# Chapter 9 Student Book Answers

## What you should already know

1 Procedure – a single set of statements that can be grouped together and called in a program when required, rather than repeated each time the statements are used.

2 Function – a single set of statements grouped together that return a value and are called in a program when required, rather than repeated each time the statements are used.

3 Algorithm – an ordered set of steps to complete a task.

4 Structured English – using English words and mathematical operations to show the steps in an algorithm.

5 Flowchart – a diagrammatical representation of the steps in an algorithm.

6 Pseudocode – shows the detailed logical steps in an algorithm using a set of keywords, declared and typed identifiers and mathematical and logical operators.

Flowchart – Figure 9.3, Pseudocode before – Figure 9.3, Programs – before ACTIVITY 9F

## Activity 9A

**Possible solution**

1 Ask for the number of sides
2 Ask for the length of each side
3 Calculate the internal angle of the polygon
4 Using a pencil and ruler draw a line of the required length
5 From the leftmost end of the line draw another line of the required length at the calculated angle
6 Repeat step 5 for number of sides − 1

## Activity 9B

```
Counter is 2
MyChar is "A"
LetterValue is 65
StudentMark is 40
Percentage is 50
OldString is "Your mark is"
NewString is "Your mark is ninety-seven"
```

## Activity 9C

1 `else` used in all three programming languages.

### *Python*

```
# IF - single choice with alternative Python
MyValue = int(input("Please enter my value "))
YourValue = int(input("Please enter your value "))
if MyValue > YourValue:
  print ("I win")
else:
  print ("You win")
```

*VB*

```
'IF - single choice with alternative VB
Module Module1

    Sub Main()

        Dim MyValue, YourValue As Integer
            Console.Write("Please enter my value ")
        MyValue = Integer.Parse(Console.ReadLine())
            Console.Write("Please enter your value ")
        YourValue = Integer.Parse(Console.ReadLine())
        If MyValue > YourValue Then
            Console.WriteLine("I win")
        Else
            Console.Writeline("You win")
        End If
        Console.ReadKey() 'wait for keypress

    End Sub

End Module
```

*Java*

```
//IF - single choice with alternative Java
import java.util.Scanner;
class IFProgramWithAlt
{
   public static void main(String args[])
    {
         Scanner myObj = new Scanner(System.in);

      System.out.println("Please enter my value ");
      int MyValue = myObj.nextInt();
      System.out.println("Please enter your value ");
      int YourValue = myObj.nextInt();

      if (MyValue > YourValue)
      {
           System.out.println("I win");
      } else {
          system.out.println("You win");
      }
      }
}
```

**2**

***Python** - does not have a case statement*

```
#  - Multiple choice Python
X=0
Y=0
Direction = input("Please Enter N, S, E or W ")

if Direction == "N":
            X=X+1
elif Direction == "S":
            X=X-1
elif Direction == "E":
            Y=Y+1
elif Direction == "W":
            Y=Y-1
else:
    print("Error")
print(X,Y)
```

***VB** – uses Select Case and Case Else*

```
'Select Case VB
Module Module1

    Sub Main()

        Dim X, Y As Integer
        Dim Direction As String
        X = 0
        Y = 0
        Console.Write("Please Enter N, S, E or W ")
        Direction = Console.ReadLine()
        Select Case Direction
            Case "N"
                Y = Y + 1
            Case "S"
                Y = Y - 1
            Case "E"
                X = X + 1
            Case "W"
                X = X - 1
            Case Else
                Console.WriteLine("Error")
        End Select
        Console.Write(X & " " & Y)
        Console.ReadKey() 'wait for keypress
    End Sub

End Module
```

