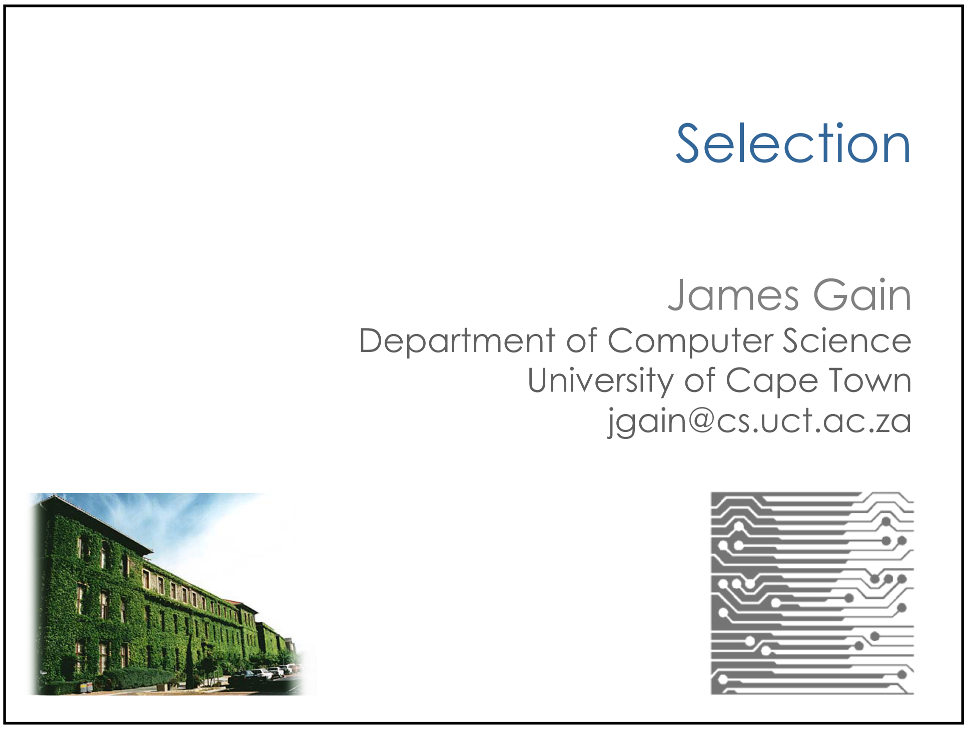

Selection

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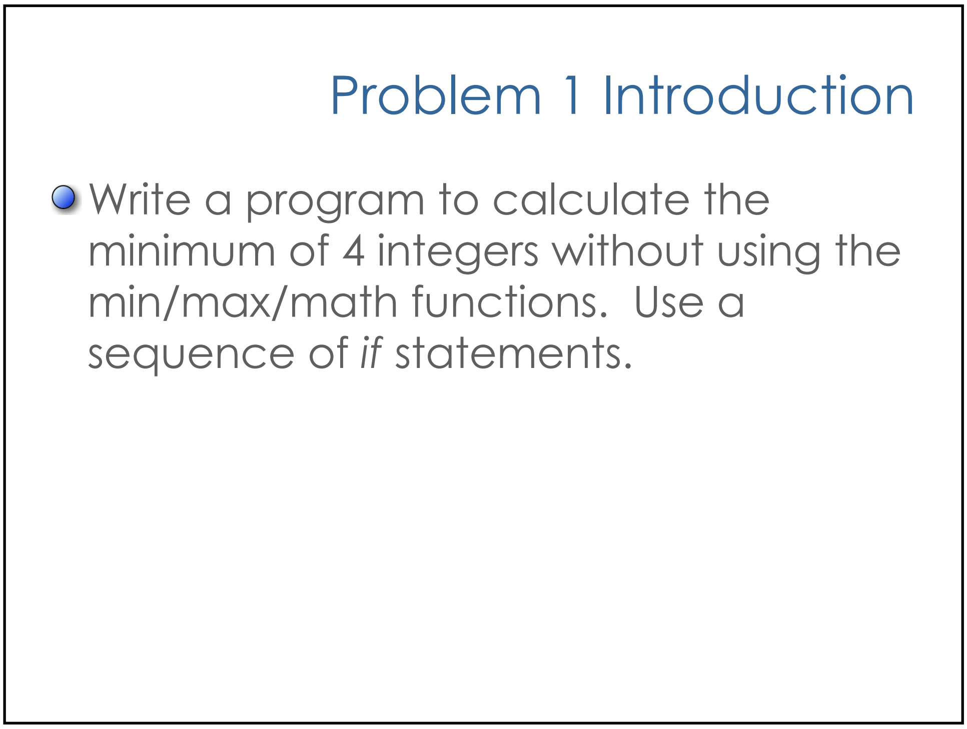
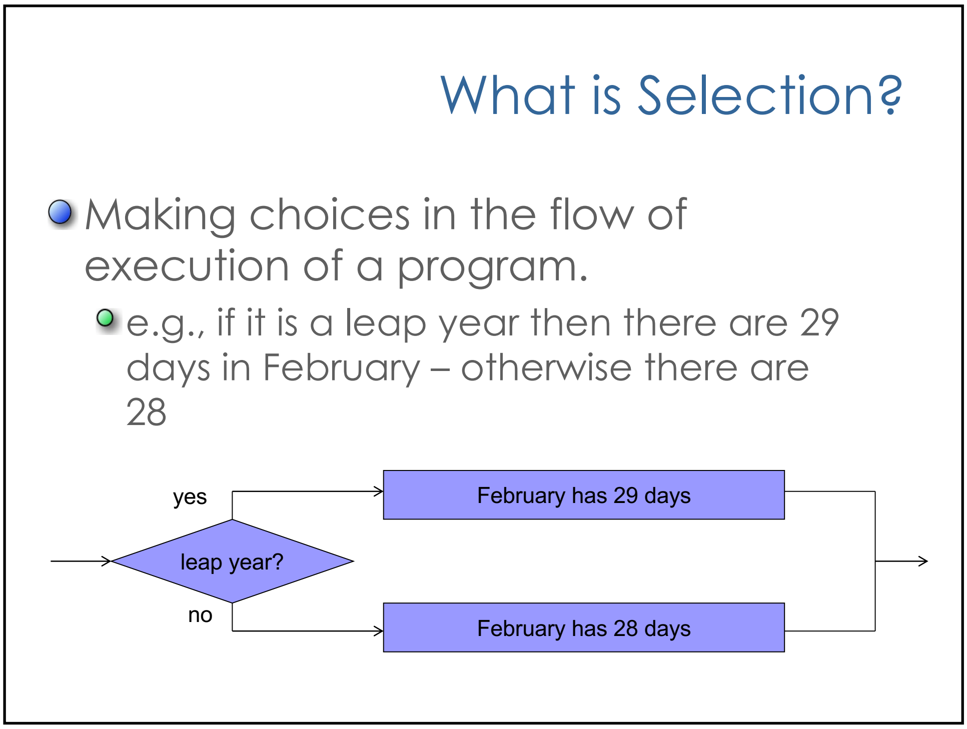


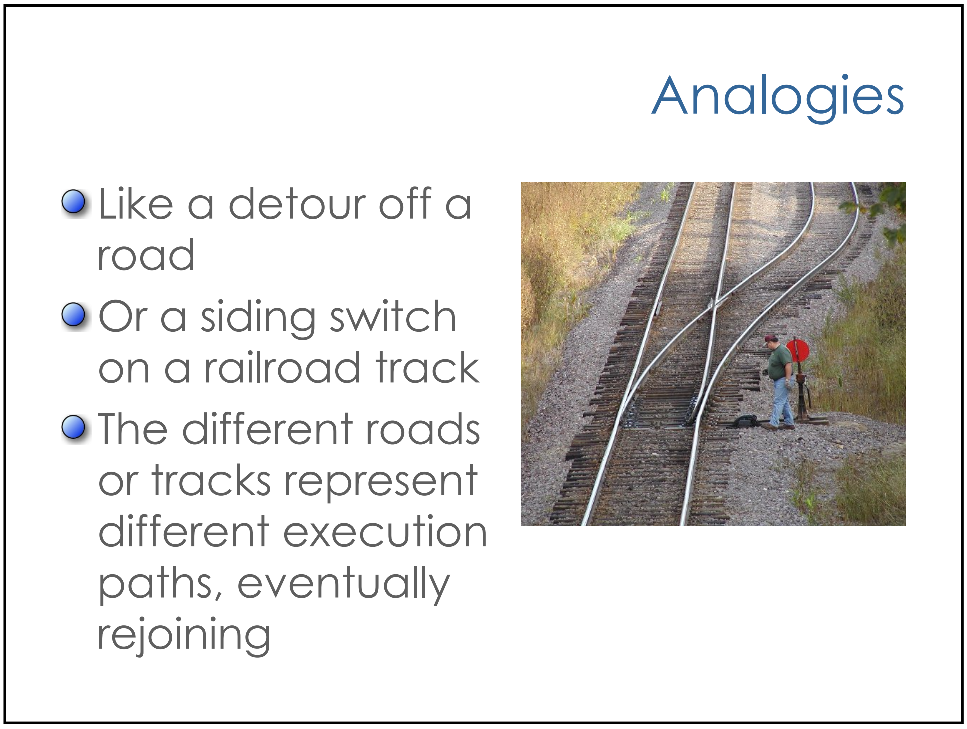
Problem 1 Introduction

- Write a program to calculate the minimum of 4 integers without using the min/max/math functions. Use a sequence of *if* statements.



