Please login

- Take a seat
- Login with your HawkID
- Locate SAS 9.4
  - Start / All Programs / SAS / SAS 9.4 (64 bit)
- Raise your hand if you need assistance

Introduction to Data Management in SAS

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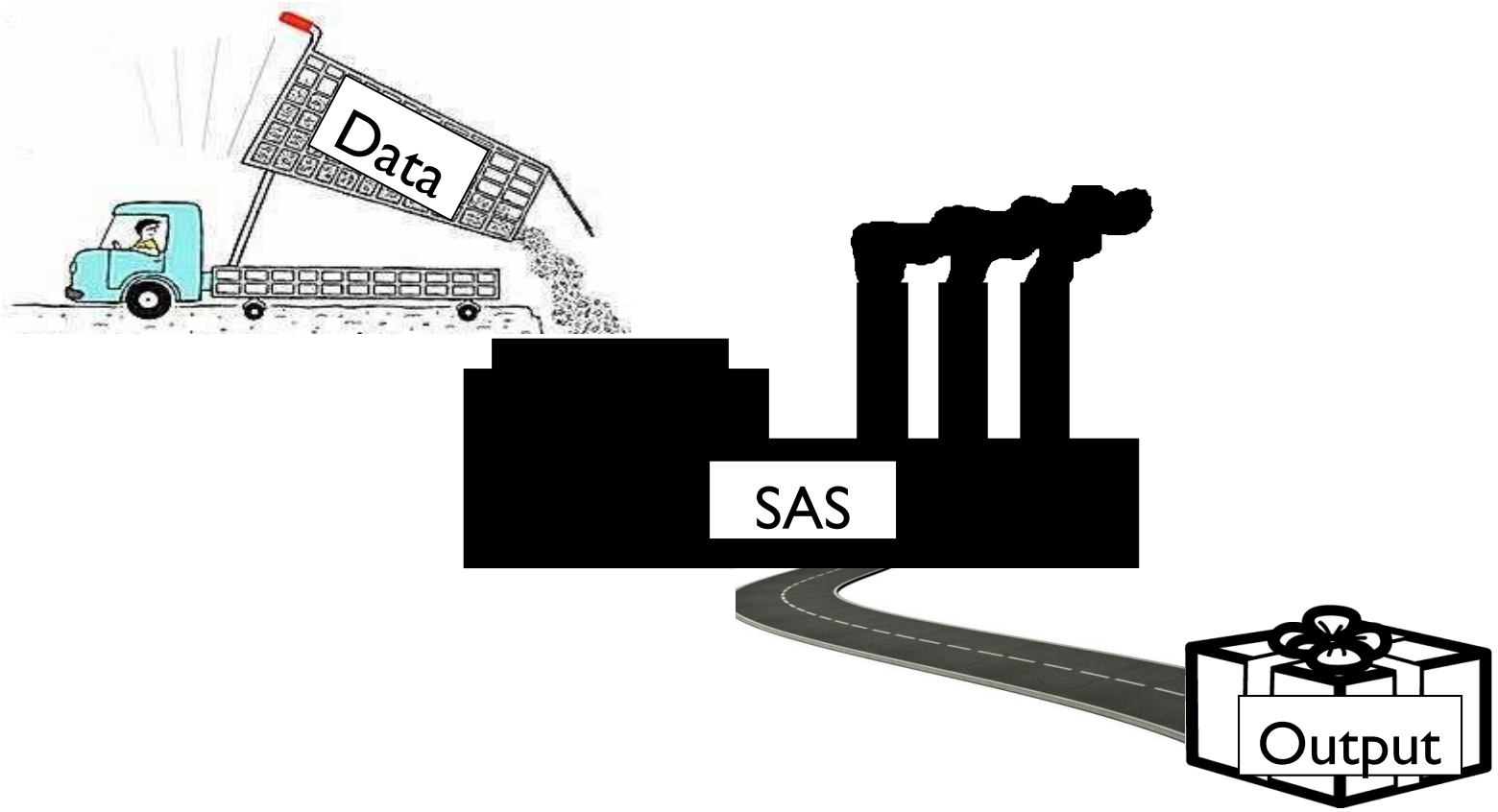
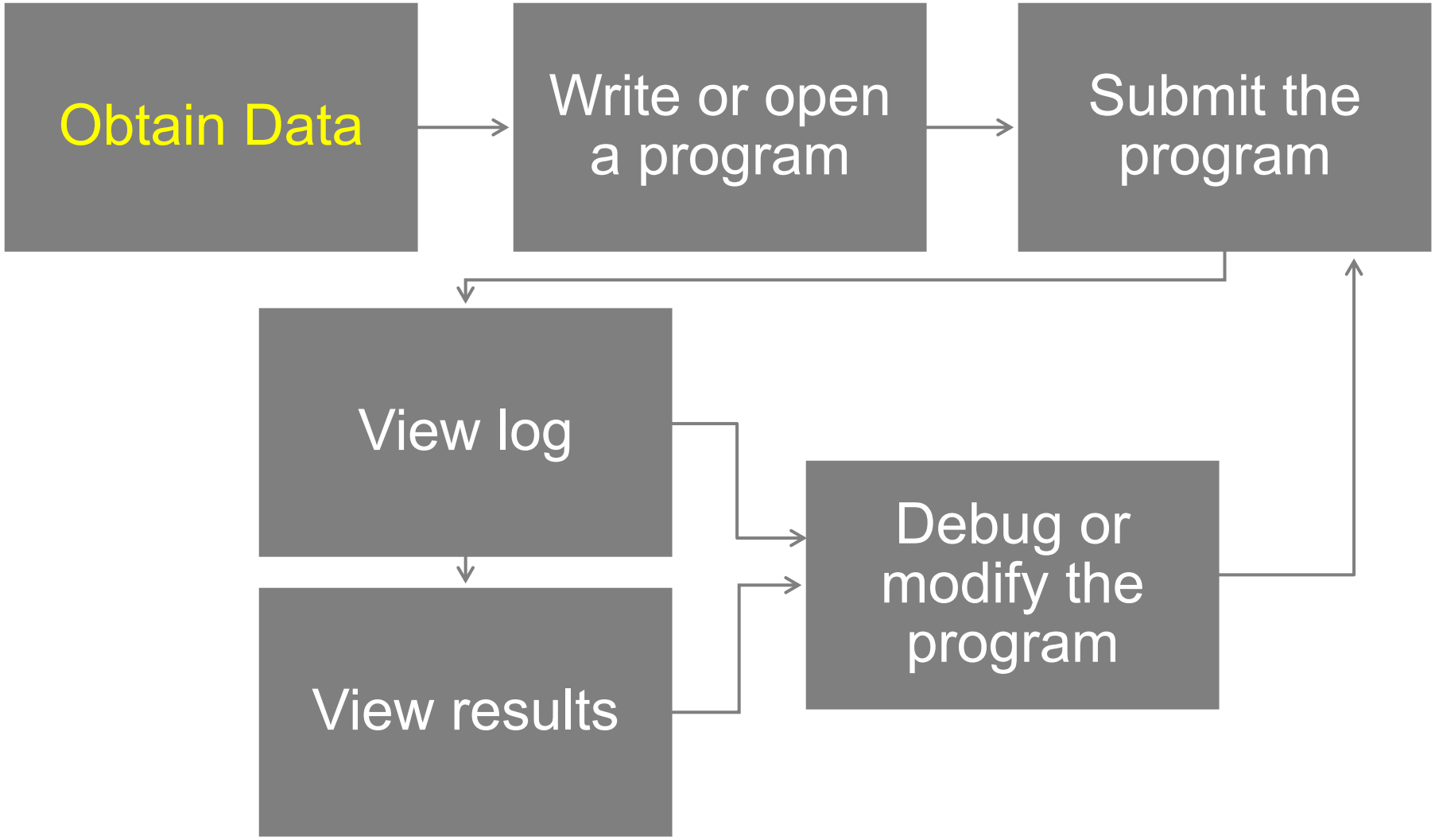
Overview