***Java** – uses switch case and default*

```
// Switch Case Java

import java.util.Scanner;
public class CaseStatement
{
       public static void main(String args[])
       {
       int X = 0,Y = 0;
       Scanner myObj = new Scanner(System.in);

           System.out.println("Please Enter N, S, E or W ");
           String Direction = myObj.next();
           switch (Direction){
               case "N":
                Y = Y + 1;
                break;
               case "S":
                Y = Y - 1;
                break;
               case "E":
                X = X + 1;
                break;
               case "W":
                X = X - 1;
                break;
               default:
               System.out.println("Error");
           }
           System.out.println(X + " " + Y);
     }
}
```

## Activity 9D

### FOR without step

***Python** - does not reach 10*

```
# FOR - simple loop Python without step
for Counter in range (1,10):
  print(Counter)
```

***VB** - does reach 10*

```
'FOR - simple loop VB without step
Module Module1

    Sub Main()

        Dim Counter As Integer
        For Counter = 1 To 10
            Console.WriteLine(Counter)
        Next
        Console.ReadKey() 'wait for keypress
    End Sub

End Module
```

***Java** - does reach 10 but always needs to include an increment*

```
//FOR - simple loop Java always needs to include an increment
class FORProgramWithoutStep
{
   public static void main(String args[])
    {
      for (int Counter = 1; Counter <= 10; Counter++)
      {
       System.out.println(Counter);
      }
   }
}
```

**REPEAT UNTIL loop**

***Python** - does not have a repeat loop*

***VB** – uses Do and Loop Until*

```
'REPEAT UNTIL loop
Module Module1

    Sub Main()
        Dim Number As Integer
        Do
            Console.Write("Please enter a positive number ")
            Number = Console.ReadLine()

        Loop Until Number > 0
        Console.ReadKey() 'wait for keypress

    End Sub

End Module
```

***Java** – uses a post condition while loop*

```
//Post condition loop
import java.util.Scanner;
class PostConditionLoop
{
   public static void main(String args[])
    {
      Scanner myObj = new Scanner(System.in);
      int Number = 0;
      do {
      System.out.println("Please enter a positive number ");
      Number = myObj.nextInt();
      }
      while (Number <= 0);
   }
}
```

**While loop**

***Python** – uses while and indentation*

```
# WHILE Python
Number = 0
while Number >= 0:
    Number = int(input("Please enter a negative number "))
```

***VB** – uses While and End While*

```
'WHILE loop
Module Module1

    Sub Main()
        Dim Number As Integer
        Number = 0
        While Number >= 0
            Console.Write("Please enter a positive number ")
            Number = Console.ReadLine()
        End While
        Console.ReadKey() 'wait for keypress
    End Sub

End Module
```

***Java** – uses a pre-condition while loop*

```
//Pre-condition while loop
import java.util.Scanner;
class PreConditionWhileLoop
{
   public static void main(String args[])
    {
      Scanner myObj = new Scanner(System.in);
      int Number = 0;
      while (Number >= 0){
      System.out.println("Please enter a negative number ");
      Number = myObj.nextInt();
      }
      }
}
```

## Activity 9E

```
Number ← 0
REPEAT
    PRINT "Enter a number, your number must be between 10 and 20 or over
100"
    INPUT Number
UNTIL (Number > 10 AND Number < 20) OR (Number > 100)
```

## Activity 9F

```
DECLARE Password1, Password2 : STRING
DECLARE Counter : INTEGER
Counter ← 0
REPEAT
    PRINT "Enter your password "
    INPUT Password1
    PRINT "Enter your password again "
    INPUT Password1
    Counter ← Counter + 1
UNTIL (Counter = 3) OR (Password1 = Password2)
IF Password1 = Password2
  THEN
    OUTPUT "Password correct"
  ELSE
    OUTPUT "Password incorrect"
ENDIF
```

| Identifier Name | Description |
|---|---|
| Counter | To count the number of attempts |
| Password1 | To store the first password attempt |
| Password2 | To store the second password attempt |

### *Python*

```
# three attempts at checking password
Counter = 0
Password1 = "Pass1"
Password2 = "Pass2"
while ((Counter != 3) and (Password1 != Password2)):
        Password1 = input("Enter your password ")
        Password2 = input("Enter your password again ")
        Counter = Counter + 1
if Password1 == Password2:
        print ("Password correct")
else:
        print ("Password incorrect")
```

