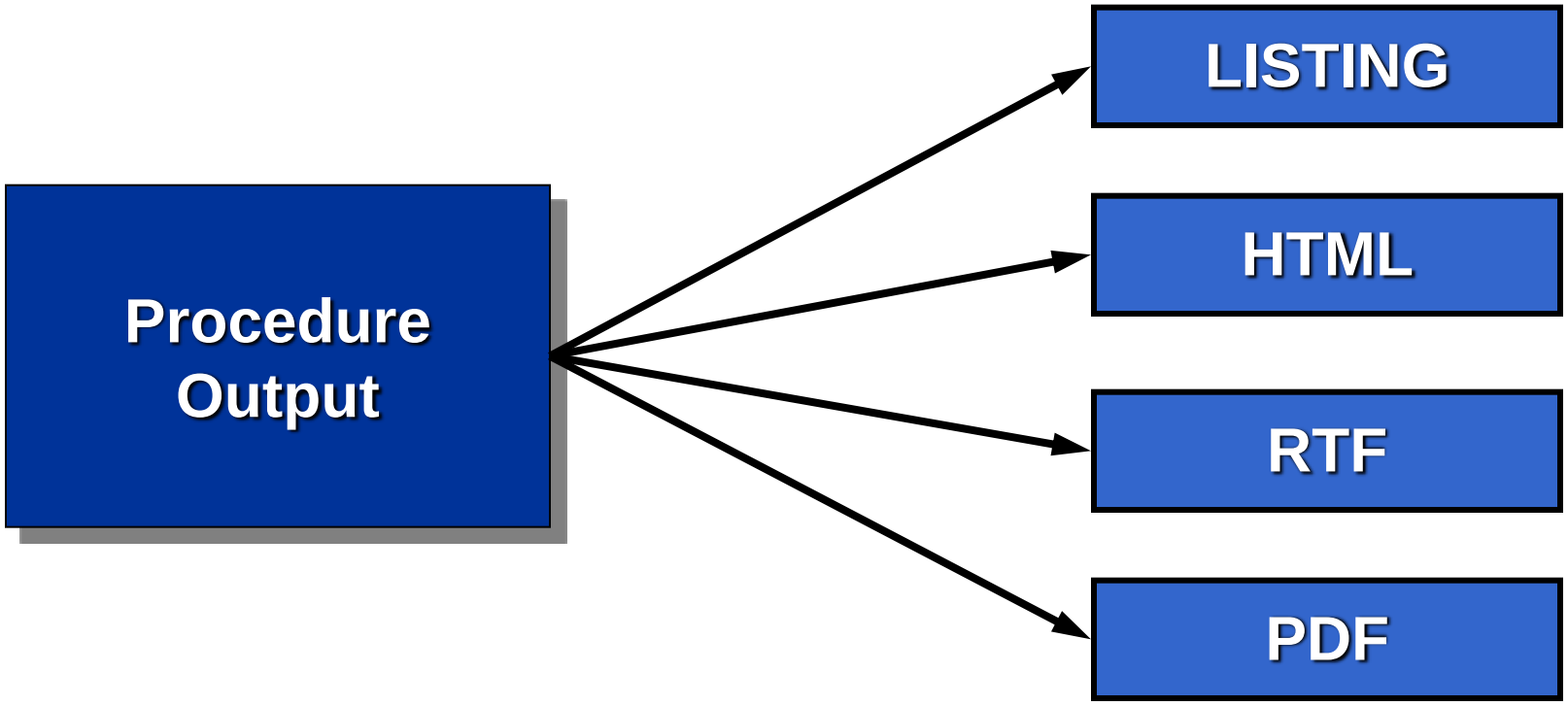


Objectives

- Direct output to ODS destinations by using ODS statements.
- Specify a style definition by using the STYLE= option.

Output Delivery System

Output can be sent to a variety of destinations by using ODS statements.



