Branching

CS195 - Lecture 5
Instructor: Dr. V

- if-elif-else
- boolean operators
- boolean algebra
- nested code blocks
  - nested if statements and while loops
- while, break, continue

if syntax

- start with the word **if**
- then a space, followed by some *condition*
- followed by a colon and a newline
- then add your indented *code block* (things to do if the the condition is **True**)

```
[ code before if statement ]
if [condition] :
    [ code block ]
[ code after if statement ]
```

if

```
1  ERROR_MSG_AGE = '''Sorry, you're not old enough.
2      Please get your parent's permission.'''
3
4
5
6  age = int( input("How old are you?\n>> ") )
7
8  if age < 13:
9      print(ERROR_MSG_AGE)
10
11
12
13
14
15
```

if-else

```
1  ERROR_MSG_AGE = '''Sorry, you're not old enough.
2      Please get your parent's permission.'''
3  WELCOME_MSG = 'Welcome to my app!'
4
5
6  age = int( input("How old are you?\n>> ") )
7
8  if age < 13:
9      print(ERROR_MSG_AGE)
10 else:
11     print(WELCOME_MSG)
12
13
14
15
```

if-else-elif

```
1  ERROR_MSG_AGE = '''Sorry, you're not old enough.
2      Please get your parent's permission.'''
3  WARNING_MSG_AGE = '''WARNING: This app has advanced mathematical
4  concepts. Use at your own risk.'''
5  WELCOME_MSG = 'Welcome to my app!'
6
7
8  age = int( input("How old are you?\n>> ") )
9
10 if age < 13:
11     print(ERROR_MSG_AGE)
12 elif age < 15:
13     print(WARNING_MSG_AGE)
14 else:
15     print(WELCOME_MSG)
```

if-else-elif

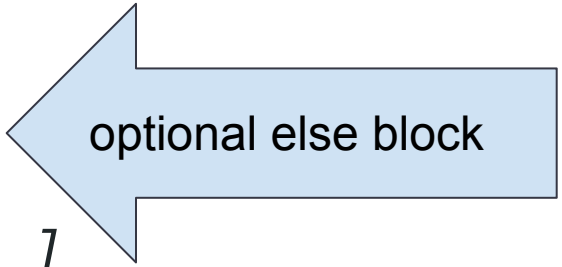
```
1  ERROR_MSG_AGE = '''Sorry, you're not old enough.
2      Please get your parent's permission.'''
3  WARNING_MSG_AGE = '''WARNING: This app has advanced mathematical
4  concepts. Use at your own risk.'''
5  WELCOME_MSG = 'Welcome to my app!'
6
7
8  age = int( input("How old are you?\n>> ") )
9
10 if age < 13:
11     print(ERROR_MSG_AGE)
12 elif 13 <= age < 15:          # age<15 would've been sufficient
13     print(WARNING_MSG_AGE)
14 else:
15     print(WELCOME_MSG)
```

if-elif-else

```
1  points=int(input('How many points did you get on the test?\n> '))
2
3  # you can have as many elif blocks as you want
4  print('You got an ', end='')
5  if points > 90:
6      print('A')
7  elif points > 80:
8      print('B')
9  elif points > 70:
10     print('C')
11 elif points > 65:
12     print('D')
13 else:
14     print('F')
15
```

if-elif-else syntax

```
[ code before if-elif-else statements ]
if [condition] :
    [ code block ]
elif [condition] :
    [ code block ]
elif [condition] :
    [ code block ]
else :
    [ code block ]
[ code after if-elif-else statements ]
```



blocks and indentation

```
1
2  age = int( input("How old are you?\n>> ") )
3
4  # block of code starts after a colon :
5  # each line in the same block of code must be indented the same
6  way
7  if age < 13:
8      print("Sorry you're not old enough.")
9      confirm = input('Is a parent around?')
10     ...
11 else:
12     print('Welcome to my app!')
13     print('Did you know that 2+2 is 4?')
14
15     print('Goodbye!')
```

blocks and indentation

```
1
2  age = int( input("How old are you?\n>> ") )
3
4  # block of code starts after a colon :
5  # each line in the same block of code must be indented the same
6  way
7  if age < 13:
8      print("Sorry you're not old enough.")
9      confirm = input('Is a parent around?')
10     ...
11 else:
12     print('Welcome to my app!')
13     print('Did you know that 2+2 is 4?')
14
15 print('Goodbye!')
```

if-elif condition

- **condition** will be evaluated as a boolean expression
  - boolean expression evaluates to either *True* or *False*

```
# if the condition1 is True, execute code block 1
if [condition1] :
    [ code block 1 ]
# else, if the condition2 is True, execute code block 2
elif [condition2] :
    [ code block 2 ]
```