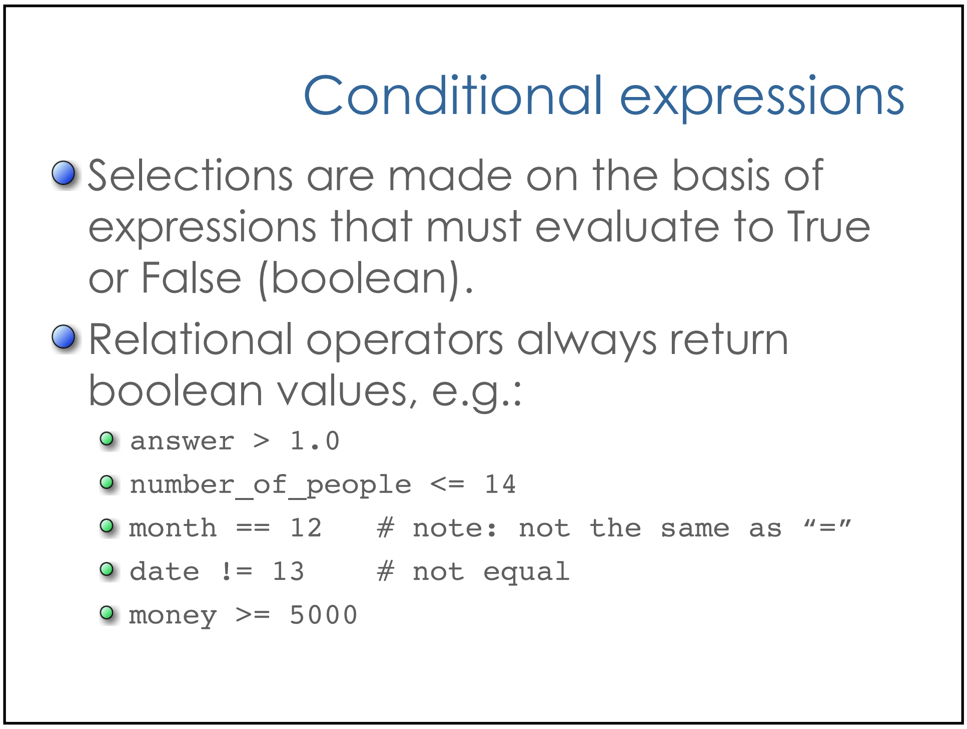
What is Selection?

- Making choices in the flow of execution of a program.
  - e.g., if it is a leap year then there are 29 days in February – otherwise there are 28



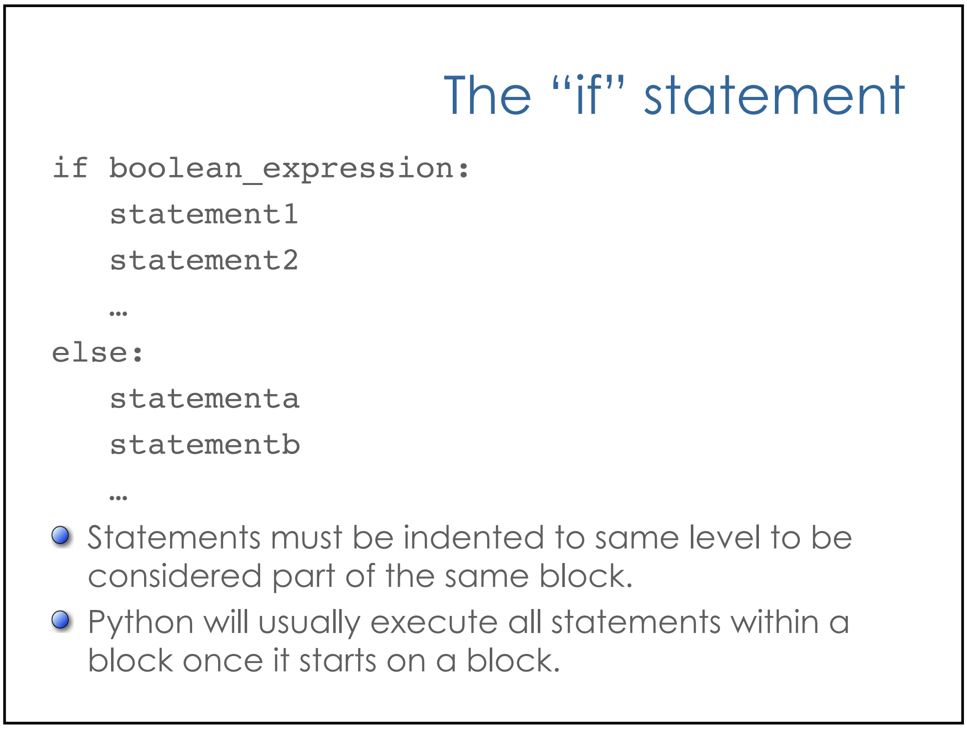
Analogies

- Like a detour off a road
- Or a siding switch on a railroad track
- The different roads or tracks represent different execution paths, eventually rejoining



Conditional expressions

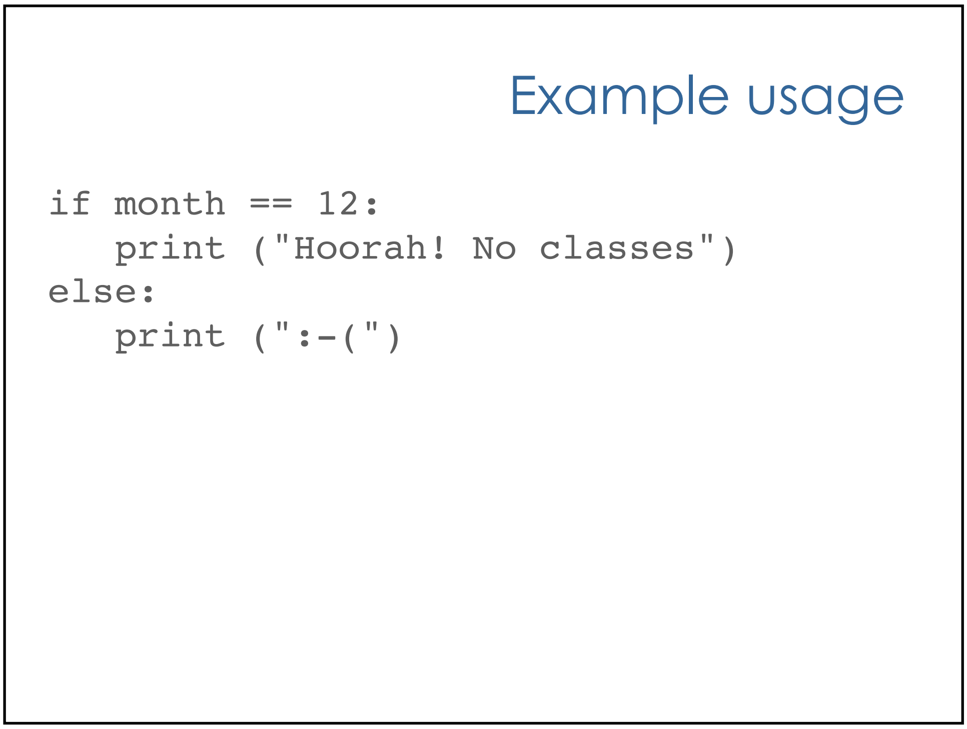
- Selections are made on the basis of expressions that must evaluate to True or False (boolean).
- Relational operators always return boolean values, e.g.:
  - `answer > 1.0`
  - `number_of_people <= 14`
  - `month == 12    # note: not the same as "="`
  - `date != 13     # not equal`
  - `money >= 5000`



The "if" statement

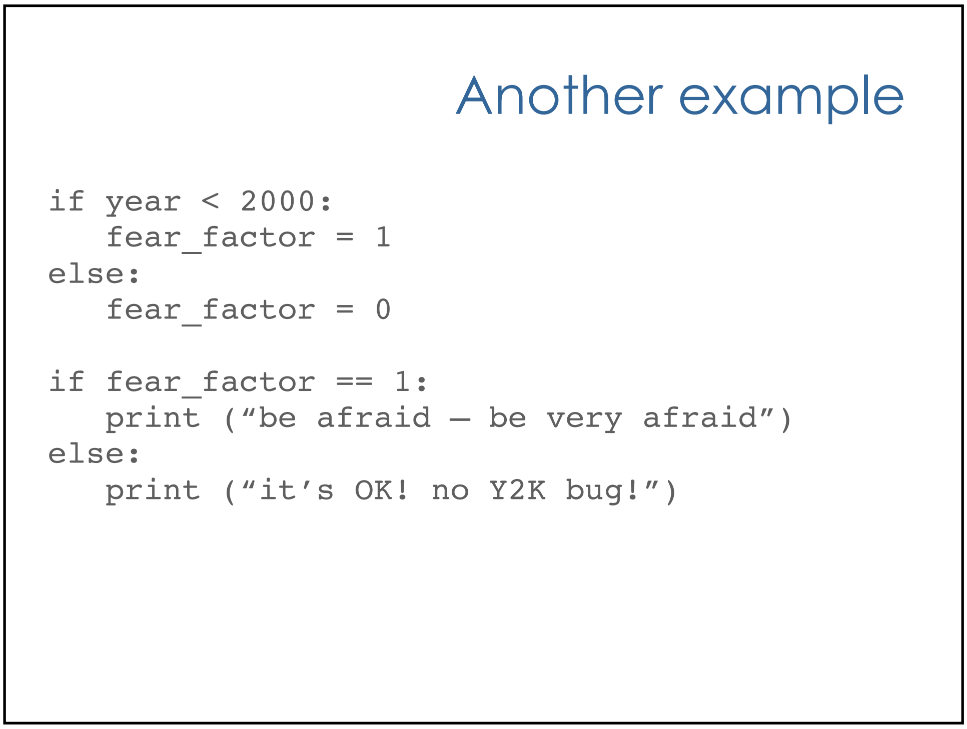
```
if boolean_expression:
   statement1
   statement2
   …
else:
   statementa
   statementb
   …
```

- Statements must be indented to same level to be considered part of the same block.
- Python will usually execute all statements within a block once it starts on a block.