Output Delivery System

Destination	Type of File	Viewed In
LISTING		SAS Output Window or SAS/GRAPH Window
HTML	Hypertext Markup Language	Web Browsers such as Internet Explorer
PDF	Portable Document Format	Adobe Products such as Acrobat Reader
RTF	Rich Text Format	Word Processors such as Microsoft Word

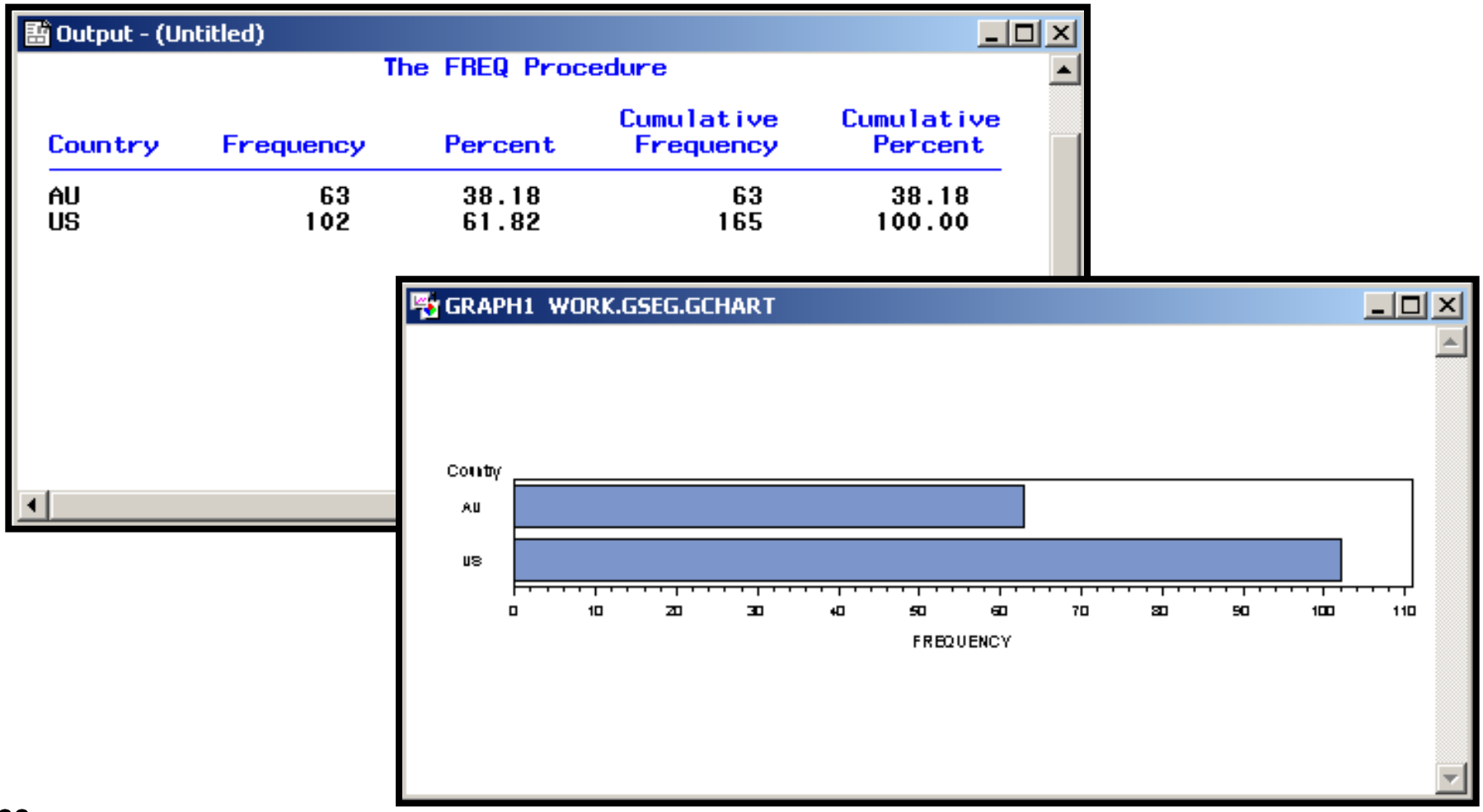
Default ODS Destination

The LISTING destination was the default ODS destination until late 9.2. Since then it has been HTML.

```
ods listing;

proc freq data=orion.sales;
   tables Country;
run;

proc gchart data=orion.sales;
   hbar Country / nostats;
run;
```

Default ODS Destination

The LISTING destination directs output to the OUTPUT window and the GRAPH window.



