Summation Notation

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Summation

The symbol, Σ (called sigma) means “sum”. The lower bound tells you what value to start the summation from and the upper bound tells you when to stop the summation.

Let us consider some examples.

$$\sum_{x=1}^{4} x = 1 + 2 + 3 + 4 = 10$$

Here we have substituted the values x=1, x=2, x=3 and x=4 into the function (in this case the function is just x) and we add them together.

In R we would tell it to do:

```
> sum(1:4)

[1] 10
```

Summation via for loop

Now suppose we are given the vector n = (10, 20, 30) and we want to calculate:

$$\sum_{i=1}^{3} n_i = n_1 + n_2 + n_3 = 10 + 20 + 30 = 60$$

In R we would use the commands:

```
> n <- c(10, 20, 30)

> sum_n <- 0

> for (i in 1:3) sum_n <- sum_n + n[i]

> sum_n

[1] 60
```

Summation example

Functions can be more elaborate too:

$$\sum_{x=1}^{4} x(x+1) = (1 \times 2) + (2 \times 3) + (3 \times 4) + (4 \times 5) = 40$$

How would you code this in R?

Summation example solution

Functions can be more elaborate too:

$$\sum_{x=1}^{4} x(x+1) = (1 \times 2) + (2 \times 3) + (3 \times 4) + (4 \times 5) = 40$$

How would you code this in R?

```
> y <- 0

> for (x in 1:4) y <- y + x*(x+1)

> y

[1] 40
```