Example usage

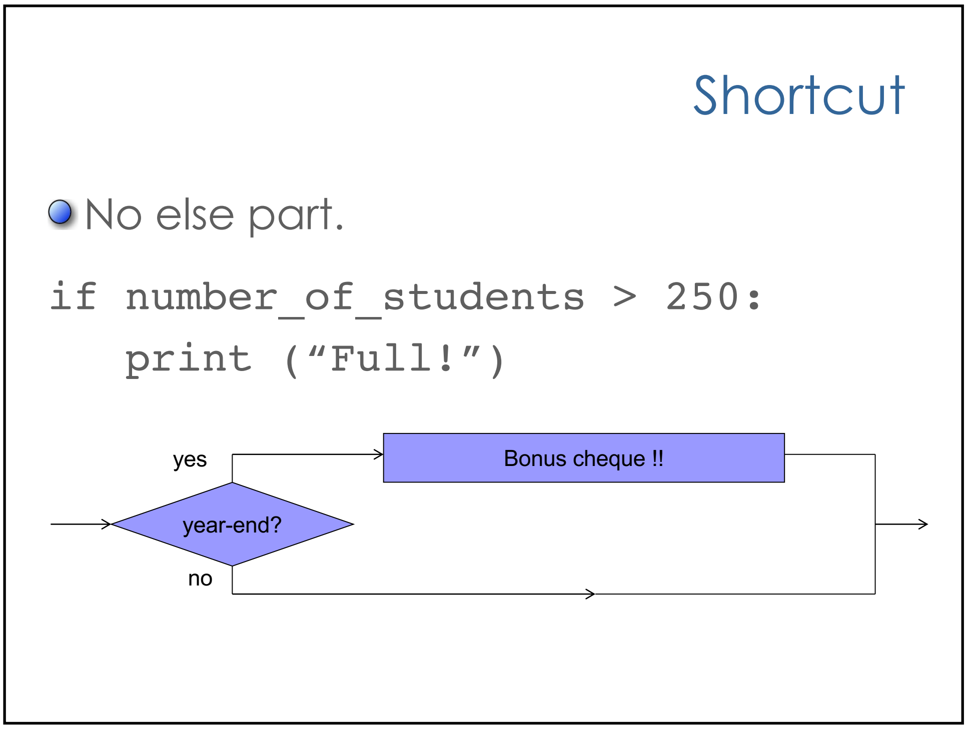
```
if month == 12:
   print ("Hoorah! No classes")
else:
   print (":-(")
```



Another example

```
if year < 2000:
   fear_factor = 1
else:
   fear_factor = 0

if fear_factor == 1:
   print (“be afraid – be very afraid”)
else:
   print (“it’s OK! no Y2K bug!”)
```



Shortcut

- No else part.

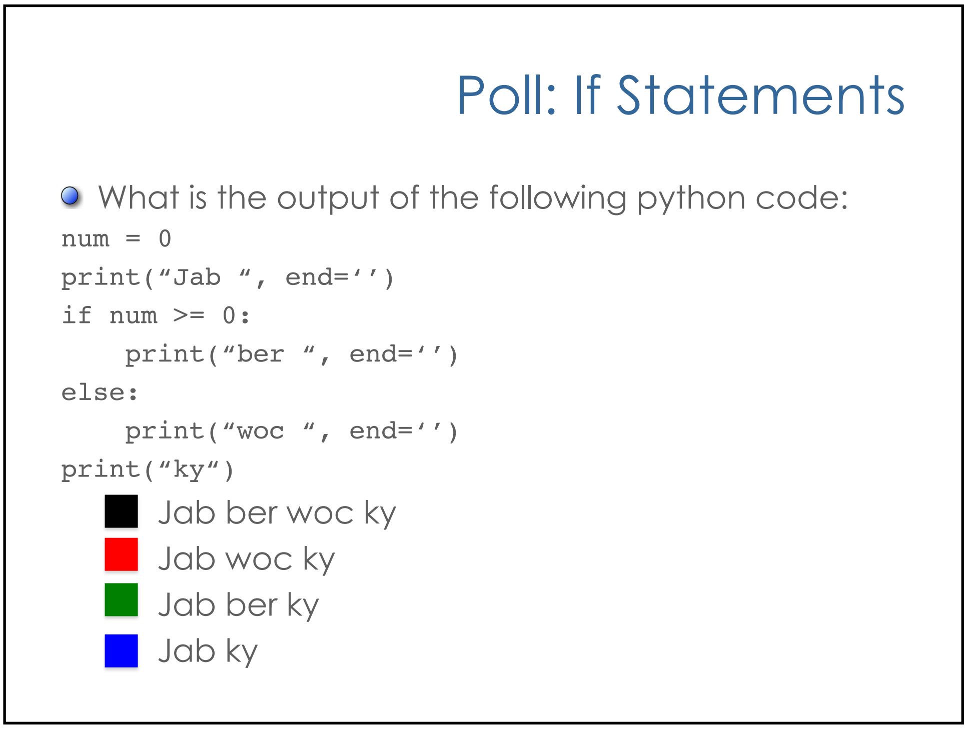
```
if number_of_students > 250:
   print (“Full!”)
```

yes

Bonus cheque !!

year-end?

no

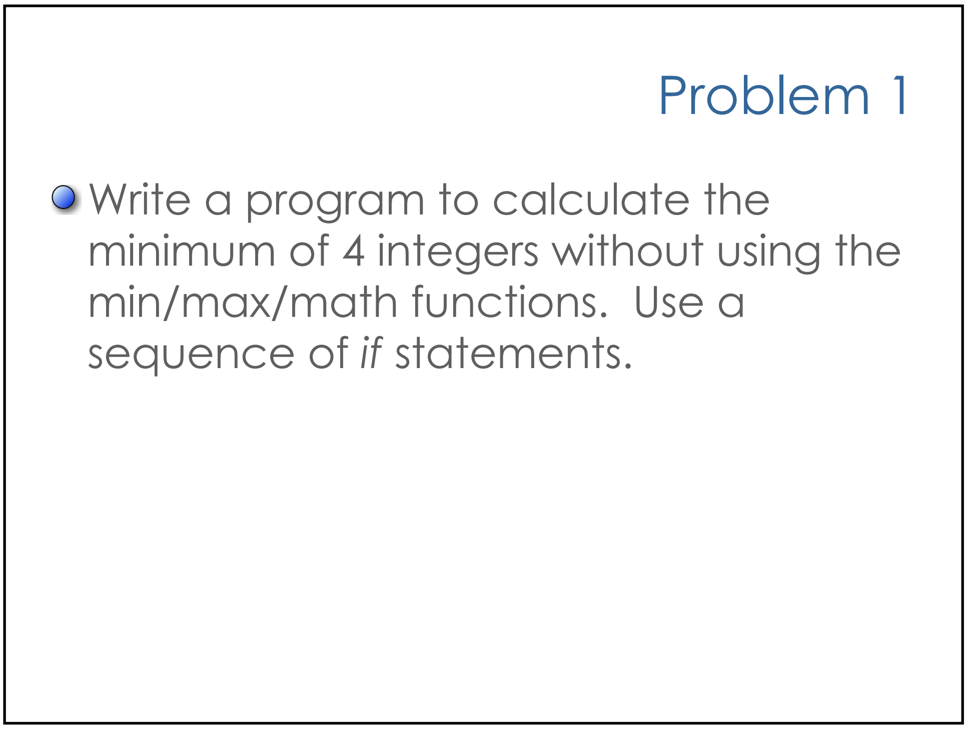


Poll: If Statements

- What is the output of the following python code:

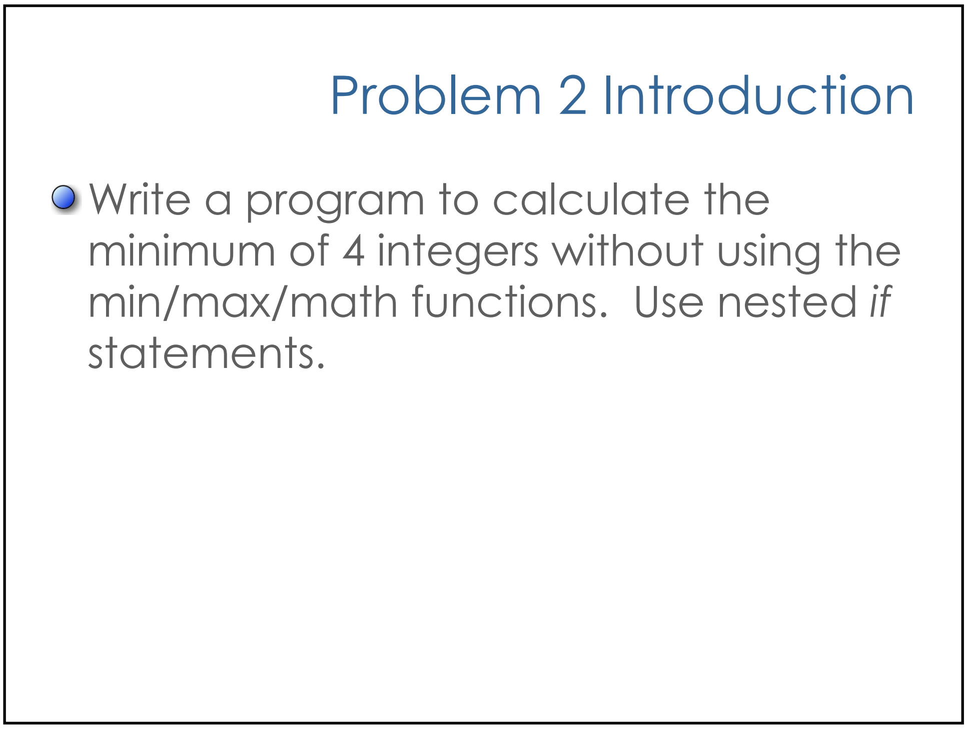
```
num = 0
print(“Jab “, end=‘’)
if num >= 0:
    print(“ber “, end=‘’)
else:
    print(“woc “, end=‘’)
print(“ky“)
```