Default ODS Destination

The ODS LISTING CLOSE statement stops sending output to the OUTPUT and GRAPH windows.

```
ods listing close;

proc freq data=orion.sales;
   tables Country;
run;

proc gchart data=orion.sales;
   hbar Country / nostats;
run;
```


p111d10

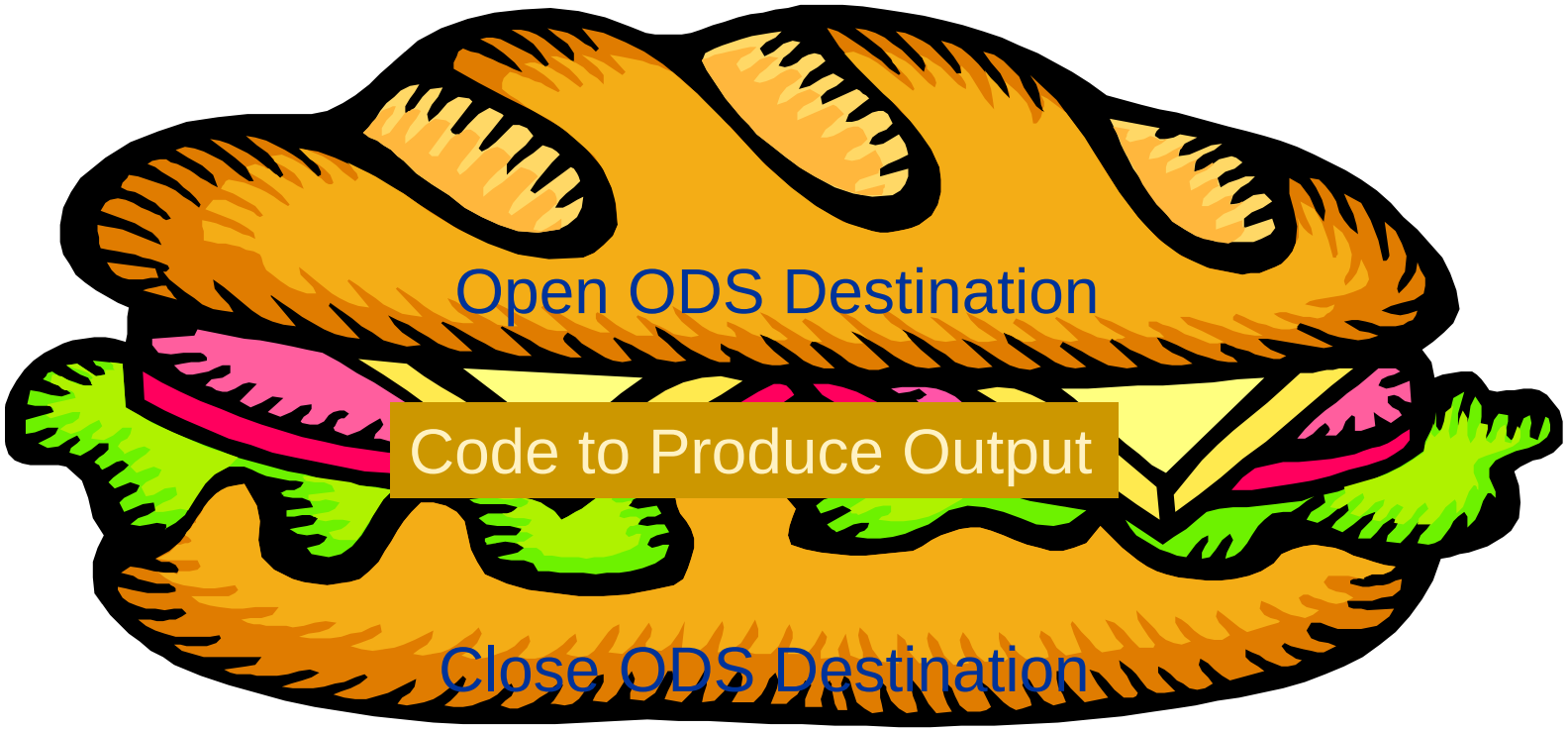
Default ODS Destination

A warning will appear in the SAS log if the LISTING destination is closed and no other destinations are active.

