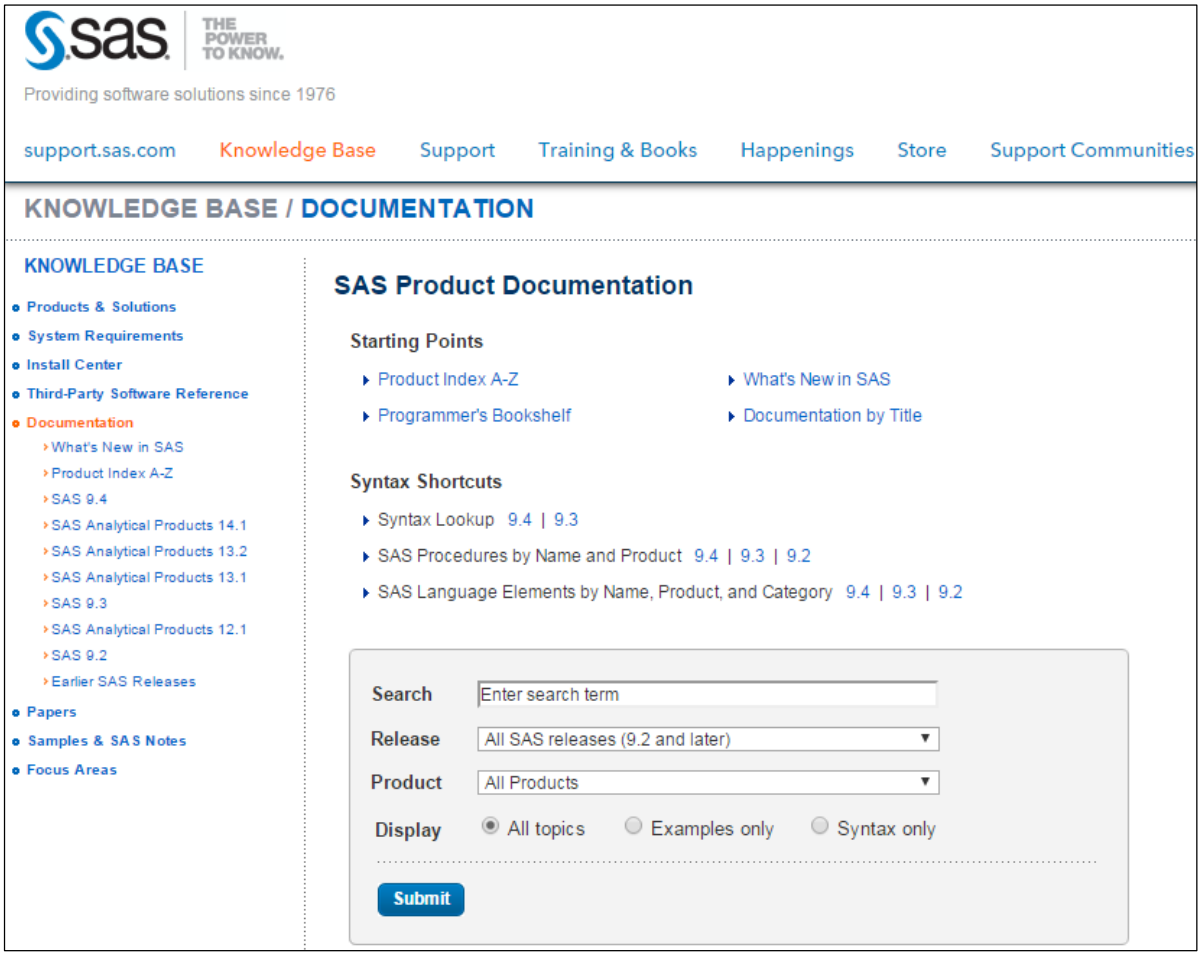
Navigating the Online Documentation

1. Go to the SAS online documentation at **http://support.sas.com/documentation/**.



   You can search SAS syntax using the Syntax Shortcuts or enter a search item in the query box.