*VB*

```
'three attempts at checking password
Module Module1

    Sub Main()
        Dim Password1, Password2 As String
        Dim Counter As Integer
        Counter = 0
        Do
            Console.Write("Please enter password ")
            Password1 = Console.ReadLine()
            Console.Write("Please enter password again ")
            Password2 = Console.ReadLine()
            Counter = Counter + 1
        Loop Until ((Counter = 3) Or (Password1 = Password2))
        If Password1 = Password2 Then
            Console.WriteLine("Password correct")
        Else
            Console.WriteLine("Password incorrect")
        End If
        Console.ReadKey() 'wait for keypress

    End Sub

End Module
```

***Java** – note the use of .equals for string comparison*

```
//three attempts at checking password
import java.util.Scanner;
class ACTIVITY9F
{
   public static void main(String args[])
    {
      Scanner myObj = new Scanner(System.in);
      int Counter = 0;
      String Password1 = "Pass1", Password2 = "Pass2";
      do {
      System.out.println("Enter your password  ");
      Password1 = myObj.next();
      System.out.println("Enter your password again ");
      Password2 = myObj.next();
      Counter = Counter + 1;
      }
      while ((!Password1.equals(Password2)) && (Counter != 3));
      if (Password1.equals(Password2)){
         System.out.println("Password correct");
        } else {
              System.out.println("Password incorrect");
            }
    }
}
```

## Activity 9G

```
OUTPUT "Enter your personal best time in seconds "
INPUT PBTimeSeconds
IF TotalMarathonTimeSeconds < PBTimeSeconds
  THEN
    PBTimeSeconds ← TotalMarathonTimeSeconds
ENDIF
OUTPUT "Your personal best time in seconds is ", PBTimeSeconds
```

| Identifier Name | Description |
|---|---|
| PBTimeSeconds | Personal Best time in seconds |

### *Python*

```
# checking personal best time
TotalMarathonTimeSeconds = 14400 #value to use for test
PBTimeSeconds = int(input("Enter your personal best time in seconds "))
if TotalMarathonTimeSeconds < PBTimeSeconds:
                    PBTimeSeconds = TotalMarathonTimeSeconds
print( "Your personal best time in seconds is ", PBTimeSeconds)
```

### *VB*

```
'checking personal best time
Module Module1

    Sub Main()
        Dim TotalMarathonTimeSeconds, PBTimeSeconds As Integer
        TotalMarathonTimeSeconds = 14400 'value to use for test
        Console.Write("Enter your personal best time in seconds ")
        PBTimeSeconds = Console.ReadLine()
        If TotalMarathonTimeSeconds < PBTimeSeconds Then
            PBTimeSeconds = TotalMarathonTimeSeconds
        End If
        Console.WriteLine("Your personal best time in seconds is " +
PBTimeSeconds.ToString())
        Console.ReadKey() 'wait for keypress
    End Sub

End Module
```

*Java*

```
//checking personal best time
import java.util.Scanner;
class ACTIVITY9G
{
   public static void main(String args[])
    {
      Scanner myObj = new Scanner(System.in);
      int TotalMarathonTimeSeconds = 14400;
      System.out.println("Enter your personal best time in seconds");
      int PBTimeSeconds = myObj.nextInt();
      if ( TotalMarathonTimeSeconds < PBTimeSeconds){
      PBTimeSeconds= TotalMarathonTimeSeconds;
      }
      System.out.println("Your personal best time in seconds is " +
PBTimeSeconds);
    }
}
```

