Group 2: Short-Circuit Evaluation -

1.Knowledge Components:

1. Basic operators including “and”, “or”, “not”. The meaning of each operator and the conditions under which an operation returns True
2. The truth table of the three logical operators
3. De Morgan’s Law. The way to evaluate an expression in the form of “not(e1 and e2)” or “not(e1 or e2)”
   1. not (e1 and e2) = (not e1) or (not e2)
   2. not (e1 or e2) = (not e1) and (not e2)
4. Common truthy and falsy values.
5. Falsy values: 0, None, [ ], “”
6. Truthy values: values that are not falsy
7. The condition under which short-circuit evaluation happens. There is short-circuit evaluation if there is no need to check all sub expressions in order to get the value of a boolean expression
8. The expression stops evaluating as soon as the final result can be determined
9. The return value of a boolean expression. For any boolean expression, it returns the last value it evaluates no matter whether it is fully evaluated or evaluated with short-circuitry

In this exercise, our final goal is to teach students when short-circuit evaluation happens, when a boolean expression stops evaluating and what the return value of a boolean expression is. In order to achieve this goal, we first help students build knowledge about logic operators, truth tables and truthy and falsy values. We will also touch a little bit on De Morgan’s Law to help students analyze logical expressions more quickly.

2. STORYBOARD

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1

|  |  |  |
| --- | --- | --- |
| or | True | False |
| True | True | True |
| False | True | False |

|  |  |  |
| --- | --- | --- |
| and | True | False |
| True | True | False |
| False | False | False |

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2

“Truthy” values “Falsey” values

“112” “ “

5 None

[1] [ ]

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3

print(5 or 42) print(5 and 42) print(“” and True)

print(5) print(42) print(“”)

5 42 “”

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4

Assessment: Now it’s your turn!

def foo(x): def bar(y):

return (42 and False) return None or 42 or [ ]

print(foo(“hello”) or 112) print(((bar(1)+1) and None) or 1)

What does this print? What does this print?

3. User Feedback:

1. Truth table is not really necessary for someone with mathematic/ECE background.
2. The connection between truthiness and True is still very vague.
   * 1. During testing I found it very helpful to use "not" to illustrate whether a value is truthy. For example, not None == True.
3. The subject was quick to accept the concept of short circuit evaluation. However, the subject fails to apply the concept when the expression involves multiple operators.
4. Presenting the expression in a function call has made it difficult for the subject to understand the purpose of the question. I suggest that expressions can be used to simplify the form of the question.