2. Click **SAS Analytics Products 14.1**. This is the most recent version of SAS Analytics, a software suite developed by SAS to accomplish different tasks.

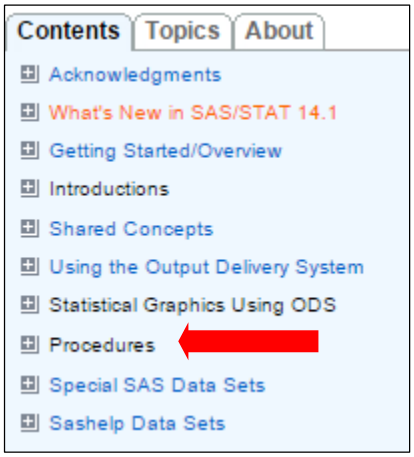
   The following are different licenses of SAS software.

SAS/ETS	provides extensive facilities for analyzing time series and performing financial analysis.
SAS Enterprise Miner	streamlines the data mining process and creates both predictive and descriptive models based on vast amounts of data.
SAS Factory Miner	is a web-based tool that enables you to build models for every segment of your business using a variety of machine learning techniques.
SAS/IML	provides a matrix language to perform simple or complex matrix operations.

SAS/IML Studio	contains a highly flexible programming language that can run SAS/STAT and SAS/IML and display graphics and data tables.
SAS/OR	integrates essential optimization, scheduling, simulation, and related modeling solution capabilities in an adaptable environment. It enables companies to optimize business processes and management challenges.
SAS/QC	provides a comprehensive set of tools for statistical quality improvement and design of experiments.
SAS/STAT	enables the use of high-performance modeling tools for massive data.
SAS Text Miner	enables you to extract information from a collection of text documents and uncover themes and concepts previously concealed.

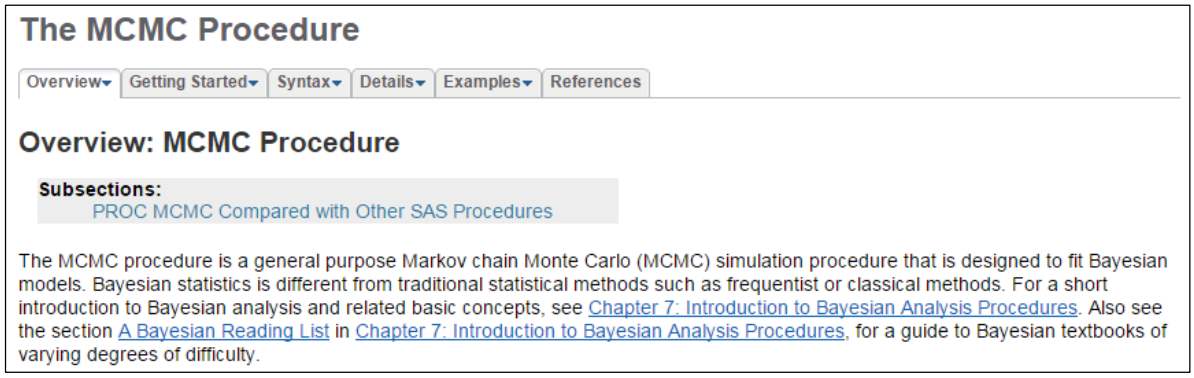
For this course, you use SAS/STAT and SAS/IML extensively.