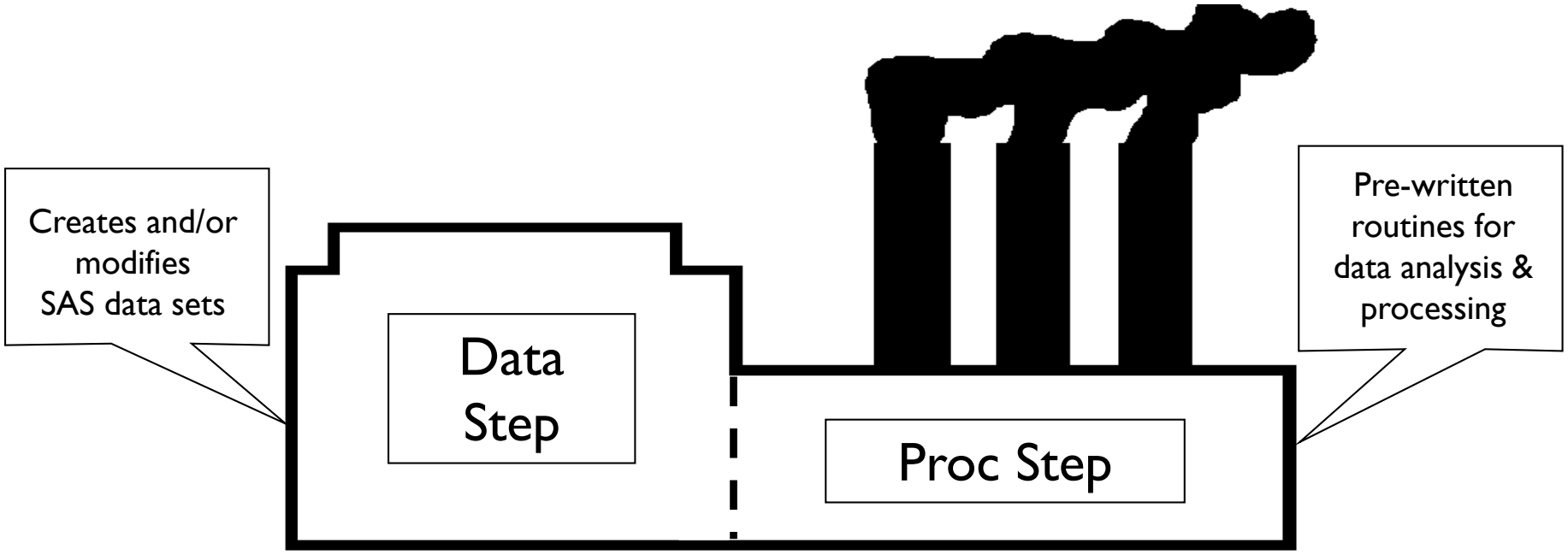
- Review
- Labels & Formats
- Missing Data
- Expressions & Functions
- If-Then/Else & Do…End
- Sub-setting
- Exporting

