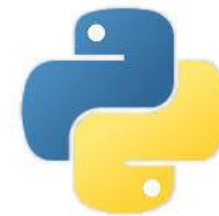


CMPT 120: Introduction to Computing Science and Programming 1

Procedural programming in Python



python™

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Reminders

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One-Stop Access To Course Information

- **Course website**: One-stop access to all course information.

<http://www2.cs.sfu.ca/CourseCentral/120/liaqata/WebSite/index.html>

- Course Outline
- Exam Schedule
- Python Info
- **CourSys/Canvas** link
- Learning Outcomes
- Office Hours
- Textbook links
- and more...
- Grading Scheme
- Lab/Tutorial Info
- Assignments

- **Canvas**: Discussions forum - <https://canvas.sfu.ca/courses/39187>

- **CourSys**: Assignments submission, grades - www.coursys.sfu.ca

How to Learn in This Course?



- A** **Attend** Lectures & Labs
- R** **Read** / review Textbook/Slides/Notes
- R** **Reflect** and ask Questions
- O** **Organize** – your learning activities on weekly basis,
and finally...
- W** **Write** Code, **Write Code**, and **Write Code**.

Additional / Online References

- **Additional references** are as important as the texts, and very important to your success.
 - They aren't meant to be read from beginning to end like the readings in the textbook.
- Use them to get an overall picture of the topic and as references as you do the assignments.

Course Topics

1. General introduction
2. Algorithms, flow charts and pseudocode
3. **Procedural programming in Python**
4. Data types and control structures
5. Fundamental algorithms
6. Binary encodings
7. Basics of computability and complexity
8. Basics of Recursion
9. Subject to time availability:
 - Basics of Data File management

Today's Topics

1. Programs Recap
2. Expressions
3. Operands
4. Operators
 - i. Arithmetic Operators (+, -, *, /)
 - ii. Comparison operators
5. Reflection

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Programs Recap

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Program Recap: Compute Grade (Solution)

```
midterm = 0
```

```
final = 0
```

```
midterm = input("Enter midterm:")
```

```
final = input("Enter final:")
```

```
total = float(midterm) + float(final)
```

```
if total >= 95: print("A+")
```

```
elif total >= 90 and total < 95: print("A")
```

```
elif total >= 85 and total < 90: print("A-")
```

```
elif total >= 80 and total < 85: print("B+")
```

```
elif total >= 75 and total < 80: print("B")
```

```
elif total >= 70 and total < 75: print("B-")
```

```
elif total >= 65 and total < 70: print("C+")
```

```
elif total >= 60 and total < 65: print("C")
```

```
elif total >= 55 and total < 60: print("C-")
```

```
elif total >= 50 and total < 55: print("D")
```

```
else: print("F")
```

Program Recap: Sum of Natural Numbers (Solution)

```
sum = 0
```

```
n = 1
```

```
while ( n <= 100 ):
```

```
    sum=sum+n
```

```
    n=n+1
```

```
print(sum)
```

```
sum = 0
```

```
n = 1
```

```
limit = int(input("How many numbers? "))
```

```
while ( n <= limit ):
```

```
    sum=sum+n
```

```
    n=n+1
```

```
print(sum)
```

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Expressions

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Expressions

- We are now familiar with, and have used in our programs:
 - a. **values**, such as 5, 7, or 100
 - b. **variables**, such as midterm, final, or total
 - c. **operators**, such as +, /, or %
- An **expression** is a **combination** of *values*, *variables*, and *operators*.
 - So, **5 + 7** is an expression; **n + 1** is an expression; **2*x + 2*y** is an expression;
 - **15 < 20** is an expression, and even **45** by itself is an expression.
 - We can categorize expressions based on their result types:
 1. **Arithmetic expressions**
 2. **Boolean expressions**

Arithmetic Expressions

- When result of an expression is a numeric value, we can call it an **Arithmetic Expression**.
 - For example, **$n + 1$** is an arithmetic expression if n is numeric.
 - Suppose n is **5**, then the value of the arithmetic expression **$n + 1$** would be **6**, which is a numeric value.
 - **meters * 39.37** is an arithmetic expression if meters is numeric.
 - Suppose meters is **2**, then the value of the arithmetic expression **meters * 39.37** would be **78.74**, which is again a numeric value.
 - A numeric value can be an integer (whole number), or
 - A floating point number (with decimal point).

Boolean Expressions

- When the result of an expression is either **True** or **False**, we call it a **Boolean Expression**. For example:

	<u>Meaning</u>	<u>Outcome</u>
▫ 5 < 7	Is 5 less than 7?	Either True or False
▫ marks > 95	Is marks greater than 90?	Either True or False

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Operands

In our previous class, we talked about operators.

- **Operators** are special symbols that represent **computations**.
- **Arithmetic Operators** are symbols we use to represent arithmetic operations. For example, $+$, $-$, $*$, or $/$.
- We'll continue with operators today and will talk about **Comparison Operators**.
- But first, let's get familiar with a new term **Operands**.

