9.4 Random Numbers from Various Distributions

Mathematica 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 *Mathematica* for Module 9.4 on "Random Numbers from Various Distributions." Complete all code development in *Mathematica*.

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 *Mathematica* package ***Statistics`ContinuousDistributions`*** has functions to generate random numbers in various distributions, including a normal distribution. To access these functions, we first load the package, as follows:

```
<< Statistics`ContinuousDistributions`
```

***NormalDistribution*[*μ*,σ]** represents the normal distribution with mean *μ* and standard deviation σ. The segment below assigns this representation with mean 0 and standard deviation 1 to a variable *randNormal* and calls *Random* with argument *randNormal* in the creation of a table of 1000 random numbers in the Gaussian distribution. Figure 9.3.7 contains the display of a histogram of one such set of numbers.

```
randNormal = NormalDistribution[0, 1];
tblNormal = Table[Random[randNormal], {1000}]
Histogram[tblNormal];
```

Quick Review Question 7 Write a *Mathematica* 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 *Mathematica* package *Statistics`ContinuousDistributions`* has its own version of this method. ***ExponentialDistribution*** with argument *r* declares the distribution to be of the form re^{-rt}, and ***Random*[*ExponentialDistribution*[*r*]]** returns an appropriate random number. For example, the following command returns a random number from 0 to infinity in the probability distribution $2e^{-2t}$:

```
Random[ExponentialDistribution[2]]
```

Quick Review Question 9 Consider the following command:

```
Random[ExponentialDistribution[5]]
```

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. `Random[Integer, 6]`

4. `If[Random[] < probPollen, POLLEN, EMPTY]`

7. `n = Random[NormalDistribution[70, 8]]`

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

b. C. greater than 0

c. C. close to 0