Lesson 7 – Conditional Statements

⏱ **4h**

Logical Variables

So far, we have seen three types of variables integer, real, and string. As a type it is extremely simple because it can accept only two different values: True – False which in fact internally on the computer are translated into states 1 and 0 (leaked by current or not).

The statement of a logic (from now on we will call it Boolean) becomes like the other simple variables we have known:

```
Private intDistance = 100, intTotalTravel = 0 As  Int
Private blnFlag  As  Boolean  = False
Private blnDone  As  Boolean
```

Comparative Operators

Comparative operators are used to make comparisons between values in the programming languages. They are the known mathematical symbols of inequalities only that on the computer are written in a slightly different way.

Mathematical Symbol	B4X	Meaning
=	=	Equality
≤	<=	Smaller or Equal
≥	>=	Greater or Equal
≠	<>	Different
<	<	Smaller
>	>	Larger

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Generally, to make a comparison you must compare variables or values of the same type. Eg. Integer values with integer values, real with real prices, etc. Also, in B4X you can compare numeric variables, such as integer variable and float, or Strings (strings) and numeric variables because internally the language converts strings into numbers.

```
38    Private intDistance = 100 As Int     ' Notice the different declaration
39    Private intTotalTravel As Int = 0    ' of two integers
40    Private fltD As Float = 100.45
41    Private strN As String = "100"
42    Private s As String = "School"
43
44    Log( fltD > intDistance)       'Shows True
45    Log( strN = intDistance)       'Shows True
46    Log( strN = intTotalTravel)    'Shows False
47    Log( s = intTotalTravel)       'Shows False
48    Log( intTotalTravel <> strN )  'Shows True
```

Picture 1 Variable Comparisons

Remember

The result of a comparison is always a logical value of True or False.

Logical Operators

Consider a sentence such as 'I am going to school now'.

Mathematician George Boole developed an algebra based on logical sentences.

In Mathematics and Mathematical Logic, Boolean Algebra is the algebra where the values of the variables are the true and false, usually represented by 1 and 0 respectively. Unlike elementary algebra where the values of variables are numbers and the main acts are addition and multiplication, in Boolean there are three main acts **And**, **OR** and Denial **No**.

Remember

AND (conjunction), denoted x AND y, satisfies x AND y = 1 if x = y = 1, and xANDy = 0 otherwise.

OR (disjunction), denoted x OR y, satisfies x OR y = 0 if x = y = 0, and x OR y = 1 otherwise.

NOT (negation), denoted NOT x, satisfies Not x = 0 if x = 1 and Not x = 1 if x = 0.

Example:

1st Sentence: Today it rains,   **2nd Sentence**: *I am going to school*.

Today it's raining. (P1)	*I am going to school.* (P2)	P1 AND P2	P1 or P2	NO P1

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True	True	True	True	False
True	False	False	True	False
False	True	False	True	True
False	False	False	False	True

From the table we observe that

- Two sentences that unite with the logical **AND** are true when it unites two truths only.
- Two sentences that are united by logical **OR** are true when even one sentence is true.
- The **logical** NO reverses the truth or lie of a sentence.

Logical operators in programming

Logical operators are used in programming to create complex comparative expressions. This helps the developer optimize their code with fewer lines and simpler code.

In B4X logical variables are used as below.

```
50        'Logical operators
51        Private blnL1, blnL2 As Boolean
52        blnL1 = True
53        blnL2 = False
54
55        Log (blnL1 And blnL2)    ' Shows False
56        Log (blnL1 Or blnL2)     ' Shows True
57        Log (Not(blnL1))         ' Shows False
58        Log (Not(blnL2))         ' Shows True
```

Picture 2 Use of Logical Acts

Notice that logical operations must link logical variables or logical expressions as we will see later.

Examples of evaluation of logical sentences.

The following variables are given with their values:

```
Private intA = 10, intB = 20, = 30 As int
Private strName1 = "George", strName2 = "Georgia"  As  String
Private blnA = True, blnB = False blnC = False As Boolean
```

Calculate the value of the following logical expressions.

1.

blnA	**AND**	blnB
True		False
	False	

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2.

Inta	>	intC	AND	blnA
10		30		True
	False			
		False		

3.

intA + intB	>=	intC	AND	(blnA	OR	blnB)
10 + 20		30		True		False
	True				True	
			True			

4.

intA + intB	>=	intC	OR	(blnA	AND	blnB)
10 + 20		30		True		False
	True				False	
			True			

5.

strName1	=	"George"	OR	strName2	=	"John"
George		George		Georgia		John
	True				False	
			True			

If command

Often as in life we ask questions so in programming there is a need for the developer to ask questions to check values or change the continuity of the program in different directions.

The **if command** is used to make the corresponding questions:

Its basic form is as follows:

```
If ( condition )  Then
   Commands
End If
```

Where condition enter a comparative or logical expression studied above.

