DATA605 - Disc 5

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7 A die is rolled until the first time T that a six turns up.

### (a) What is the probability distribution for T ?

From Wikipedia[1] "The geometric distribution gives the probability that the first occurrence of success requires k independent trials, each with success probability p. If the probability of success on each trial is p, then the probability that the kth trial (out of k trials) is the first success is $Pr(X = k) = (1-p)^{k-1}p$"

Or as the book defines it $P(T = n) = q^{n-1}p$ where $q = 1 - p$

Probability of rolling a six on a fair die is $Pr(6) = \frac{1}{6}$

Plot using the density function

```
plot(dgeom(1:25,1/6))
```
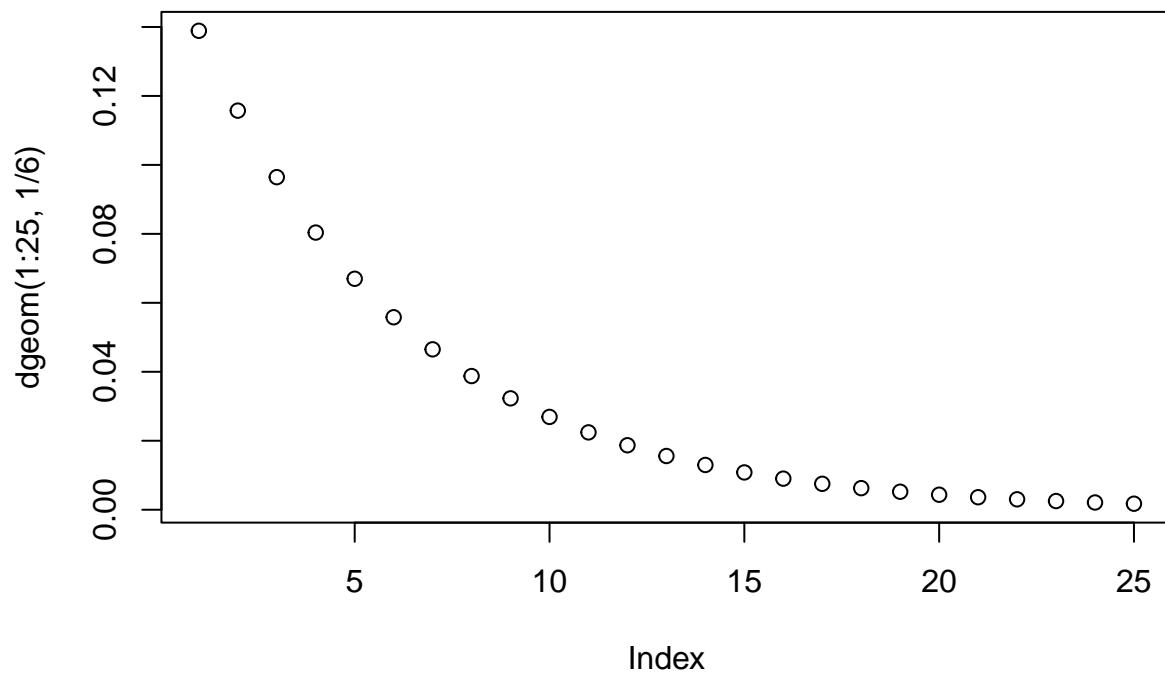
[1]https://en.wikipedia.org/wiki/Geometric_distribution/

(b) Find P (T > 3)

$$P(T > 3) = (1 - \frac{1}{6})^{3-1}\frac{1}{6}$$

```
((1 - (1/6)) ^ (4 -1)) * (1/6)
```

```
## [1] 0.09645062
```

```
dgeom(3, 1/6)
```

```
## [1] 0.09645062
```

(c) Find P (T > 6|T > 3)

From the book $P(T > r + s | T > s) = q^s$ where $q = 1 - p$

```
(1-(1/6))^3
```

```
## [1] 0.5787037
```