



## FastTrack Advanced Certification – the Language of SAS

Please read our [Terms and Conditions](#) and our [Privacy Policy](#)

**Duration:** 54 – 56 hrs over 2 weeks (plus additional time required for exercises and study)

### Learning Overview:

This course aims to provide Learners with the training required to get SAS Advanced Certification ready and help you become a Data Analyst Professional using the Language of SAS.

The learning is delivered using blended learning techniques via our digital learning platform.

There are mini quizzes and comprehensive exercises throughout to help assess and reinforce your learning.

You will also be signposted to practice exam questions and given access to our certification exam preparation product MemoTrainer™

The SAS Advanced Certification exam is delivered as a proctored exam and taken remotely at your home or office within one week of course completion.

The exam fee is included in the course price and will be scheduled by us. Should a resit be required this will be managed by the learner at their expense. For full information please refer to **Booking of Third Party Exams** in our Terms & Conditions.

### Learning Outcomes:

By the end of this course you will be able to:

- Describe the language elements of SQL
- Write SQL queries to summarise data tables, generate reports and create new data tables
- Manage tables and indexes using SQL
- Utilise macro variables and functions to make your programs smarter
- Create and store macro programs to simplify repetitive tasks
- Implement conditional iterative macro processing to help you generate dynamic, data driven code.
- Use Advanced Programming methods to perform table lookups

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- Apply Advanced techniques to select observations and update values
- Use Advanced Functions and create Custom Functions with Proc FCMP
- Code PERL Regular Expressions to Match, Change and Validate data

## Delivery Schedule:

### Week 1

On day 1 we invite you to join a short online welcome to meet your instructor, introduce you to our Digital Learning platform and get you started on the PROC SQL eLearning modules of this course.

You will need 2 hours to complete the 3 eLearning modules with additional time required for exercises.

We ask you to complete these modules before joining us for the online masterclass on the afternoon of day 1. This is followed by 3 live online classes to complete your PROC SQL learning.

In the afternoon of day 3 we introduce you to the MACROS eLearning modules. You will need 2.5 hours to complete the 3 eLearning modules with additional time required for exercises. We ask you to complete these modules before joining us for the online masterclass on day 4.

This is followed by 3 live online classes to complete your MACROS learning.

Each day finishes with an opportunity for you to join an open Q&A session with the instructor if you need any additional support.

	09:00 - 12:00	13:00 - 17:00
Day 1	Welcome and Introduction to PROC-SQL eLearning modules	Live Online Masterclass to consolidate PROC SQL elearning
Day 2	PROC SQL (Live Online Class 1)	PROC SQL (Live Online Class 2)
Day 3	PROC SQL (Live Online Class 3)	MACROS eLearning modules
Day 4	Live Online Masterclass to consolidate MACROS elearning	MACROS (Live Online Class 1)
Day 5	MACROS (Online Class 2)	MACROS (Live Online Class 3)

### Week 2

On day 1 we invite you to join a short online welcome to week 2 and get started on the Advanced Programming learning of this course.

When learning is complete you will be signposted to practice exam questions and given access to our certification exam preparation product MemoTrainer™

Again each day finishes with an opportunity for you to join an open Q&A session with the instructor if you need any additional support.

	09:00 - 12:00	13:00 - 17:00
Day 1	Welcome and Advanced Programming (Live Online Class 1)	Advanced Programming (Live Online Class 2)
Day 2	Advanced Programming (Live Online Class 3)	Advanced Programming (Live Online Class 4)
Day 3	PROC SQL/ Macro / Advanced Programming Learning Consolidation	PROC SQL/ Macro / Advanced Programming Learning Consolidation
Day 4	Advanced Certification Exam Prep (Mock Exam/MemoTrainer)	Advanced Certification Exam Prep (Mock Exam/MemoTrainer)
Day 5	Advanced Certification Exam Prep (Mock Exam/MemoTrainer)	Advanced Certification Exam Prep - 30 min individual session with instructor

## Pre-requisites:

To get the most out of this course, it is expected that you should have attended our Fundamentals and Intermediate courses in the language of SAS (or comparable courses) or have completed nine months of developing code in the language of SAS including topics:

