Code in Place 2025

Stanford CS106A

Section - Week 4

Python Control Flow

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Today's Agenda

1. Check-In

How are we all doing?

2. Concepts Review

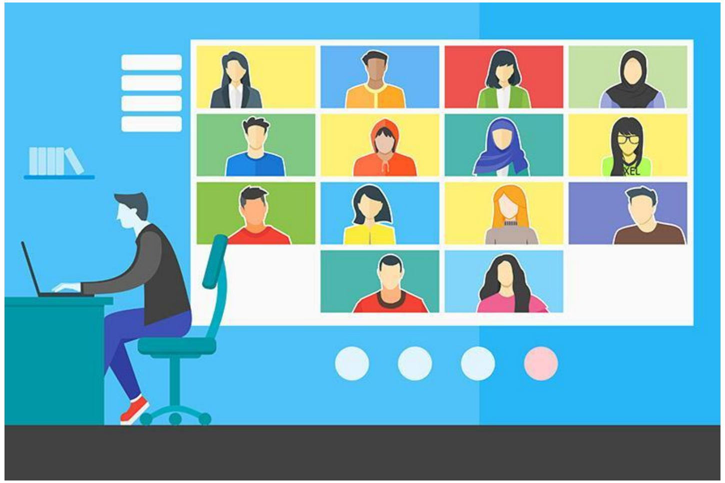
Control Flow

3. Practice Problem

"High Low Game"

Please Turn On Your Camera

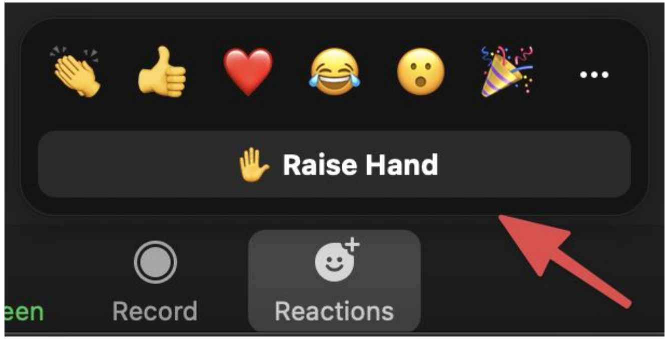
If you're able, please **turn on your camera**!
. . . . It can really make the section come to life!

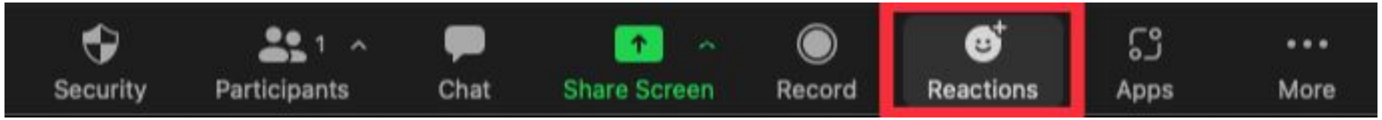


(Image source: https://as.virginia.edu/eight-ways-get-more-out-zoom)

Zoom Reactions

- 👍 **Thumbs Up:** If you understand.
- ✋ **Raise Hand:** If you have a question (or just speak in the mic).





Introductions

Hi, I’m **David**!

- Head TA, here at my 4th Code in Place.
  - Started as a CIP student! 2x volunteer Section Leader.
- CS @ Massachusetts Institute of Technology (MIT)
- Produced Manager and former Software Engineer
- Love photography, video games, movies
- Guilty pleasure: Reality competition shows like Survivor

Check-In

How is everyone doing?
Hopefully your third week of CIP went well!

- Share something nice that happened in the last week

Concepts Review

Control Flow

- Everything from Karel is still in play!
- `for` loops
- `while` loops
- booleans (`True` or `False`, used in conditional statements)
- `if, else, elif`

```
user_number = int(input(“Enter a number: ))      # Variable assignment
if user_number == 0:                             # Equality comparison
      print(“Your number is 0!”)
elif user_number > 0:
      print(“Your number is positive!”)
else:
      print(“Your number is negative!”)
```

Expressions & Arithmetic Operators

- Any **expression** on the right sight of the equal sign is calculated before being assigned to a variable.

- **Precedence of operations** (similar to “PEMDAS” in Algebra):
  - `()` “parentheses” **highest precedence**
  - `**` “exponentiation”
  - `-` “negation”
  - `*, /, //, %`
  - `+, -` **lowest precedence**

- Example:

```
x = (1 + 3 * 5 / 2) * (-3)    # Python will calculate the right-side expression.
x = (1 + 15 / 2) * (-3)
x = (1 + 7.5) * (-3)
x = (8.5) * (-3)
x = -25.5                     # float -25.5 assigned to “x”.
```

Comparison Operators

Operator	Meaning	Example	Result
`==`	equals	`1 + 1 == 2`	`True`
`!=`	does not equal	`3.2 != 2.5`	`True`
`<`	less than	`10 < 5`	`False`
`>`	greater than	`10 > 5`	`True`
`<=`	less than or equal to	`126 <= 100`	`False`
`>=`	greater than or equal to	`5.0 >= 5.0`	`True`

WARNING: Notice the difference between variable **assignment** vs **equality** comparison.

