# SAS 9.4 Programming Fundamentals Exam

## Fundamental SAS Concepts

Recall general rules of DATA and PROC steps.

Recognize general rules of SAS statements including global statements.

Interpret the SAS log.

Distinguish between syntax and logic errors.

- Recall SAS syntax rules.
- Recognize different types of syntax errors and be able to resolve common problems.
- Recall use of the PUTLOG statement to troubleshoot logic errors.

## Explore SAS Data Sets

Recall naming conventions used for SAS data sets and variables.

Recognize variable types (character and numeric).

Explain how to create and manipulate SAS date values.

- Explain how SAS stores date values.
- Recall how to use SAS date formats to specify how the values are displayed.

Recognize how SAS stores missing data.

Use the LIBNAME statement to read SAS data sets.

Use PROC CONTENTS to view the descriptor portion of a data set.

Recall how to use Data Set options: DROP=, KEEP=, RENAME=, OBS=.

## Using the DATA Step to Access SAS Data Sets

Use the DATA statement to create one or multiple data sets.

Use the SET statement to read a data set.

Explain how to combine data sets.

- Use MERGE and BY statements to combine multiple data sets horizontally.

- Use the IN= option on the MERGE statement to control processing.
- Use the SET statement to combine multiple data sets vertically.

## Explain the compilation and execution process of the DATA step.

- Describe how the Program Data Vector PDV is created.
- Explain how the LENGTH statement affects the default behavior of the PDV.
- Describe the process of the data step iteration.

## Subset observations and variables.

- Use the WHERE statement to subset observations during input.
- Use the IF statement to subset observations during processing.
- Use DROP/KEEP statements to subset variables at output.
- Use DROP=/KEEP= options to subset variables at input and output.

# Using the DATA Step to Manipulate Data

## Create or update variables.

- Use the assignment statement to create character and numeric variables.
- Recall how to assign a date constant to a variable.

## Recognize SAS Functions.

- Use Character Functions:  UPCASE, PROPCASE, SUBSTR, SCAN, FIND, LENGTH, CATX.
- Use Date Functions:  MONTH, DAY, YEAR, TODAY, MDY.
- Use Truncation Functions:  ROUND, INT.
- Use Descriptive Stats Functions:  MEAN, SUM.

## Perform conditional processing.

- Use the IF-THEN and ELSE statements.
- Use IF-THEN DO and ELSE DO statements.
- Use the LENGTH statement for assigning byte size of character variables.

## Control the output of observations.

- Use the OUTPUT statement to output to a specific data set.
- Use the OUTPUT statement to control output timing.

## Create an accumulating variable.

- Use the SUM statement.
- Use BY group processing with FIRST. and LAST to accumulate in groups.

Explain the function of iterative DO loops.

Assign permanent attributes.

- Use the FORMAT statement to change the display of the variable value.
- Use the LABEL statement to change the display of the variable name.

# Generate Reports Using PROC Steps

Use PROC PRINT to generate a detail report.

- Use the LABEL option and NOOBS options to enhance the report.
- Use the VAR statement to control the display of variables.

Use PROC MEANS to generate a summary report.

- Use the MAXDEC= option to control the display of decimal places.
- Use VAR and CLASS statements to control the structure of the report.

Use PROC FREQ to generate a frequency report.

- Use the ORDER=option to control the order of the rows of the report.
- Use the TABLES statement for one-way and two-way tables.
- Use the NOCUM and NOPERCENT options in a one-way table.
- Use the CROSSLIST option to control the layout of two-way tables.

Identify methods to enhance reports.

- Use TITLE statement.
- Use FOOTNOTE statement.
- Use FORMAT statement for temporary attributes.
- Use the LABEL statement for temporary attributes.
- Use the WHERE statement for subsetting observations.

# Use Utility Procedures

Use PROC SORT to sort a report based on values of a variable.

- Use the OUT= option to create an output data set that contains the data in sorted order.

- Use the BY statement to specify the variable(s) whose values are used to sort the data.
- Use the DESCENDING option with the BY statement to sort options in descending order.

## Use PROC FORMAT to define custom formats.

- Use the VALUE statement to display one or more values.
- Use the keyword OTHER to label missing values.

# Import and Export non-SAS files

## Use a procedure to transfer a CSV file.

- Use PROC IMPORT to import a CSV file.
- Use the PROC EXPORT to export to a CSV file.

## Use the LIBNAME statement to import/export an Excel file with XLSX engine.

## Use ODS to direct reports to external files.

- Use the destinations of PDF, RTF, EXCEL.
- Use the options of FILE= and STYLE=.

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**Note:** All 32 main objectives will be tested on every exam. The 84 expanded objectives are provided for additional explanation and define the entire domain that could be tested.