Dataset 3: Bike Frequency

B: Poisson Distribution, Estimates

Why is this a Poisson distribution?

- Independent events (unless there's a gang)
- Bikes occupy physical space, two bikes cannot pass the same spot in the same instant
- Has a ratio of expected number of events per time unit

Calculations

$\hat{\lambda} = \frac{X}{t}$

```
lambda = 78 / 30
```

```
lambda = 2.6000
```

$Var(X) = \lambda t$

```
variance = lambda * 30
```

```
variance = 78
```

```
%variance = total;
```

$\hat{\sigma} = \sqrt{Var(X)} = \sqrt{\lambda t}$

```
standard_deviation = sqrt(variance)
```

```
standard_deviation = 8.8318
```

$\hat{\mu} = \hat{\lambda} \cdot t = \frac{X}{t} \cdot t = X$

```
forventning = 78
```

```
forventning = 78
```

Assuming that the estimates of μ and σ are the exact values:

$P(X = x) = \frac{(\lambda t)^x}{x!} e^{-\lambda t}$

$P(X > \mu + \sigma) = 1 - P(X \leq \mu + \sigma)$

```
P = @(x) exp(-78)*78^x / factorial(x)
```

```
P = function_handle with value:
    @(x)exp(-78)*78^x/factorial(x)
```

```
standard_deviation + forventning
```

```
ans = 86.8318
```

```
limit = round(forventning + standard_deviation, 0, "decimals")
```

```
limit = 87
```

```
p = 1;
for i=0:limit - 1
    p = p - P(i);
end
sprintf('The probability of \nX exceeding those parameters\nis %f', p)
```

```
ans = 
    'The probability of 
     X exceeding those parameters
     is 0.167454'
```

Graphs

Parameter: $\hat{\lambda} \cdot t = \frac{x}{t} \cdot t = x$

```
x = 50:110;
plot(x, poisspdf(x,78))
title('Probability of x bikes per 30 minutes')
```