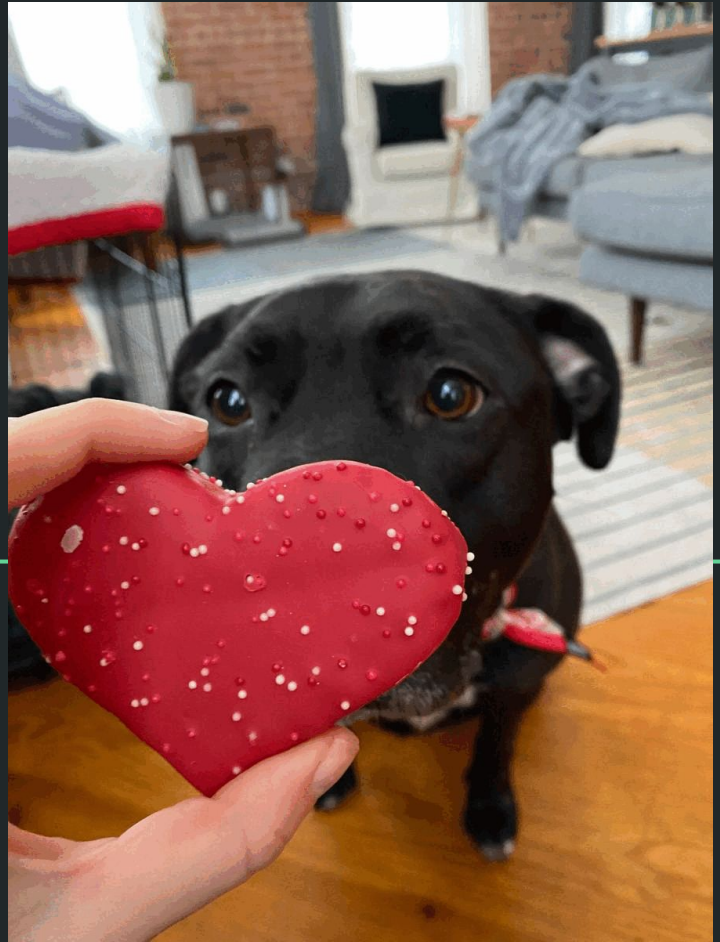


week 4!



so far in the course we've used single variables

but this can be frustrating as we create more and more complex code

if we wanted to know the mean, variance, and quartiles of height of everyone in our class, one technique could be to define a variable for everyone

but, to get the mean of this, we need to add everything together and then divide by the number of students. if a new student is added to the class, we have to recount all the variables we made. we might want something more flexible!

similarly if we were going to ask more questions than height – it would be a pain to make variables for all of our individual data!

this is why we use arrays and matrices

Introduction to vectors

<code>d=[1 2 3 4 5 6]</code>	<code>d = 1 2 3 4 5 6</code>	d, e, and f are all equivalent 1 x 6 vectors
<code>e=[1:6]</code>	<code>e = 1 2 3 4 5 6</code>	
<code>f=1:6</code>	<code>f = 1 2 3 4 5 6</code>	

Introduction to vectors

<code>g = 0:2:6</code>	<code>g = 0 2 4 6</code>	
<code>sin(g)</code>	<code>ans = 0 0.9093 -0.7568 -0.2794</code>	Matlab applies the sine function to each element of g.
<code>g(3)</code>	<code>4</code>	
<code>g(1:3)</code>	<code>0 2 4</code>	
	<code>ans = 0 2 4 6</code>	

More on vectors

g'	ans = 0 2 4 6	
$g+g$	ans = 0 4 8 12	
$g+g'$	Error using + Matrix dimensions must agree.	
$g*g'$	ans = 120	This is matrix multiplication, or the dot production in this case.

<code>g*g</code>	Error using * Inner matrix dimensions must agree.	
<code>g.*g</code>	ans = 0 4 16 36 64	Including the dot tells Matlab that you don't want matrix multiplication but instead want pointwise multiplication.

<code>h=[1 2 3; 4 5 6; 7 8 9]</code>	<code>h =</code> <div> 1 2 3 4 5 6 7 8 9 </div>	
<code>h(2,2)</code>	<code>ans =</code> 5	Selecting the entry in the second row second column.
<code>h(2,:)</code>	<code>ans =</code> 4 5 6	Selecting the entries in the second row but all columns.
<code>h(:,2:3)</code>	<code>ans =</code> 2 3 5 6 8 9	Selecting the entries in the all rows in columns 2-3.

<code>h(3)</code>	<pre>ans = 7</pre>	With one index, Matlab counts column-by-column.
<code>h^2</code>	<pre>ans = 30 36 42 66 81 96 102 126 150</pre>	This is matrix multiplication.
<code>h.^2</code>	<pre>ans = 1 4 9 16 25 36 49 64 81</pre>	With the period we get multiply the elements of h by themselves pointwise.

Exercises

1. Let $x = [3 \ 1 \ 5 \ 7 \ 9 \ 2 \ 6]$. For each of the following commands first think about what the result should be and then type the command and verify your answer.

- a. `x(3)`
- b. `x(1:7)`
- c. `x(1:end)`
- d. `x(1:end-1)`
- e. `x(6:-2:1)`
- f. `x([1 6 2 1 1])`
- g. `sum(x)`

2. Given the array $A = \begin{bmatrix} 2 & 4 & 1 \\ 6 & 7 & 2 \\ 3 & 5 & 9 \end{bmatrix}$, provide the commands needed to

- a. assign the first row of A to a vector called `x1`
- b. assign the last 2 rows of A to an array called `y`
- c. compute the sum over the columns of A
- d. compute the sum over the rows of A

solutions to exercises - post on edstem if you aren't sure why they work!

a. 5

b. [3 1 5 7 9 2 6]

c. [3 1 5 7 9 2 6]

d. [3 1 5 7 9 2]

e. [2 7 1]

f. [3 2 1 3 3]

g. 33

a. $x1 = A(1,:)$

b. $y = A(2:3,:);$

c. $\text{sum}(A,2)$

d. $\text{sum}(A,1)$