## Activity 9H

```
DECLARE Mark : INTEGER
DECLARE Grade, Reply : STRING
REPEAT
  OUTPUT "Enter your exam mark"
  INPUT Mark
  IF Mark < 40
    THEN
      Grade ← "Fail"
    ELSE
      IF Mark < 60
        THEN
          Grade ← "Pass"
        ELSE
          IF Mark < 80
            THEN
              Grade ← "Merit"
            ELSE
              Grade ← "Distinction"
          ENDIF
      ENDIF
  ENDIF
  OUTPUT "Your grade is ", Grade
  OUTPUT "Enter another exam mark Y/N "
  INPUT Reply
UNTIL Reply <> "Y"
```

| Identifier Name | Description |
|---|---|
| Mark | Exam mark |
| Grade | Exam grade |
| Reply | Check for another mark |

*Python*

```
# more than one mark
Reply = "Y"
while Reply == "Y":
    Mark = int(input("Enter your exam mark "))
    if Mark < 40:
        Grade = "Fail"
    elif Mark < 60:
        Grade = "Pass"
    elif Mark < 80:
        Grade = "Merit"
    else:
        Grade = "Distinction"
    print( "Your grade is ", Grade)
    Reply = input("Enter another exam mark Y/N ")
```

*VB*

```
'more than one mark
Module Module1

    Sub Main()
        Dim Mark As Integer
        Dim Grade, Reply As String
        Reply = "Y"
        Do
            Console.Write("Enter your exam mark ")
            Mark = Console.ReadLine()
            Select Case Mark
                Case 0 To 39
                    Grade = "Fail"
                Case 40 To 59
                    Grade = "Pass"
                Case 60 To 79
                    Grade = "Merit"
                Case 80 To 100
                    Grade = "Distinction"
            End Select
            Console.WriteLine("Your Grade is " + Grade)
            Console.Write("Enter another exam mark Y/N ")
            Reply = Console.ReadLine()
        Loop While (Reply = "Y")
        Console.ReadKey() 'wait for keypress
    End Sub

End Module
```

*Java*

```
//more than one mark
import java.util.Scanner;
class ACTIVITY9H
{
   public static void main(String args[])
    {
      Scanner myObj = new Scanner(System.in);
      String Grade, Reply;
      Grade = "";
      int Mark;
      do {
          System.out.println("Enter your exam mark");
          Mark = myObj.nextInt();
          if ( Mark < 40){
              Grade = "Fail";
            }
          if ((Mark >= 40) && (Mark < 60) ){
              Grade = "Pass";
            }
          if ((Mark >= 60) && (Mark < 80)) {
              Grade = "Merit";
            }
          if (Mark > 80) {
              Grade = "Distinction";
            }
          System.out.println("Your grade is " + Grade);
          System.out.println("Enter another exam mark Y/N ");
          Reply = myObj.next();
      }
      while (Reply.equals("Y"));

    }
}
```

## Activity 9I

```
DECLARE Shape : STRING
DECLARE Side, Base, Height, Radius : INTEGER
DECLARE Area : REAL
Area = 0
CONSTANT Pi = 3.142
OUTPUT "Please enter the shape (Square, Triangle, Circle) "
INPUT Shape

IF Shape = "Square"
  THEN
    OUTPUT "Please enter length of side "
    INPUT Side
    Area ← Side * Side
ENDIF

IF Shape = "Triangle"
  THEN
    OUTPUT "Please enter length of base and height "
    INPUT Base, Height
    Area ← (Base * Height) / 2
ENDIF

IF Shape = "Circle"
  THEN
```

```
    OUTPUT "Please enter length of radius "
    INPUT Radius
    Area ← Pi * Radius * Radius
ENDIF

IF Area <> 0
  THEN
    OUTPUT "Area of ", Shape, " is ", Area
ENDIF
```

### *Python*

```
# finding the area of a shape
Pi = 3.142
Area = 0.0
Shape = input("Please enter the shape ")
if Shape == "Square":
    Side = int(input("Plese enter the length of the side "))
    Area = Side * Side
elif Shape == "Triangle":
    Base = int(input("Plese enter the length of the base "))
    Height = int(input("Plese enter the length of the height "))
    Area = (Base * Height) / 2
elif Shape == "Circle":
    Radius = int(input("Plese enter the length of the radius "))
    Area = Pi * Radius * Radius

if Area != 0:
    print("Area of ", Shape, " is ", Area)
```

