Chapter 11 Student Book Answers

What you should already know

Pseudocode

```
DECLARE myList : ARRAY[0:9] OF INTEGER
DECLARE upperBound : INTEGER
DECLARE lowerBound : INTEGER
DECLARE index : INTEGER
DECLARE swap : BOOLEAN
DECLARE temp : INTEGER
DECLARE top : INTEGER
upperBound ← 9
lowerBound ← 0
DECLARE found : BOOLEAN

// input values to myList
FOR index ← lowerBound TO upperBound
    OUTPUT "Please Enter Value "
    INPUT myList[index]
NEXT index
top ← upperBound

// sort myList
REPEAT
    FOR index ← lowerBound TO top - 1
        Swap ← FALSE
        IF myList[index] > myList[index + 1]
          THEN
           temp ← myList[index]
          myList[index] ← myList[index + 1]
          myList[index + 1] ← temp
          swap ← TRUE
        ENDIF
    NEXT
    top ← top -1
UNTIL (NOT swap) OR (top = 0)

// Output sorted list
OUTPUT "Sorted List"
FOR index ← lowerBound TO upperBound
    OUTPUT myList[index]
NEXT index

// search for 27
found ← FALSE
index ← lowerBound
REPEAT
    IF 27 = myList[index]
      THEN
        found ← TRUE
```

```
    ENDIF
    index ← index + 1
UNTIL (found = TRUE) OR (index > upperBound)

// Output if 27 found
IF found
  THEN
    OUTPUT "27 found"
  ELSE
    OUTPUT "27 not found"
ENDIF
```

Python

```
#input values into myList
myList =[]
upperBound = 10
lowerBound = 0
for index in range (lowerBound, upperBound):
    myList.append(int(input("Please Enter Value ")))

#sort myList
top = len(myList) - 1
swap = True
while (swap and top > lowerBound):
     swap = False
     for index in range (lowerBound, top):
           if myList[index] > myList[index + 1]:
            temp = myList[index]
            myList[index] = myList[index + 1]
            myList[index + 1] = temp
            swap = True
     top = top - 1

#output sorted list
print (*myList)
#search for 27

lowerBound = 0
upperBound = len(myList) - 1
found = False
index = lowerBound
while (not found) and (index <= upperBound):
    if 27 == myList[index]:
        found = True
        foundIndex = index
    index = index + 1
# output if 27 found
if found:
    print ("27 found")
else:
    print ("27 not found")
```

VB

```
Module Module1

    Sub Main()
        Dim myList(9) As Integer
        Dim index, lowerBound, upperBound, top, temp As Integer
        Dim swap As Boolean
        Dim found = False
        lowerBound = 0
        upperBound = 9

'input values into myList
        For index = lowerBound To upperBound
            Console.Write("Please Enter Value  ")
            myList(index) = Console.ReadLine()
        Next

'sort myList
        Do
            swap = False
            For index = myList.GetLowerBound(0) To top
                If myList(index) > myList(index + 1) Then
                    temp = myList(index)
                    myList(index) = myList(index + 1)
                    myList(index + 1) = temp
                    swap = True
                End If
            Next
            top = top - 1
        Loop Until Not swap Or top = myList.GetLowerBound(0)

'output sorted list
        Console.WriteLine("Sorted List")
        For index = myList.GetLowerBound(0) To
myList.GetUpperBound(0)
            Console.Write(myList(index).ToString() + " ")
        Next
        Console.WriteLine()

'search for 27
        index = myList.GetLowerBound(0)
        Do
            If 27 = myList(index) Then
                found = True
            End If
            index = index + 1
        Loop Until found Or index > myList.GetUpperBound(0)

'Output if 27 found
        If found Then
            Console.WriteLine("27 found")
        Else
            Console.WriteLine("27 not found")
        End If
        Console.ReadKey() 'wait for keypress

    End Sub

End Module
```