Partial SAS Log

```
23   ods listing close;
24
25   proc freq data=orion.sales;
26      tables Country;
27   run;

WARNING: No output destinations active.
NOTE: There were 165 observations read from the data set ORION.SALES.
```

The ODS Sandwich



HTML, PDF, and RTF Destinations

ODS destinations such as HTML, PDF, and RTF are opened and closed in the following manner:

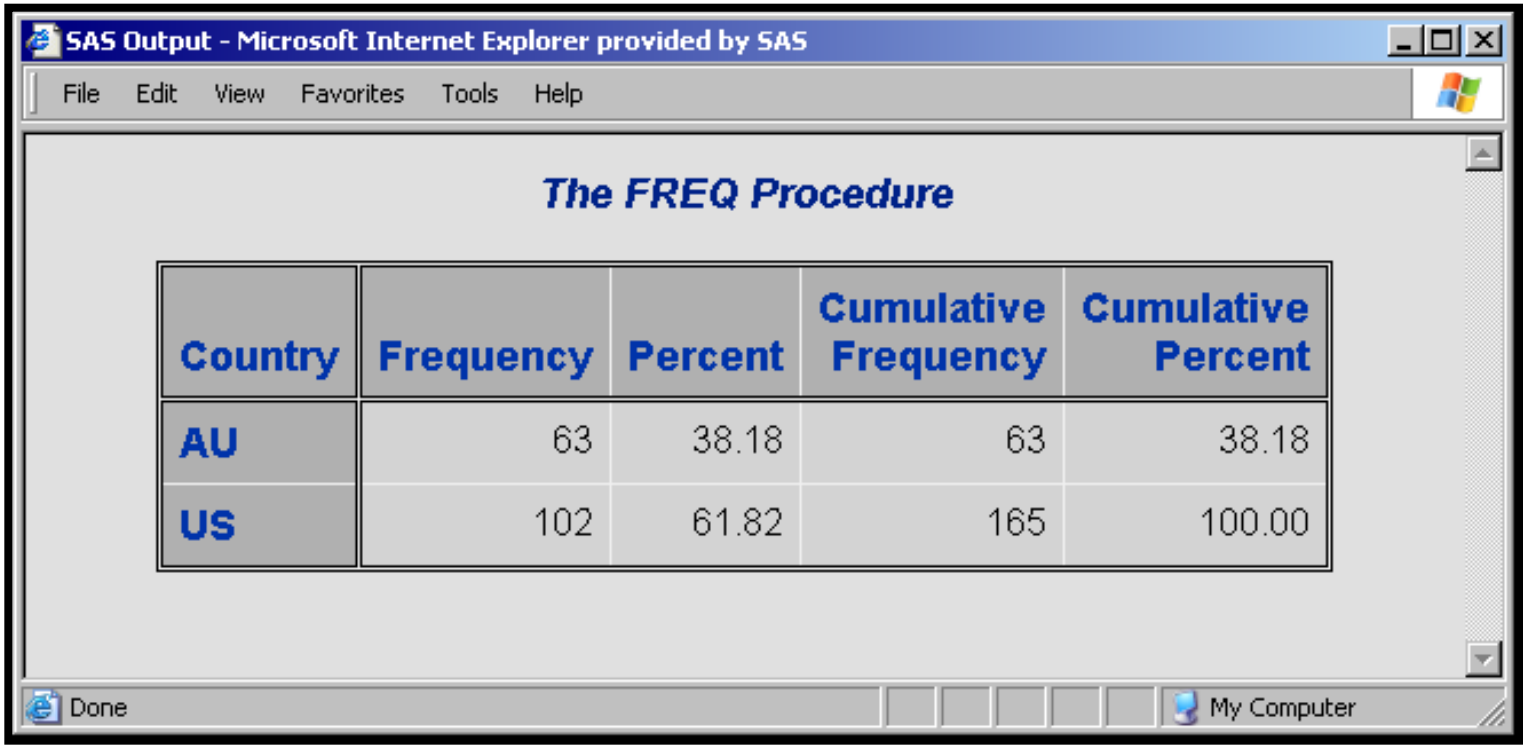
ODS *destination* FILE = ' *filename.ext* **'** *<options>***;**