Operands

- **Operands** are the values that appear on either side of an operator.
 - For example, in an arithmetic expression **50 + 10**, the values **50** and **10** are operands.
 - In **70 * 15**, the values **70** and **15** are operands.
- They are the data to be **operated on** by the operator.
- So, think of operands **just another name** for the values operators use.
- **Operands** can be values or variable names.
 - For example, in **mid + final**, both the operands **mid** and **final** are variables.

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Comparison Operators

Operators: Compute Grade

```
midterm = 0  
final = 0
```

Special symbol.
Arithmetic Op.

```
midterm = input("Enter midterm:")  
final = input("Enter final:")
```

```
total = float(midterm) + float(final)
```

```
if total >= 95: print("A+")
```

```
elif total >= 90 and total < 95: print("A")
```

There are some.
What are they called?

```
elif total >= 85 and total < 90: print("A-")  
elif total >= 80 and total < 85: print("B+")  
elif total >= 75 and total < 80: print("B")  
elif total >= 70 and total < 75: print("B-")  
elif total >= 65 and total < 70: print("C+")  
elif total >= 60 and total < 65: print("C")  
elif total >= 55 and total < 60: print("C-")  
elif total >= 50 and total < 55: print("D")  
else: print("F")
```

Comparison Operators

- The symbols $<$, $>$, $<=$, $>=$, $==$ and $!=$ are called **comparison operators**. (They are 6 in number.)
- **Comparison operators** are used to **compare** values or operands.
 - For example in a Boolean expression:
 - $5 < 6$: the symbol $<$ is a comparison operator, and **5** and **6** are values.
 - $total >= 90$, $>=$ is a comparison operator, and **total** and **90** are values.
- A comparison either returns a **True** or **False** result.
 - An expression that results into a true or false value is called a Boolean Expression.

Comparison Operators: Descriptions and Examples

Suppose: $a = 5$ $b = 7$

			Meaning	
1.	$<$ less than	$(a < b)$	is a less than b?	True
2.	$<=$ less than or equal	$(a <= b)$	is a less than or equal to b?	True
3.	$>$ greater than	$(a > b)$	is a greater than b?	False
4.	$>=$ greater than or equal	$(a >= b)$	is a greater than or equal b?	False
5.	$==$ equal	$(a == b)$	is a equal to b?	False
6.	$!=$ not equal	$(a != b)$	is a not equal to b?	True
		$(a <> b)$		

Grade Program Example

- Recall this program we wrote last week.
- In the comparison expression **if total >= 50:**
 - What conditional operator did it use?
 - **>=** (greater than or equal)
 - What are the operands?
 - **total** and **50**
 - What are the possible outcomes?
 - Either the total is greater than or equal 50.
 - We call this outcome as **True**
 - Or, the total is not greater than or equal 50.
 - We call this outcome as **False**

```
midterm = input()
final = input()
total = float(mid) +
float(final)

if total >= 50:
    print("Pass")

else:
    print("F")
```

Grade Computation Program

Greater than or equal comparison operator

```
midterm = 0
final = 0
total = 0
midterm = input()
final = input()
total = float(midterm) +
        float(final)
if total >= 95: print("A+")
```

```
elif total >= 90 and total < 95: print("A")
elif total >= 85 and total < 90: print("A-")
elif total >= 80 and total < 85: print("B+")
elif total >= 75 and total < 80: print("B")
elif total >= 70 and total < 75: print("B-")
elif total >= 65 and total < 70: print("C+")
elif total >= 60 and total < 65: print("C")
elif total >= 55 and total < 60: print("C-")
elif total >= 50 and total < 55: print("D")
else: print("F")
```

We'll talk next.

Less than comparison operator.

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Reflection

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Compute Grade – Version 2

```
midterm = 0
```

```
final = 0
```

```
grade = ""
```

```
midterm = input("Enter midterm:")
```

```
final = input("Enter final:")
```

```
total = float(midterm) + float(final)
```

```
if total >= 95: grade = "A+"
```

```
elif total >= 90 and total < 95: grade = "A"
```

```
elif total >= 85 and total < 90: grade = "A-"
```

```
elif total >= 80 and total < 85: grade = "B+"
```

```
elif total >= 75 and total < 80: grade = "B"
```

```
elif total >= 70 and total < 75: grade = "B-"
```

```
elif total >= 65 and total < 70: grade = "C+"
```

```
elif total >= 60 and total < 65: grade = "C"
```

```
elif total >= 55 and total < 60: grade = "C-"
```

```
elif total >= 50 and total < 55: grade = "D"
```

```
else: grade = "F"
```

```
print(grade)
```

```
print(total, grade)
```

```
print("Total marks = ", total, "Grade = ", grade)
```

Class Participation Activity

1. Copy and run this program.
2. Reflect on:
 - a. How this program differs from the program on slide 8.
 - b. Why it produces the same output as the program on slide 8.
 - c. Which approach you think is better: direct printing, or using a variable? Think of one reason?
 - d. What if you replace the word **and** with **or** in the if conditionals?
 - Modify and run the program for the pair of values 34,40; 60,30; 23, 4; and 45, 46.
3. Post your reflections on the **Canvas Discussions** forum after the class today.



Questions?