### *VB*

```
' finding the area
Module Module1

    Sub Main()
        Dim Shape As String
        Dim Area As Decimal
        Dim Side, Base, Height, Radius As Integer
        Const Pi As Decimal = 3.142
        Area = 0.0
        Console.Write("Please enter the shape ")
        Shape = Console.ReadLine()

        Select Case Shape
            Case = "Square"
                Console.Write("Please enter the side ")
                Side = Console.ReadLine()
                Area = Side * Side
            Case = "Triangle"
                Console.Write("Please enter the base ")
                Base = Console.ReadLine()
                Console.Write("Please enter the height ")
                Height = Console.ReadLine()
                Area = (Base * Height) / 2
            Case = "Circle"
                Console.Write("Please enter the radius ")
                Radius = Console.ReadLine()
                Area = Pi * Radius * Radius
        End Select
        If Area <> 0.0 Then
```

```
            Console.WriteLine("Area of shape " + Shape + " is " + Area.ToString())
        End If
        Console.ReadKey() 'wait for keypress

    End Sub

End Module
```

### *Java*

```
// finding the area

import java.util.Scanner;
public class ACTIVITY9I
{
        public static void main(String args[])
        {
        int Side, Base, Height, Radius;
        float Area = 0.0f;
        float Pi = 3.142f;

        Scanner myObj = new Scanner(System.in);

            System.out.println("Please enter the shape ");
            String Shape = myObj.next();
            switch (Shape){
                case "Square":
                 System.out.println("Please enter the side ");
                 Side = myObj.nextInt();
                 Area = Side * Side;
                 break;
                case "Triangle":
                 System.out.println("Please enter the base ");
                 Base = myObj.nextInt();
                 System.out.println("Please enter the height ");
                 Height = myObj.nextInt();
                 Area = (Base * Height) / 2;
                 break;
                case "Circle":
                 System.out.println("Please enter the radius ");
                 Radius = myObj.nextInt();
                 Area = Pi * Radius * Radius;

            }
            if (Area != 0.0) {
                System.out.println("Area of " + Shape + " is " + Area);
             }
         }
}
```

## End of chapter questions

**1** See Key terms 9.2.

**2** See Section 9.1.

**3** See Section 9.2.5.

**4** **a)** 40 **b)** 314.2 **c)** Z not declared error **d)** True.

**5** **a)** **i)** 13 or 14 **ii)** 07, 11 or 19 **iii)** 01 to 24

**b)**

| Identifier Name | Description |
|---|---|
| `Choice` | Store Menu Choice |
| `Temperature` | Store temperature input |
| `ConvertedTemperature` | Store converted temperature |

**c)** Use a variable `Try`

```
01  Try ← 0
02  REPEAT
03  OUTPUT"   Menu Temperature Conversion"
04  OUTPUT" Celsius to Fahrenheit         1"
05  OUTPUT" Fahrenheit to Celsius         2"
06  OUTPUT" Exit                          3"
07  OUTPUT" Enter choice"
08  IF Choice = 1 OR Choice = 2
09    THEN
10      OUTPUT"Enter temperature"
11      INPUT Temperature
12      IF Choice = 1
13        THEN
14          ConvertedTemperature ← 1.8*Temperature + 32
15        ELSE
16          ConvertedTemperature ← (Temperature - 32) * 5 / 9
17      ENDIF
18      OUTPUT "Converted temperature is ", ConvertedTemperature
19    ELSE
20      IF Choice <> 3
21        THEN
22          OUTPUT "Error in choice"
23          Try ← Try + 1
24      ENDIF
25  ENDIF
26  UNTIL Choice = 3 OR Try = 3
```