It’s not magic…it’s a tool

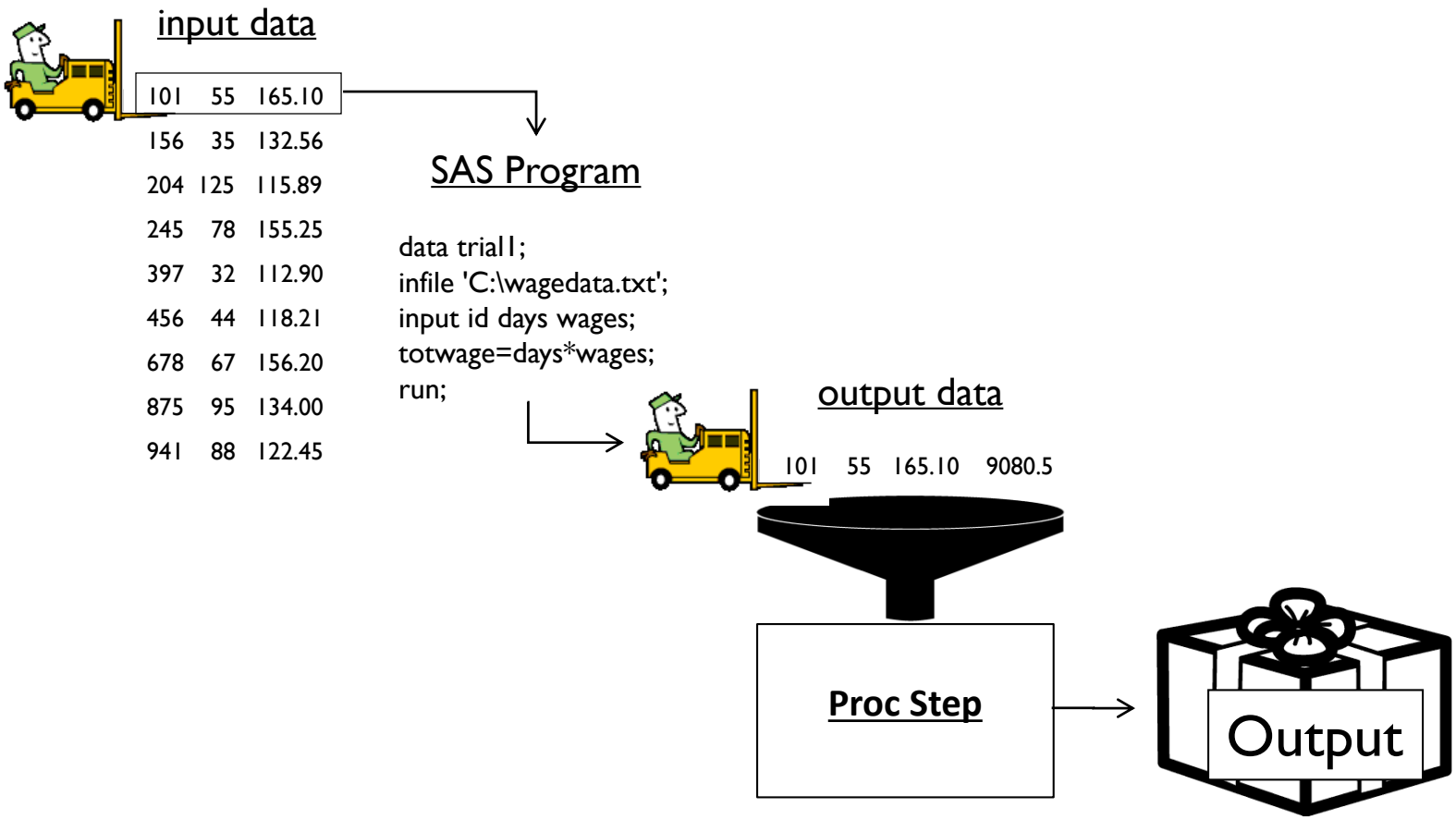



Obtain Data
Write or open a program
Submit the program
View log
View results
Debug or modify the program

A Basic SAS Program



Structure Overview



LIBNAME statement

- General Format
  - `libname <name of library> "<folder location>";`
- Example
  - `libname class "H:\SASClass\";`
  -
```
data class.session2;
  set class.newheart;
run;
```
  ← Creates “permanent” data set
  -
```
data session2;
  set class.newheart;
run;
```
  ← Creates temporary “work” data set

SAS Help

- Press ‘F1’ to access internal SAS Help
- Web Help: http://support.sas.com/documentation/

Questions?