- `x = 64        # Assigns the int value 64 to the variable x.`
- `x == 64       # Checks if the value of x is equal to 64.`

Logical Operators

`and`

`X`	`Y`	`X and Y`
`True`	`False`	`False`
`False`	`True`	`False`
`True`	`True`	`True`
`False`	`False`	`False`

If all variables are `True`, the outcome is `True`.

`or`

`X`	`Y`	`X or Y`
`True`	`False`	`True`
`False`	`True`	`True`
`True`	`True`	`True`
`False`	`False`	`False`

If one variable is `True`, the outcome is `True`.

`not`

`X`	`not X`
`True`	`False`
`False`	`True`

Reverse a variable’s logical state.

Logical Operators: Examples

- **and**

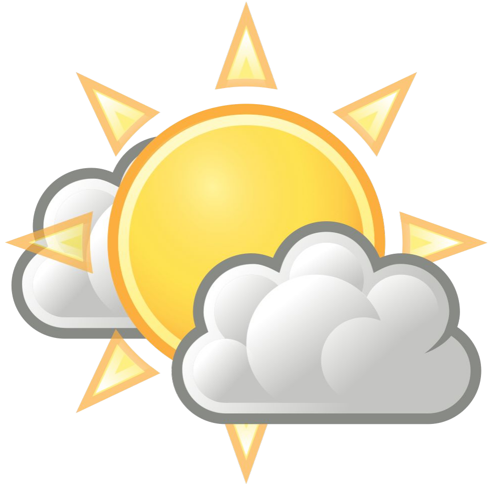
```
if temperature > 0 and temperature < 30:
        print(“The temperature is good”)
else:
        print(“The temperature is bad”)
```

- **or**

```
if temperature <= 0 or temperature >= 30:
        print(“The temperature is bad”)
else:
        print(“The temperature is good”)
```

- **not**

```
is_sunny = False
if not is_sunny:
        print(“It is not sunny outside!”)
else:
        print(“It is sunny outside!”)
```



A Classic Joke: “The Mathematician’s Answer”

Q: Would you like an apple or a banana?

A: Yes

Boolean Expressions

- **Precedence of operations**:
  - `arithmetic`   5 * 7   **highest precedence**
  - `comparison`   >=
  - `not`
  - `and/or`   **lowest precedence**

- Example:

```
25 >= 3 + 2 * 10 and not False              # arithmetic
25 >= 23 and not False                      # comparison
True and not False                          # not
True and True                               # and
True
```

- The following example can produce an infinite loop.

```
while True:
    body
```

Boolean Variables

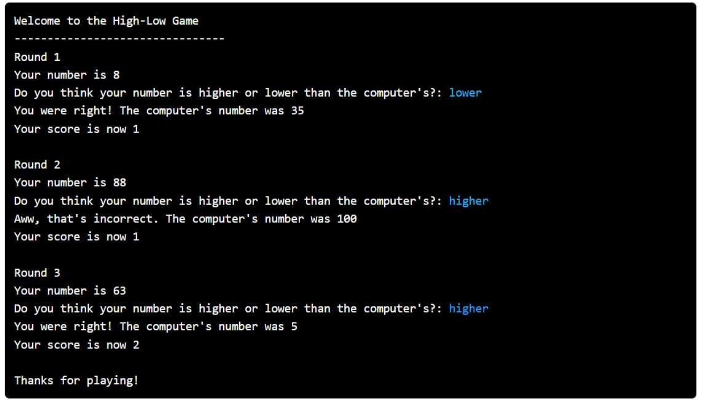
You can store expressions that evaluate to True/False into variables.

- The variables x, y, and z are assigned data of type `bool`:
    - `x = 1 < 2                         # True`
    - `y = “Michael” == “Michelle”    # False`
    - `z = True`
    - You can use boolean variables and chain them together.

```
if x and y:          if True and False:          if False:
    body                 body                        body
```

$$\begin{tikzcd} \texttt{if x and y:} \arrow[r] & \texttt{if True and False:} \arrow[r] & \texttt{if False:} \end{tikzcd}$$

Section Exercise: “High Low Game”



```
Welcome to the High-Low Game
--------------------------------
Round 1
Your number is 8
Do you think your number is higher or lower than the computer's?: lower
You were right! The computer's number was 35
Your score is now 1

Round 2
Your number is 88
Do you think your number is higher or lower than the computer's?: higher
Aww, that's incorrect. The computer's number was 100
Your score is now 1

Round 3
Your number is 63
Do you think your number is higher or lower than the computer's?: higher
You were right! The computer's number was 5
Your score is now 2

Thanks for playing!
```

Game Steps:

#1) Randomly generate two numbers from 1 to 100 (inclusive):
- One number for you, and one number for the computer

#2) Game prints your number but not the computer’s. You make a guess:
- Type “`lower`” if you think your number is lower than the computer’s
- Type “`higher`” if you think your number is higher

#3) If you guess correctly, you score 1 point!

“High Low Game” Milestones

Milestone #1: Generate two random numbers.

Milestone #2: Get the player’s choice of `lower` or `higher`.

Milestone #3: Write the game logic. Compare player’s guess vs actual #.

Milestone #4: Play multiple rounds.

Milestone #5: Add a points system.

Extension #1: Safeguard user input.

Extension #2: Conditional ending messages.