

- Previous Lecture:
  - 1-d array—vector
  - Easy plots in MATLAB
- Today's Lecture:
  - Easy plots in MATLAB
  - Array of characters—string
- Reading:
  - CFile: Chapter 5 Sec 5.2

## Example 3: Take a hike!

random

- Write a function `randomWalk` to perform  $n$  steps of random walk:
 

```
function randomWalk(n,x0,y0)
```
- Display the walk

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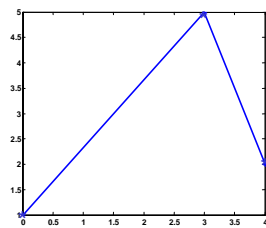
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## Drawing plots

```
a= [0 3 4];
b= [1 5 2];
plot(a,b,'-*')
```

Function name  
x-values  
y-values  
Line/marker format



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## Drawing plots

Draw multiple graphs in the same plot by specifying additional pairs of vectors as arguments in function `plot`. Let  $a$ ,  $b$ ,  $c$ ,  $d$  be vectors, then

```
plot(a,b,'-',c,d,'*')
```

draws 2 graphs:  $a$  vs  $b$  as a line and  $c$  vs  $d$  as asterisks. The pair of vectors storing the  $x$ - and  $y$ -values must have the same length.

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## Drawing plots

To add a title and  $x$ - and  $y$ -axis label, use the menus on the figure window or use the following commands:

```
title('your plot title')
xlabel('name of x-axis')
ylabel('name of y-axis')
```

Use Matlab's help facility to learn more!

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## Characters

- A word is made up of letters
- A sentence is made up of letters, punctuation marks, blanks, even digits. It is an **array of characters**.
- The character array `'CS100M rocks!'` is of length 13, has 8 letters, 3 digits, 1 blank, and 1 symbol.
- Use **single quotes** to enclose characters:
  - `'100'` is a (character) vector of length 3
  - `100` is a numeric value

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## Characters

Use **single quotes** to enclose characters:

- `'100'` is a character array of length 3
- `100` is a numeric value
- `'pi'` is a character array of length 2
- `pi` is the built-in constant 3.1416...
- `'x'` is a character (array of length 1)
- `x` may be a variable name in your program

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## Some useful string functions

```
str= 'Cs 100';
isletter(str) %[1 1 0 0 0 0]
isspace(str)  %[0 0 1 0 0 0]
lower(str)    %'cs 100'
upper(str)    %'CS 100'
ischar(str)   %is str a char
              %array? Answer is 1
```

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## Example

Write a function to capitalize the 1st letter of each word in a string. Assume that the string has lower case letters and blanks only.

```
function [str, nCaps] = caps(str)
% Post: Capitalize 1st ltr of each word.
% str= partially capitalized string
% nCaps= no. of capital letters
% Pre: str= string with lower case ltrs & blanks only
```

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## ASCII characters

| <i>ascii code</i> | <i>Character</i> | <i>ascii code</i> | <i>Character</i> |
|-------------------|------------------|-------------------|------------------|
| :                 | :                | :                 | :                |
| :                 | :                | :                 | :                |
| 65                | 'A'              | 48                | '0'              |
| 66                | 'B'              | 49                | '1'              |
| 67                | 'C'              | 50                | '2'              |
| :                 | :                | :                 | :                |
| 90                | 'Z'              | 57                | '9'              |
| :                 | :                | :                 | :                |

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## Character vs ASCII code

```
str= 'Age 19'
%a1-d array of characters
code= double(str)
%convert chars to ascii values
str1= char(code)
%convert ascii values to chars
```

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## Arithmetic with characters

- You can "do math" with characters!
- `'c'-'a'` gives 2
- `'6'-'5'` gives 1
- `letter1='e'; letter2='f'; letter1-letter2` gives -1
- `'c'>'a'` gives true
- `letter1==letter2` gives false

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### Example: toUpperCase

Write a function `toUpperCase(char)` to convert character `char` to upper case if `char` is a lower case letter. Return the converted letter. If `char` is not a lower case letter, simply return the character `char`.

Do not use Matlab's function `upper`!

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### Example: search in a DNA strand

Write a function to find the number of occurrences of a specific pattern in a DNA string. E.g. `'agt'` occurs 2 times in `'gcagttacagt'`

```
function n = countPattern(pat, str)
%Post: n= no. of times pat appears in str
%Pre: 1 <= length(pat) <= length(str)
```

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