SAS Macro Language 1: Essentials

Duration: 14.0 hours

This course focuses on the components of the SAS macro facility and how to design, write, and debug macro systems. Emphasis is placed on understanding how programs with macro code are processed.

Learn how to

- perform text substitution in SAS code
- automate and customize the production of SAS code
- conditionally or iteratively construct SAS code
- use macro variables and macro functions.

Who should attend: Experienced SAS programmers who have a sound understanding of DATA step processing and who want to write SAS programs that are reusable and dynamic

Prerequisites

Before attending this course, you should have completed the *SAS Programming 2: Data Manipulation Techniques* course or have equivalent knowledge. Specifically, you should be able to

- use a DATA step to read from or write to a SAS data set or external file
- use DATA step programming statements such as IF-THEN/ELSE, DO WHILE, DO UNTIL, and iterative DO
- use SAS data set options such as DROP=, KEEP=, and OBS=
- use character functions such as SUBSTR, SCAN, INDEX, and UPCASE
- form subsets of data using the WHERE clause
- create and use SAS date values and constants
- use SAS procedures such as SORT, PRINT, CONTENTS, MEANS, FREQ, TABULATE, and CHART.

Software Addressed

This course addresses Base SAS software. This course is appropriate for students who are using SAS 9 software.

Course Contents

Introduction

- overview of SAS Foundation
- course logistics
- course data files

- purpose of the macro facility
- program flow

Macro Variables

- introduction to macro variables
- automatic macro variables
- macro variable references
- user-defined macro variables
- delimiting macro variable references
- macro functions

Macro Definitions

- defining and calling a macro
- macro parameters

DATA Step and SQL Interfaces

- creating macro variables in the DATA step
- indirect references to macro variables
- creating macro variables in SQL

Macro Programs

- conditional processing
- parameter validation
- iterative processing
- global and local symbol tables

Learning More

- SAS resources
- beyond this course

Supplemental Materials

- program flow

SAS SQL 1: Essentials

Duration: 17.5 hours

This outline is provisional and subject to change.

This course teaches you how to process SAS data using Structured Query Language (SQL).

Learn how to

- query and subset data
- summarize and present data
- combine tables, including complex joins and merges
- create and modify table views and indexes
- replace multiple DATA and PROC steps with one SQL query.

Who should attend: SAS programmers and business analysts

Prerequisites
Before attending this class, you should be able to

- submit SAS programs on your operating system
- create and access SAS data sets
- use arithmetic, comparison, and logical operators
- invoke SAS procedures.

You can gain this experience from the *SAS Programming 1: Essentials* course. No knowledge of SQL is necessary.

Software Addressed
This course addresses Base SAS software. This course is appropriate for students who are using SAS 9 software.

Course Contents

Introduction

- overview of SAS Foundation
- course logistics
- course data files
- introducing the Structured Query Language

Basic Queries

- overview of the SQL procedure
- specifying columns
- specifying rows

Displaying Query Results

- presenting data
- summarizing data

SQL Joins

- introduction to SQL joins
- inner joins
- outer joins
- complex SQL joins

Subqueries

- noncorrelated subqueries
- in-line views

Set Operators

- introduction to set operators
- the UNION operator
- the OUTER UNION operator
- the EXCEPT operator
- the INTERSECT operator

Creating Tables and Views

- creating tables with the SQL procedure
- creating views with the SQL procedure

Advanced PROC SQL Features

- dictionary tables and views
- using SQL procedure options
- interfacing PROC SQL with the macro language

Learning More

- SAS resources
- beyond this course

SAS Programming 3: Advanced Techniques and Efficiencies

Duration: 21.0 hours

This course is for SAS programmers who prepare data for analysis. The comparisons of manipulation techniques and resource cost benefits are designed to help programmers choose the most appropriate technique for their data situation.

Learn how to compare various SAS programming techniques that enable you to

- benchmark computer resource usage
- control memory, I/O, and CPU resources
- create and use indexes
- combine data horizontally
- use hash and hiter DATA step component objects and arrays as lookup tables
- compress SAS data sets
- sample your SAS data sets
- create and use SAS data views
- safely reduce the length of numeric variables
- create user-defined functions and informats.

Who should attend: Experienced SAS programmers

Prerequisites

This course is **not** appropriate for beginning SAS software users. Before attending this course, you should have at least nine months of SAS programming experience and should have completed the *SAS Programming 2: Data Manipulation Techniques* course. Specifically, you should be able to do the following:

- understand your operating system file structures and perform basic operating system tasks
- understand programming logic concepts
- understand the compilation and execution processes of the DATA step
- use different varieties of input to create SAS data sets from external files
- use SAS software to access SAS libraries
- create and use SAS date values
- read, concatenate, merge, match-merge, and interleave SAS data sets
- use the DROP=, KEEP=, and RENAME= data set options
- create multiple output data sets
- use one-dimensional array processing and DO loops to process data iteratively

- use SAS functions to perform data manipulation and transformations
- use the FORMAT procedure to create user-defined formats.

Software Addressed

This course addresses Base SAS software. This course is appropriate for students who are using SAS 9 software.

Course Contents

Introduction

- overview of SAS Foundation
- course logistics
- creating the course data

Efficient SAS Programming

- identifying computer resources related to efficiency

Controlling I/O Processing and Memory

- SAS DATA step processing
- controlling I/O
- reducing the length of numeric variables
- compressing SAS data sets
- using SAS views

Accessing Observations

- access methods
- accessing observations by number
- creating an index
- using an index

DATA Step Arrays

- introduction to lookup techniques
- one-dimensional arrays
- multidimensional arrays
- loading a multidimensional array from a SAS data set

DATA Step Hash and Hiter Objects

- introduction
- hash object methods
- loading a hash object from a SAS data set

- DATA step hiter object

Combining Data Horizontally

- DATA step merges and SQL procedure joins
- using an index to combine data
- combining summary and detail data
- combining data conditionally

User-Defined Functions and Formats

- user-defined functions
- user-defined formats

Learning More

- areas of support from SAS
- other courses to consider

Combining Raw Data Files Vertically

- combining raw data files vertically