# Advanced SAS Programming

#### Accessing Data Using SQL

Generate detail reports by working with a single table, joining tables, or using set operators in the SQL procedure.

Generate summary reports by working with a single table, joining tables, or using set operators in the SQL procedure.

Construct sub-queries and in-line views within an SQL procedure step.

Compare solving a problem using the SQL procedure versus using traditional SAS programming techniques.

Access Dictionary Tables using the SQL procedure.

## Macro Processing

Create and use user-defined and automatic macro variables within the SAS Macro Language.

Automate programs by defining and calling macros using the SAS Macro Language.

Understand the use of macro functions.

Use various system options that are available for macro debugging and displaying values of user-defined and automatic macro variables in the SAS log.

Create data-driven programs using SAS Macro Language.

### **Advanced Programming Techniques**

Demonstrate the use of advanced data look-up techniques such as array processing, hash objects, formats, and combining/merging data.

Reduce computing resource requirements by controlling the space required to store SAS data sets using compression techniques, length statements, or eliminating variables and observations.

Reduce programming time by developing reusable SAS programs which incorporate data step views, DATA steps that write SAS programs, and the FCMP procedure.

Perform effective benchmarking by using the appropriate SAS System options and interpreting the resulting resource utilization statistics.

Identify appropriate applications for using indexes and create them using the DATA step, the DATASETS procedure, or the SQL procedure.

Compare techniques to eliminate duplicate data using the DATA step, the SORT procedure, and the SQL procedure.

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