COMP 110

CL02

Expressions

Expressions

- Something that *evaluates* at runtime
- Every expression evaluates to a specific typed value
- Examples
    - 1 + 2 * 3
    - 1
    - 1.0 * 2.0
    - “Hello” + “ World!”
    - 1 > 3

Numerical Operators

Operator Name	**Symbol**
Addition	+
Subtraction/Negation	-
Multiplication	*
Division	/
Exponentiation	**
Remainder “modulo”	%

Addition +

- If numerical objects, add the values together
  - 1 + 1 → 2
  - 1.0 + 2.0 → 3.0
- If strings, concatenate them
  - “Comp” + “110” → “Comp110”
- The result type depends on the operands
  - float + float → float
  - int + int → int
  - float + int → float
  - int + float → float
  - str + str → str

Addition +

- If numerical objects, add the values together
  - 1 + 1 → 2
  - 1.0 + 2.0 → 3.0
- If strings, concatenate them
  - “Comp” + “110” → “Comp110”
- The result type depends on the operands
  - float + float → float
  - int + int → int
  - float + int → float
  - int + float → float
  - str + str → str

Question: What happens when you try to add incompatible types?

Subtraction/Negation -

- Meant strictly for numerical types
  - 3 - 2 → 1
  - 4.0 - 2.0 → 2.0
  - 4.0 - 2 → 2.0
  - - (1 + 1) → -2
- The result type depends on the operands
  - float - float → float
  - int - int → int
  - float - int → float
  - int - float → float

Multiplication *

- If numerical objects, multiply the values
    - 1 * 1 → 1
    - 1.0 * 2.0 → 2.0
- If string and int, repeat the string
    - “Hello” * 3 → “HelloHelloHello”
- The result type depends on the operands
    - float * float → float
    - int * int → int
    - float * int → float
    - int * float → float
    - str * int → str

Division /

- Meant strictly for numerical types
  - 3 / 2 → 1.5
  - 4.0 / 2.0 → 2.0
  - 4 / 2 → 2.0
- Division results in a float
  - float / float → float
  - int / int → float
  - float / int → float
  - int / float → float

Exponentiation **

- Meant strictly for numerical types
  - 2 ** 2 → 4
  - 2.0 ** 2.0 → 4.0
- The result type depends on the operands
  - float ** float → float
  - int ** int → int
  - float ** int → float
  - int ** float → float

Remainder “modulo”

- Calculates the *remainder* when you divide two numbers
- Meant strictly for numerical types
  - 5 % 2 → 1
  - 6 % 3 → 0
- The result type depends on the operands
  - int % int → int
  - float % float → float
  - float % int → float
  - int % float → float
- Note:
  - If x is even, x % 2 → 0
  - If x is odd, x % 2 → 1

Order Of Operations

- P ()
- E **
- MD * / %
- AS + -
- Tie? Evaluate *Left to Right*

Relational Operators

Operator Name	**Symbol**
Equal?	==
Less than?	<
Greater than?	>
Less than or equal to? (At most)	<=
Greater than or equal to? (At least)	>=
Not equal?	!=

Relational Operators

- Always result in a bool (True or False)
- Equals (==) and Not Equal (!=)
  - Can be used for all primitive types we've learned so far! (bool, int, float, str)
- Every other type
  - Just use on floats and ints
  - (Can *technically* use on all primitive types)

Practice! Simplify and Type

- 2 + 4 / 2 * 2
- 220 >= int((“1” + “1” + “0”) * 2)

Simplify: 2 + 4 / 2 * 2

(Reminder: P E M D A S)

Simplify: 2 + 4 / 2 * 2

What type is 2 + 4 / 2 * 2?

Simplify:

220 >= int((“1” + “1” + “0”) * 2)

Mods Practice! Simplify

- 7 % 2
- 8 % 4
- 7 % 4
- Any even number % 2
- Any odd number % 2

Pause to practice:

Please do the LS on Gradescope!