- ⬛ Jab ber woc ky
- 🟥 Jab woc ky
- 🟩 Jab ber ky
- 🟦 Jab ky



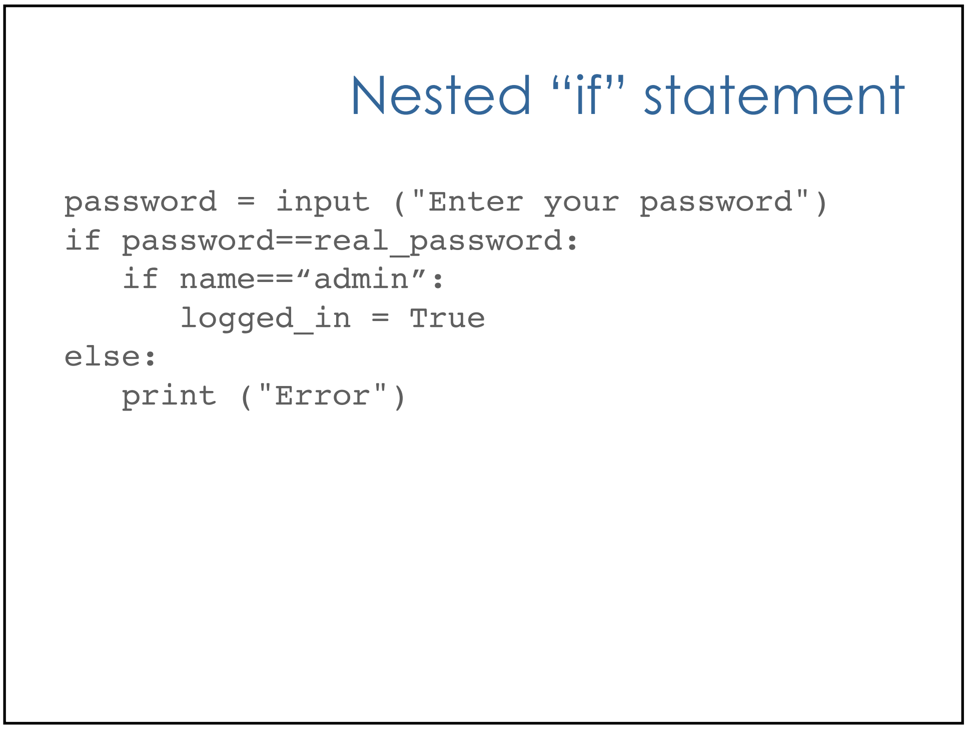
Problem 1

- Write a program to calculate the minimum of 4 integers without using the min/max/math functions. Use a sequence of *if* statements.



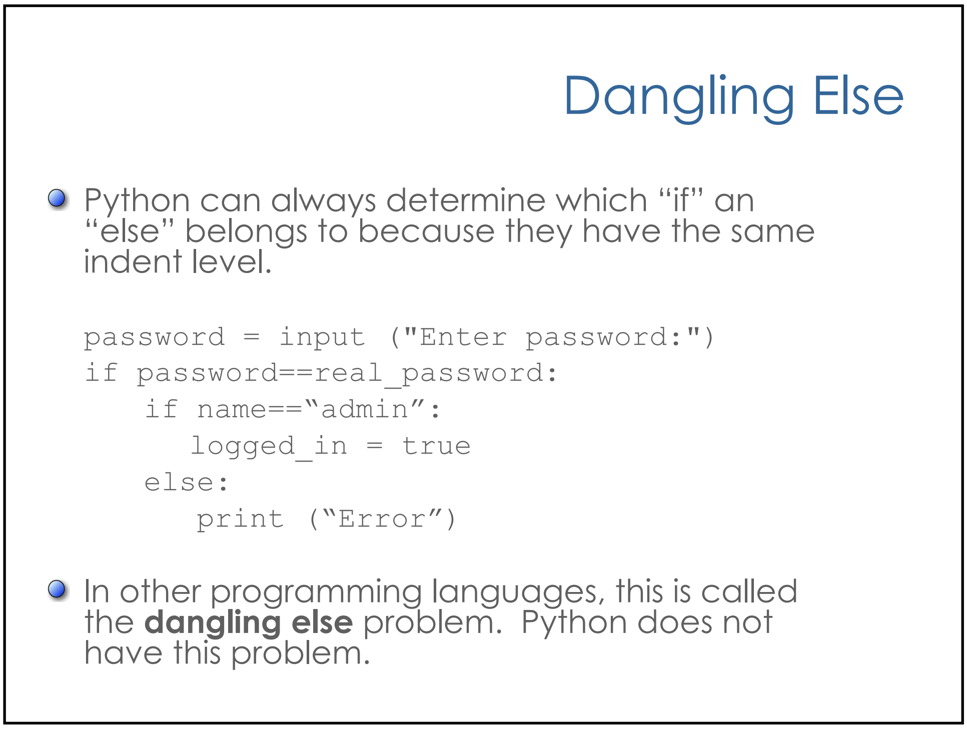
Problem 2 Introduction

- Write a program to calculate the minimum of 4 integers without using the min/max/math functions. Use nested *if* statements.



Nested “if” statement

```
password = input ("Enter your password")
if password==real_password:
   if name==“admin”:
      logged_in = True
else:
   print ("Error")
```

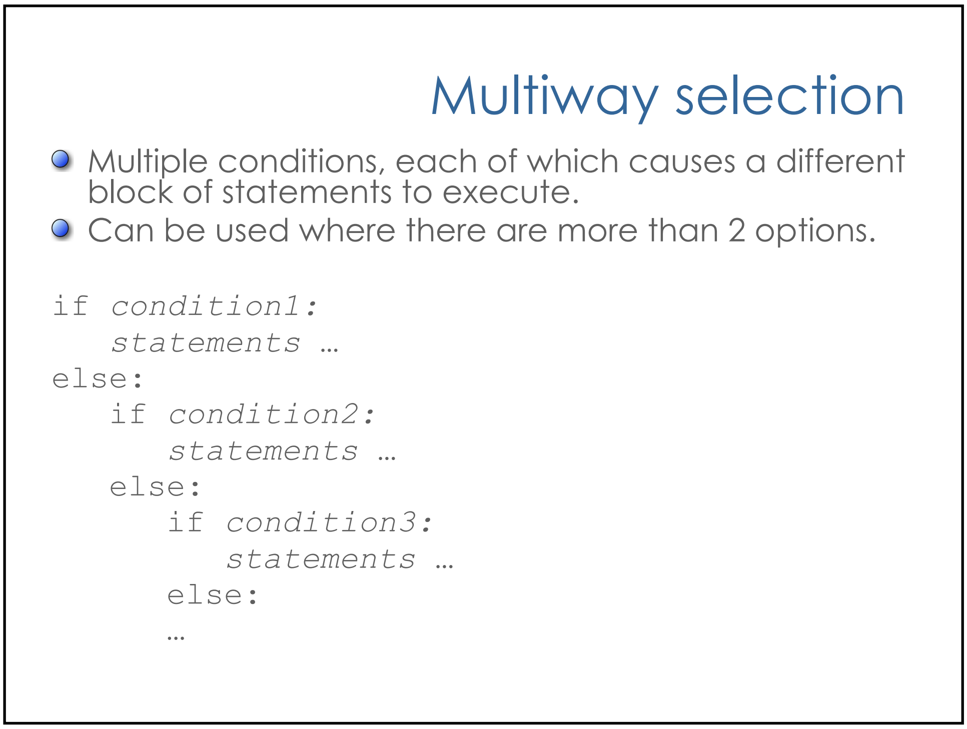


Dangling Else

- Python can always determine which “if” an “else” belongs to because they have the same indent level.

```
password = input ("Enter password:")
if password==real_password:
    if name==“admin”:
       logged_in = true
    else:
       print (“Error”)
```

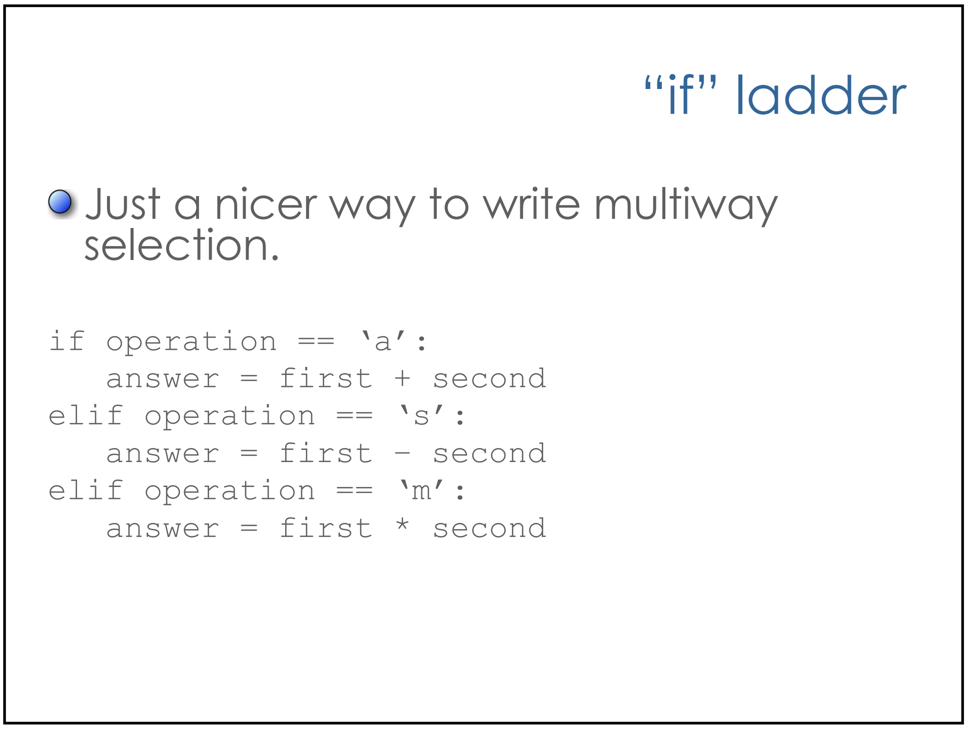
- In other programming languages, this is called the **dangling else** problem. Python does not have this problem.