SAS code to generate a report(s)

ODS *destination* CLOSE;

HTML Destination

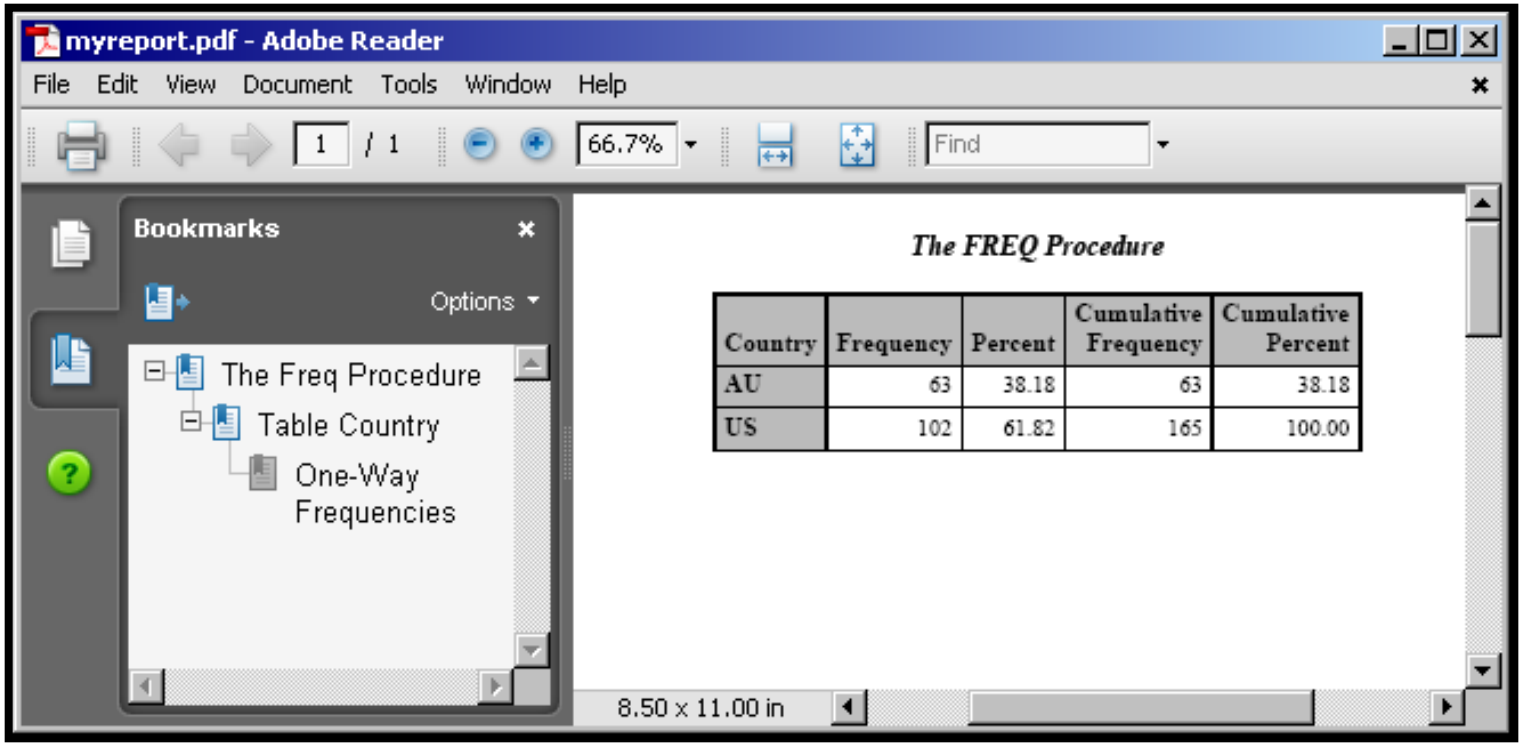
```
ods html file='myreport.html';
proc freq data=orion.sales;
   tables Country;
run;
ods html close;
```



