Programming with Scala: Language Exploration
Volume 1

Bhim Upadhyaya

bpupadhyaya@equalinformation.com
https://www.linkedin.com/in/bhim-upadhyaya-0648a223

EqualInformation LLC
Sunnyvale, CA 94089, USA

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Introduction to Computing

Definition: Computation and Computing [O.E.D.]

- *Computation* The action of mathematical calculation.
- *Computing* The use of operation of computers.

Examples

- $1 + 1 = 2$
- $13 + 29 = 42$

Questions

- Are these computational problems?
- Is there any difference between two?

Introduction to Computing contd...

Is it a computational problem?

SN	Hiearchy	Human	Dog	Domestic Pigeon
1	*Kingdom*	Animalia	Animalia	Animalia
2	*Phylum*	Chordata	Chordata	Chordata
3	*Class*	Mammalia	Mammalia	Aves
4	*Order*	Primates	Carnivora	Columbiformes
5	*Family*	Hominidae	Canidae	Columbidae
6	*Genus*	Homo	Canis	Columba
7	*Species*	H. Sapiens	C. lupus	C. livia

Introduction to Computers

Computers

- Tools to perform computation
- Come in various shape and size
- Hundreds of companies world-wide manufacturing computers
- Two important aspects: H/W and S/W

Basic Components

Components

- Memory Unit
- Processing Unit
- Storage Unit
- Input Device
- Output Device

Operation

Real time processing

1. No noticeable difference between I/P & O/P
2. Typically for small amount of data
3. Interactive applications
4. Personal computing applications

Batch processing

1. Significant difference between I/P & O/P
2. Typically for large amount of data
3. Fire and forget
4. Large data processing like facebook

Operating Systems

- An operating system (OS), as name suggests, is the software that operates hardware components.
- Linux
- Mac OS
- Windows

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Programming Languages

Programming Languages

- Low level programming languages: Machine Code, Assembly Language
- High level programming languages: Pascal, C, Java, Scala

Programming Languages contd...

Sample Assembly Code Fragment

```
    ...
SUB AX, AX
MOV ES, AX
SUB BH, BH
SHL BX,1
    ...
```

Programming Languages contd...

Sample Pascal Program

```
PROGRAM sampleprogram;
BEGIN
    writeln('Welcome to programming');
END.
```

Programming Languages contd...

Sample C Program

```c
#include<stdio.h>
main() {
    printf("Welcome to programming");
}
```

Programming Languages contd...

Sample Java Program

```
public class TestProgram {
   public static void main(String[] arguments) {
      System.out.println("Welcome to programming");
   }
}
```

Programming Languages contd...

Sample Scala Program

```scala
object TestProgram {
   def main(arguments: Array[String]): Unit = {
      println("Welcome to programming")
   }
}
```

Introduction to Scala

- Dr. Martin Odersky
- EPFL
- Around 2004
- OO + Functional

Example

```
package com.equalinformation.scala.programs
object AddTwoIntegers {
   def main(arguments: Array[String]): Unit = {
      val firstNumber = 1
      val secondNumber = 1
      val sum = firstNumber + secondNumber
      println("The sum is "+sum)
   }
}
```

Introduction to Scala contd...

Example

```scala
package com.equalinformation.scala.programs
import scala.io.StdIn._
object AddTwoIntegers {
   def main(arguments: Array[String]): Unit = {
      print("Enter the first integer: ")
      val firstNumber = readInt()
      print("Enter the second integer: ")
      val secondNumber = readInt()
      val sum = firstNumber + secondNumber
      println("The sum is "+sum)
   }
}
```

Program Attributes

Attributes

- Comprehensible
- Maintainable
- General
- Simple
- Modular
- Efficient
- Correct and accurate

Conclusion

Conclusion

- Computation and computing
- Computers: Basic components and operation
- Operating system
- Programming languages
- Introduction to Scala
- Program attributes

Review Questions

SomeReview Questions

1. What is a difference between computation and computing?
2. List basic components of a typical modern digital computer.
3. What roles do operating systems play?
4. List three most popular operating systems today?
5. Where can we find Scala installation information?
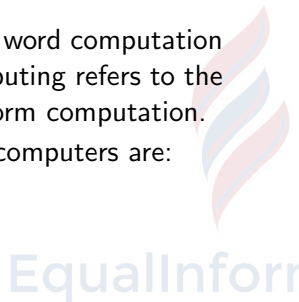6. *(Please refer book for remaining questions)*

Problems

Problems

1. Write a program to print "Scala is fun." on the screen.

2. Write a program to calculate the difference between two integers. *Pre-condition*: The two integers should be read from a keyboard. *Post-condition*: The difference should be displayed on the screen.

3. Write a program to print each letter of a string. *Pre-condition*: The string should be read from a keyboard. *Post-condition*: Each letter should be printed in a separate line.

Answers to Review Questions

1. According to Oxford English Dictionary, the word computation refers to mathematical calculation and computing refers to the use of computing machines in order to perform computation.

2. The basic components of a typical modern computers are:
   - Memory Unit
   - Processing Unit
   - Storage Unit
   - Input Device
   - Output Device

3. *(Please refer book for remaining answers)*

Solutions to Problems

#3 Write a program to print each letter of a string ...

```
object SolutionToProblem3 {
   def main(arguments: Array[String]): Unit = {
      print("Please enter a string: ")
      val inputString = scala.io.StdIn.readLine()
      inputString.toString.foreach(println)
   }
}
```

Note: Please refer book for rest of the solutions.