

Maple for Module 9.4

File: *Distributions.mw*

Statistical Distributions

Load package containing *histogram* and view documentation.

```
> with(stats):  
> with(stats[statplots]):  
> ?histogram
```

Generate 10000 uniformly distributed random numbers between 0.0 and 1.0 and generate histogram with 10 categories.

```
> with(stats[random]):  
tbl := [uniform(1000)]"  
histogram(tbl, area = count, numbars = 10);
```

Normal Distributions

A normal or Gaussian distribution, which statistics frequently employs, has the following probability density function, where μ is the mean and σ is the standard deviation:

```
> normalPDF := (mu, sigma, x) ->  
exp( -(x-mu)^2/2/sigma^2 ) / sqrt(2*Pi*sigma^2):
```

Produce a plot of this function with mean 70 and standard deviation 5.

```
> plot(normalPDF(70, 5, x), x = 50..90);
```

The following command generates 20 random numbers in a Gaussian distribution with mean 0 and standard deviation 1:

```
> stats[random, normald](20);
```

Load package containing *normald* and view documentation.

```
> with(stats[random]):  
> ?normald
```

One random number from normal distribution with mean 0 and standard deviation 1

```
> randNormal := stats[random, normald]();
```

Generate 1000 random numbers from normal distribution with mean 0 and standard deviation 1. Employs r from above. Display histogram.

```
> tblNormal := [random[normald](1000)] :  
> histogram(tblNormal, area = count, numbars = 100);
```

Generate 1000 random numbers from normal distribution with mean 3 and standard deviation 5. Display

[histogram.

```
[ > tblNormal := [stats[random, normald[3, 5]](1000)]:
```

```
[ > histogram(tblNormal, area = count, numbars = 100);
```

Exponential Distributions

[Graph of an exponential distribution

```
[ > expPDF := (r, a, x) -> r * exp(-r * (x - a)):
```

```
[ > plot(expPDF(2, 1, x), x = 1..4);
```

[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)]:
```

```
[ > with (stats[statplots]):  
  histogram(tblExponential);
```

[Adding 7 moves to right by 7

```
[ > tblExponential := [seq(randExponential()+7, i = 1..1000)]:
```

```
[ > histogram(tblExponential);
```

```
[ >
```