Java

```
//linear search
import java.util.Scanner;
class Chapter11
 {
   public static void main(String args[]){
      Scanner myObj = new Scanner(System.in);
      int[] myList = new int [10];
      int top = myList.length - 1;
      int index = 0;
      boolean found = false;
      int temp;
      int lowerBound = 0;
      boolean swap;

// input values to myList
       for (index = lowerBound; index <= top; index++){
          System.out.println("Please enter value ");
          myList[index] = myObj.nextInt();
        }
      System.out.println();

//sort myList
      do {
         swap = false;
          for (index = lowerBound; index < top; index++){
            if (myList[index] > myList[index + 1]) {
             temp = myList[index];
             myList[index] = myList[index + 1];
             myList[index + 1] = temp;
             swap = true;
            }
          }
          top = top - 1;
         }
      while (swap && (top >  lowerBound));

// output sorted list
      System.out.println("sorted list");
      for (index = lowerBound; index <= myList.length - 1;
index++){
          System.out.print(myList[index] + " ");
        }
      System.out.println();

//search for 27
      found = false;
      index = lowerBound;
```

```
        do {
           if (27 == myList[index]) {
            found = true;
          }
          index = index + 1;
        }
        while (!found && index< myList.length);

//output if 27 found
        if (found){
           System.out.println ("27 found");
          } else {
              System.out.println ("27 not found");
     }
    }
}
```

Activity 11A

Python

```
#calculate the volume and surface area of a sphere
pi = 3.142
finish = False
radius = float(input("Please enter the radius of the sphere "))
while finish == False:
        while radius <= 0 and radius != -1:
                radius = float(input("Please enter the radius
of the sphere "))
        if radius != -1:
                volume = (4 / 3) * pi * radius * radius *
radius
                surfaceArea = 3 * pi * radius * radius
                print("Volume is ", volume)
                print("Surface area is ", surfaceArea)
                radius = float(input("Please enter the radius
of the sphere "))
        else:
                finish = True
```

VB

```
Module Module1
    Public Sub Main()
        Dim radius As Decimal
        Dim volume As Decimal
        Dim surfaceArea As Decimal
        Const pi As Decimal = 3.142
        Dim found As Boolean = False
        Do
            Do
                Console.Write("Please enter the radius of the sphere
")
                radius = Decimal.Parse(Console.ReadLine())
            Loop Until (radius > 0) Or (radius = -1.0)
            If radius <> -1 Then
                volume = (4 / 3) * pi * radius * radius * radius
                surfaceArea = 3 * pi * radius * radius
                Console.WriteLine("Volume is " & volume)
                Console.WriteLine("Surface area is " & surfaceArea)
            Else
                found = True
            End If
        Loop Until found

        Console.ReadKey()

    End Sub

End Module
```

Java

```
import java.util.Scanner;
class Activity11A
{
   public static void main(String args[])
    {
       Scanner myObj = new Scanner(System.in);
       final double PI = 3.142;
       double radius;
       boolean found = false;

      do {
       do {
        System.out.println("Please enter the radius of the sphere ");
        radius = myObj.nextDouble();
       }
      while (radius < 0 && radius != -1);
      if (radius != -1){
          double volume = (4 / 3) * PI * radius * radius * radius;
          double surfaceArea = 4 * PI * radius * radius;

          System.out.println("Volume is " + volume);
          System.out.println("Surface area is " + surfaceArea);

     }
        else {
          found = true;
     }
    }
      while(!found);

    }
}
```

Activity 11B

Python

```
#password checker
storedPassword = "Secret"
inputPassword = input("Please enter your password ")
size = len(inputPassword)
if size == len(storedPassword) :
  if (inputPassword[0] == storedPassword[0]) and (inputPassword[-1]
== storedPassword[-1:]):
      print ("Password entered has correct first and last letters")
  else:
      print("Password entered is incorrect")
else:
   print("Password entered is incorrect")
```