- Use of Global statements e.g. LIBNAME, FILENAME and OPTIONS
- Use of functions to transform character data (e.g. SCAN, FIND, SUBSTR)
- Use of functions to transform numeric data (e.g. CEIL, INT, FLOOR, ROUND)
- Use of functions to transform dates (e.g. DAY, MONTH, YEAR, INTCK)
- KEEP and DROP statements and dataset options to select variables
- IF and WHERE statements to select observations
- Conditional Processing with IF-THEN-ELSE
- Iterative DO Loops
- Conditional Do Loops – DO WHILE and DO UNTIL
- Compile-Time statements (e.g. LENGTH, RETAIN)
- Combining Data Sets Vertically and Horizontally
- Summarising data with the FREQ, MEANS and TABULATE procedures

For the hands-on practice activities in the course, you will need access to an environment that runs the programming Language of SAS. On our courses, we signpost you to some of the free tools available.

Check out the link below to review system requirements:

- [SAS® OnDemand for Academics](#)

## Learning Modules:

### PROC SQL

#### Introduction to SQL Language Elements (eLearning)

*Learning Objective: Explain how to implement SQL within the language of SAS;*

- Origins of Structured Query Language (SQL)
- Implementing SQL within the Language of SAS
- SQL Language Elements

#### Selecting COLUMNS & ROWS (eLearning)

*Learning Objective: Describe how to subset data to select columns and rows.*

- Selecting Columns
- The DESCRIBE and FEEDBACK options
- Create Columns
- The CASE Expression
- Selecting Rows
- Special WHERE Operators

## **Summarising Data (eLearning)**

*Learning Objective: Explain how to summarise and classify data*

- Producing Summary Statistics
- Columns created by a query
- Classifying Data – GROUP BY
- Summary Statistics by Group  
Selecting Summarised Data - HAVING

## **Report Presentation (live online class)**

*Learning Objective: Describe ways to improve the presentation of data.*

- Formats and Labels
- Ordering Data
- Summarising Data

## **Sub Queries (live online class)**

*Learning Objective: Describe the different types of sub-queries used in the programming Language of SAS*

- Non-Correlated Subquery
- Correlated Subquery
- Substituting Values
- Returning Multiple Values

## **Creating Data Tables (live online class)**

*Learning Objective: Explain PROC-SQL techniques used to create a Data Table*

- Create a Data Table from the Results of a Query
- Create a Data Table from a Definition
- Create a Data View from the Results of a Query
- Data Views versus Data Tables

## **Joining Data Tables Horizontally (live online class)**

*Learning Objective: Explain PROC-SQL techniques used to join Data Tables horizontally*

- Inner Joins
- Outer Joins
- Full Outer Joins
- The COALESCE Statement
- Table Aliases
- In-Line Views

## **Joining Data Tables Vertically (live online class)**

*Learning Objective: Explain the PROC SQL techniques used to join Data Tables vertically*

- Methods of Combining Data
- Modifiers
- Except Rule
- Intersect Rule
- Union Rule
- Outer-Union Rule

## **Managing Tables (live online class)**

*Learning Objective: Describe how to manage tables using PROC SQL*

- Add, Update and Delete data rows
- Add, Modify and Delete data columns
- Delete a Table, View or Index
- Explain what an Index is
- Create and use an Index

## **Macros**

### **Introduction to Macro processing (eLearning)**

*Learning Objective: Explain basic Macro Processing in the Language of SAS.*

- Compilation and Execution phases
- Tokenisation
- Macro Triggers
- The %PUT Statement
- Displaying macro variable values

### **Introduction to Macro variables (eLearning)**

*Learning Objective: Describe six different features of Macro Variables.*

- Macro Variable Storage
- Macro Variable Resolution
- User-Defined Macro Variables
- The %LET Statement
- The SYMBOLGEN Option
- Delimiting Macro Variables

## **Macro Functions (eLearning)**

*Learning Objective: Identify three different types of Macro Functions.*

- Character Functions – review
- Using Macro Functions
- Macro Functions for Numbers
- The %SYSFUNC and other functions including: %INDEX, %SCAN, %SUBSTR, %UPCASE, %BQUOTE, %STR, %NRBQUOTE, %NRSTR, %EVAL and %SYSEVALF.

