CS 110 - Randomness

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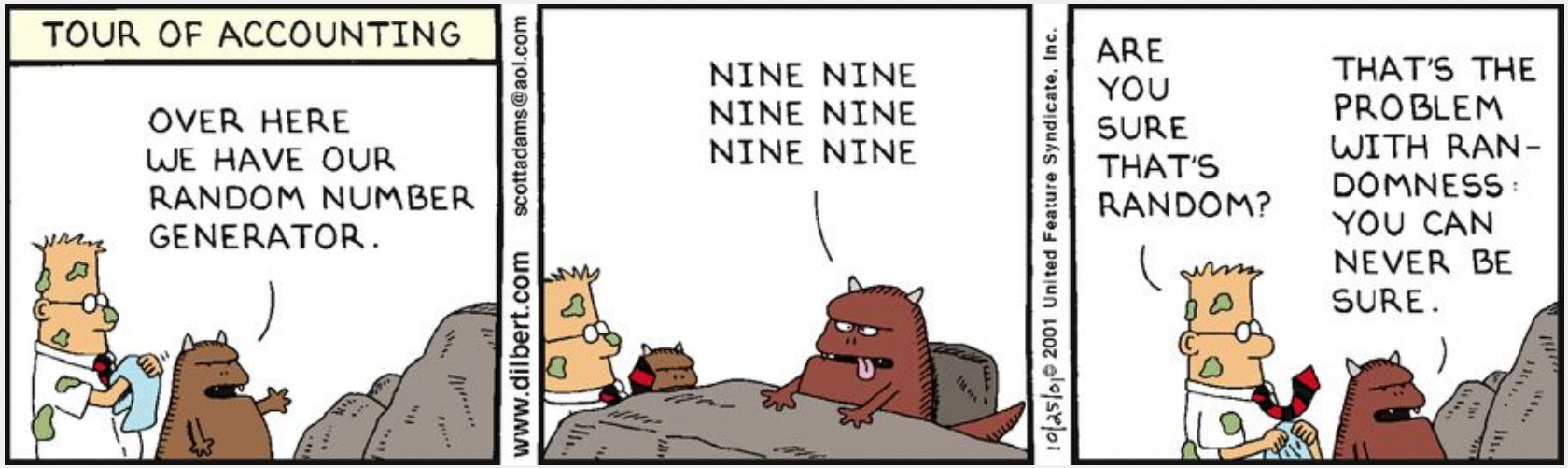

Uses for random?

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- Artificial Intelligence (Games)

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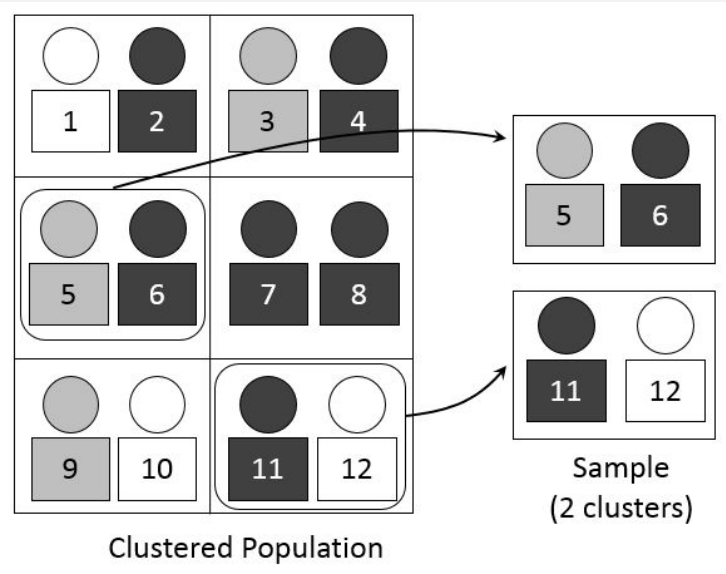
- Statistical Sampling



Uses for random?

- Artificial Intelligence (Games)
- Statistical Sampling
- Simulation

Random

- Can generate random numbers in programming
- Use the **random** Python module
- Import the module before using

```
import random
```

Functions that generate “random” numbers

- **`random.random()`** returns a floating-point value between 0.0 (inclusive) and 1.0 (exclusive)
- **`random.randint(a, b)`** returns an integer between a and b (both inclusive)

What Type? Min and Max?

```
import random
a = random.randint(10, 20)
number = random.randint(5, a)

print(type(number))  # What is the type?
print(number)        # What is the value?
```

What Type? Min and Max?

```
import random
number = random.random() * 10

print(type(number))  # What is the type?
print(number)        # What is the value?
```

What are the percentages?