Variables

Variables

Declaration of a variable

```
<name>: <type> = <value>
students: int = 300
message: str = “Howdy!”
```

Update a variable

```
<name> = <new value>
students = 325
message = “See ya!”
```

User Input

User input

- input() function: prompts the user for input and returns the response
- Example

  ```
  your_name: str = input(“What is your name?”)
  ```

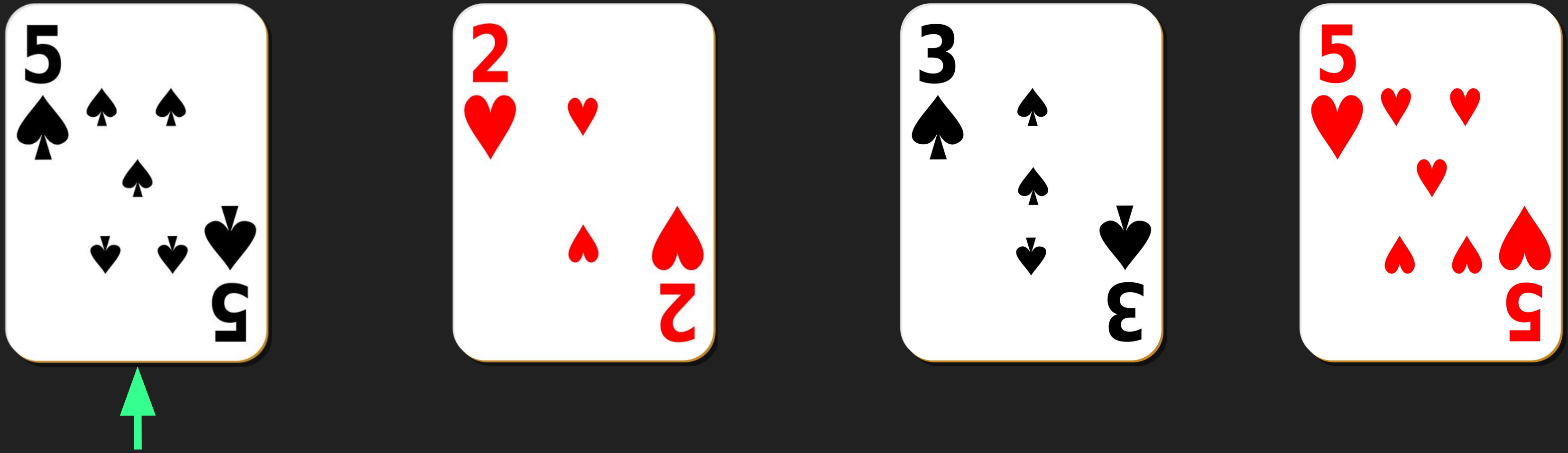
  Will store the user’s response as the variable your_name.

Pause to practice:

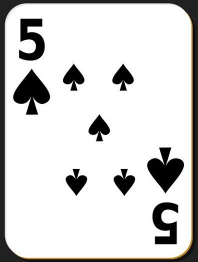
Please do the LS on Gradescope!

