CS101: Intro to Computing
Fall 2015

Lecture 25

Administrivia

- Homework 14 released
  - The last homework!
  - Counts as ***two*** assignments
  - Three parts (finish first two this week)
  - Due on the last day of class
- Final exam
  - December 15th 1:30pm-4:30pm (here)
  - Get approval for the conflict (email me)

REVIEW

1	2	2
2	1	2
2	2	1

What will produce this array in Matlab?

```
a) ones(3,3)-2*eye(3,3)
b) ones(3,3)+2*eye(3,3)
c) 2*ones(3,3)+eye(3,3)
d) 2*ones(3,3)-eye(3,3)
```

1	**2**
3	**4**
5	**6**

How can we index 6 in Matlab?

a) a(2,1)

b) a(1,2)

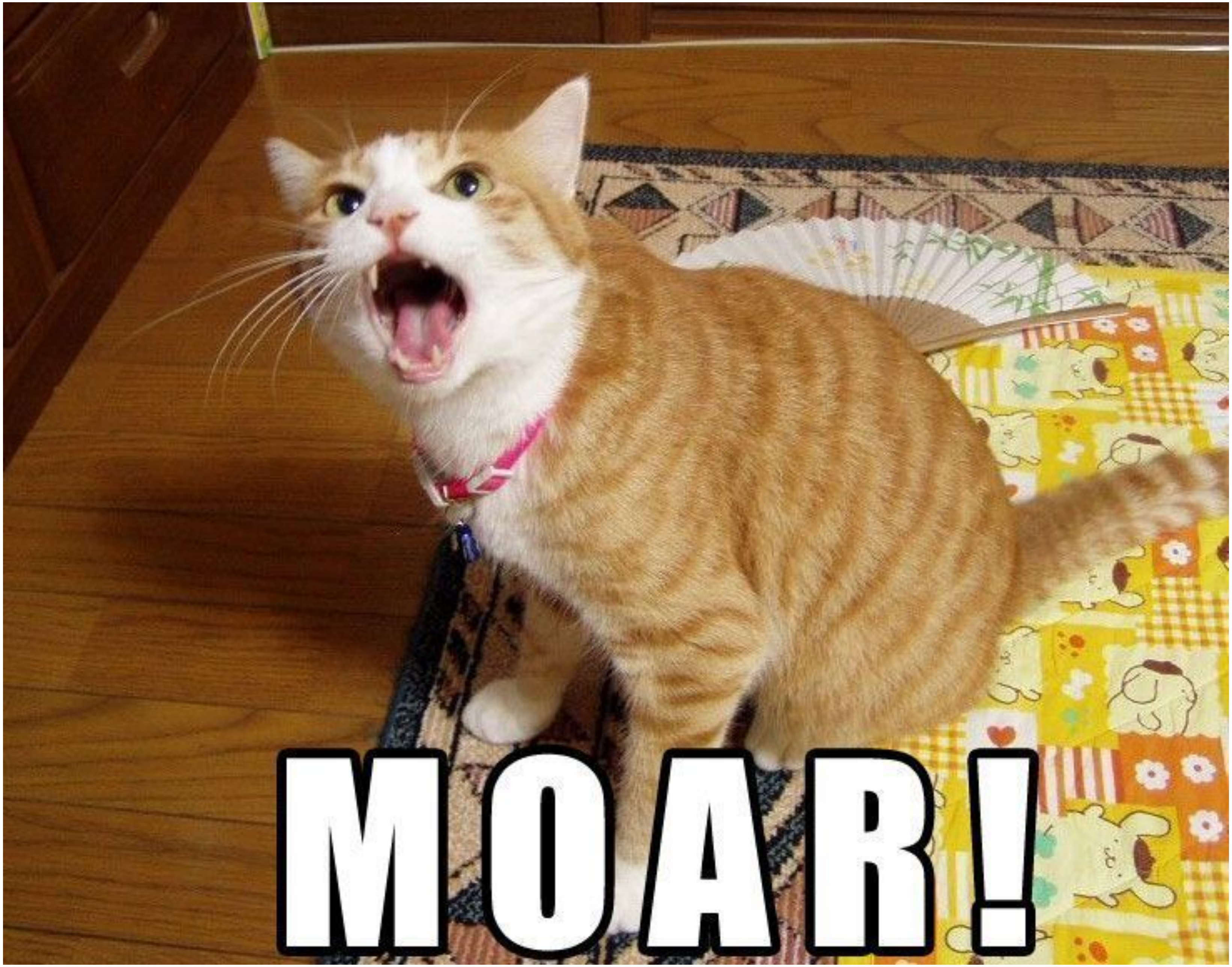
c) a(3,2)

d) a(2,3)