p111d11

PDF Destination

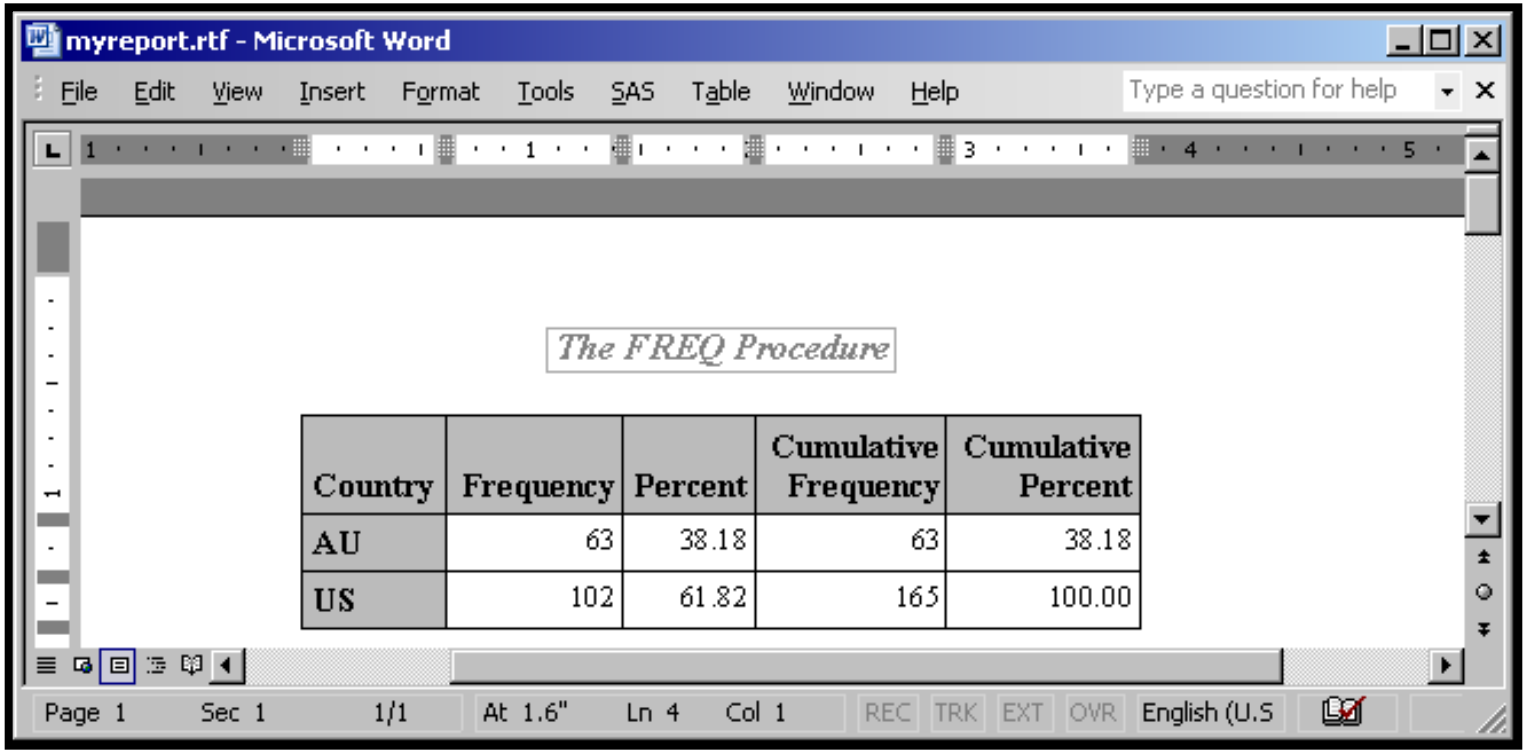
```
ods pdf file='myreport.pdf';
proc freq data=orion.sales;
   tables Country;
run;
ods pdf close;
```