Conditionals

Recall: Finding the Lowest Card

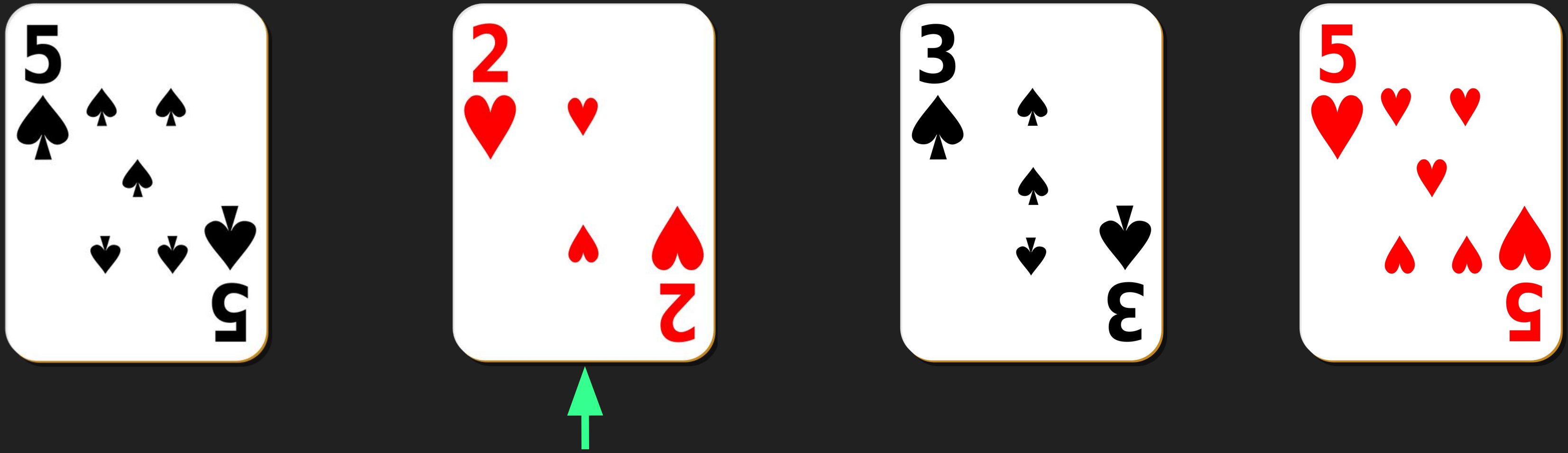


Low card:



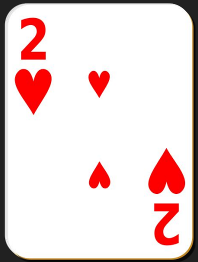
If current card < low card, make it the low card.