OVERVIEW

Course Summary (so far…)

1. Matlab fundamentals ✓
2. Data visualization ✓
3. Data wrangling
4. Simulation
5. Random processes
6. Optimization


MOAR!

Arrays

- Created using square brackets

```
a=[1, 2, 3]
```

- Indexed using parentheses

```
b=a(1)
```

- Indexed from 1, ***not 0!!!!***

Creating Arrays

- : works like “range” in Python
- We can create arrays with one : symbol

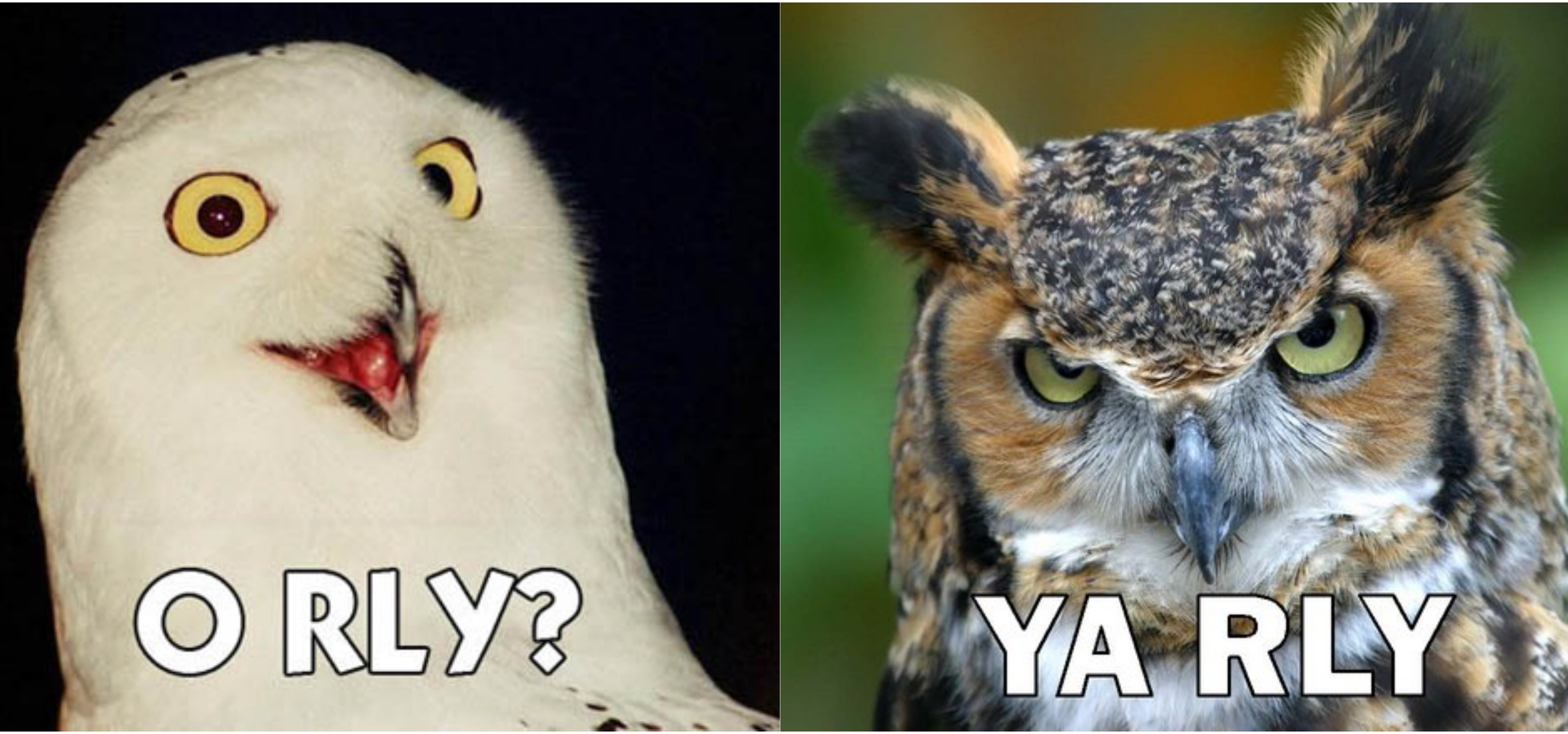
```
A=5:8
```

- We can create arrays with a stride with two : symbols

```
A=1:3:9
```

Slicing

- We can index arrays using… arrays.



Slicing

- We can index arrays using… arrays.

```
A=0:10:100
B=A([5,9,2,2])
```

- We can use this to slice arrays

```
A=0:10:100
B=A(4:7)
```

Slicing Multidimensional Arrays

- Slice using two lists.

```
A=[1,2,3;4,5,6;7,8,9]
B=A(1:2,1:2)
```

- : without numbers means “the whole thing”

```
C=A(:,1:2)
```

- Slices out columns 1 and 2

CONDITIONALS

If statement

```
if 1==1
    disp(‘Math is true.’);
end
```

- Blocks are denoted by keywords
- Blocks in Matlab are ***not*** denoted by whitespace and colons

```
if 1==1 disp(‘Math is true.’); end
```

If/else

```
if 1==1
    disp(‘Math is true.’);
else
    disp(‘Math is a lie.’);
end
```

If/elseif/else

```
if 1~=1
    disp(‘Math is a lie.’);
elseif 2~=2
    disp(‘Math weird.’);
else
    disp(‘Math is true’);
end
```

Logical operators

- Matlab does NOT have a Boolean type