Variable Labels

- The LABEL Statement is a data step statement which assigns descriptive labels to be displayed in place of variable names
- *Syntax:* LABEL variable-1=label-1 … variable-n=label-n;

Variable Labels

```
data class.session2;
        set class.session2;
        label sysbp = "Initial Systolic Blood Pressure"
              diasbp = "Initial Diastolic Blood Pressure";
run;
```

Before Label

sysbp	diasbp
57	38
75	30
76	50

After Label

Initial Systolic Blood Pressure	Initial Diastolic Blood Pressure
57	38
75	30
76	50

Variable Formats

- A format controls the written appearance of data values; it specifies how SAS displays the values of a particular variable
- Types of Formats

Category	Description
Character	instructs SAS to write character data values from character variables.
Date and Time	instructs SAS to write data values from variables that represent dates, times, and datetimes.
ISO 8601	instructs SAS to write date, time, and datetime values using the ISO 8601 standard.
Numeric	instructs SAS to write numeric data values from numeric variables.

Variable Formats

- Variables with values that include letters are always assigned character formats
- Variables comprised exclusively of numbers can be assigned either numeric or character formats

Applying a Character Format

- *Syntax:* $UPCASEw.
- $ indicates a character format is being applied, UPCASE specifies the type of format, and w specifies the width of the output field

```
data class.session2;
        set class.session2;
        format State $UPCASE2.;
run;
```

Before Applying Format

State
Mo
Vt
Pa
Ca

After Applying Format

State
MO
VT
PA
CA

Applying a Numeric Format

- *Syntax:* w.d (standard numeric format)
- The w specifies the width, and the d specifies the number of digits to the right of the decimal point

```
data class.session2;
        set class.session2;
        format BMI 4.1;
run;
```

Before Applying Format

Body Mass Index
25.54051
24.02398
22.1429

After Applying Format

Body Mass Index
25.5
24.0
22.1

Applying a Date Format

- *Syntax:* mmddyy10.
- Writes date values in the form mm/dd/yyyy

```
data class.session2;
        set class.session2;
        format admitdate disdate fdate mmddyy10.;
run;
```

Before Applying Format

Hospital Admission Date	Hospital Discharge Date	Date of Last Follow Up
13JAN1997	18JAN1997	11JAN2003
19JAN1997	24JAN1997	19JAN2003
01JAN1997	06JAN1997	06JAN2003
17FEB1997	27FEB1997	11DEC1997

After Applying Format

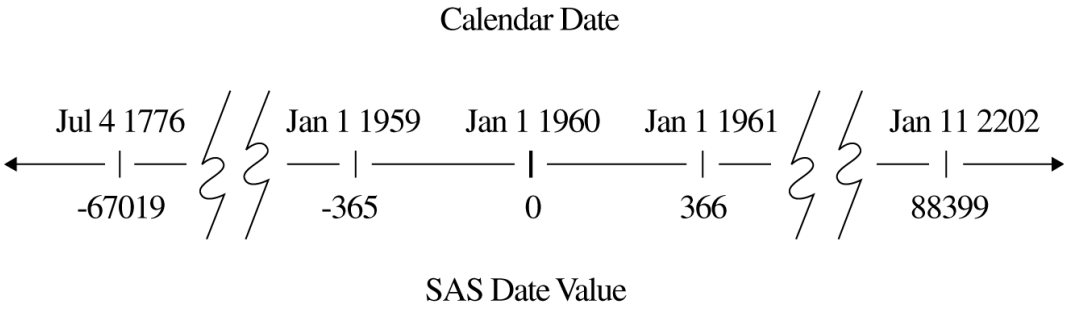
Hospital Admission Date	Hospital Discharge Date	Date of Last Follow Up
01/13/1997	01/18/1997	01/11/2003
01/19/1997	01/24/1997	01/19/2003
01/01/1997	01/06/1997	01/06/2003
02/17/1997	02/27/1997	12/11/1997

Missing Data

- SAS stores missing values in two ways:
  - Missing numeric and date values are represented by a period (.)
  - Missing character values are represented by a blank enclosed in quotes (‘ ‘)
- Numeric and date values
  - Arithmetic operations with a missing value will result in a missing return value
  - Missing values are less than non-missing values

Date Variables

- A SAS date value represents the number of days between January 1, 1960, and a specified date
- Dates before January 1, 1960, are negative; dates after are positive