VB

```
'Password checker
Module Module1
    Sub Main()
        Dim storedPassword = "Secret"
        Dim inputPassword As String
        Dim size As Integer
        Console.Write("Please enter your password ")
        inputPassword = Console.ReadLine() I'
        size = Len(inputPassword)
        If size = Len(storedPassword) Then
            If Left(inputPassword, 1) = Left(storedPassword, 1) And
Right(inputPassword, 1) = Right(storedPassword, 1) Then
                Console.WriteLine("Password has correct first and last
letters")
            Else
                Console.WriteLine("Password entered is incorrect")
            End If
        Else
            Console.WriteLine("Password entered is incorrect")
        End If
        Console.ReadLine()
    End Sub
End Module
```

Java

```
//password checker
import java.util.Scanner;
class ACTIVITY11B {
   public static void main(String args[]){
      Scanner myObj = new Scanner(System.in);
      String storedPassword = "Secret";
      System.out.println("Please enter your password ");
      String inputPassword = myObj.next();
      int size = inputPassword.length();
     if (size == storedPassword.length()){
         if ((inputPassword.charAt(0) == storedPassword.charAt(0)) &&
(inputPassword.charAt(size - 1) ==
storedPassword.charAt(storedPassword.length() - 1))) {
          System.out.println("Password entered has correct first and last
letters");
                }
          else{
              System.out.println("Password entered is incorrect");
          }

        } else {
            System.out.println ("Password entered is incorrect");
    }
   }
}
```

Extension

The strings would need converting to upper or lower case using these functions.

Upper	**Language**
`inputPassword.upper()`	Python
`UCase(inputPassword)`	Visual Basic
`inputPassword.toUpperCase();`	Java
Lower	**Language**
`inputPassword.lower()`	Python
`LCase(inputPassword)`	Visual Basic
`inputPassword.tolowerCase();`	Java

Activity 11C

Python

Standard Library Routines – examples

1. NumPy – mathematical functions and large arrays
2. datetime – allows the use of dates
3. Scrapy – web crawler
4. Pandas – data manipulation and management
5. Matplotlib – 2D plotting
6. PyGTK – creation of programs with a GUI

VB

Standard Library functions – examples

1. MsgBox – pop up message box
2. Format – for displaying dates
3. Sign – determines the sign of a number
4. Int – returns the integer part of a number
5. Rnd – returns a random number
6. Clipboard – access to the clipboard

Java

Standard Library Packages – examples

1. util – miscellaneous useful classes
2. time – date, time etc
3. math – maths calculations
4. net – networking
5. sql – accessing a relational database
6. awt – user interfaces and graphics

Activity 11D

```
DECLARE number1, number2, answer : REAL
DECLARE sign : STRING
OUTPUT "Please enter Number one "
INPUT number1
OUTPUT "Please enter Number two "
INPUT number2
OUTPUT "Please enter + - * or / "
INPUT sign
CASE OF sign
  "+" : answer ← number1 + number2
  "-" : answer ← number1 - number2
  "*" : answer ← number1 * number2
  "/" : answer ← number1 / number2
  OTHERWISE OUTPUT "Invalid sign entered"
ENDCASE
IF sign = "+" or sign = "-" or sign = "*" or sign = "/"
  THEN
    OUTPUT "Answer is ", answer
ENDIF
```

Python

```
# calculations
number1 = float(input("Please enter number one "))
number2 = float(input("Please enter number two "))
sign = input("Please enter + - * or / ")
if sign =="+":
    answer = number1 + number2
    print("Answer is ", answer)
elif sign =="-":
    answer = number1 - number2
    print("Answer is ", answer)
elif sign =="*":
    answer = number1 * number2
    print("Answer is ", answer)
elif sign =="/":
    answer = number1 / number2
    print("Answer is ", answer)
else:
    print("Invalid sign")
```