p111d11

RTF Destination

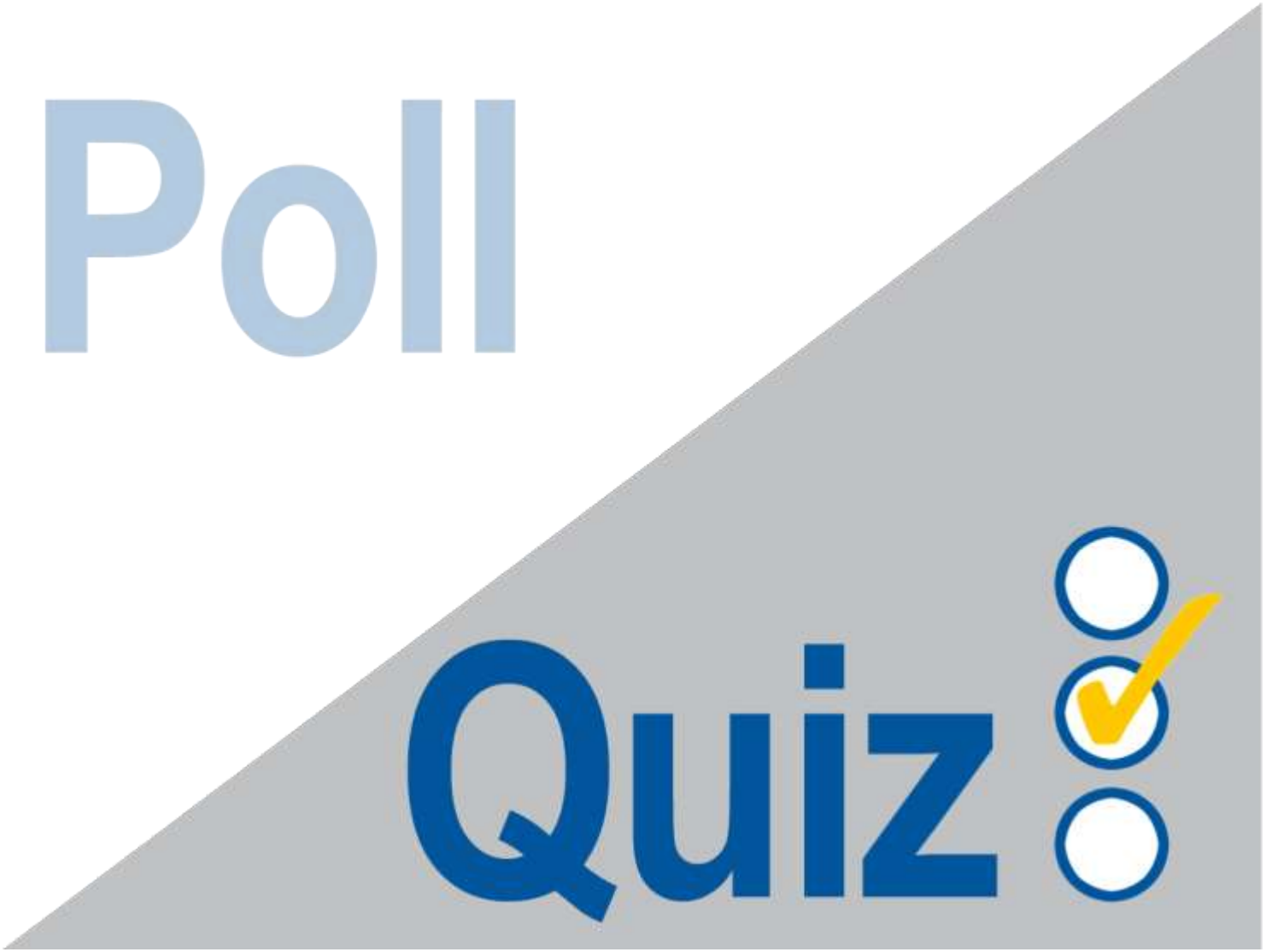
```
ods rtf file='myreport.rtf';
proc freq data=orion.sales;
   tables Country;
run;
ods rtf close;
```



Country	Frequency	Percent	Cumulative Frequency	Cumulative Percent
AU	63	38.18	63	38.18
US	102	61.82	165	100.00

p111d11

Poll



11.11 Quiz

What is the problem with this program?

```
ods pdf file='myreport.pdf';

proc print data=orion.sales;
run;

ods close;
```

11.11 Quiz – Correct Answer

What is the problem with this program?

```
ods pdf file='myreport.pdf';

proc print data=orion.sales;
run;

ods pdf close;
```

Single Destination

Output is only being sent to one destination.

```
ods listing close;

ods html file='example.html';

proc freq data=orion.sales;
   tables Country;
run;

ods html close;

ods listing;
```

It is a good habit to open the LISTING destination at the end of a program to guarantee an open destination for the next submission.

p111d11

Multiple Destinations

Output can be sent to many destinations.

```
ods listing;
ods pdf file='example.pdf';
ods rtf file='example.rtf';

proc freq data=orion.sales;
   tables Country;
run;

ods pdf close;
ods rtf close;
```

To view the results, all destinations except the LISTING destination must be closed.

