ISAT381

# Assignment 1

# Creating R Vectors (35 Points)

|  |
| --- |
| **INSTRUCTIONS**   * **Copy and paste the R commands you type in, along with the outputs, under each question. You should use the "Text Highlight Color" feature in WORD for all your answers.**   Example:  Question: Create a vector, named *x*, that contains 2, 4, and 6. Print (displpay) x.  > x <- c(2,4,6)  > x  [1] 2 4 6 |

**Problem:**

1. (2 points) Create a vector that contains five numeric data: **6.7, 8.9, 10.2, -29, 49.5, -20**. Assign the vector to a variable, named **x1**. **Print (display) x1** to verify that it has been created correctly.

x1 <- c(6.7,8.9,10.2,-29,49.5,-20)

> x1

[1] 6.7 8.9 10.2 -29.0 49.5 -20.0

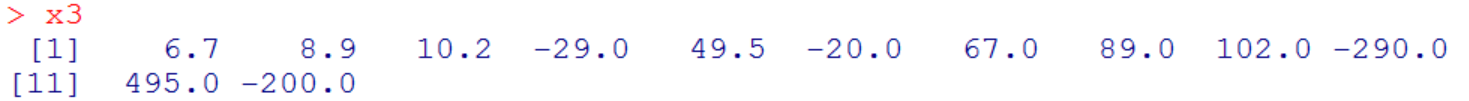
2. (2 points) Multiple the vector x1 by 10 and assign the result to another variable, named x2. Print (display) x2.

> x2 <- x1 \* 10

>x2

[1] 67 89 102 -290 495 -200

3. (2 points) Combine the two vectors (x1 and x2) you just created. Assign the result to the third variable, named x3. Print (display) x3. The output of x3 should appear as follows:



> x3 <- c(x1, x2)

> x3

[1] 6.7 8.9 10.2 -29.0 49.5 -20.0 67.0 89.0 102.0 -290.0

[11] 495.0 -200.0

4. (4 points) First create the following 2 vectors and **print these two vectors**

>a1 = c(2,4,6,8)   
>a2 = c(10,20)

> a1

[1] 2 4 6 8

> a2

[1] 10 20

Then multiple a1 by a2 and assign the output to a3. **Print a3.**

> a3 = a1\*a2

> a3

[1] 20 80 60 160

As you have noticed, a1 and a2 are of unequal length. **What rule has been applied to execute the command listed above?**

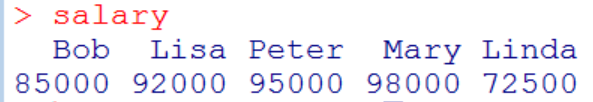
**The shorter one will be recycled to do the math again**

5. (5 points) Create a vector *salary* that contains the annual income data for Bob, Lisa, Peter, Mary, and Linda. NOTE:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Employee | Bob | Lisa | Peter | Mary | Linda |
| Salary | 85000 | 92000 | 95000 | 98000 | 72500 |

You should use the two options mentioned in the lecture to assign names to the vector components. **(Lecture 4: Slides #18 and #19)**

When you print the "salary," the output should appear as below:



Salary <- c(“Bob” = 85000, “Lisa” = 92000, “Peter” = 95000, “Mary” = 98000, “Linda” = 72500)

6. (5 points) Create the following sequences (sequenced vectors):

1. Create a vector s1 containing the integers **between 10 and 20 in increasing sequence**.

> s1 <- c(10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20)

1. Create a vector s2 containing the integers **between 20 and 10 in decreasing sequence**..

> s2 <- c(20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10)

1. Use the seq() function to create a vector s3 containing **a sequence of values between 1 and 40 in steps of 3**.

s3 <- seq(from=10, to=20, by=3)

1. Use the seq() function to create a vector s4 containing **a sequence of 3 values between 1 and 40**.

s4 <- seq(1, 40, length = 3)

7. (5 points) Use the **rep()** function to create:

a) a vector containing the following numbers:

1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4

> rep(1:4, 5)

[1] 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4

b) a vector containing the following numbers:

1 4 1 4 1 4 1 4 1 4

rep(c(1,4),5)

[1] 1 4 1 4 1 4 1 4 1 4

c) a vector containing the following numbers:

1 1 1 1 1 2 2 2 2 2 3 3 3 3 3 4 4 4 4 4

> rep(1:4, each=5)

[1] 1 1 1 1 1 2 2 2 2 2 3 3 3 3 3 4 4 4 4 4

d) a vector containing the following numbers:

1 2 2 3 3 3 4 4 4 4

> rep(1:4, c(1, 2, 3, 4))

[1] 1 2 2 3 3 3 4 4 4 4

8. (5 points) A vector named city containing data of several cities in Illinois, shown as follows:

> city = c("Carbondale","Chicago","Bloomington","Naperville","Centralia")

Use the appropriate indexing operation to select (access) either an individual element or multiple elements of the city vector:

1. Select only Chicago.

> city[2]

[1] "Chicago"

1. Select only Carbondale and Naperville.

city[c(1,4)]

[1] "Carbondale" "Naperville"

1. Use the **range index** to select the cities of Carbondale, Chicago, Bloomington, and Naperville.

city[1:4]

[1] "Carbondale" "Chicago" "Bloomington" "Naperville"

1. Use the **negative index** to select cities producing the same result as that in Question 8.c.

city[-5]

[1] "Carbondale" "Chicago" "Bloomington" "Naperville"

9. (5 points) The vector x has been created:

> x = c(0,21, -31, 51, -1 ,46 , 90, -20)

Use the appropriate indexing operation to select (access) either an individual element or multiple elements of the vector:

1. Select only those elements great than 0

> x[x>0]

[1] 21 51 46 90

1. > Select only those elements between -25 and 50.

> x[x>-25 & x<50]

[1] 0 21 -1 46 -20

1. Select only those elements less than -25 or those great than 50.

> x[x<-25 | x>50]

[1] 0 21 -31 51 -1 46 90 -20