Numeric Expressions

- Arithmetic operators indicate that an arithmetic calculation is performed
- Reminder: if a value is missing in the data, the result is a missing value

Operation	Symbol
Addition	+
Subtraction	-
Multiplication	*
Division	/
Exponentiation	**

Numeric Expressions

- When performing arithmetic operations, understanding the order of operations is very important

Order	Operations
1	Parentheses
2	Exponents
3	Multiplication and Division
4	Addition and Subtraction

Numeric Expressions

- Mean Arterial Blood Pressure
- Create a new variable, MAP, using the below formula:

- $$\frac{Systolic\ BP + 2 * Diastolic\ BP}{3}$$

Common Numeric Functions

Function	Description
ABS	Returns the absolute value.
CEIL	Returns the smallest integer that is greater than or equal to the argument, fuzzed to avoid unexpected floating-point results.
FLOOR	Returns the largest integer that is less than or equal to the argument, fuzzed to avoid unexpected floating-point results.
INT	Returns the integer value, fuzzed to avoid unexpected floating-point results.
INTCK	Returns the number of interval boundaries of a given kind that lie between two dates, times, or datetime values.
IQR	Returns the interquartile range.
LOG	Returns the natural (base e) logarithm.
MAX	Returns the largest value.
MEAN	Returns the arithmetic mean (average).
MEDIAN	Returns the median value.
MIN	Returns the smallest value.
N	Returns the number of nonmissing numeric values.

Common Numeric Functions

Function	Description
NMISS	Returns the number of missing numeric values.
PCTL	Returns the percentile that corresponds to the percentage.
PUT	Returns a value using a specified format.
QUANTILE	Returns the quantile from a distribution when you specify the left probability (CDF).
RAND	Generates random numbers from a distribution that you specify.
RANGE	Returns the range of the nonmissing values.
ROUND	Rounds the first argument to the nearest multiple of the second argument.
SQRT	Returns the square root of a value.
STD	Returns the standard deviation of the nonmissing arguments.
STDERR	Returns the standard error of the mean of the nonmissing arguments.
SUM	Returns the sum of the nonmissing arguments.
VAR	Returns the variance of the nonmissing arguments.

Common Date & Time Functions

Function	Description
DATDIF	Returns the number of days between two dates after computing the difference between the dates according to specified day count conventions.
DATEPART	Extracts the date from a SAS datetime value.
DATETIME	Returns the current date and time of day as a SAS datetime value.
DAY	Returns the day of the month from a SAS date value.
DHMS	Returns a SAS datetime value from date, hour, minute, and second values.
MONTH	Returns the month from a SAS date value.
TIMEPART	Extracts a time value from a SAS datetime value.
TODAY	Returns the current date as a numeric SAS date value.
WEEK	Returns the week-number value.
YEAR	Returns the year from a SAS date value.
YRDIF	Returns the difference in years between two dates according to specified day count conventions; returns a person's age.

Common Character Functions

Function	Description
CATS	Removes leading and trailing blanks, and returns a concatenated character string.
CATX	Removes leading and trailing blanks, inserts delimiters, and returns a concatenated character string.
CMISS	Counts the number of missing arguments.
COMPRESS	Returns a character string with specified characters removed from the original string.
COUNT	Counts the number of times that a specified substring appears within a character string.
COUNTC	Counts the number of characters in a string that appear or do not appear in a list of characters.
COUNTW	Counts the number of words in a character string.
FIND	Searches for a specific substring of characters within a character string.
INDEX	Searches a character expression for a string of characters, and returns the position of the string's first character for the first occurrence of the string.
INPUT	Returns the value that is produced when SAS converts an expression by using the specified informat.
LAG	Returns values from a queue.

Common Character Functions

Function	Description
LENGTH	Returns the length of a non-blank character string, excluding trailing blanks, and returns 1 for a blank character string.
LOWCASE	Converts all uppercase single-width English alphabet letters in an argument to lowercase.
PROPCASE	Converts all words in an argument to proper case.
SCAN	Returns the nth word from a character string.
STRIP	Returns a character string with all leading and trailing blanks removed.
SUBSTR (right of =)	Extracts a substring from an argument.
TRANSLATE	Replaces specific characters in a character expression.
TRANSTRN	Replaces or removes all occurrences of a substring in a character string.
TRANWRD	Replaces all occurrences of a substring in a character string.
TRIM	Removes trailing blanks from a character string, and returns one blank if the string is missing.
UPCASE	Converts all lowercase single-width English alphabet letters in an argument to uppercase.

If-Then/Else Statements

- An IF-THEN/ELSE Statement executes a SAS statement for observations that meet specific conditions
- Statements can be nested to produce a series of logical evaluations, which stop once a true statement is encountered
- More computationally efficient than repeated IF statements

If-Then/Else Statements

- *Syntax*: **IF** expression **THEN** statement; <**ELSE** statement;>
  - *expression* can be any logical SAS expression
  - *THEN statement* specifies the statement that is executed if expression is true
  - *ELSE statement* (optional) specifies the statement that is executed if expression is false.