Multiway selection

- Multiple conditions, each of which causes a different block of statements to execute.
- Can be used where there are more than 2 options.

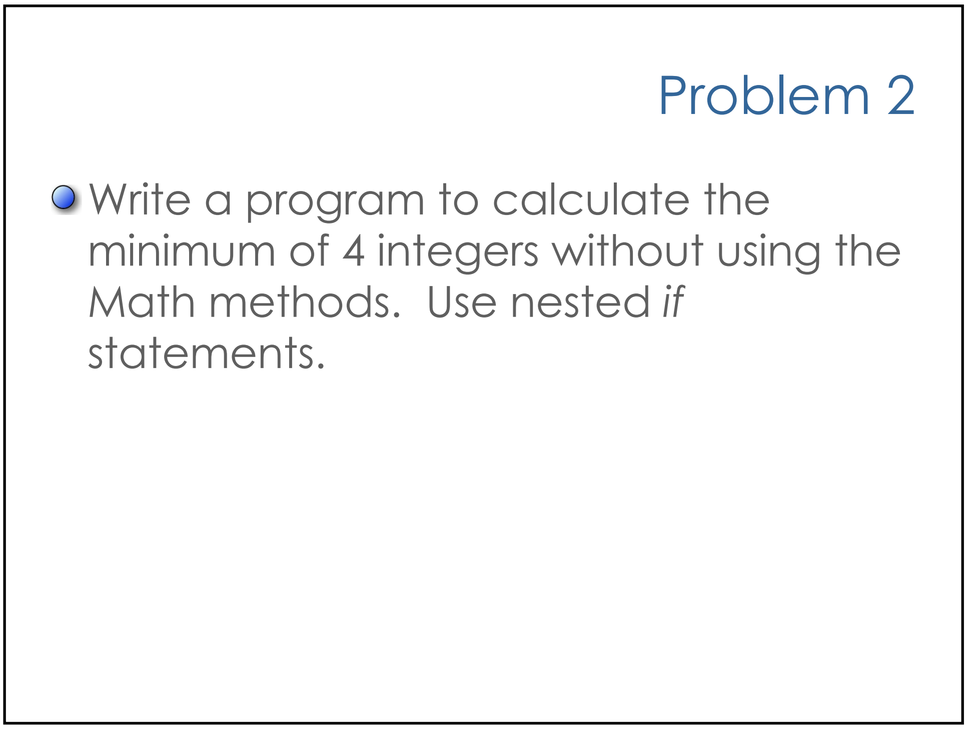
```
if condition1:
   statements …
else:
   if condition2:
      statements …
   else:
      if condition3:
         statements …
      else:
      …
```



“if” ladder

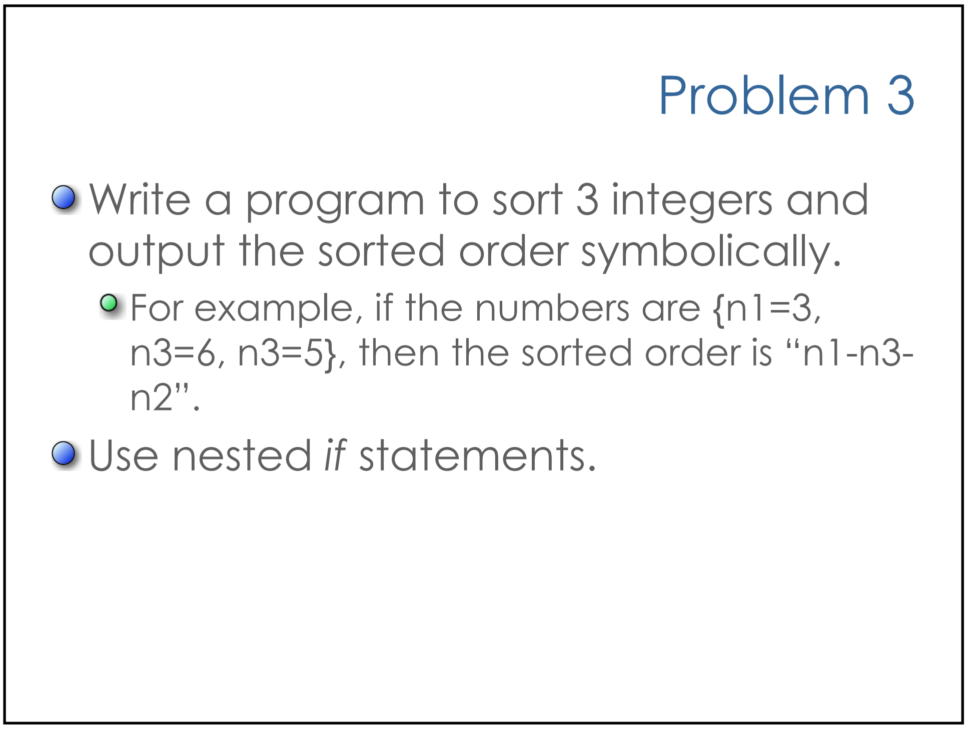
- Just a nicer way to write multiway selection.

```
if operation == ‘a’:
   answer = first + second
elif operation == ‘s’:
   answer = first – second
elif operation == ‘m’:
   answer = first * second
```



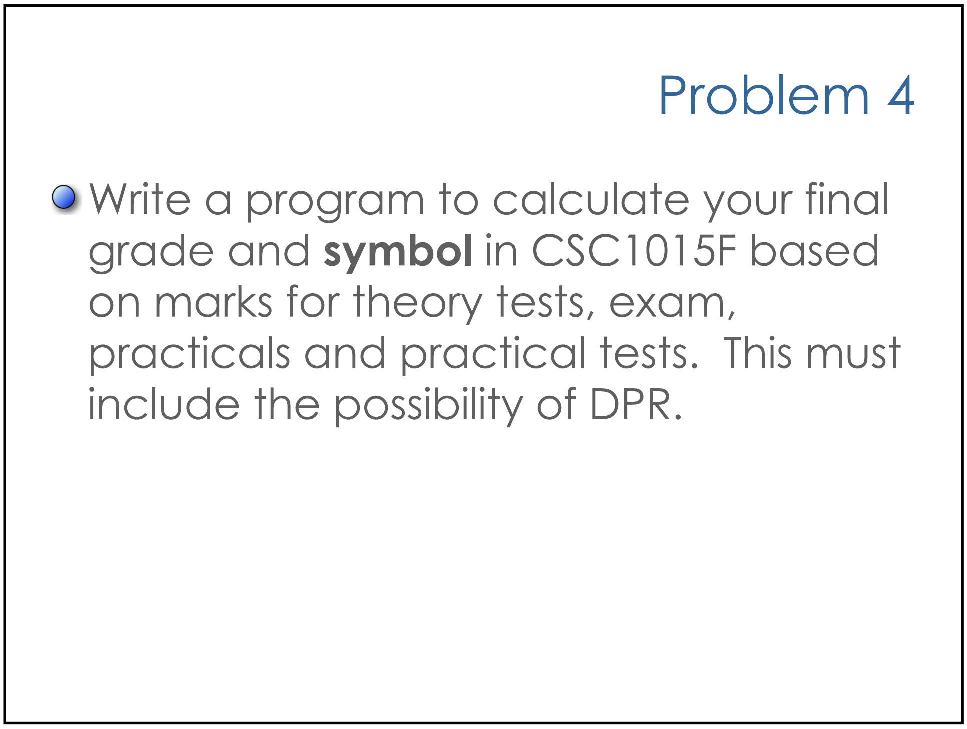
Problem 2

- Write a program to calculate the minimum of 4 integers without using the Math methods. Use nested *if* statements.



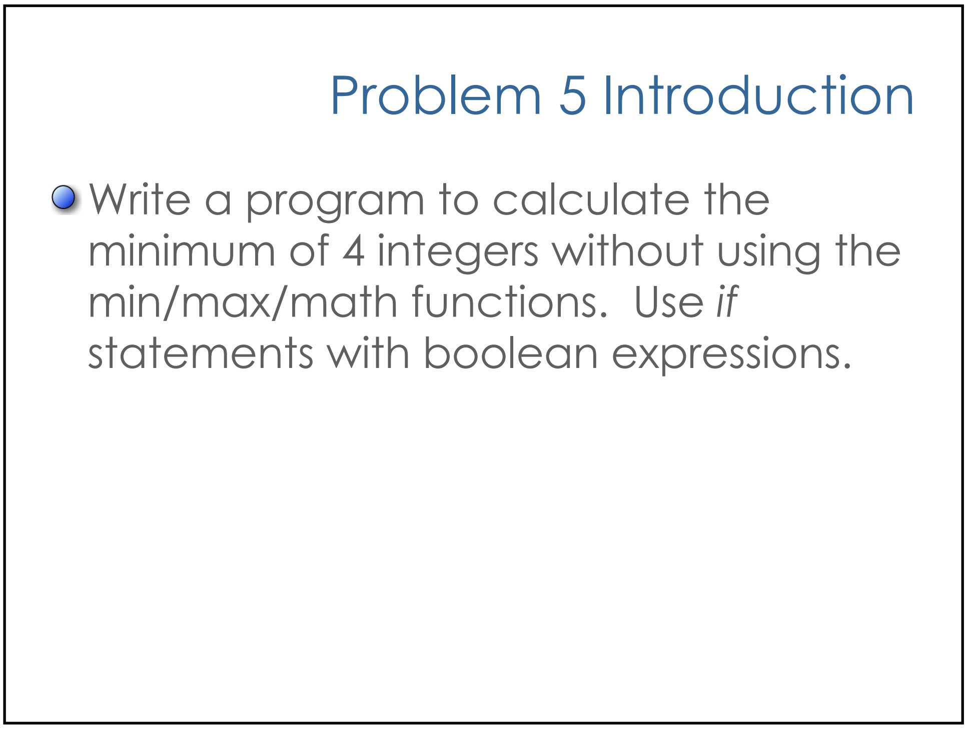
Problem 3

- Write a program to sort 3 integers and output the sorted order symbolically.
  - For example, if the numbers are {n1=3, n3=6, n3=5}, then the sorted order is "n1-n3-n2".
- Use nested *if* statements.



