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A-level  
**COMPUTER SCIENCE**  
**(7517/1E)**

Paper 1 VB.NET

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Skeleton Program

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Module Module1
    Sub Main()
        Dim Choice As Integer = 0
        While Choice <> 9
            DisplayMenu()
            Choice = GetMainMenuChoice()
            Select Case Choice
                Case 1
                    Dim MyGame As New Game(False)
                Case 2
                    Dim MyGame As New Game(True)
            End Select
        End While
    End Sub

    Public Sub DisplayMenu()
        Console.WriteLine("MAIN MENU")
        Console.WriteLine()
        Console.WriteLine("1. Start new game")
        Console.WriteLine("2. Play training game")
        Console.WriteLine("9. Quit")
        Console.WriteLine()
        Console.Write("Please enter your choice: ")
    End Sub

    Public Function GetMainMenuChoice() As Integer
        Dim Choice As Integer
        Choice = CInt(Console.ReadLine())
        Console.WriteLine()
        Return Choice
    End Function

    Structure CellReference
        Dim NoOfCellsEast As Integer
        Dim NoOfCellsSouth As Integer
    End Structure

    Class Game
        Const NS As Integer = 4
        Const WE As Integer = 6
        Private Player As New Character
        Private Cavern As New Grid(NS, WE)
        Private Monster As New Enemy
        Private Flask As New Item
        Private Trap1 As New Trap
        Private Trap2 As New Trap
        Private TrainingGame As Boolean

        Public Sub New(ByVal IsATrainingGame As Boolean)
            TrainingGame = IsATrainingGame
            Randomize()
            SetUpGame()
            Play()
        End Sub

        Public Sub Play()
            Dim Count As Integer
            Dim Eaten As Boolean
            Dim FlaskFound As Boolean
            Dim MoveDirection As Char
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Dim ValidMove As Boolean
Dim Position As CellReference
Eaten = False
FlaskFound = False
Cavern.Display(Monster.GetAwake)
Do
    Do
        DisplayMoveOptions()
        MoveDirection = GetMove()
        ValidMove = CheckValidMove(MoveDirection)
    Loop Until ValidMove
    If MoveDirection <> "M" Then
        Cavern.PlaceItem(Player.GetPosition, " ")
        Player.MakeMove(MoveDirection)
        Cavern.PlaceItem(Player.GetPosition, "*")
        Cavern.Display(Monster.GetAwake)
        FlaskFound = Player.CheckIfSameCell(Flask.GetPosition)
        If FlaskFound Then
            DisplayWonGameMessage()
        End If
        Eaten = Monster.CheckIfSameCell(Player.GetPosition)
        'This selection structure checks to see if the player has
triggered one of the traps in the cavern
        If Not Monster.GetAwake And Not FlaskFound And Not Eaten And
(Player.CheckIfSameCell(Trap1.GetPosition) And Not Trap1.GetTriggered Or
Player.CheckIfSameCell(Trap2.GetPosition) And Not Trap2.GetTriggered) Then
            Monster.ChangeSleepStatus()
            DisplayTrapMessage()
            Cavern.Display(Monster.GetAwake)
        End If
        If Monster.GetAwake And Not Eaten And Not FlaskFound Then
            Count = 0
            Do
                Cavern.PlaceItem(Monster.GetPosition, " ")
                Position = Monster.GetPosition
                Monster.MakeMove(Player.GetPosition)
                Cavern.PlaceItem(Monster.GetPosition, "M")
                If Monster.CheckIfSameCell(Flask.GetPosition) Then
                    Flask.SetPosition(Position)
                    Cavern.PlaceItem(Position, "F")
                End If
                Eaten = Monster.CheckIfSameCell(Player.GetPosition)
                Console.WriteLine()
                Console.WriteLine("Press Enter key to continue")
                Console.ReadLine()
                Cavern.Display(Monster.GetAwake)
                Count = Count + 1
            Loop Until Count = 2 Or Eaten
        End If
        If Eaten Then
            DisplayLostGameMessage()
        End If
    End If
Loop Until Eaten Or FlaskFound Or MoveDirection = "M"
End Sub