Boolean expressions

```
1  x = 13
2
3
4  # x>10 is a boolean expression - it is either True or False
5  if x > 10:
6      print("hello")
7  else:
8      print("goodbye")
9
10
11
12
13
14
15
```

Boolean expressions

```
1  x = 13
2  a = x > 10
3  # what is the value of a?
4  # what will this print?
5  if a:
6      print("hello")
7  else:
8      print("goodbye")
9
10
11
12
13
14
15
```

Boolean expressions

```
1  x = 13
2
3  a = x < 10
4
5  # what is the value of a?
6  # what will this print?
7  if a:
8      print("hello")
9  else:
10     print("goodbye")
11
12
13
14
15
```

Boolean expressions

```
1
2
3  a = True
4
5  if a:
6      print("hello")
7  else:
8      print("goodbye")
9
10
11
12
13
14
15
```

Boolean expressions

```
1
2  # you can use the literals True or False as your condition
3  #  (although this is not very useful)
4
5  if True:
6      print("hello")
7  else:
8      print("goodbye")
9
10
11
12
13
14
15
```

Boolean conversion

```
1
2  # if your condition is not a boolean expression,
3  #   it will automatically, get converted to a boolean
4
5  if 0:    # equivalent to  if bool(0):
6      print("hello")
7  else:
8      print("goodbye")
9
10
11
12
13
14
15
```

Boolean conversion

```
1  #what do you think this will print?
2  name, greeting = "john", ""
3
4  if greeting:
5      print(f"well, {greeting} right back at ya")
6  elif name:
7      print(f"hi {name}!")
8  else:
9      print("hello.")
10
11
12
13
14
15
```

Boolean operators

```
1  x, y = 13, 10
2
3  # what do you think each of these prints?
4  print( x > y )
5  print( x < y )
6  print( x >= y )
7  print( x <= y )
8  print( x <= x )
9  print( x == y )
10 print( x != y )
11
12 # what about these?
13 print( 10 < x < 20 )
14 print( 10 <= x < 20 )
15
```

not

```
1
2  # what do you think each of these prints?
3  print( 2 > 5 )
4  print( not 2 > 5 )
5
6
7  # what about this?
8  print( (not 2) > 5 )
9
10
11
12
13
14
15
```

or

```
1  x = 13
2
3  # what do you think this prints?
4  if x < 0 or x > 10:
5      print("hello")
6  else:
7      print("goodbye")
8
9
10
11
12
13
14
15
```

or

```
1  x = -13
2
3  # what do you think this prints?
4  if x < 0 or x > 10:
5      print("hello")
6  else:
7      print("goodbye")
8
9
10
11
12
13
14
15
```

and

```
1  name = "john"
2  age = 17
3
4  # what do you think this prints?
5  if name and age > 13:
6      print("hello")
7  else:
8      print("goodbye")
9
10
11
12
13
14
15
```

and

```
1  name = ""
2  age = 17
3
4  # what do you think this prints?
5  if name and age > 13:
6      print("hello")
7  else:
8      print("goodbye")
9
10
11
12
13
14
15
```

and

```
1  name = "john"
2  age = 10
3
4  # what do you think this prints?
5  if name and age > 13:
6      print("hello")
7  else:
8      print("goodbye")
9
10
11
12
13
14
15
```

and, or, not

```
>>> True and True
>>> True and False
>>> False and True
>>> False and False
```

```
>>> True or True
>>> True or False
>>> False or True
>>> False or False
```

```
>>> not True
>>> not False
```