Multiple Destinations

Use _ALL_ in the ODS CLOSE statement to close all open destinations including the LISTING destination.

```
ods listing;
ods pdf file='example.pdf';
ods rtf file='example.rtf';

proc freq data=orion.sales;
   tables Country;
run;

ods _all_ close;
ods listing;
```

Multiple Procedures

Output from many procedures can be sent to ODS destinations.

```
ods listing;
ods pdf file='example.pdf';
ods rtf file='example.rtf';

proc freq data=orion.sales;
   tables Country;
run;

proc means data=orion.sales;
   var Salary;
run;

ods _all_ close;
ods listing;
```

p111d11

File Location

A path can be specified to control the location of where the file is stored.

```
ods html file='s:\workshop\example.html';

proc freq data=orion.sales;
   tables Country;
run;

proc means data=orion.sales;
   var Salary;
run;

ods html close;
```

If no path is specified, the file is saved in the current default directory.

p111d11

Operating Environments

The Output Delivery System works on all operating environments.

z/OS (OS/390) Example:

```
ods html file='.workshop.report(example)'
         rs=none;

proc freq data=orion.sales;
   tables Country;
run;

ods html close;
```

Use the RS=NONE option when you create HTML and RTF files on z/OS (OS/390).


Question
&
Answer

STYLE= Option

Use a STYLE= option in the ODS destination statement to specify a style definition.

```
ODS destination FILE = 'filename.ext'
                STYLE = style-definition;
```

- A *style definition* describes how to display the presentation aspects such as colors and fonts of SAS output.
- STYLE= cannot be used with the LISTING destination.

SAS Supplied Style Definitions

Analysis	Astronomy	Banker	BarrettsBlue
Beige	blockPrint	Brick	Brown
Curve	D3d	Default	Education
EGDefault	Electronics	fancyPrinter	Festival
FestivalPrinter	Gears	Journal	Magnify
Meadow	MeadowPrinter	Minimal	Money
NoFontDefault	Normal	NormalPrinter	Printer
Rsvp	Rtf	sansPrinter	sasdocPrinter
Sasweb	Science	Seaside	SeasidePrinter
serifPrinter	Sketch	Statdoc	Statistical
Theme	Torn	Watercolor	

SAS Supplied Style Definitions

The following style definitions are new to SAS 9.2:

grayscalePrinter	Harvest	HighContrast
Journal2	Journal3	Listing
monochromePrinter	Ocean	Solutions

HTML Examples

STYLE=DEFAULT

The FREQ Procedure

Country	Frequency	Percent	Cumulative Frequency	Cumulative Percent
AU	63	38.18	63	38.18
US	102	61.82	165	100.00

STYLE=SASWEB

The FREQ Procedure

Country	Frequency	Percent	Cumulative Frequency	Cumulative Percent
AU	63	38.18	63	38.18
US	102	61.82	165	100.00

p111d13

PDF Examples

STYLE=PRINTER

The FREQ Procedure

Country	Frequency	Percent	Cumulative Frequency	Cumulative Percent
AU	63	38.18	63	38.18
US	102	61.82	165	100.00

STYLE=JOURNAL

The FREQ Procedure

Country	*Frequency*	*Percent*	*Cumulative Frequency*	*Cumulative Percent*
AU	63	38.18	63	38.18
US	102	61.82	165	100.00

p111d13

RTF Examples

STYLE=RTF

The FREQ Procedure

Country	Frequency	Percent	Cumulative Frequency	Cumulative Percent
AU	63	38.18	63	38.18
US	102	61.82	165	100.00

STYLE=OCEAN

The FREQ Procedure

Country	Frequency	Percent	Cumulative Frequency	Cumulative Percent
AU	63	38.18	63	38.18
US	102	61.82	165	100.00

p111d13


Question
&
Answer