Public Sub DisplayMoveOptions()
    Console.WriteLine()
    Console.WriteLine("Enter N to move NORTH")
    Console.WriteLine("Enter S to move SOUTH")
    Console.WriteLine("Enter E to move EAST")
    Console.WriteLine("Enter W to move WEST")

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        Console.WriteLine("Enter M to return to the Main Menu")
        Console.WriteLine()
    End Sub

    Public Function GetMove() As Char
        Dim Move As Char
        Move = Console.ReadLine
        Console.WriteLine()
        Return Move
    End Function

    Public Sub DisplayWonGameMessage()
        Console.WriteLine("Well done! You have found the flask containing the
Styxian potion.")
        Console.WriteLine("You have won the game of MONSTER!")
        Console.WriteLine()
    End Sub

    Public Sub DisplayTrapMessage()
        Console.WriteLine("On no! You have set off a trap. Watch out, the
monster is now awake!")
        Console.WriteLine()
    End Sub

    Public Sub DisplayLostGameMessage()
        Console.WriteLine("ARGHHHHHH! The monster has eaten you. GAME
OVER.")
        Console.WriteLine("Maybe you will have better luck next time you play
MONSTER!")
        Console.WriteLine()
    End Sub

    Public Function CheckValidMove(ByVal Direction As Char) As Boolean
        Dim ValidMove As Boolean
        ValidMove = True
        If Not (Direction = "N" Or Direction = "S" Or Direction = "W" Or
Direction = "E" Or Direction = "M") Then
            ValidMove = False
        End If
        Return ValidMove
    End Function

    Public Function SetPositionOfItem(ByVal Item As Char) As CellReference
        Dim Position As CellReference
        Do
            Position = GetNewRandomPosition()
        Loop Until Cavern.IsCellEmpty(Position)
        Cavern.PlaceItem(Position, Item)
        Return Position
    End Function

    Public Sub SetUpGame()
        Dim Position As CellReference
        Cavern.Reset()
        If Not TrainingGame Then
            Position.NoOfCellsEast = 0
            Position.NoOfCellsSouth = 0
            Player.SetPosition(Position)
            Cavern.PlaceItem(Position, "*")
            Trap1.SetPosition(SetPositionOfItem("T"))
            Trap2.SetPosition(SetPositionOfItem("T"))
        End If
    End Sub
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        Monster.SetPosition(SetPositionOfItem("M"))
        Flask.SetPosition(SetPositionOfItem("F"))
Else
    Position.NoOfCellsEast = 4
    Position.NoOfCellsSouth = 2
    Player.SetPosition(Position)
    Cavern.PlaceItem(Position, "*")
    Position.NoOfCellsEast = 6
    Position.NoOfCellsSouth = 2
    Trap1.SetPosition(Position)
    Cavern.PlaceItem(Position, "T")
    Position.NoOfCellsEast = 4
    Position.NoOfCellsSouth = 3
    Trap2.SetPosition(Position)
    Cavern.PlaceItem(Position, "T")
    Position.NoOfCellsEast = 4
    Position.NoOfCellsSouth = 0
    Monster.SetPosition(Position)
    Cavern.PlaceItem(Position, "M")
    Position.NoOfCellsEast = 3
    Position.NoOfCellsSouth = 1
    Flask.SetPosition(Position)
    Cavern.PlaceItem(Position, "F")
End If
End Sub

Public Function GetNewRandomPosition() As CellReference
    Dim Position As CellReference
    Do
        Position.NoOfCellsSouth = Int(Rnd() * (NS + 1))
        Position.NoOfCellsEast = Int(Rnd() * (WE + 1))
    Loop Until Position.NoOfCellsSouth > 0 Or Position.NoOfCellsEast > 0
    Return Position
End Function
End Class

Class Grid
    Private NS As Integer
    Private WE As Integer
    Private CavernState(,) As Char

    Public Sub New(ByVal S As Integer, ByVal E As Integer)
        NS = S
        WE = E
        ReDim CavernState(NS, WE)
    End Sub