3. Select **What's New in SAS/STAT 14.1**.
4. Select **Procedures** in the Contents pane.



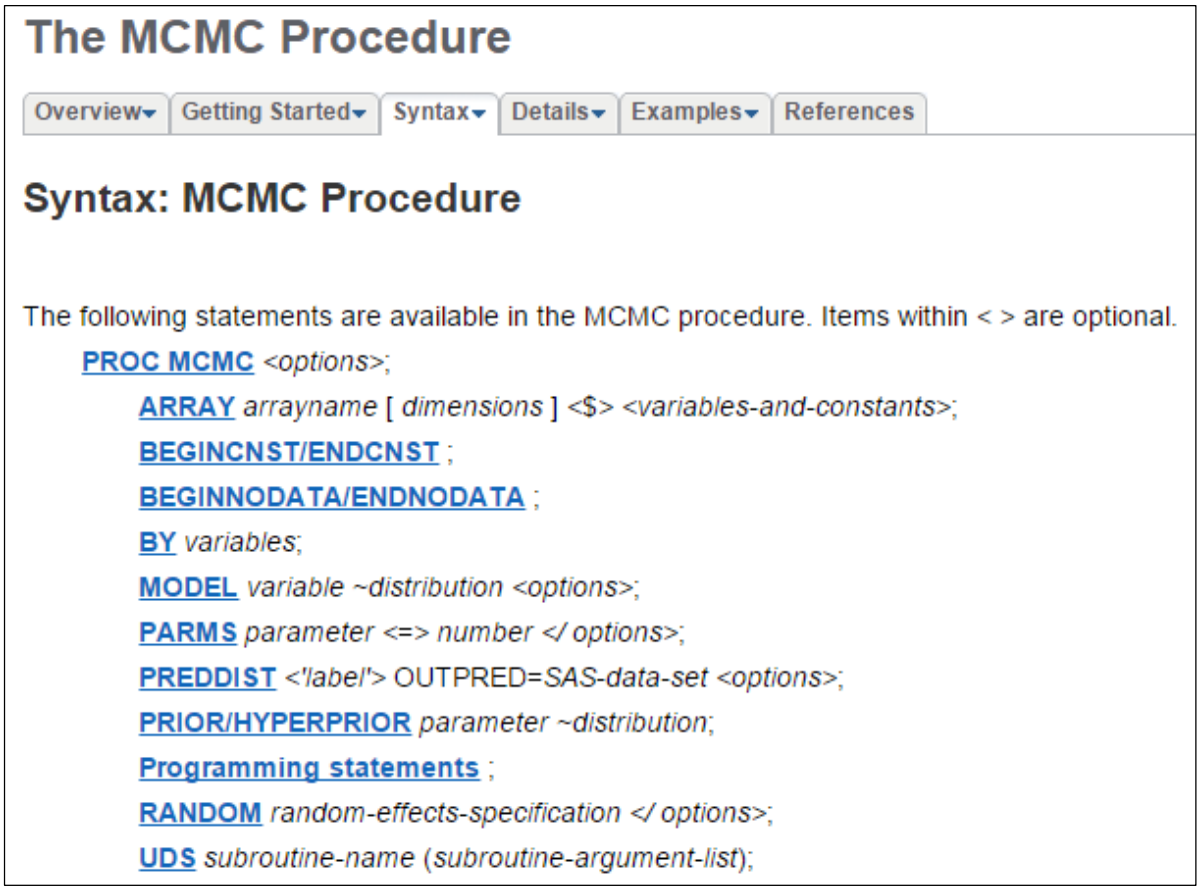
This category lists all the statistical procedures that are available in SAS/STAT. You can also click the **Topics** tab to view procedures according to analysis.

5. Select **The MCMC Procedure** and then select the **Overview** tab.



The Overview tab discusses the procedure and the analyses that it conducts.

6. Click the **Syntax** tab.



The Syntax tab lists all the statements of the procedure and the subsequent code that the user needs to provide. The < > brackets denotes optional syntax. You can select any statement to view options that are available to the user.