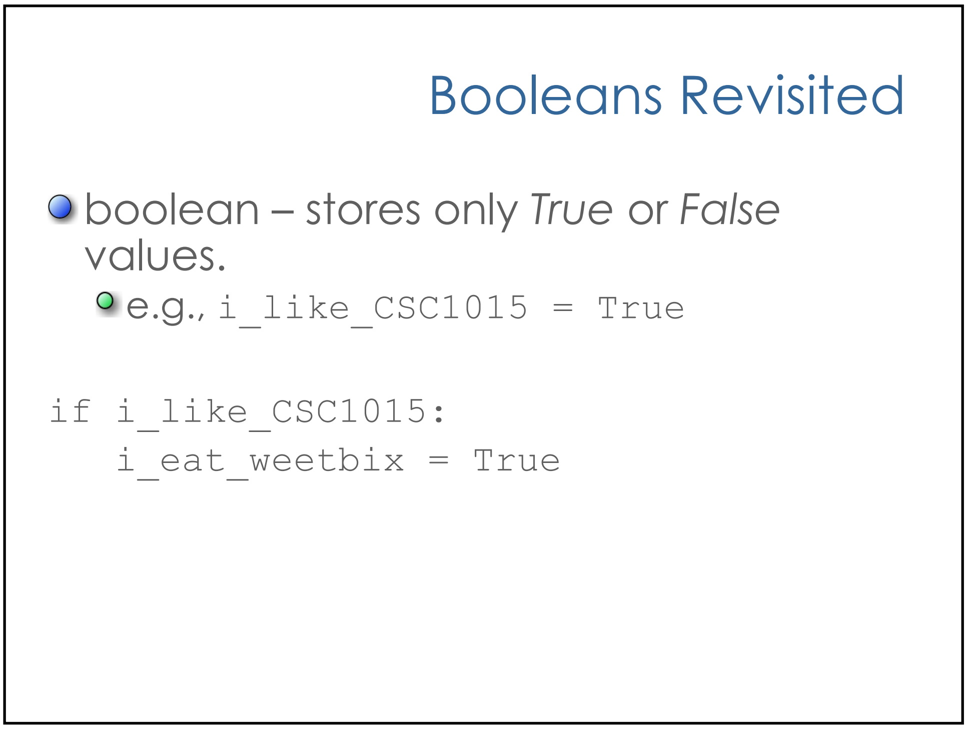
Problem 4

- Write a program to calculate your final grade and **symbol** in CSC1015F based on marks for theory tests, exam, practicals and practical tests. This must include the possibility of DPR.



Problem 5 Introduction

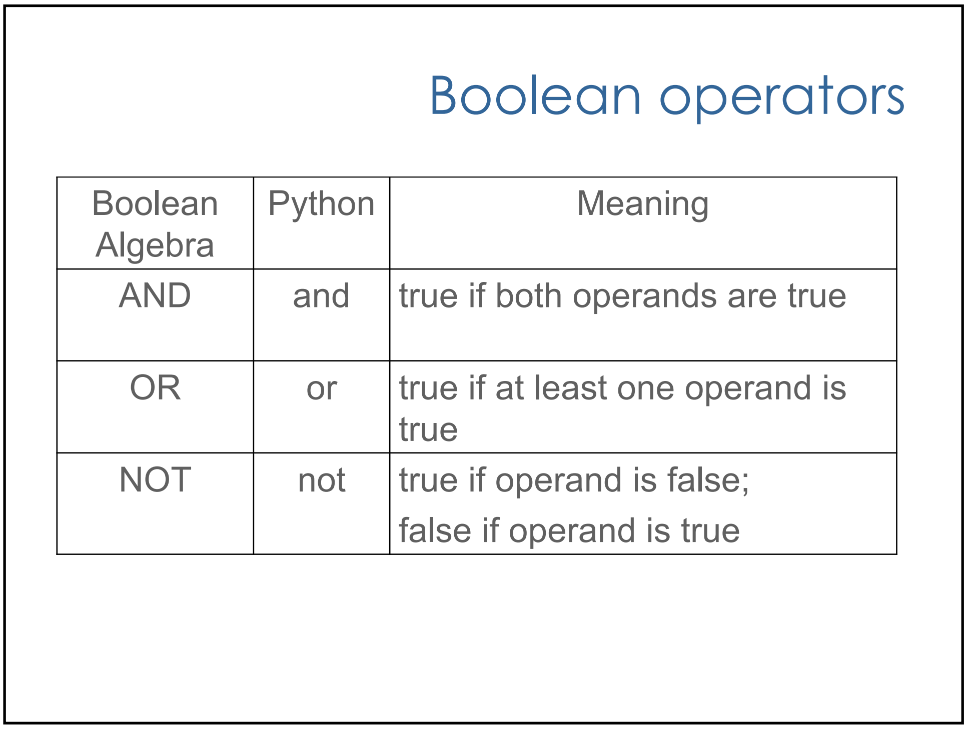
- Write a program to calculate the minimum of 4 integers without using the min/max/math functions. Use *if* statements with boolean expressions.



Booleans Revisited

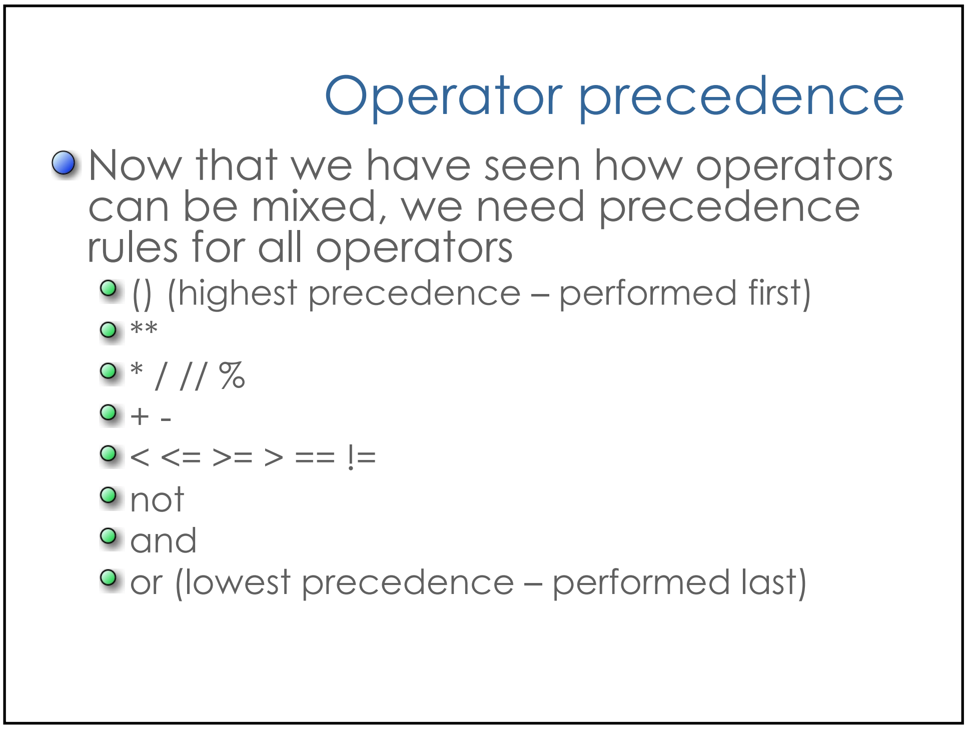
- boolean – stores only *True* or *False* values.
  - e.g., `i_like_CSC1015 = True`

```
if i_like_CSC1015:
   i_eat_weetbix = True
```



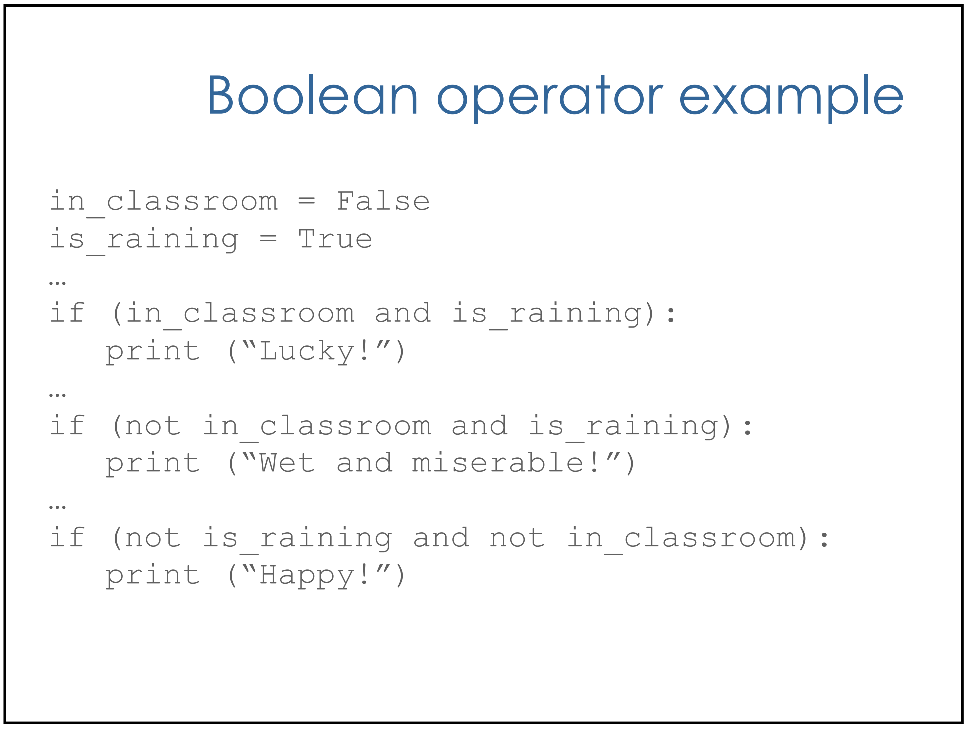
Boolean operators

Boolean Algebra	Python	Meaning
AND	and	true if both operands are true
OR	or	true if at least one operand is true
NOT	not	true if operand is false; false if operand is true



