Using loops in R

stirlingcodingclub.github.io/using_loops/loop_notes.html

Stirling Coding Club

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How would you do it in R (without a loop)?

How would you explain what you want to do (verbally)?

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How would you do it in R (without a loop)?

How would you explain what you want to do (verbally)?

1. For each integer from 1 to 1000
2. If the number is odd, print it
3. If the number is even, divide by the number then print it
4. Stop when when finished printing

What is a loop?

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Suppose you want to print the following sequence:

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How would you do it in R (without a loop)?

How would you explain what you want to do (verbally)?

- For $x = 1, 2, 3, ..., 999, 1000$
  - Check if x is even
  - If x is not even, then print x
  - If x is even, then print $1/x$
- Stop when all x values have been considered

Using a for loop in R

```r
for(x in 1:1000){         # The loop starts here



    # Do everything within these brackets,
    #     in the order set by 1:1000
    #     i.e., for x = 1, then x = 2,
    #     then x = 3, ..., then x = 1000

    # Finish the loop only after 'x' has
    #     substituted for each value



} # The loop ends here
```

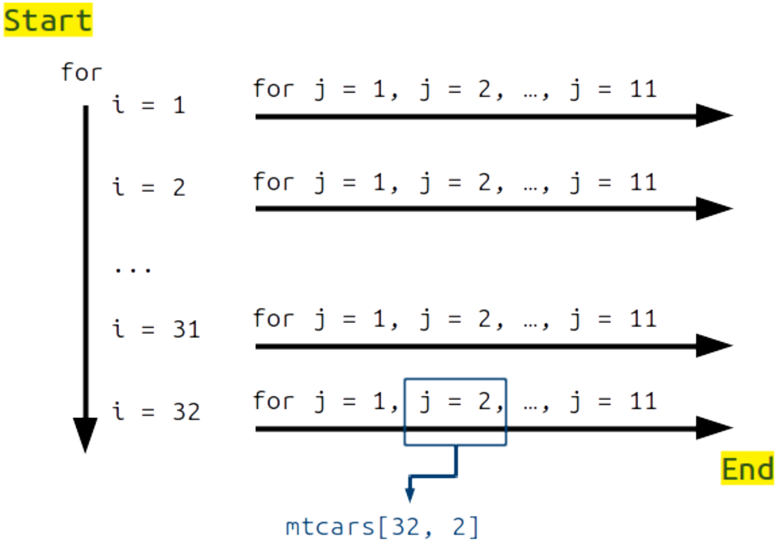
Using a for loop in R

```
for(x in 1:1000){         # The loop starts here

    is_odd <- TRUE;       # First assume'x' is odd
    if(x %% 2 == 0){      # If 'x' is not odd
        is_odd <- FALSE;  # Set to false
    }                     # Now know if 'x' is odd

    if(is_odd == TRUE){   # If 'x' is odd,
        print(x);         # then print 'x'
    }else{                # Else it is even,
        print(1/x);       # so print 1/x
    }
} # The loop ends here
```

Loops can be inside other loops

```
data(mtcars) # Read in R table of data about cars
rows <- dim(mtcars)[1]; # Get total mtcars rows
cols <- dim(mtcars)[2]; # Get total mtcars columns
for(i in 1:rows){            # for each row
    for(j in 1:cols){        # for each column
        print(mtcars[i, j]); # print the value
    }
}
```

Loops can be inside other loops



Start
for
i = 1
for j = 1, j = 2, …, j = 11
i = 2
for j = 1, j = 2, …, j = 11
...
i = 31
for j = 1, j = 2, …, j = 11
i = 32
for j = 1, j = 2, …, j = 11
End
mtcars[32, 2]

While loops in R

Same idea as a `for` loop, but different termination condition

```
counter <- 200; # Set a counter outside the loop
while(counter > 0){ # Keep looping while counter > 0

    print(counter);

    counter <- counter - 1; # Avoid infinite loop

} # The loop ends here
```

Guided with with using_loop notes

- **Feel free now to work through the guided notes on using loops, or to practice using loops with your own code**

- **Notes include five practice problems, with suggested answers, to get started**

https://stirlingcodingclub.github.io/using_loops/loop_notes.html

Practice problems

1. Using a `for` or `while` loop, print all of the numbers from 1 to 1000 that are multiples of 17
2. Using `data(nhtemp)`, write a loop to add up the temperatures *for all of the even numbered years*, then divide by the total number of even numbered years to get the average.
3. Using a `while` loop, calculate the sum of the series, $Y = \frac{4}{1} - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11} + \ldots$ to at least 10000 terms. What does Y appear to approach as more terms are added?
4. Write a while loop that keeps printing numbers sampled from $\mathcal{N}(0, 1)$, but stops after sampling a number > 1.
5. Create an 8×8 matrix `mat` with diagonal values of 1 and off-diagonal selected from $\mathcal{N}(0, 1)$. Swap elements `mat[i, j]` with `mat[j, i]` **only** if `mat[i, j] < mat[j, i]`

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