

(\* BIOEN 3070/6070: Introduction to Statistics for Bioengineers \*)

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(\* In-Class Project 2:  
Mean, Variance, and the Poisson Distribution \*)

(\* General Commands \*)

```
Clear["Global`*"]
```

(\* Bulmer (Dover 1979) \*)

(\* Table 13, p. 92 \*)

(\* Observed \*)

```
list = {144, 91, 32, 11, 2, 0};  
dimension = Dimensions[list][[1]];  
list = list / Sum[list[[a]], {a, 1, dimension}];  
mean = N[Sum[(a - 1) * list[[a]], {a, 1, dimension}]]  
variance = N[Sum[((a - 1) - mean)^2 * list[[a]], {a, 1, dimension}]]
```

0.7

0.76

(\* Expected \*)

```
list = {139, 97, 34, 8, 1, 0};  
dimension = Dimensions[list][[1]];  
list = list / Sum[list[[a]], {a, 1, dimension}];  
mean = N[Sum[(a - 1) * list[[a]], {a, 1, dimension}]]  
variance = N[Sum[((a - 1) - mean)^2 * list[[a]], {a, 1, dimension}]]
```

0.691756

0.672011

(\* Table 14, p. 95 \*)

```
list = {57, 203, 383, 525, 532, 408, 273, 139, 45, 27, 10, 4, 0, 1, 1, 0};  
dimension = Dimensions[list][[1]];  
list = list / Sum[list[[a]], {a, 1, dimension}];  
mean = N[Sum[(a - 1) * list[[a]], {a, 1, dimension}]]  
variance = N[Sum[((a - 1) - mean)^2 * list[[a]], {a, 1, dimension}]]
```

3.87155

3.69477

(\* Luria and Delbrück (Genetics 1943) \*)

(\* Table 1, p. 503 \*)

(\* Experiment No. 10a \*)

```
list = {14, 15, 13, 21, 15, 14, 26, 16, 20, 13};
mean = N[Sum[list[[a]], {a, 1, Dimensions[list][[1]]}] / Dimensions[list][[1]]]
variance =
  N[Sum[(list[[a]] - mean)^2, {a, 1, Dimensions[list][[1]]}] / Dimensions[list][[1]]]
16.7
16.41
```

(\* Experiment No. 11a \*)

```
list = {46, 56, 52, 48, 65, 44, 49, 51, 56, 47};
mean = N[Sum[list[[a]], {a, 1, Dimensions[list][[1]]}] / Dimensions[list][[1]]]
variance =
  N[Sum[(list[[a]] - mean)^2, {a, 1, Dimensions[list][[1]]}] / Dimensions[list][[1]]]
51.4
34.84
```

(\* Experiment No. 3 \*)

```
list = {4, 2, 2, 1, 5, 2, 4, 2, 4, 7};
mean = N[Sum[list[[a]], {a, 1, Dimensions[list][[1]]}] / Dimensions[list][[1]]]
variance =
  N[Sum[(list[[a]] - mean)^2, {a, 1, Dimensions[list][[1]]}] / Dimensions[list][[1]]]
3.3
3.01
```

(\* Table 2, p. 503 \*)

(\* Experiment No. 15 \*)

```
list = {6, 5, 10, 8, 24, 13, 165, 15, 6, 10};
mean = N[Sum[list[[a]], {a, 1, Dimensions[list][[1]]}] / Dimensions[list][[1]]]
variance =
  N[Sum[(list[[a]] - mean)^2, {a, 1, Dimensions[list][[1]]}] / Dimensions[list][[1]]]
26.2
2169.16
```

(\* Compare the results from Table 1 to those from Table 2. Explain. \*)

(\* What relationship would you expect regarding the mean and the variance of the combined observations from Experiments No. 10a, 11a and 3 in Table 1 to be? Explain. \*)