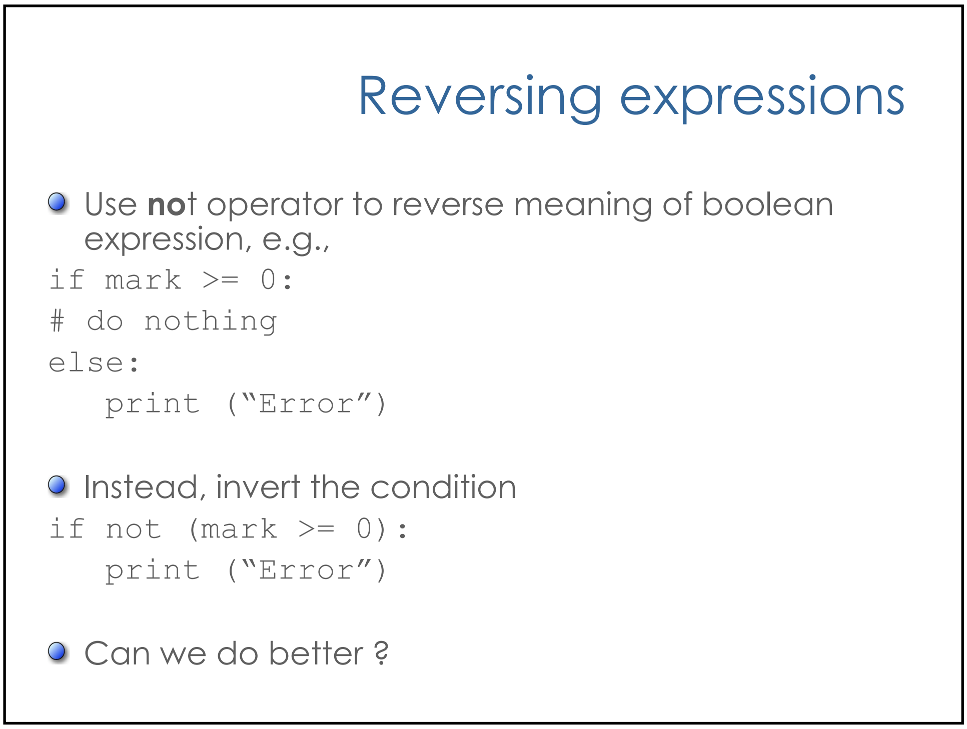
Operator precedence

- Now that we have seen how operators can be mixed, we need precedence rules for all operators
  - () (highest precedence – performed first)
  - **
  - * / // %
  - + -
  - < <= >= > == !=
  - not
  - and
  - or (lowest precedence – performed last)



Boolean operator example

```
in_classroom = False
is_raining = True
…
if (in_classroom and is_raining):
   print (“Lucky!”)
…
if (not in_classroom and is_raining):
   print (“Wet and miserable!”)
…
if (not is_raining and not in_classroom):
   print (“Happy!”)
```



Reversing expressions

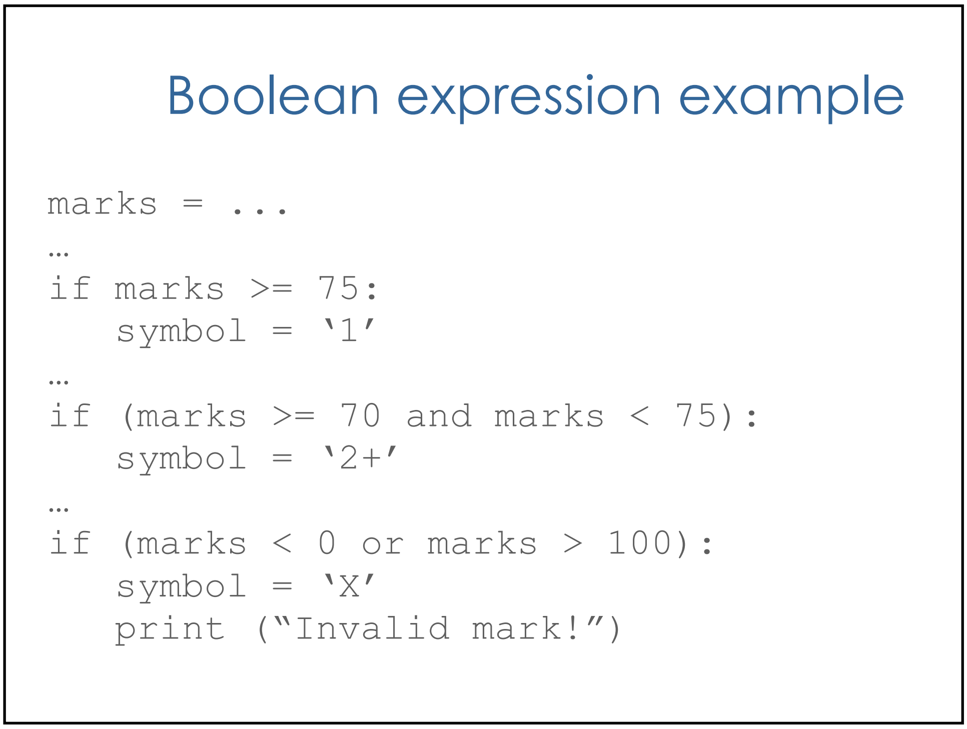
- Use **not** operator to reverse meaning of boolean expression, e.g.,

```
if mark >= 0:
# do nothing
else:
   print (“Error”)
```

- Instead, invert the condition

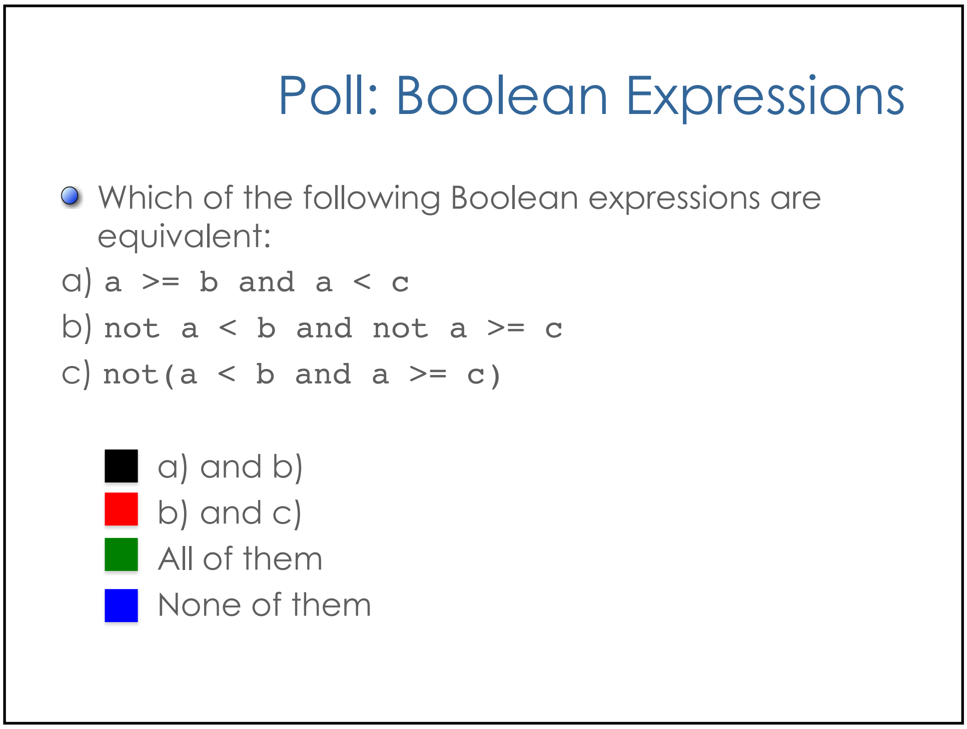
```
if not (mark >= 0):
   print (“Error”)
```

- Can we do better ?