Recall: Finding the Lowest Card



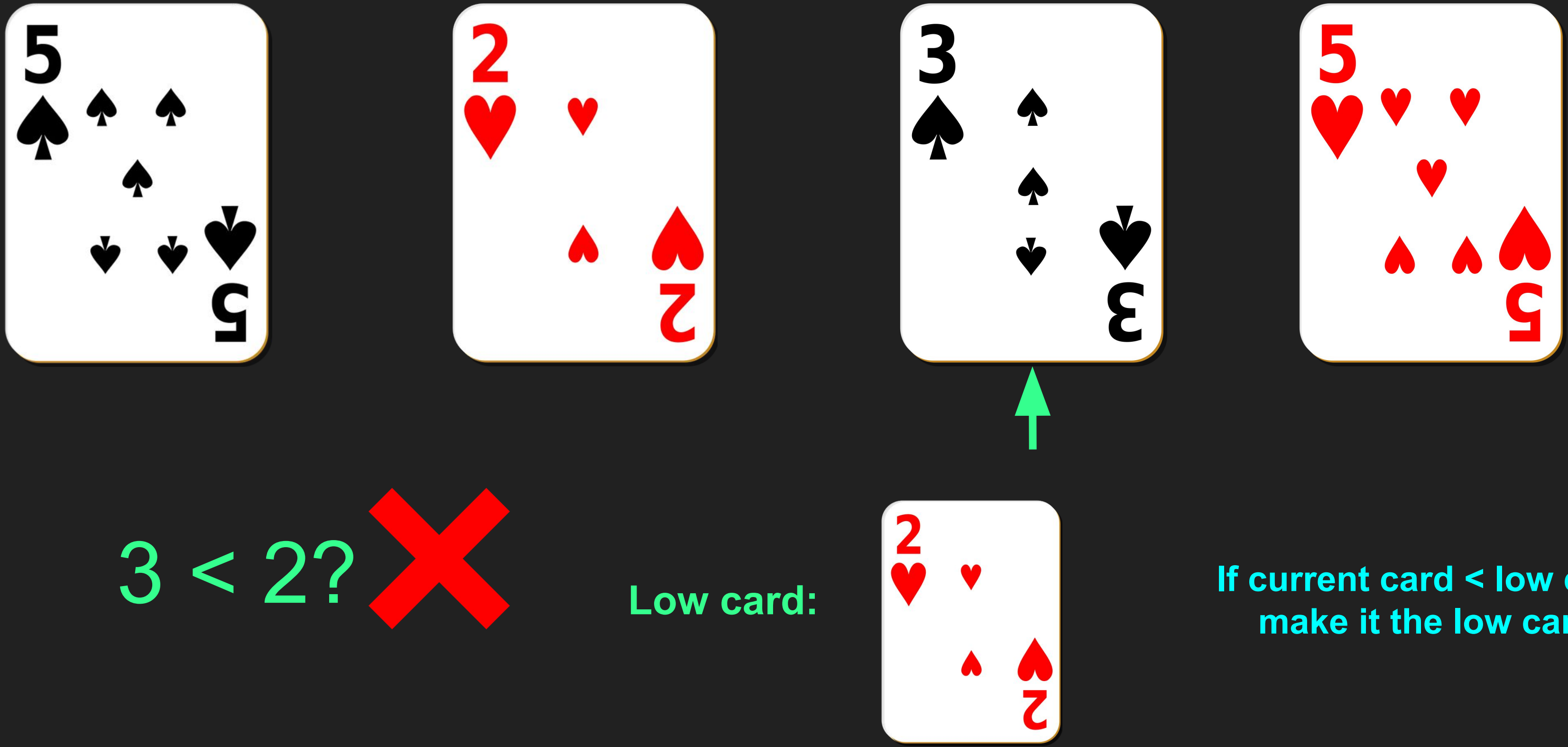
2 < 5? ✓

Low card:



If current card < low card,
make it the low card.

Recall: Finding the Lowest Card

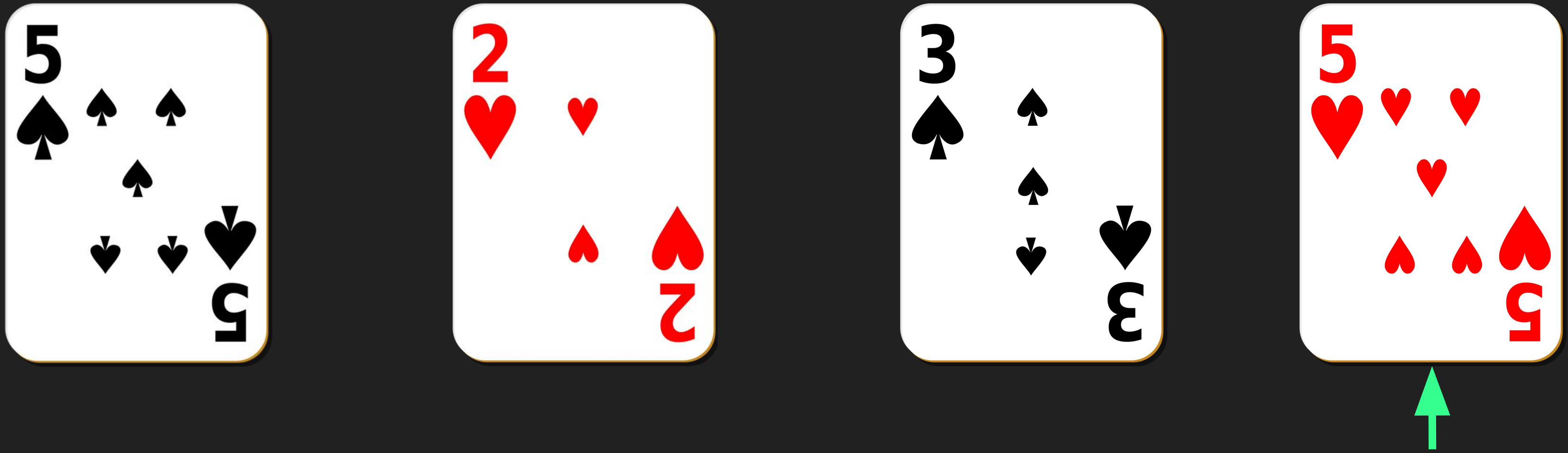


3 < 2? ✗

Low card:

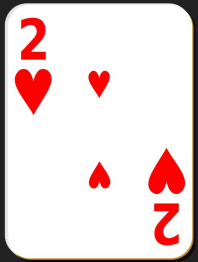
If current card < low card, make it the low card.