Length Statement

- The LENGTH Statement is a data step statement specifying the internal storage lengths of variables
- Length can only be set *prior* to the assignment of values
- *Syntax*: **LENGTH** variable-1 <**$**>length ... variable-n <**$**>length;
  - *$* (optional) specifies that the preceding variables are character variables
  - *length* specifies a numeric constant that is the number of bytes used for storing variable values

Length Statement

```
data class.session2;
        set class.session2;
        length Symptoms $11.;
        if symptoms_sum = 0 then Symptoms = "None";
        else if symptoms_sum = 1 then Symptoms = "One";
        else if symptoms_sum > 1 then Symptoms = "Two or
        more";
run;
```

With LENGTH Statement

Symptoms
None
None
None
None
One
Two or more

Without LENGTH Statement

Symptoms
None
None
None
None
One
Two

Do…End Statements

- The DO Statement specifies a group of statements to be executed as a unit.
- A simple DO statement is often used within IF-THEN/ELSE statements to designate a group of statements to be executed depending on whether the IF condition is true or false.

Do…End Statements

- *Syntax*: **DO;**
  statement-1;
  …
  statement-n;
  END;

```
data class.session2;
        set class.session2;
        if dstat = 1 then do;
                TotalTime = LOS
        end;
        else if dstat = 0 then do;
                TotalTime = LOS + OSTime
        end;
run;
```

Sub-Setting By Observation

- The DELETE Statement can be used to exclude observations that meet specified criteria

```
data subset_delete;
       set class.session2;
       if OSTime = . then delete;
run
```

Sub-Setting By Observation

- The OUTPUT Statement can be used to only include observations that meet specified criteria

```
data subset_output;
       set class.session2;
       if gender = 1 then output;
run;
```

Sub-Setting By Variable

- The DROP Statement can be used to delete unwanted variables

```
data subset_drop;
       set class.session2;
       drop Title Address ZipCode Occupation;
run;
```

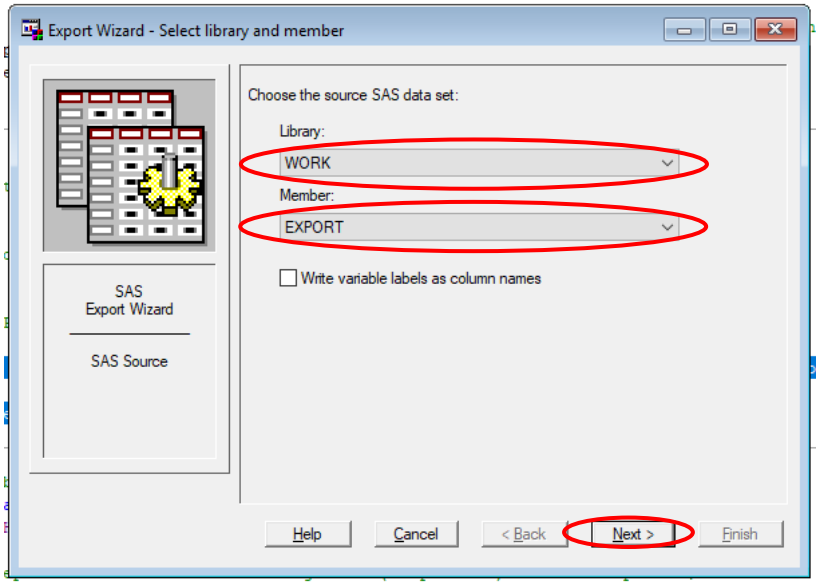
Sub-Setting By Variable

- The KEEP Statement can be used to keep only the variables you want

```
data subset_keep;
       set class.session2;
       keep ID age gender fdate;
run;
```