  - 0 is false (can type “false”)
  - Nonzero is true (can type “true”)
- & is logical and (&& is also okay)
- | is logical or (|| is also okay)

Comparison operators

- == is equal
- ~= not equal, ~ not
- < less than, <= less than or equal
- > greater than, <= greater than or equal

```
a=5

b=3


x=(a<5) & ((b<=5) | (a~=b))
```

What is the value of x?

a) 1

b) 0

```
x=10
if (x/2)<=5 | (x==1)
  x=x+1
end
if x~=10 & x<=x
  x=x*2
end
```

What is the value of x?

a) 10

b) 11

c) 20

d) 22

LOOPING

For loop

```
for x=1:10
    disp(‘Math is true.’);
end
```

- Always has
  - – variable name
  - – = sign
  - – values that variable will take (array)

```
A=1:2:30;
sum=0;
for x=3:2:8
    sum=sum+A(x);
end
disp(sum);
```

What value is displayed?

a) 18

b) 30

c) 24

d) 27

```
sum=[0;0;0];
for x=eye(3,3)
   sum=sum+x;
end
disp(sum);
```

What is displayed?

a)[1;1;1]

b)3

c)[3,3,3]

d)[1,1,1]

While loop

```
while x<10
    disp(‘Math is true.’);
end
```

- Always has condition (that’s all)

While loop

```
x=0
while x<10
    disp(‘Math is true.’);
    x=x+1
end
```

Looping Features

- Matlab has continue and break statements
- They behave exactly the same way they do in Python

WRITING FUNCTIONS

Writing functions

- **MUST BE STORED IN A FILE WITH THE NAME OF THE FUNCTION**
- Arguments go in parentheses
- Return values come before equals sign
- Block ends with end statement

