9.4 Random Numbers from Various Distributions

Maple Quick Review Questions

Introduction to Computational Science: Modeling and Simulation for the Sciences
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This file contains system-dependent text along with Quick Review Questions and answers in *Maple* for Module 9.4 on "Random Numbers from Various Distributions." Complete all code development in *Maple*.

Discrete Distributions

Quick Review Question 3 Give the command to generate an appropriate random number for Example 1 in the "Discrete Distributions" section of Module 9.3 on "Random Numbers from Various Distributions."

Quick Review Question 4 Give the statement for the pseudocode at the end of Example 2 in the "Discrete Distributions" section of Module 9.3 on "Random Numbers from Various Distributions." The *if* statement should return *POLLEN* or *EMPTY*, depending on the value of the random number.

Normal Distributions

The *Maple* package ***stats*** has functions to generate random numbers in various distributions, including a normal distribution. To access these functions, we can use the long form of the commands or employ the short form by first loading the package, as follows:

```
with stats;
```

***normald*[*μ*,σ]** represents the normal distribution with mean *μ* and standard deviation σ. The default mean and standard deviation are 0 and 1, respectively. The segment below assigns this representation with mean 0 and standard deviation 1 to *randNormal* and uses *randNormal* in the creation of a table of 1000 random numbers in the Gaussian distribution. Figure 9.4.7 contains the display of a histogram of one such set of numbers.

```
randNormal := stats[random, normald] :
tblNormal := [seq(randNormal(), i = 1..1000)]:
with (stats[statplots]) :
histogram(tblNormal);
```

Quick Review Question 7 Write a *Maple* statement to assign to *n* a random number in a normal distribution with mean 70 and standard deviation 8. Have *n* be the only variable. Thus, place the call to *NormalDistribution* inside the invocation of *Random*.

Exponential Distributions

The *Maple* package *stats* has its own version of this method. ***exponential*[*r*, *a*]** declares the distribution to be of the form $re^{-r(t-a)}$, and ***stats*[*random*, *exponential*[*r*, *a*]]** returns an appropriate random number. For example, the following command assigns to *tblExponential* a list of 1000 random numbers from 0 to infinity in the probability distribution $2e^{-2(t-1)}$:

```
randExponential := stats[random, exponential[2, 1]]:
tblExponential := [seq(randExponential(), i = 1..1000)]:
```

Quick Review Question 9 Consider the following command:

```
stats[random, exponential[5, 0]]();
```

a. Give the probability function.

b. Indicate the interval to which the pseudorandom numbers belong.

A. between 0 and 5 B. between -5 and 0
C. greater than 0 D. less than 0
E. greater than 5 F. less than -5

c. Indicate where such a random number is more likely to be.

A. close to 5 B. close to -5 C. close to 0

Answers to Quick Review Questions

3.
```
rand(1..6)();
```

4.
```
with(stats[random]):
`if`( uniform() < probPollen, POLLEN, EMPTY);
```
or
```
`if`( stats[random, uniform]() < probPollen, POLLEN, EMPTY);
```

7.
```
n := stats[random, normald[70, 5]]();
```

9. **a.** $5e^{-5t}$

b. C. greater than 0

c. C. close to 0