7. Select **PROC MCMC** to view the statement options.

Table 73.1: PROC MCMC Statement Options

Option	Description
Basic options	
DATA=	Names the input data set
OUTPOST=	Names the output data set for posterior samples of parameters
Debugging output	
LIST	Displays the model program and variables
LISTCODE	Displays the compiled model program
TRACE	Displays detailed model execution messages
Frequently used MCMC options	
ALG=	Specifies the default sampling algorithm
MAXTUNE=	Specifies the maximum number of tuning loops
MINTUNE=	Specifies the minimum number of tuning loops
NBI=	Specifies the number of burn-in iterations
NMC=	Specifies the number of MCMC iterations, excluding the burn-in iterations
NTHREADS=	Specifies the number of threads to use
NTU=	Specifies the number of tuning iterations
PROPCOV=	Controls options for constructing the initial proposal covariance matrix
SEED=	Specifies the random seed for simulation
THIN=	Specifies the thinning rate

8. Select the **OUTPOST=** option to view a more detailed description.

OUTPOST=*SAS-data-set*
specifies an output data set that contains the posterior samples of all model parameters, the iteration numbers (variable name ITERATION), the log of the posterior density (LOGPOST), the log of the prior density (LOGPRIOR), the log of the hyperprior density (LOGHYPER), if the HYPER statement is used, and the log likelihood (LOGLIKE). Any secondary parameters (assigned using the operator "=") listed in the MONITOR= option are saved to this data set. By default, no OUTPOST= data set is created.

9. There are also opportunities to learn about statistics in the documentation. Select **Metropolis** and **Metropolis-Hastings Algorithms** under the PROPDIST= option.

1. Set $t = 0$. Choose a starting point θ^0. This can be an arbitrary point as long as $f(\theta^0|\mathbf{y}) > 0$.

2. Generate a new sample, θ_{new}, by using the proposal distribution $q(\cdot|\theta^t)$.

3. Calculate the following quantity:

$$r = \min\left\{\frac{f(\theta_{\text{new}}|\mathbf{y})}{f(\theta^t|\mathbf{y})}, 1\right\}$$

4. Sample u from the uniform distribution $U(0, 1)$.

5. Set $\theta^{t+1} = \theta_{\text{new}}$ if $u < r$; otherwise set $\theta^{t+1} = \theta^t$.

6. Set $t = t + 1$. If $t < T$, the number of desired samples, return to step 2. Otherwise, stop.

10. Go back one page and click the **Examples** tab. Then select **Logistic Regression Model with a Diffuse Prior**.

```
title 'Logistic Regression Model with a Diffuse Prior';
data beetles;
   input n y x @@;
   datalines;
6  0  25.7   8  2  35.9   5  2  32.9   7  7  50.4   6  0  28.3
7  2  32.3   5  1  33.2   8  3  40.9   6  0  36.5   6  1  36.5
6  6  49.6   6  3  39.8   6  4  43.6   6  1  34.1   7  1  37.4
8  2  35.2   6  6  51.3   5  3  42.5   7  0  31.3   3  2  40.6
;
```

You can model the data points y_i with a binomial distribution,

$$y_i | p_i \sim \text{binomial}(n_i, p_i)$$

where p_i is the success probability and links to the regression covariate x_i through a logit transformation:

$$logit(p_i) = \log\left(\frac{p_i}{1-p_i}\right) = \alpha + \beta x_i$$

The priors on α and β are both diffuse normal:

$$\begin{aligned} \alpha &\sim \text{normal}(0, \text{var} = 10000) \\ \beta &\sim \text{normal}(0, \text{var} = 10000) \end{aligned}$$

These statements fit a logistic regression with PROC MCMC:

```
ods graphics on;
proc mcmc data=beetles ntu=1000 nmc=20000 propcov=quanew
          diag=(mcse ess) outpost=beetleout seed=246810;
   ods select PostSumInt mcse ess TADpanel;
   parms (alpha  beta) 0;
   prior alpha beta ~ normal(0, var = 10000);
   p = logistic(alpha + beta*x);
   model y ~ binomial(n,p);
run;
```

The documentation provides SAS syntax examples, which might be more helpful when you become comfortable with SAS syntax.