nested if statements

```
1
2  age = int( input("How old are you?\n>> ") )
3
4  if age < 13:
5      print("Sorry you're not old enough.")
6      confirm = input('Is a parents around?')
7      if confirm == 'yes':
8          print("Please have your parent answer the following.")
9          confirm = input("Are you the parent?")
10         if confirm  == 'yes':
11             confirm = input("Do you give your child permission?")
12             ...
13
14
15
```

nested if statements

```
1  age = int( input("How old are you?\n>> ") )
2
3  if age < 13:
4      print("Sorry you're not old enough.")
5      confirm = input('Is a parents around?')
6      if confirm == 'yes':
7          print("Please have your parent answer the following.")
8          askTheParent()
9
10     else:
11         print('Welcome to my App!')
12
13
14
15
```

nested if statements

```
1  age = int( input("How old are you?\n>> ") )
2
3  if age < 13:
4      print("Sorry you're not old enough.")
5      confirm = input('Is a parents around?')
6      if confirm == 'yes':
7          print("Please have your parent answer the following.")
8          askTheParent()
9
10 else:
11     print('Welcome to my App!')
12
13
14
15
```

nested if statements

```
1  age = int( input("How old are you?\n>> ") )
2
3  if age < 13:
4      print("Sorry you're not old enough.")
5      confirm = input('Is a parents around?')
6      if confirm == 'yes':
7          print("Please have your parent answer the following.")
8          askTheParent()
9      else:
10         print('Sorry, you'll need your parent.')
11         exit()
12 else:
13     print('Welcome to my App!')
14
15
```

nested while loops

```
1
2  # what does this print?
3  x = 1
4  while x <= 3:
5      y = 1
6      while y <= 3:
7          print(f"{x * y = }")
8          y+=1
9      x+=1
10
11
12
13
14
15
```

nested code blocks

```
1  MIN_NUMBER = 50
2
3  # what do you think this code does?
4  while True:
5      userResponse = input('Please enter a number: ')
6      while not userResponse.isdecimal():
7          print('You did not enter a valid number.')
8          userResponse = input('Please try again: ')
9      userResponse = int(userResponse)
10     if userResponse < MIN_NUMBER:
11         print('Your number is too low.')
12     else:
13         print('This is a good number. I like it.')
14
15
```

using **break** to get out of a loop

```
1  MIN_NUMBER = 50
2
3  # this is no longer an infinite loop
4  while True:
5      userResponse = input('Please enter a number: ')
6      while not userResponse.isdecimal():
7          print('You did not enter a valid number.')
8          userResponse = input('Please try again: ')
9      userResponse = int(userResponse)
10     if userResponse < MIN_NUMBER:
11         print('Your number is too low.')
12     else:
13         print('This is a good number. I like it.')
14         break   # break out of the loop
15 print('Goodbye.')
```

using **continue** to skip code in a loop

```
1  MIN_NUMBER = 50
2
3  # what do you think this code does?
4  while True:
5      userResponse = input('Please enter a number: ')
6      if not userResponse.isdecimal():
7          print('You did not enter a valid number.')
8          continue  # this will skip all code below
9      userResponse = int(userResponse)
10     if userResponse < MIN_NUMBER:
11         print('Your number is too low.')
12     else:
13         print('This is a good number. I like it.')
14         break
15 print('Goodbye.')
```

Assignment 5 - due before week 7 lecture

- Guess-the-number game
  1. *think a random number, *myNum*, between 1 and 100
  2. ask user to guess a number between 1 and 100
  3. if user's response is not a valid positive integer, ask again until it is
  4. if user's guess is less than *myNum*, let them know their guess is too low
  5. if user's guess is higher than *myNum*, let them know their guess is too high
  6. if user's guess is spot on, tell them they win!

Assignment 5

- Extra credit 1
  - Keep track of the number of user guesses
    - At the end of each game, tell user their score, where score = 10 - [number of guesses]

- Extra credit 2
  - Allow user to play multiple games
    - At the end of each game, ask user if they want to play again
    - If user says yes, restart the game, otherwise end program

Assignment 5

- Guess-the-number game
  1. *think a random number, *myNum*, between 1 and 100

* Here's code for generating a random number between 1 and 100:

```
# import randint function from random library
from random import randint

# generate a random number between 1 and 100 and save it as myNum
myNum = randint(1,100)
```