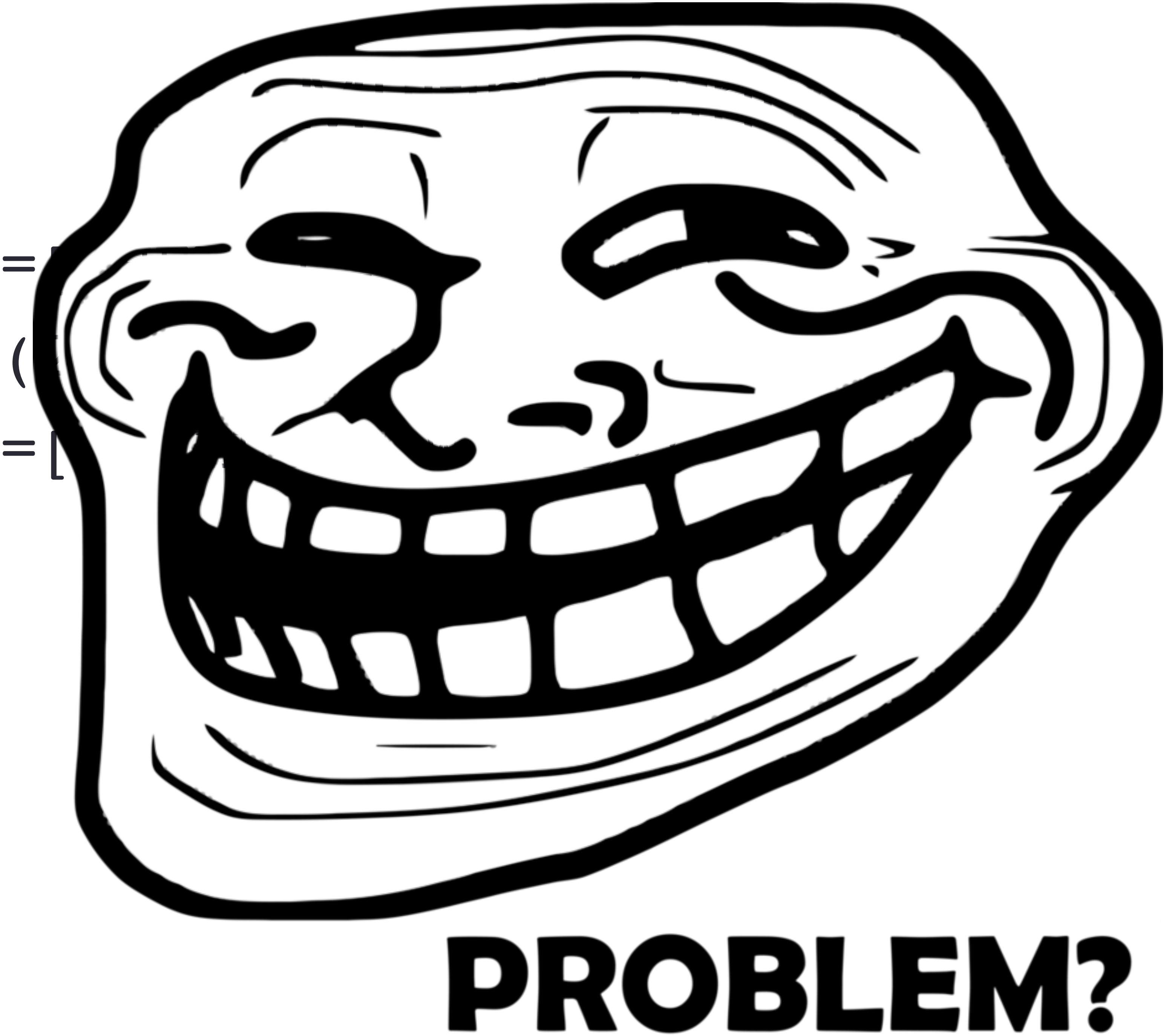
```
function [y]=squareit(x)
    y=x^2;
end
```

Multiple Arguments/Returns

```
function [a,b]=nonsense(x,y)
    a=x^2;
    b=y^3;
end

q,r=nonsense(3,4)
```

```
A=
A(
C=[
```



What happened?

- The dimensions of arrays must always match!
- The type has to be the same, too.
- What do we do?

CELL ARRAYS

Cell Arrays

- Arrays that can contain data of multiple types and sizes
- Created with curly brackets

```
c={pi,[3,4,5;1,2,3],’Eight’}
```

Course Summary (so far…)

1. Matlab fundamentals ✓
2. Data visualization ✓
3. Data wrangling
4. Simulation
5. Random processes
6. Optimization