

# for/while Loops

A Quick Review

# Repetition Structures

- Program: a sequence of instructions
- *Repetition structure*: allows a code segment to be repeated
  - `for`
  - `while`
- *Decision structure*: allows the computer to decide between different courses of action
  - `if/elseif/else`
  - Logical operators
  - `switch`

# Repetition Structures

- Consider the vector  $a = [10 \ 40 \ 100 \ 12]$
- We want to create the vector  $b = a/2$

- One implementation:

```
a = [10 40 100 12]
```

```
b(1) = a(1) / 2
```

```
b(2) = a(2) / 2
```

```
b(3) = a(3) / 2
```

```
b(4) = a(4) / 2
```

```
Command Window

a =
    10    40   100    12

b =
     5

b =
     5    20

b =
     5    20    50

b =
     5    20    50     6
```

# for Loops

- General syntax:

```
for index=start:step:finish  
    statements  
end
```

- `index`: variable set at an initial value, `start`
- If  $\text{index} \leq \text{finish}$ , program executes statements
- `index` is incremented by `step` once the computer reaches `end`
- Process continues until  $\text{index} > \text{finish}$  → loop exits

# for Loops

```
for index=start:step:finish
    statements
end
```

- If `step=1` it can be omitted
  - `start:1:finish = start:finish`
- `start`, `step`, and `finish` can be any numbers (incl. negatives)
- `index` can be named anything, typically `i`

# while Loops

- General syntax:

```
while condition
    statements
end
```

- statements are repeated as long as condition is true
- Typically must manually increment/decrement some variable within statements to eventually switch condition from true to false

# for vs while Loops

Use a `for` loop when:

- You know in advance how many times you want to iterate
- Common usage:
  - Filling the elements of a vector/matrix
  - Repeating a calculation  $n$  times

Use a `while` loop when:

- You do *NOT* know in advance how many times you want to iterate
- Common usage:
  - Repeating a calculation to satisfy an error criterion

# for vs while Loops

- “How much money did I earn in the last month?”
  - `while` loop; number of paychecks/month varied
- “How much money did I earn from the last 4 paychecks?”
  - `for` loop; I am only counting the last 4 paychecks

