Formative Assessment 7

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Question 1

In Example 16.3 with $\lambda = 4$ per minute, use R to obtain:
(a) $P(T \leq 0.25)$ = P(time between submissions is at most 15 seconds);

```
average_occurence = 4
k <- pexp(0.25, average_occurence)
k
```

```
## [1] 0.6321206
```

(b) $P(T > 0.5)$ = P(time between submissions is greater than 30 seconds);

```
average_occurence = 4
k <- 1-pexp(0.5, average_occurence)
k
```

```
## [1] 0.1353353
```

(c) $P(0.25 < T < 1)$ = P(time between submissions is between 15 seconds and 1 minute).

```
average_occurence = 4
k <- pexp(1, average_occurence)-pexp(0.25, average_occurence)
k
```

```
## [1] 0.3495638
```

Question 3 The average rate of job submissions in a computer center is 2 per minute. If it can be assumed that the number of submissions per minute has a Poisson distribution, calculate the probability that:
(a) more than two jobs will arrive in a minute;

```
average_occurence <- 2
x <- 0:2
prob_morethan_2 <- 1 - sum(dpois(x, average_occurence))
cat("Probability of more than two jobs arriving in a minute:", prob_morethan_2)
```

```
## Probability of more than two jobs arriving in a minute: 0.3233236
```

(b) at least 30 seconds will elapse between any two jobs;
$P(T \geq 0.5)$= P(time between submissions is at least 30 seconds)

```
k <- 1 - pexp(30/60, average_occurence)
k
```

```
## [1] 0.3678794
```

(c) less than 30 seconds will elapse between jobs;
$P(T < 0.5)$= P(time between submissions is less than 30 seconds)

```
k <- pexp(30/60, average_occurence)
k
```

```
## [1] 0.6321206
```

(d) a job will arrive in the next 30 seconds, if no jobs have arrived in the last 30 seconds.
$P(0.5 \leq T \leq 1)$= P(time between submissions is in between of 30 and 60 seconds)

```
k <- pexp(60/60, average_occurence) - pexp(30/60, average_occurence)
k
```

```
## [1] 0.2325442
```

Question 7

A website receives an average of 15 visits per hour, which arrive following a Poisson distribution.
(a) Calculate the probability that at least 10 minutes will elapse without a visit.
10 minutes is 0.16666667 of an hour
$P(0.16666667 \leq T)$= P(time between visits is at least 10 minutes)

```
average_occurence = 15
k <- pexp(0.16666667, average_occurence)
k
```

```
## [1] 0.917915
```

(b) What is the probability that in any hour, there will be less than eight visits?
$P(X < 8)$= P(less than eight visits)

```
k <- ppois(7, average_occurence)
k
```

```
## [1] 0.01800219
```

(c) Suppose that 15 minutes have elapsed since the last visit, what is the probability that a visit will occur in the next 15 minutes.
$P(0.25 < T \leq 0.5)$= P(time between visits is between 15 and 30 minutes)

```
k <- pexp(0.5, average_occurence) - pexp(0.25, average_occurence)
k
```

```
## [1] 0.02296466
```

(d) Calculate the top quartile, and explain what it means

```
k <- qpois(0.75, average_occurence)
k
```

```
## [1] 18
```