cs 101 lecture #18
march 30, 2016
scientific modeling
which of the following will produce this array?

![1 1 1]

a. `np.array([1,1,1])`
b. `np.array(1)*3`
c. `np.array([1]*3)`
d. `np.array((1)*3)`
e. a, c
what will be the result of running the following code?

```python
a = np.array((1,1,1))
a[2] = 'a'
```

a. `np.array([[1,1,'a']])`

b. `ValueError`
what will be the result of running the following code?

```python
a = np.arange(0, 15, 3)
len(a)
```

a. 3  
b. 4  
c. 5  
d. 6
what is needed to complete the following code

```python
a = np.linspace(0, 10, ____)
```

if we want to get

```python
np.array(0.0, 1.0, 2.0, ..., 10.0)
```

a. 10
b. 11
c. 11, dtype=np.float64
d. 10, dtype=np.float64
how would you refer to the number 6 in this array $A$?

```
1 2 3
4 5 6
7 8 9
```

a. $A[2][1]$
b. $A[1][2]$
c. $A[2][3]$
elements of modeling
what modeling is
elements of modeling
what modeling is

input/data → model: mathematics, physics, code → result/prediction
elements of modeling
the model lifecycle

problem
elements of modeling
the model lifecycle

problem

model definition
elements of modeling
the model lifecycle

- problem
- model definition
elements of modeling
the model lifecycle

- problem
- model definition
- calibration
elements of modeling the model lifecycle

- problem
- model definition
- calibration
- application
elements of modeling
the model lifecycle

- problem
- model definition
- calibration
- application
- extension
elements of modeling: problem statement

prob

defn

cal

app

ext
elements of modeling
model definition

\[ \Delta L = \alpha (T - T_0) \]
elements of modeling
model definition

\[ \Delta L = \alpha (T - T_0) \]
\[ y = mx + b \]
elements of modeling
model definition

\[ \Delta L = \alpha (T - T_0) \]

\[ y = mx + b \]

\[ \Delta L = \alpha T + (-\alpha T_0) \]
elements of modeling
calibration

prob
defn
cal
app
ext

calibration
verification
validation
elements of modeling
application

prob

defn

cal

app

ext

solution

analysis & error
elements of modeling extension

prob → defn → cal → app → ext

shortcomings
surprises
LIGHTS ALL ASKEW:
IN THE HEAVENS

Men of Science More or Less Agog Over Results of Eclipse Observations.

EINSTEIN THEORY TRIUMPHS

Stars Not Where They Seemed or Were Calculated to be, but Nobody Need Worry.