Ph3 Set 8

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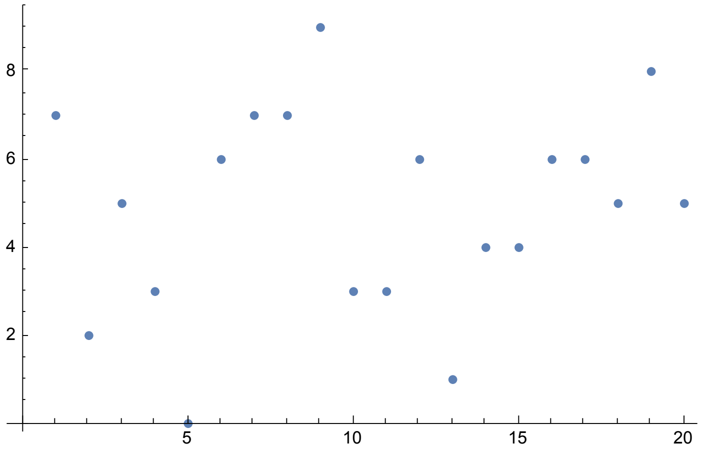
```
randnums = Table[Round@Mod[MantissaExponent[N@1 / 7 ^ (i)][[1]] * 10 ^ (6), 10], {i, 20}]
```

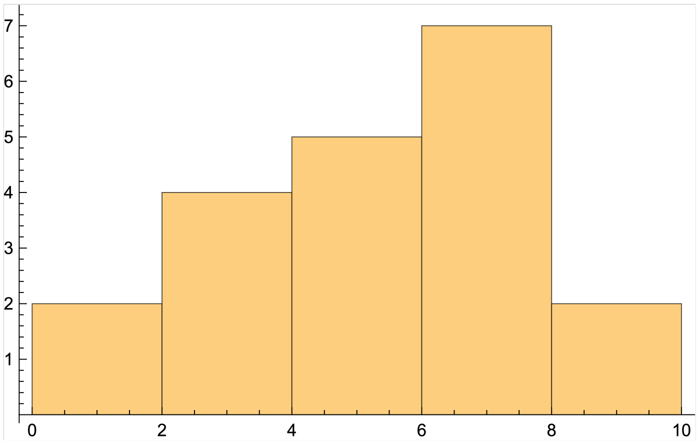
```
{7, 2, 5, 3, 0, 6, 7, 7, 9, 3, 3, 6, 1, 4, 4, 6, 6, 5, 8, 5}
```

They look reasonably random.

```
ListPlot@randnums
```



```
Histogram@randnums
```



It looks much less random when plotted as a histogram; we can see that the numbers between 0 and 2 and between 8 and 10 are much less frequently chosen.

```
RandomReal[{0, 1}]
```

```
0.145634
```

```
RandomReal[{0, 1}]
```

```
0.472807
```

```
RandomReal[{0, 1}]
```

```
0.360859
```

```
SeedRandom[1]
RandomReal[{0, 1}]
```

```
0.817389
```

```
SeedRandom[1]
RandomReal[{0, 1}]
```

```
0.817389
```

```
SeedRandom[1]
RandomReal[{0, 1}]
```

```
0.817389
```

```
N@Sqrt[22] / 25
```

```
0.187617
```

Uncertainty is 0.187617, which is about 5% of Pi. Therefore we got lucky with the 1% error.
In order to get 1% accuracy, if we sample x points, then the number counted will be on average x(1-Pi/4) so the uncertainty in Pi will be 4*[x(1-Pi/4)]^(1/2)/x. If we set this equal to Pi/100, we get:

```
x = N@(((Pi / 400) ^2) / (1 - Pi / 4)) ^ (-1)
```

```
3478.99
```

So we’d need 3479 points to consistently get 1% accuracy.

```
numpts = 3479;
randomdata = RandomReal[{0, 1}, {numpts, 2}];
N@4 * Total@Map[If[#[[2]] ^2 > 1 - #[[1]] ^2, 0, 1 / numpts] &, randomdata]
```

```
3.12389
```