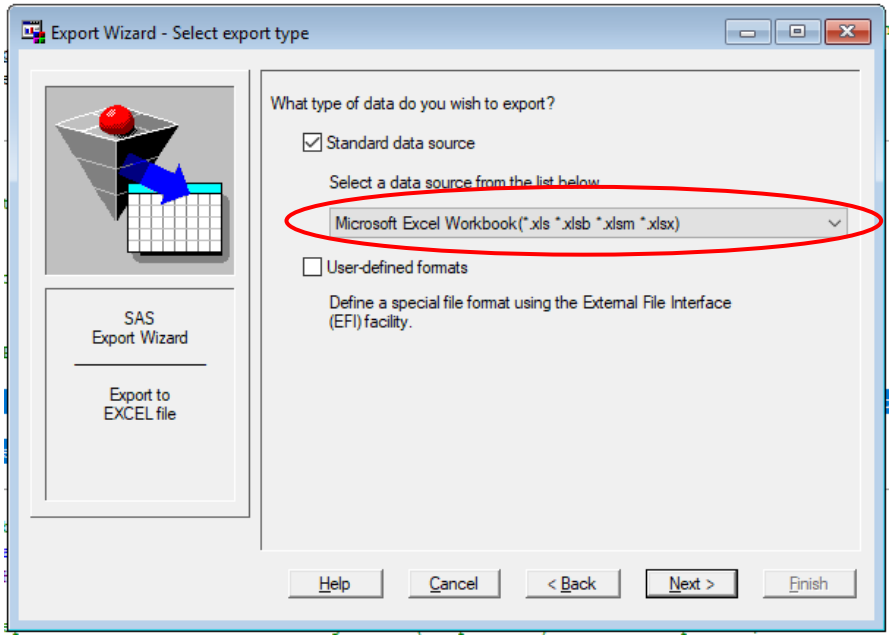
Export Wizard

- Select File » Export Data
- The window dialog box will appear
- Select the SAS library
- Select the member of the library
- Click Next



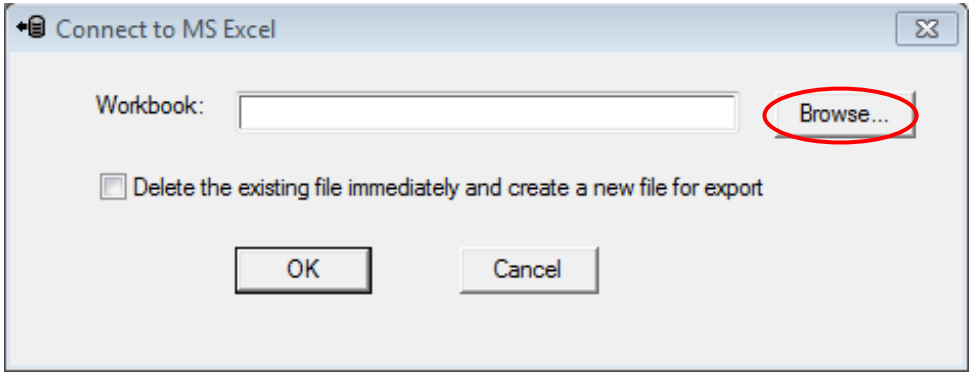
Export Wizard

- The “Select Export Type” dialog box will appear
- Select a data source you want to export to



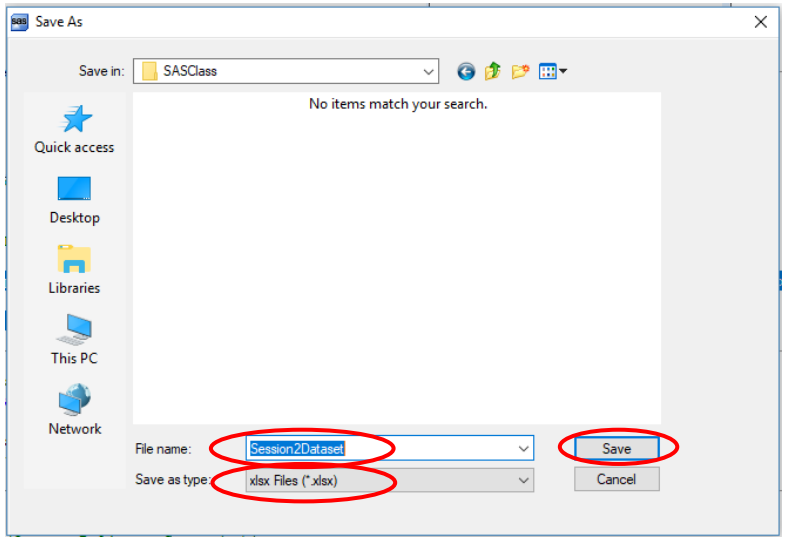
Export Wizard

- Click the Browse button to locate the folder where you want the data saved
  - H:\SASClass\