How often will this program print **`small`**, **`medium`**, and **`large`** ?

```
random_number = random.randint(0, 99)
if random_number < 20:
    print('small')
elif random_number >= 75:
    print('large')
else:
    print('medium')
```

Activity

Implement a simple rock, paper, scissors game

```
def get_computer_rps():
    # Get random RPS selection, return string

def get_user_rps():
    # Get user RPS, ensure is valid, return string

def did_user_win(user, computer):
    # Two string parameters, determine if the user won,
    # return True if user won, False otherwise

def main():
    # Get user input, Get random computer RPS,
    # Print whether or not user won

main()
```

Activity

Implement a simple rock, paper, scissors game

```
def get_computer_rps():
    random_number = random.randint(1, 101)
    if random_number <= 30:
        return 'rock'
    elif random_number < 65:
        return 'paper'
    return 'scissors'

def get_user_rps():
    # Get user RPS, ensure is valid, return string

def did_user_win(user, computer):
    # Two string parameters, determine if the user won,
    # return True if user won, False otherwise

def main():
    # Get user input, Get random computer RPS,
    # Print whether or not user won
```

Activity

Implement a simple rock, paper, scissors game

```
def get_computer_rps():
    . . .

def get_user_rps():
    rps = ''
    while rps != 'rock' and rps != 'paper' and rps != 'scissors':
        rps = input('Enter rock, paper, or scissors:\n')
    return rps

def did_user_win(user, computer):
    # Two string parameters, determine if the user won,
    # return True if user won, False otherwise

def main():
    # Get user input, Get random computer RPS,
    # Print whether or not user won
```

Activity

Implement a simple rock, paper, scissors game

```
def get_computer_rps():
    . . .

def get_user_rps():
    . . .

def did_user_win(user, computer):
    if user == 'rock' and computer == 'scissors':
        return True
    elif user == 'paper' and computer == 'rock':
        return True
    elif user == 'scissors' and computer == 'paper':
        return True
    return False

def main():
    # Get user input, Get random computer RPS,
    # Print whether or not user won
```

Activity

Implement a simple rock, paper, scissors game

```
def get_computer_rps():
    . . .

def get_user_rps():
    . . .

def did_user_win(user, computer):
    . . .

def main():
    user_rps = get_user_rps()
    computer_rps = get_computer_rps()
    result = did_user_win(user_rps, computer_rps)
    print('Did user win?', result)
```

```
def get_computer_rps():
    random_number = random.randint(1, 101)
    if random_number <= 30:
        return 'rock'
    elif random_number < 65:
        return 'paper'
    return 'scissors'

def get_user_rps():
    rps = ''
    while rps != 'rock' and rps != 'paper' and rps != 'scissors':
        rps = input('Enter rock, paper, or scissors:\n')
    return rps

def did_user_win(user, computer):
    if user == 'rock' and computer == 'scissors':
        return True
    elif user == 'paper' and computer == 'rock':
        return True
    elif user == 'scissors' and computer == 'paper':
        return True
    return False

def main():
    user_rps = get_user_rps()
    computer_rps = get_computer_rps()
    result = did_user_win(user_rps, computer_rps)
    print('Did user win?', result)

main()
```

```
def get_computer_rps():
    random_number = random.randint(1, 101)
    if random_number <= 30:
        return 'rock'
    elif random_number < 65:
        return 'paper'
    return 'scissors'

def get_user_rps():
    rps = ''
    while rps != 'rock' and rps != 'paper' and rps != 'scissors':
        rps = input('Enter rock, paper, or scissors:\n')
    return rps

def did_user_win(user, computer):
    if user == 'rock' and computer == 'scissors':
        return True
    elif user == 'paper' and computer == 'rock':
        return True
    elif user == 'scissors' and computer == 'paper':
        return True
    return False

def main():
    user_rps = get_user_rps()
    computer_rps = get_computer_rps()
    result = did_user_win(user_rps, computer_rps)
    print('Did user win?', result)

main()
```

What could make this program better?

```python
import random

def get_computer_rps():
    '''
    This function returns either rock, paper, or scissors.
    Which is returns is determine pseudo-randomly.
    '''
    random_number = random.randint(1, 101)
    if random_number <= 30:
        return 'rock'
    elif random_number < 65:
        return 'paper'
    return 'scissors'

def get_user_rps():
    '''
    This function requests an input from the user.
    The input should be either rock, paper, or scissors.
    It will continue to request the input until it gets
    one of those three.
    Once it gets one, it returns the string.
    '''
    rps = ''
    while rps != 'rock' and rps != 'paper' and rps != 'scissors':
        rps = input('Enter rock, paper, or scissors:\n')
    return rps
```

```python
def did_user_win(user, computer):
    '''
    This function determines True of the user won,
    and False otherwise.
    user: The user's RPS entry, a string
    computer: The computer's RPS entry, a string
    Both of the parameters should be either 'rock',
    'paper', or 'scissors'
    '''
    if user == 'rock' and computer == 'scissors':
        return True
    elif user == 'paper' and computer == 'rock':
        return True
    elif user == 'scissors' and computer == 'paper':
        return True
    return False

def main():
    user_rps = get_user_rps()
    computer_rps = get_computer_rps()
    result = did_user_win(user_rps, computer_rps)
    print('Did user win?', result)

main()
```

A reason why there's a code line width limit!