Recall: Finding the Lowest Card



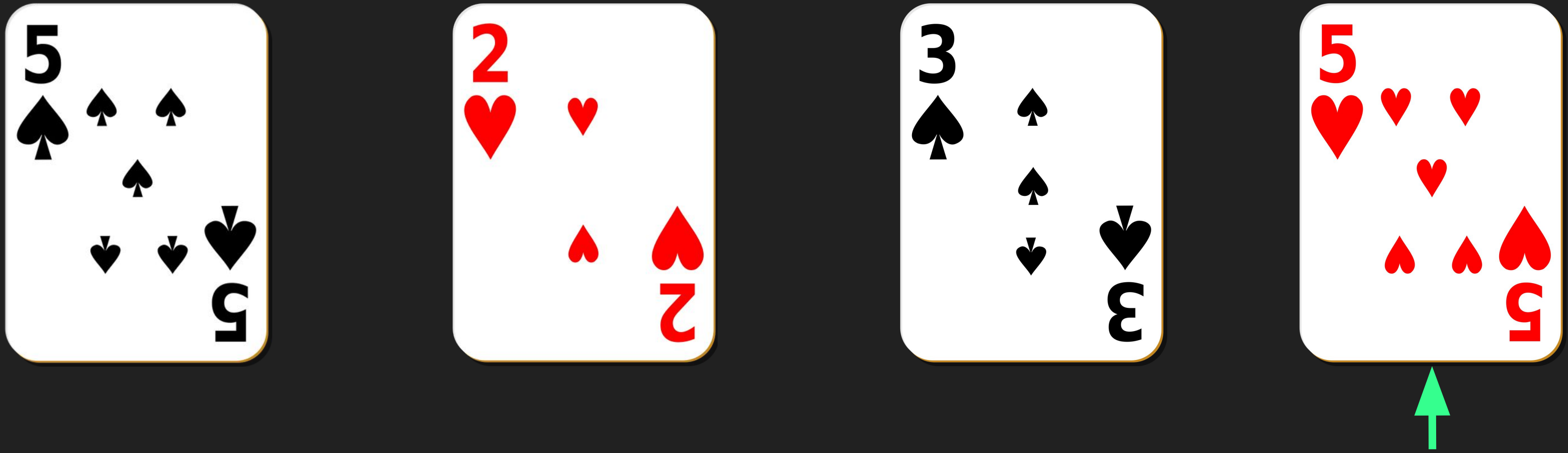
$5 < 2?$ ✗

Low card:



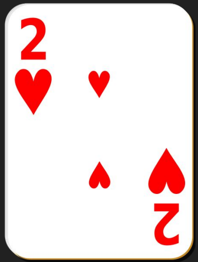
If current card < low card, make it the low card.

Recall: Finding the Lowest Card



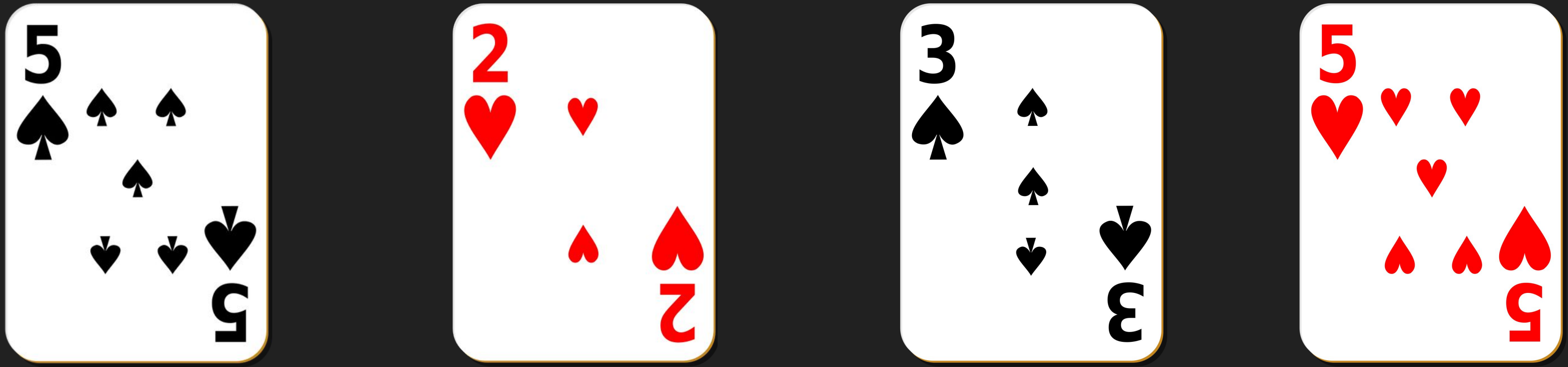
5 < 2? ❌

Low card:

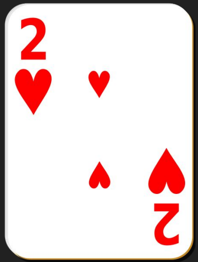


If current card < low card, make it the low card.

