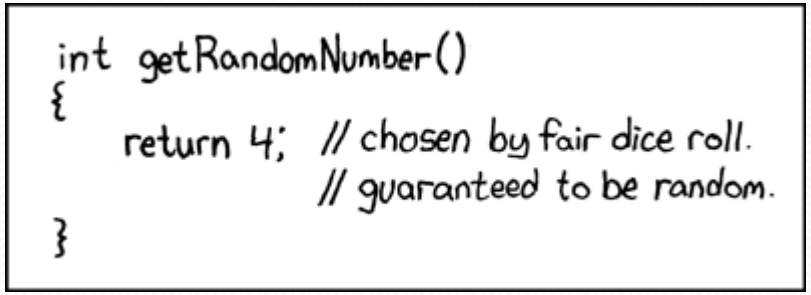
CS 115, Autumn 2021

Lecture 10: graphics; variables; random



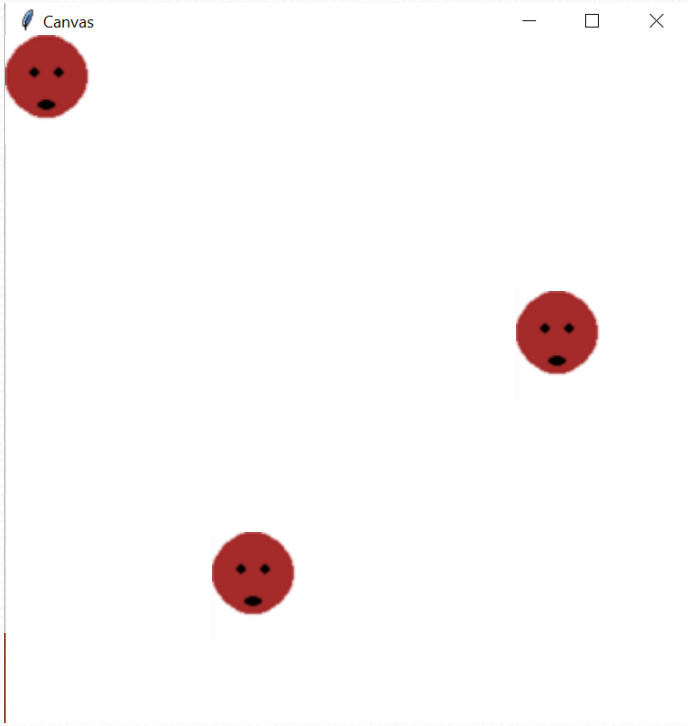
Thanks to Marty Stepp and Stuart Reges for parts of these slides

Drawing complex shapes

- What if we want a more complex shape to follow the mouse?

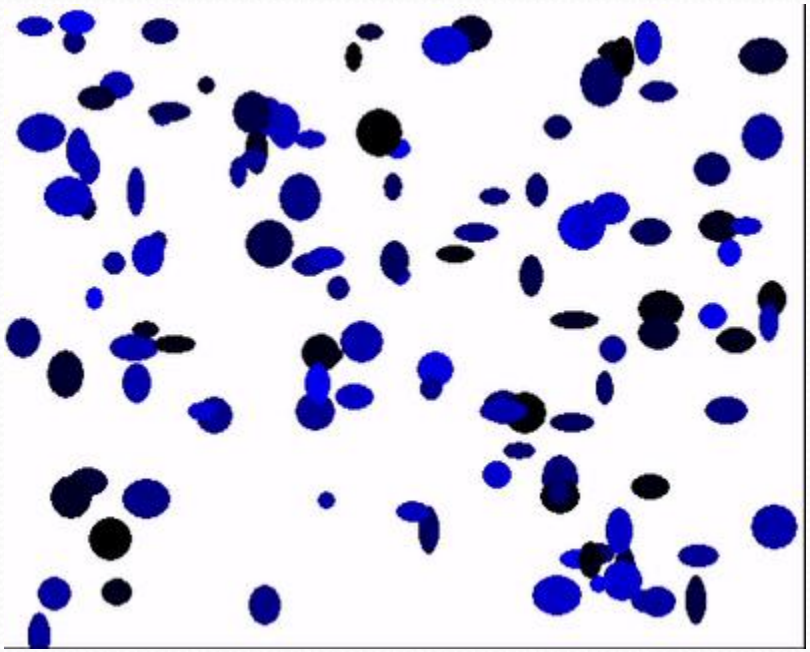
```
x = panel.get_mouse_x()
y = panel.get_mouse_y()
```

  - Can we just use `x` and `y` for all four shapes?
    - When we draw a shape, what part of the shape do the `x` and `y` get used for?



Making it rain

- What if we want to animate rain?
  - We could just draw a lot of blue circles in specific x, y locations
    - That wouldn't look very realistic – rain is much more random!



Pseudo-Randomness

- Computers generate numbers in a predictable way using a mathematical formula
- Function may include current time, mouse position
  - In practice, hard to predict or replicate
- True randomness uses natural processes
  - Atmospheric noise (http://www.random.org/)
  - Lava lamps (patent #5732138)
  - Radioactive decay

Random

- `random` generates pseudo-random numbers.
  - `random` can be accessed by including the following statement:

```
from random import *
```

Method name	Description
`random()`	returns a random float in the range [0, *1*) in other words, 0 inclusive to *1* exclusive
`randint(`***min, max***`)`	returns a random integer in the range [min, *max*) in other words, min to *max*-1 inclusive

  - Example:

```
from random import *
random_number = randint(1, 10)    # 1-9
```

Generating random numbers

- To get a number in arbitrary range [*min*, *max*] inclusive:

  `randint(`***min, max***`)`

  - Where ***size of range*** is (***max*** `-` ***min*** `+ 1`)

- Example: A random integer between 4 and 10 inclusive:

```
n = randint(4, 10)
```

Exercise: rain

- Write a program that draws a new oval on a `drawing_panel` every 10ms. All ovals should be:
  - At random x locations
  - At random y locations
  - Between 10 and 30 pixels wide
  - Between 10 and 30 pixels tall
  - Be random colors with 0 red, 0 green and a random amount of blue