Boolean expression example

```
marks = ...
…
if marks >= 75:
   symbol = ‘1’
…
if (marks >= 70 and marks < 75):
   symbol = ‘2+’
…
if (marks < 0 or marks > 100):
   symbol = ‘X’
   print (“Invalid mark!”)
```



Poll: Boolean Expressions

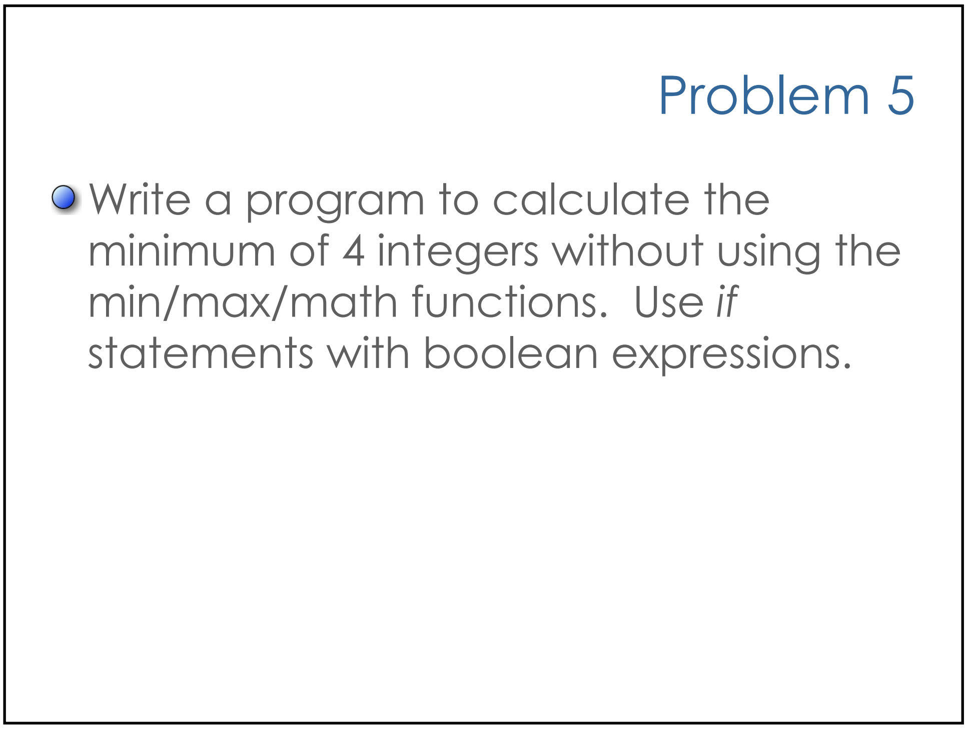
- Which of the following Boolean expressions are equivalent:

a) `a >= b and a < c`

b) `not a < b and not a >= c`

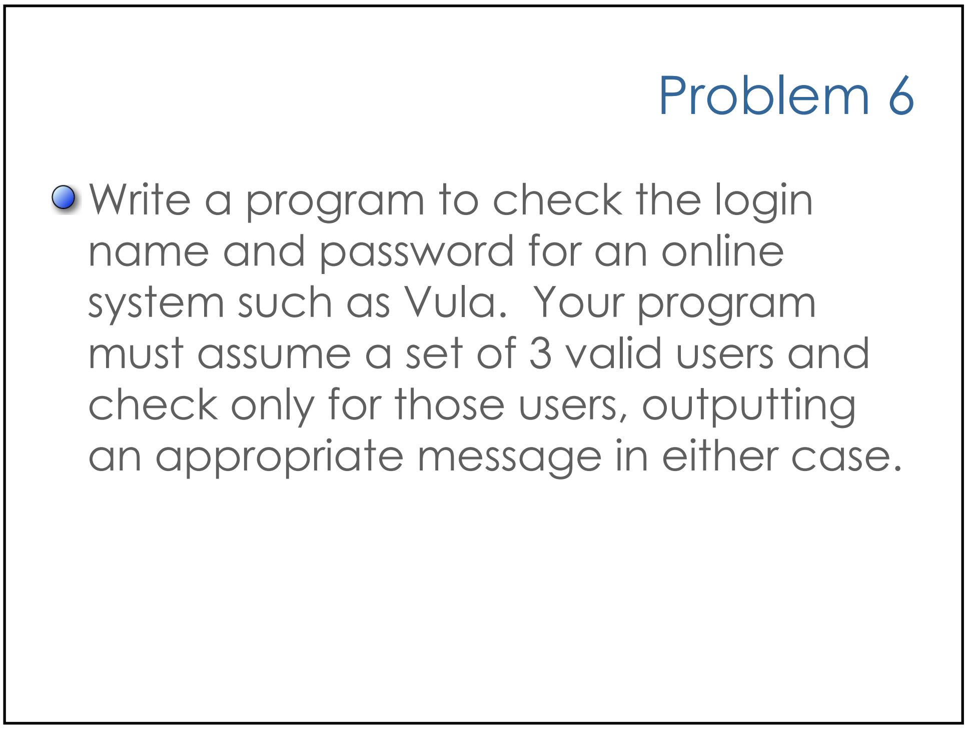
c) `not(a < b and a >= c)`

⬛ a) and b)
🟥 b) and c)
🟩 All of them
🟦 None of them



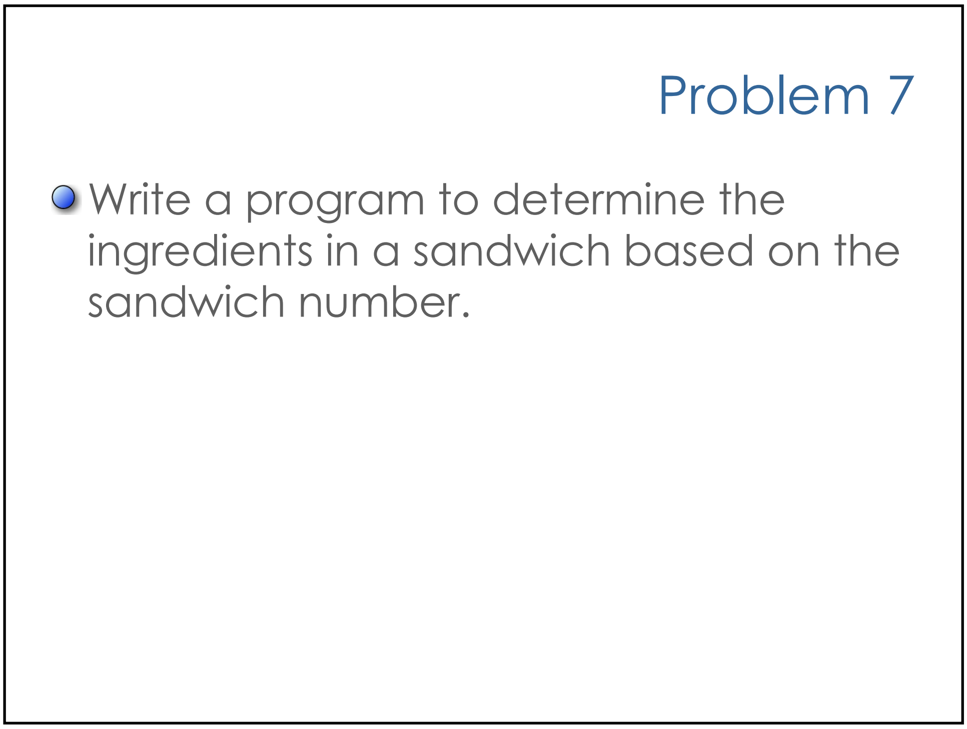
Problem 5

- Write a program to calculate the minimum of 4 integers without using the min/max/math functions. Use *if* statements with boolean expressions.



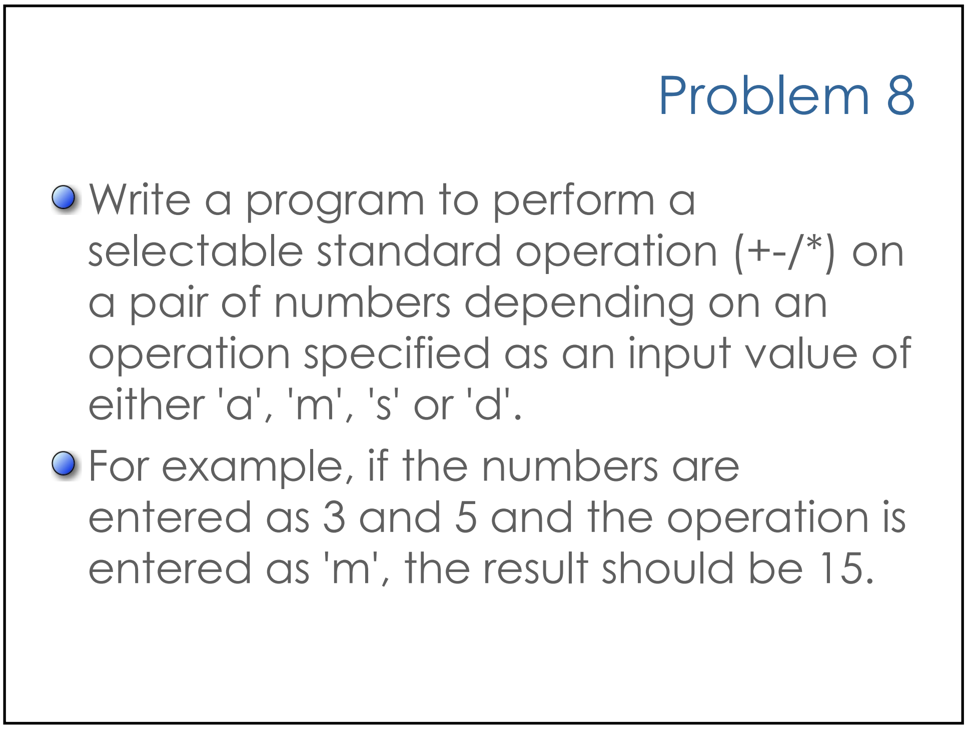
Problem 6

- Write a program to check the login name and password for an online system such as Vula. Your program must assume a set of 3 valid users and check only for those users, outputting an appropriate message in either case.



Problem 7

- Write a program to determine the ingredients in a sandwich based on the sandwich number.



Problem 8

- Write a program to perform a selectable standard operation (+-/*) on a pair of numbers depending on an operation specified as an input value of either 'a', 'm', 's' or 'd'.
- For example, if the numbers are entered as 3 and 5 and the operation is entered as 'm', the result should be 15.