Recall: Finding the Lowest Card



Low card:



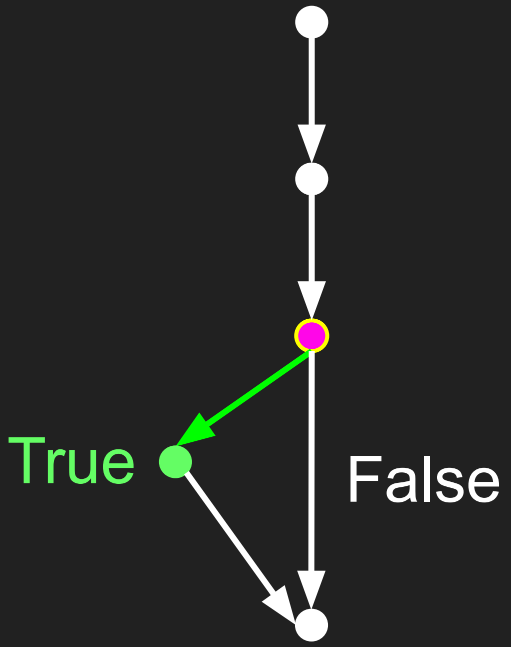
Conditional Statement

If current card < low card, make it the low card.

Conditional Statements

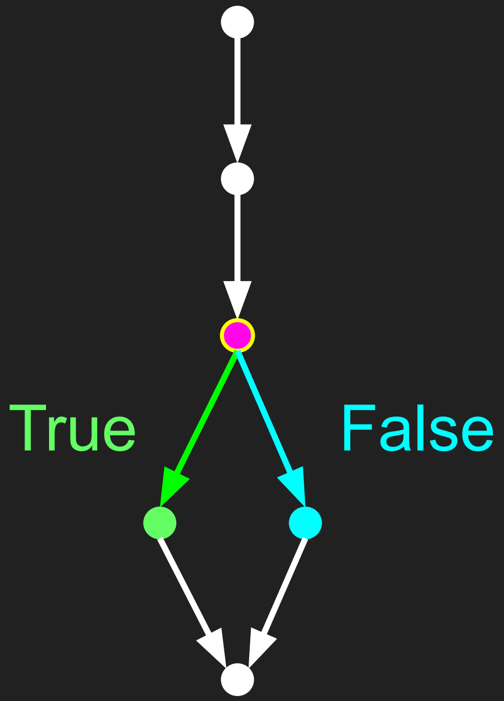
bool

```
if <something>:
    <do something>
<rest of program>
```



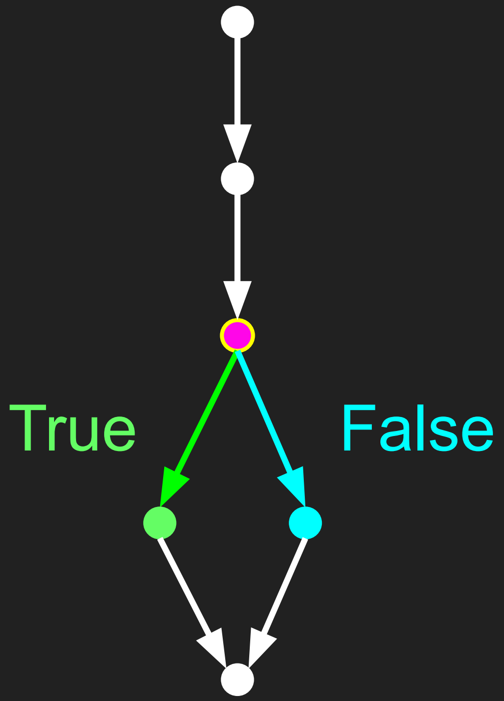
Conditional Statements

```
if <something>:
    <do something>
else:
    <do something else>
<rest of program>
```



