R tutorial

Meng Cao

2/1/2018

Try R as a calculator:

1) $15 + 3$

```
15 + 3
```

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

2) $\sqrt{4}$

```
sqrt(4)
```

```
## [1] 2
```

3) 3×15

```
3 * 15
```

```
## [1] 45
```

4) $7/3$

```
7/3
```

```
## [1] 2.333333
```

5) 4^2

```
4^2
```

```
## [1] 16
```

Binomial distribution with R:

1) Help Binomial

```
?Binomial
```

2) If $X \sim$ Bernoulli $(p = 0.5)$, calculate $P(X = 1)$.

Use the following R function:

dbinom(x, size, prob, log = FALSE)

x: value we are interested in (in this example 1)

size: n, number of Bernoulli trails (in this example 1)

prob: probability of $X = 1$

```
dbinom(1, 1, 0.5)
```

```
## [1] 0.5
```

3) If $X \sim$ Binomial $(n = 10, p = 0.5)$, calculate $P(X = 2)$.

```r
n = 10
x = 2
p = 0.5
dbinom(x, n, p)
```

```
## [1] 0.04394531
```

```r
choose(n, x) * (p)^x * (1 - p)^(n - x)
```

```
## [1] 0.04394531
```

4) If $X \sim$ Binomial $(n = 10, p = 0.5)$, calculate $P(X \leq 2)$.

Use the following R function:

dbinom(x, size, prob, log = FALSE)

x: value we are interested in (in this example 2)

size: n, number of Bernoulli trails (in this example 10)

prob: probability of $X = 1$

```r
n = 10
x = 2
p = 0.5
pbinom(x, n, p)
```

```
## [1] 0.0546875
```

```r
result = 0
for(ii in c(0:x)){
  result = result + choose(n, ii) * (p)^ii * (1 - p)^(n - ii)
}
result
```

```
## [1] 0.0546875
```

5) Bolts Example in Lesson 8:

$X \sim \text{Binom}(n = 25, p = 0.05)$

a) $P(X = 2)$

```r
n = 25
x = 2
p = 0.05
dbinom(x, n, p)
```

```
## [1] 0.2305177
```

b) $P(X \leq 4)$

```r
n = 25
x = 4
p = 0.05
pbinom(x, n, p)
```

```
## [1] 0.9928351
```

c) $P(X > 4)$

```r
n = 25
x = 4
p = 0.05
1 - pbinom(x, n, p)
```

```
## [1] 0.007164948
```

d) $E[X] = n \times p$

```r
n = 25
p = 0.05
n*p
```

```
## [1] 1.25
```

$SD(X) = \sqrt{n \times p \times (1-p)}$

```r
n = 25
p = 0.05
sqrt(n*p*(1-p))
```

```
## [1] 1.089725
```

6) Medication: $X \sim \text{Binom}(n = 12, p = 0.5)$

a) $P(X \geq 11)$

```r
n = 12
x = 10
p = 0.5
1 - pbinom(x, n, p)
```

```
## [1] 0.003173828
```

b) No, it would be very unlikely to see this result for an ineffective medicine.