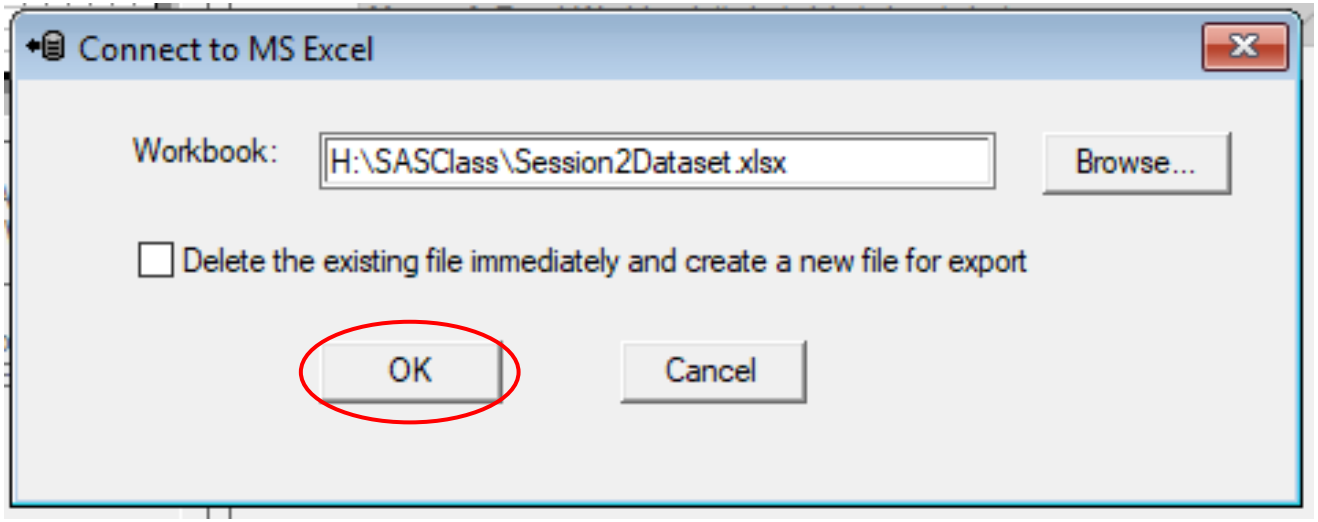
Export Wizard

- Enter File Name
- Be sure to save as type .xlsx file
  - Default is old version of Microsoft office
- Click Save



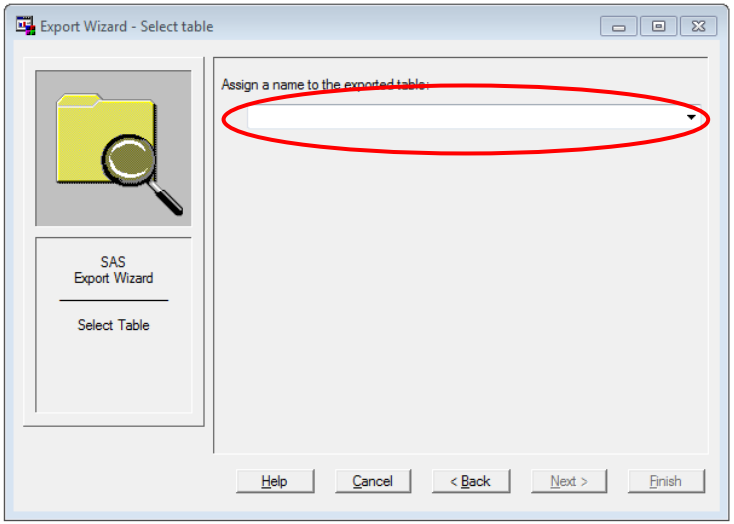
Export Wizard

- Click OK



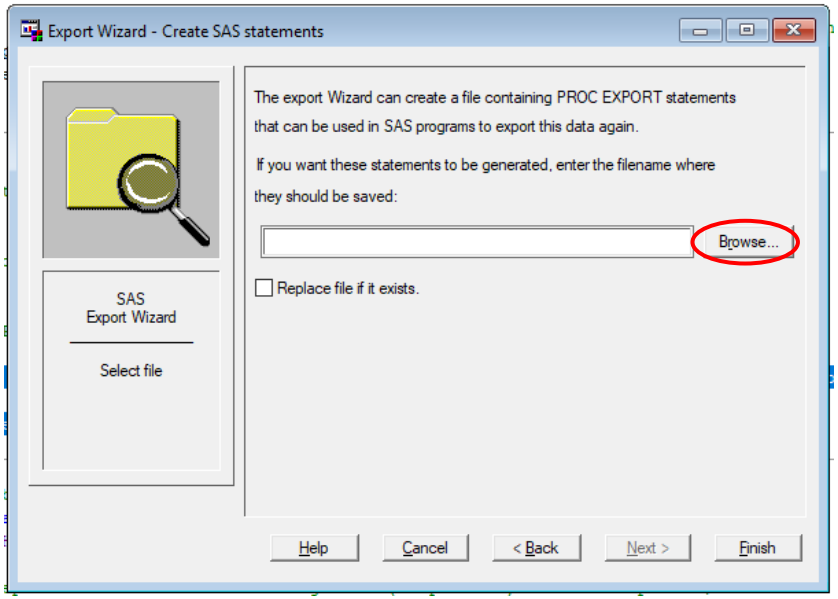
Export Wizard

- Assign a name to the exported table
  - This names the sheet in excel
- If you want to save the export code, click Next
- Otherwise, click Finish



Export Wizard

- To save the export code, click on Browse to:
  - Select the folder the program is saved to
  - Name the program
- Click finish



Export Wizard

- Export code created by export wizard

```
PROC EXPORT DATA= WORK.EXPORT
        OUTFILE="H:\SASClass\Session2Dataset.xlsx"
        DBMS=EXCEL REPLACE;
        SHEET="Data";
RUN;
```

Using ODS

- SAS ODS (Output Delivery System) provides flexibility in generating reports
- Great for printing graphs or plots

```
ods rtf file="H:\odsoutput.rtf";
proc print data = subset_keep noobs;
       where age > 90;
run;
ods rtf close;
```

Questions?

Lunch Options