Conditional Statements

```
if <something>:
    <do something>
else:
    <do something else>
<rest of program>
```



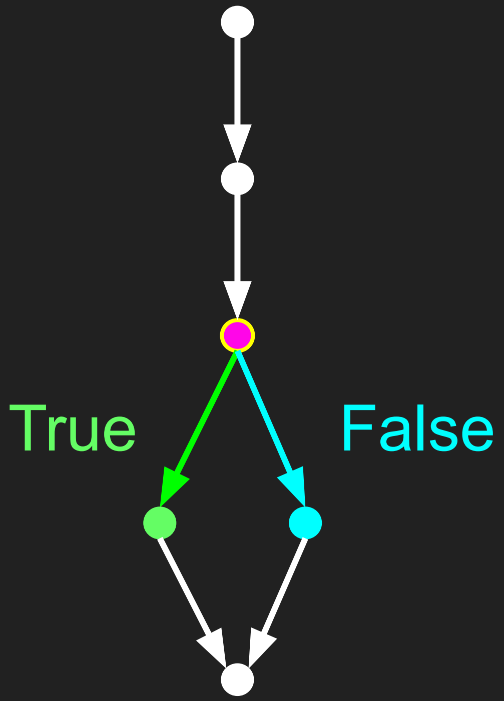
Discussion

What is a decision you make in your day-to-day that you can express as an conditional (if-else) statement?

E.g. If I my assignment is due tomorrow, I start working on it. Else (it’s not due tomorrow), I procrastinate another day.
(This is bad behavior and I don’t condone it!)

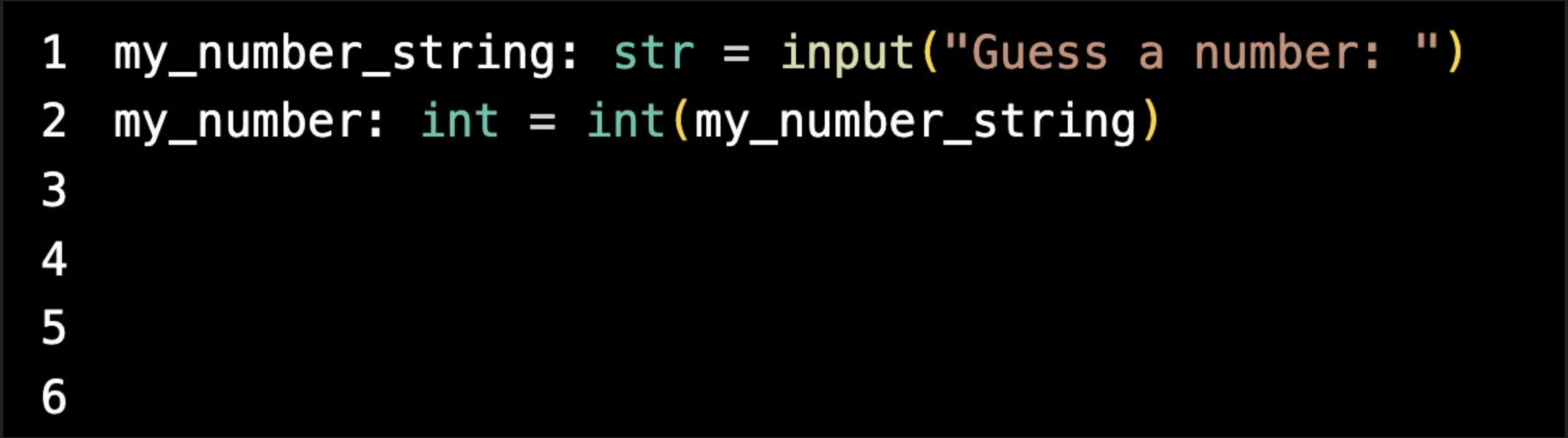
Conditional Statements

```
if                                   :
█
else:
█
```



Practice

Write a program that prints “Even” if my_number is even and “Odd” if my_number is odd.
(Hint: You will want to use % and the relational operator == from LS03)



```python
my_number_string: str = input("Guess a number: ")
my_number: int = int(my_number_string)




```