- Previous Lecture:
  - User-defined functions
    - Examples with varying numbers of input and output parameters
    - Local memory space
- Today's Lecture:
  - Probability and random numbers
  - 1-d array—vector
  - More MATLAB graphics
- Announcement:
  - Section this week in the computer labs
  - P3 posted, due 3/6 at 6pm

## Random numbers

- Pseudorandom numbers in programming
- Function rand (...) generates random real numbers in the interval (0,1). All numbers in the interval (0,1) are equally likely to occur—uniform probability distribution.
- Examples:

```
rand(1) one random # in (0,1)
6*rand(1) one random # in (0,6)
6*rand(1)+1 one random # in (1,7)
```

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## Simulate a fair 6-sided die

Which expression(s) below will give a random *integer* in [1..6] with equal likelihood?

- A round(rand(1)\*6)
- B ceil(rand(1)\*6)
- Both expressions above

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% Simulate the rolling of 2 fair dice totalOutcome= ???

- A ceil(rand(1)\*12)
- B ceil(rand(1)\*11)+1
- floor(rand(1)\*11)+2
- 2 of the above
- None of the above

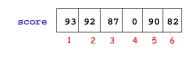
Discover the answer in section this week!

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## 1-d array: vector

- An array is a named collection of like data organized into rows or columns
- A 1-d array is a row or a column, called a *vector*
- An index identifies the position of a value in a vector



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Array index starts at 1

x 5 .4 .91 -4 -1 7

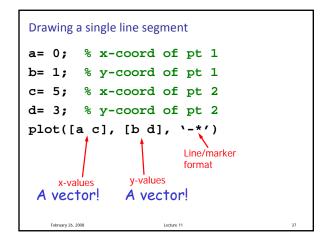
Let k be the index of vector x, then

- k must be a positive integer
- 1<= k <= length(x)</p>
- To access the kth element: x(k)

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Lecture slides



```
Prawing a polygon (multiple line segments)

% Draw a rectangle with the lower-left
% corner at (a,b), width w, height h.

x=[ ]; % x data
y=[ ]; % y data
plot(x, y)

Fill in the missing vector values!
```

```
Color is 3-vector, sometimes called the RGB values

Any color is a mix of red, green, and blue

Example:

c= [0.4 0.6 0]

Each component is a real value in [0,1]

[0 0 0] is white

[1 1 1] is black
```

```
Let's compute colors!
Show "all combinations" of red and blue

Assume some kind of granularity—discretize the color value range for red and blue
Assume no contribution from green (set to 0)

Program development:

Compute the color first; worry about drawing later
Decide on granularity, say, Δ=.25
```

```
% All combinations of R and B

gran= 0.25; %granularity

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```

Things to consider/try on the color computation problem
The granularity was the programmer's choice
Choosing how to display the colors was a design problem!
What if you want compute "all combinations" of the R, G, and B values? How would the program change?
Another design problem: how to show all color combinations of the 3-vector on a 2-dimensional plot?

Lecture slides 2