    Public Sub Reset()
        Dim Count1 As Integer
        Dim Count2 As Integer
        For Count1 = 0 To NS
            For Count2 = 0 To WE
                CavernState(Count1, Count2) = " "
            Next
        Next
    End Sub

    Public Sub Display(ByVal MonsterAwake As Boolean)
        Dim Count1 As Integer
        Dim Count2 As Integer
        For Count1 = 0 To NS
            Console.WriteLine(" ----- ")

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        For Count2 = 0 To WE
            If CavernState(Count1, Count2) = " " Or CavernState(Count1,
Count2) = "*" Or (CavernState(Count1, Count2) = "M" And MonsterAwake) Then
                Console.WriteLine("|" & CavernState(Count1, Count2))
            Else
                Console.WriteLine("| ")
            End If
        Next
        Console.WriteLine("|")
    Next
    Console.WriteLine(" ----- ")
    Console.WriteLine()
End Sub

Public Sub PlaceItem(ByVal Position As CellReference, ByVal Item As Char)
    CavernState(Position.NoOfCellsSouth, Position.NoOfCellsEast) = Item
End Sub

Public Function IsCellEmpty(ByVal Position As CellReference) As Boolean
    If CavernState(Position.NoOfCellsSouth, Position.NoOfCellsEast) = " "
Then
        Return True
    Else
        Return False
    End If
End Function
End Class

Class Enemy
    Inherits Item
    Private Awake As Boolean

    Public Overridable Sub MakeMove(ByVal PlayerPosition As CellReference)
        If NoOfCellsSouth < PlayerPosition.NoOfCellsSouth Then
            NoOfCellsSouth = NoOfCellsSouth + 1
        ElseIf NoOfCellsSouth > PlayerPosition.NoOfCellsSouth Then
            NoOfCellsSouth = NoOfCellsSouth - 1
        ElseIf NoOfCellsEast < PlayerPosition.NoOfCellsEast Then
            NoOfCellsEast = NoOfCellsEast + 1
        Else
            NoOfCellsEast = NoOfCellsEast - 1
        End If
    End Sub

    Public Function GetAwake() As Boolean
        Return Awake
    End Function

    Public Overridable Sub ChangeSleepStatus()
        If Awake Then
            Awake = False
        Else
            Awake = True
        End If
    End Sub

    Public Sub New()
        Awake = False
    End Sub
End Class
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Class Character
    Inherits Item

    Public Sub MakeMove(ByVal Direction As Char)
        Select Case Direction
            Case "N"
                NoOfCellsSouth = NoOfCellsSouth - 1
            Case "S"
                NoOfCellsSouth = NoOfCellsSouth + 1
            Case "W"
                NoOfCellsEast = NoOfCellsEast - 1
            Case "E"
                NoOfCellsEast = NoOfCellsEast + 1
        End Select
    End Sub
End Class

Class Trap
    Inherits Item
    Private Triggered As Boolean

    Public Function GetTriggered() As Boolean
        Return Triggered
    End Function

    Public Sub New()
        Triggered = False
    End Sub

    Public Sub ToggleTrap()
        Triggered = Not Triggered
    End Sub
End Class

Class Item
    Protected NoOfCellsEast As Integer
    Protected NoOfCellsSouth As Integer

    Public Function GetPosition() As CellReference
        Dim Position As CellReference
        Position.NoOfCellsEast = NoOfCellsEast
        Position.NoOfCellsSouth = NoOfCellsSouth
        Return Position
    End Function

    Public Sub SetPosition(ByVal Position As CellReference)
        NoOfCellsEast = Position.NoOfCellsEast
        NoOfCellsSouth = Position.NoOfCellsSouth
    End Sub

    Public Function CheckIfSameCell(ByVal Position As CellReference) As
Boolean
        If NoOfCellsEast = Position.NoOfCellsEast And NoOfCellsSouth =
Position.NoOfCellsSouth Then
            Return True
        Else
            Return False
        End If
    End Function
End Class
End Module
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