VB

```
'Calculations
Module Module1

    Sub Main()
        Dim number1, number2, answer As Decimal
        Dim sign As String
        Console.Write("Please enter number one ")
        number1 = (Console.ReadLine())
        Console.Write("Please enter number two ")
        number2 = (Console.ReadLine())
        Console.Write("Please enter sign ")
        sign = (Console.ReadLine())
        Select Case sign
            Case "+"
                answer = number1 + number2
                Console.WriteLine("Answer is " + answer.ToString)
            Case "-"
                answer = number1 - number2
                Console.WriteLine("Answer is " + answer.ToString)
            Case "*"
                answer = number1 * number2
                Console.WriteLine("Answer is " + answer.ToString)
            Case "/"
                answer = number1 / number2
                Console.WriteLine("Answer is " + answer.ToString)
            Case Else
                Console.WriteLine("Invalid sign")
        End Select

        Console.ReadKey()

    End Sub

End Module
```

Java

```
//calculations
import java.util.Scanner;
class ACTIVITY11D {
   public static void main(String args[]){
      Scanner myObj = new Scanner(System.in);
      System.out.println("Please enter Number one ");
      float number1 = myObj.nextFloat();
      System.out.println("Please enter Number two ");
      float number2 = myObj.nextFloat();
      System.out.println("Please enter + - * or / ");
      String sign = myObj.next();
      float answer = 0.0f;
      switch (sign) {
          case "+":
          answer = number1 + number2;
          System.out.println("Answer is " + answer);
          break;
          case "-":
          answer = number1 - number2;
          System.out.println("Answer is " + answer);
          break;
          case "*":
          answer = number1 * number2;
          System.out.println("Answer is " + answer);
          break;
          case "/":
          answer = number1 / number2;
          System.out.println("Answer is " + answer);
          break;
         default:
         System.out.println("Invalid sign entered");
        }
    }
   }
```

Activity 11E

Python

```
# validation
value = int (input("Please enter a number between 1 and 10 inclusive "))
while 1 > value or value > 10:
    value = int (input("Please enter a number between 1 and 10 inclusive "))
```

VB

```
' validation
Module Module1

    Sub Main()
        Dim value As Integer
        Console.Write("Please enter a number between 1 and 10 inclusive ")
        value = Console.ReadLine()
        While (value < 1 Or value > 10)
            Console.Write("Please enter a number between 1 and 10 inclusive
")
            value = Console.ReadLine()
        End While
        Console.ReadKey()
    End Sub

End Module
```

Java

```
//validation
import java.util.Scanner;
class ACTIVITY11E {
   public static void main(String args[]){
      Scanner myObj = new Scanner(System.in);
      int value = 0;
      while (value < 1 || value > 10){
        System.out.println ("Item Please enter a number between 1 and 10
inclusive");
        value = myObj.nextInt();
        }
   }
}
```

Activity 11F

Python

```
# line of stars
def stars():
    print("**********")
stars()
```

VB

```
' line of stars
Module Module1

    Sub Main()
        stars()
        Console.ReadKey()
    End Sub
    Sub stars()
        Console.WriteLine("**********")
    End Sub
End Module
```

Java

```
//line of stars
class ACTIVITY11F {
    static void stars(){
      System.out.println("**********");
      }
   public static void main(String args[]){
            stars();
    }
   }
```

Activity 1G

Python

```
# line of stars with parameter
def stars(number):
    for counter in range (number):
        print("*", end ='')
stars(7)
```

VB

```
' line of stars with parameter
Module Module1

    Sub Main()
        stars(7)
        Console.ReadKey()
    End Sub
    Sub stars(number As Integer)
        Dim counter As Integer
        For counter = 1 To number
            Console.Write("*")
        Next
    End Sub
End Module
```

Java

```
//line of stars
class ACTIVITY11G {
    static void stars(int number){
        for (int counter = 1 ;counter <= number; counter++)
      System.out.print("*");
      }
   public static void main(String args[]){
            stars(7);
    }
   }
```

Activity 11H

```
// procedure to convert Celsius to Fahrenheit
DECLARE myTemp : REAL
PROCEDURE Fahrenheit (BYREF temperature : REAL)
    temperature ← temperature * 9 / 5 +32
ENDPROCEDURE

CALL Fahrenheit (myTemp)
```