## **Macro Programs (live online class)**

*Learning Objective: Create and store macro programs to simplify repetitive tasks*

- Compilation
- Macro Calls
- Generating Code
- The MPRINT Option
- Storage
- Autocall Macros
- Best Practices
- Macro Program Parameters

## **Global and Local Symbol Tables (live online class)**

*Learning Objective: Utilise Macro Variables on the Global and Local Symbol Tables*

- The Global Symbol Table
- The Local Symbol Table
- Nested Macros
- Creating and Updating Macro Variables
- Resolving Macro Variables

## **DATA Step and PROC SQL (live online class)**

*Learning Objective: Creating Macro Variables in DATA Step and Proc SQL*

- Creating Macro Variables in DATA Step
- Compare CALL SYMPUTX and %LET
- Indirect Macro Variable References
- Create Macro Variables in PROC SQL
- Store multiple values in a Macro Variable

## Conditional Processing (live online class)

*Learning Objective: Implement Conditional Macro Processing*

- %IF -%THEN - %ELSE
- The MLOGIC Option
- Conditionally Returning a Program Step
- Conditionally Returning a Statement
- Conditionally Returning a Partial Statement
- %DO - %END
- The &INCLUDE Statement

## Iterative Processing (live online class)

*Learning Objective: Generate dynamic, data driven code - using Conditional Iterative Processing*

- Iterative Processing in a Macro Program
- Generate Program Code Iteratively – Dynamic Code
- Perform Conditional Iterative Processing

## Advanced Programming

### Sorting Datasets

*Learning Objective: Describe methods to improve sort performance*

- Review of the PROC SORT procedure
- Parallel Processing
- Space Requirements for Sorting
- Selecting Observations

### Selecting Observations

*Learning Objective: Explain techniques for selecting observations*

- Using the DISTINCT keyword in PROC SQL
- BY-Group processing
- Using FIRST. and LAST. in the DATA step

### Lookup Tables: Formats

*Learning Objective: Create, Maintain and Use Formats as Lookup Tables*

- Create and Use Formats
- Use Formats as lookup tables
- Create and Maintain Formats from a dataset
- Picture Formats

## **Lookup Tables: Arrays**

*Learning Objective: Define and Use Arrays as Lookup Tables*

- One-Dimensional Arrays – Definition and Usage
- DIM Function
- One-Dimensional Array Lookup Tables
- Multi-Dimensional Array Lookup Tables
- Create a Multi-Dimensional Array from a Dataset

## **Lookup Tables: Hash and Hiter Objects**

*Learning Objective: Define, Load and Use Hash Objects as Lookup Tables*

- Define a Hash Object
- Load Data into a Hash Object
- Lookup Data using Hash Object Methods
- Chained Lookups
- Hiter Objects

## **Lookup Tables: Combining Data**

*Learning Objective: Combining Data using Data Step and PROC SQL*

- Data Step Merges
- PROC SQL Joins
- Multiple SET Statements
- Combining Data using an Index
- Combining Detail and Summary Data

## **Modifying Data**

*Learning Objective: Modify/Update Data Values using the MODIFY Statement*

- The MODIFY Statement
- Master and Transaction Datasets
- Using an Index
- Control Statements
- Handling Errors

## **Advanced Functions**

*Learning Objective: Creating and Using Advanced Functions*

- Using the LAG function
- Using the COUNT, COUNTC and COUNTW functions
- Using the FIND, FINDC and FINDW functions
- Creating custom functions with Proc FCMP



## **PERL Regular Expression**

*Learning Objective: Use PERL Regular Expressions to Match, Change and Validate data*

- PERL Regular Expressions – PRXMATCH, PRXPARSE and PRXCHANGE
- Metacharacters
- PRX#Functions
- Use PERL Regular Expressions to validate data