Activity 11I

Pseudocode

```
// function to convert Celsius to Fahrenheit
DECLARE myTemp : REAL
FUNCTION fahrenheit (temperature : REAL)RETURNS REAL
    temperature ← temperature * 9 / 5 +32
ENDFUNCTION

myTemp ← fahrenheit (myTemp)
```

Python

```
# function to convert Celsius to Fahrenheit
def fahrenheit (temperature):
    return temperature * 9 /5 +32
myTemp = float(input("Please enter a temperature in Celsius "))
myTemp = fahrenheit(myTemp)
print("Temperature in Fahrenheit is ", myTemp)
```

VB

```
'function to convert Celsius to Fahrenheit

Module Module1

    Sub Main()
        Dim myTemp As Decimal
        Console.Write("Please enter a temperature in Celsius  ")
        myTemp = Console.ReadLine()
        myTemp = fahrenheit(myTemp)
        Console.WriteLine("Temperature in Fahrenheit is " +
myTemp.ToString())
        Console.ReadKey()
    End Sub
    Function fahrenheit(ByVal temperature As Decimal) As Decimal
        Return temperature * 9 / 5 + 32
    End Function
End Module
```

Java

```
// function to convert Celsius to Fahrenheit
import java.util.Scanner;
class ACTIVITY11I {
    static double fahrenheit(double temperature){
    return temperature * 9 / 5 + 32;
}

   public static void main(String args[]){
      Scanner myObj = new Scanner(System.in);
      System.out.println ("Please enter a temperature in Celsius");
        double myTemp = myObj.nextDouble();
        myTemp = fahrenheit (myTemp);
        System.out.println ("Temperature in Fahrenheit is" + myTemp);
        }
}
```

A function is the better structure because a new value is required and this will be used in an assignment statement making the code more efficient and easier to understand

End of chapter questions

1
```
DECLARE height : REAL
CONSTANT maxHeight ← 25
DECLARE width : REAL
CONSTANT maxWidth ← 30
DECLARE hypotenuse : REAL
DECLARE area : REAL
```

2
```
REPEAT
    INPUT height
UNTIL height > 0 and height <= maxHeight
REPEAT
    INPUT width
UNTIL width > 0 and height <= maxWidth
```

3 a) i)
```
hypotenuse ← SQUAREROOT(height * height + width * width)
```

ii)
```
area ← (width * height) / 2
```

iii)
```
perimeter ← hypotenuse + height + width
```

b)
```
OUTPUT "      Menu"
OUTPUT "1 ..... Area"
OUTPUT "2 ..... Hypotenuse"
OUTPUT "3 ..... Perimeter"
INPUT choice
CASE choice OF a value
        1 : area ← (width * height) / 2
        2 : hypotenuse ← SQUAREROOT(height * height + width *
    width)
        3 : perimeter ← SQUAREROOT(height * height + width *
    width) + height + width
        OTHERWISE OUTPUT "Incorrect choice "
      ENDCASE
```

c)

Python

```
#Chapter 11 question 3 c)
import math
maxHeight = 25
maxWidth = 30
height = float(input("Please enter the height of the triangle "))
while height < 0 or height > maxHeight:
    height = float(input("Please enter the height of the triangle "))

width = float(input("Please enter the width of the triangle "))
while width < 0 or width > maxWidth:
    width = float(input("Please enter the width of the triangle "))

print ("      Menu")
print ("1.......... Area")
print ("2.....Hypotenuse")
print ("3......Perimeter")
choice = int(input("Please enter your choice of calculation "))

if choice == 1:
    area = width * height / 2
    print("The area of the triangle is ", area)

elif choice == 2:
    hypotenuse = math.sqrt(height * height + width * width)
    print("The hypotenuse  is ", hypotenuse)

elif choice == 3:
    perimeter = math.sqrt(height * height + width * width) + height + width
    print("The perimeter  is ", perimeter)

else:
    print("Incorrect choice")
```

Visual Basic

```
Module Module1
    Public Sub Main()
        Dim choice As Integer
        Dim height, width, maxHeight, maxWidth, area, hypotenuse, perimeter
    As Decimal
        maxHeight = 25
        maxWidth = 30

        Do
            Console.Write("Please enter the height of the triangle ")
            height = Decimal.Parse(Console.ReadLine())
        Loop Until height > 0 And height <= maxHeight

        Do
            Console.Write("Please enter the width of the triangle ")
            width = Decimal.Parse(Console.ReadLine())
        Loop Until width > 0 And width <= maxWidth

        Console.WriteLine("          Menu")
        Console.WriteLine("1..... Area")
        Console.WriteLine("2.......Hypotenuse")
        Console.WriteLine("3........Perimeter")

        Console.Write("Please enter your choice of calculation ")
        choice = Integer.Parse(Console.ReadLine())
        Select Case choice
            Case 1
                area = width * height / 2
                Console.WriteLine("The area of the triangle is " +
    Str(area))
            Case 2
                hypotenuse = Math.Sqrt(height * height + width * width)
                Console.WriteLine("The hypotenuse is " + Str(hypotenuse))
            Case 3
                perimeter = Math.Sqrt(height * height + width * width) +
    height + width
                Console.WriteLine("The perimeter is " + Str(perimeter))
            Case Else
                Console.WriteLine("Incorrect choice")
        End Select
        Console.ReadLine()

    End Sub

End Module
```

Java

```
import java.util.Scanner;
import java.lang.*;
class Chaper11Q3C
{
   public static void main(String args[])
    {
       Scanner myObj = new Scanner(System.in);
       final double maxHeight = 25;
       final double maxWidth = 30;
       double width;
       double height;


       do {
        System.out.println("Please enter the height of the triangle ");
        height = myObj.nextDouble();
      }
      while (height < 0 || height > maxHeight);


       do {
        System.out.println("Please enter the width of the triangle ");
        width = myObj.nextDouble();
      }
      while (width < 0 || width > maxWidth);

      System.out.println("      Menu");
      System.out.println("1..... Area");
      System.out.println("2......Hypotenuse");
      System.out.println("3.......Perimeter");

      System.out.println("Please enter your choice of calculation ");
      int choice = myObj.nextInt();

      switch (choice) {
          case 1:
          double area = width * height / 2;
          System.out.println("The area of the triangle is " + area);
          break;
          case 2:
          double hypotenuse = Math.sqrt(height * height + width * width);
          System.out.println("The hypotenuse is " + hypotenuse);
          break;
          case 3:
          double perimeter = Math.sqrt(height * height + width * width) +
    height + width;
          System.out.println("The perimeter is " + perimeter);
          break;
          default:
          System.out.println("Incorrect choice");
        }

    }
}
```

4 Library routine – a prewritten fully tested subroutine that is available to incorporate into a program. For example, printer drivers, string handling routines.

5 **a)** Procedure – subroutine that may return a value

b) Function – subroutine that always returns a value

c) Parameter – a value that's passed to a function or procedure

d) Header – the first statement of a procedure/function definition that contains the name and any parameters used.

6 **a)** A function always returns a value and can be used a part of an expression, a procedure may or may not change a variable and it is called as a single statement.

b) Parameters passed by value cannot be changed, parameters passed by reference can be changed.

c) Procedures are defined once and called many times, the definition included all the statements found in the procedure and the call is a single statement.

7 **a)**

Identifier	Data type	Description
`YearCount`	Integer	Loop counter
`PurchasePrice`	Integer	Purchase price of the car
`CurrentValue`	Real	The changing depreciated value

b)

```
OUTPUT "Enter purchase price"
INPUT PurchasePrice
CurrentValue ← PurchasePrice
YearCount ← 1
WHILE YearCount < 9 AND CurrentValue >= 1000
   IF YearCount = 1
    THEN
     CurrentValue ← CurrentValue * (1 - 40 / 100)
    ELSE
     CurrentValue ← CurrentValue * 0.8
   ENDIF
   OUTPUT YearCount, CurrentValue
   YearCount ← YearCount + 1
ENDWHILE
```