The meaning is: If condition is **TRUE** execute the commands between Then and End If

Examples:

```
Private intA = 10, intB = 20 As Int
Private fltA As Float

If intA > 0 Then
   Log(intA & " is positive Number")
End If
```

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```
If intA > 10 Or intB > 10  Then
   Log("One or both numbers are greater than 10")
End If


If intA Mod 2 = 0 Then
   Log(intA & " is Even number")
End If
```

If – Else

The Else command adds the ability to **if** to execute code if its condition is not true.

Its basic form is as follows:

```
If ( condition )  Then
   Commands
Else
   Commands
End If
```

The meaning is: If condition is **TRUE** execute the commands between Then and Else otherwise Execute the commands between Else and End If.

Examples:

```
Private intA = 10, intB = 20 As  Int
Private fltA As Float

If intA > 0 Then
   Log(intA & " is possitive Number")
Else
   Log(intA & " is not possitive Number")
End If

If intA > 10 Or intB > 10 Then
   Log("One or both numbers are greater than 10")
Else
   Log("None of the two numbers are greater than 10")
End If

If intA Mod 2 = 0 Then
   Log(intA & " is Even number")
Else
   Log(intA & " is  Odd  number")
End If
```

If – else - else if

Multiple **if** further extends the functionality of an **if** command by adding more than 1 control to the structure.

How to write:

```
If ( condition1 )  Then
```

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```
   Commands
Else If (condition2 )    Then
   Commands
Else If (   condition3 )   Then
   Commands
Else If (   condition4 )   Then
   Commands
...
Else
   Commands
End If
```

The function of the multiple if is summarized as follows:

1. The first condition runs, and if it is true, then the code it contains runs and if it is completed.
2. If the first **if** is false then the second is executed and if it is true it executes the code it contains and if it is completed.
3. Other checks are always performed when the previous ones are false.
4. If none of the checks are true then the **else** command is run which is optional.

Example 3

A fast-food chain has these meals:

Meal	Price
Burger	5$
Pizza	3$
Hot Dog	1,5$

Create a program that:

Reads the meal the customer wants. Prints the cost of the meal. Input example: "Hot Dog", Output: "Hot Dog 1,50$"
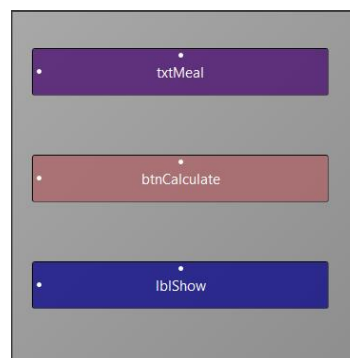
Solution

Step 1

Start a new project and give dimensions 300 x 300.

Step 2
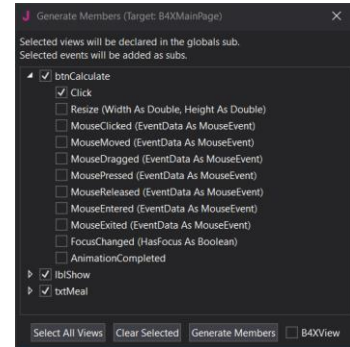
In the designer design the app screen
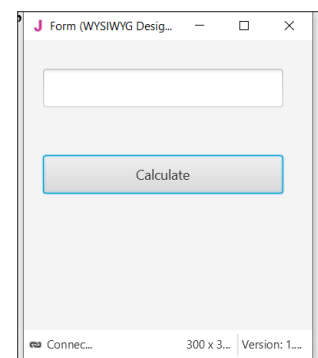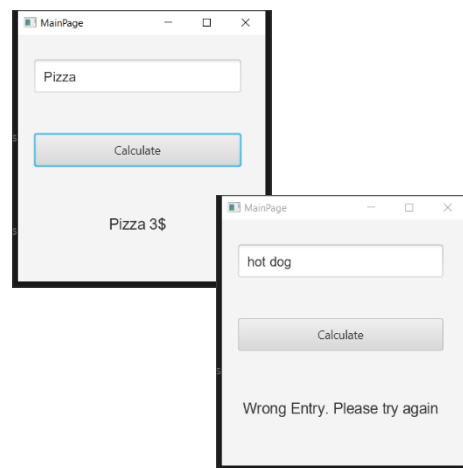

Picture 3 The app screen

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Step 3

Enter txtMetal , btnCalculate, lblShow , and btnCalculate_Click.

Step 4

The code you need to write is for btnCalculate_Click

Note that the code considers capitals to be different from small letters. So he doesn't recognize the hot dog as a meal that should be written as a Hot Dog.

Algorithms with if
Find Maximum Number

Read 3 integers and find the largest in three different ways

Method 1 – Simple If Statement

```
If Inta > intB AND Inta >
intC then
    Log(Inta)
End If
If intB > Inta AND intB >
intC then
    Log(intB)
End If
If intC > Inta AND IntC >
```

Method 2 – Nested If

```
If Inta > intB then
   If Inta > intC then
      Log(Inta)
   End If
End If
If IntB > IntA then
   If IntB > intC then
      Log(IntB)
   End If
End
If IntC > IntA then
   If IntC > IntA then
      Log(IntC)
   End If
End If
```

Method 3 – Max Algorithm

```
Max = inta
If intB > Max then
    MAX = intB
End If
If intC > Max then
    MAX = intC
End If
Log(Max)
```

Exercises

1. Make the following suggestions in logical expressions.
   - i. A belongs to space [-5, 6).
   - ii. a is less than 3 or more than 15.
   - iii. a is equal to b and c.
   - iv. a does not have a value of 3.
   - v. A is less than 2 or b is greater than 78.
   - vi. a and b true and c false.
   - vii. the a true and one of the b, c true.

2. What is the logical result (true or false) of performing the following operations if the following variables have the values below?
   A = 10, B = 2, C = -4, D = 9 and E = 1
   - i. (A>B) or (D=10)
   - ii. (D >= B) and (E <> C)
   - iii. no (E<=C) or (D<=C)
   - iv. no ((B<=C) and (D<2))
   - v. no (no (B<=E) or not (C<=B))
   - vi. ((E<=A) and (E>=C)) and not (C>=A)
   - vii. no (no (A >= 2) and (C <>9))

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1. A fast-food chain has these meals:

Meal	Price
Burger	5$
Pizza	3$
Hot Dog	1,5$

Create a program that:

Reads the meal the customer wants and second how many items of this meal needs.

Prints the cost of the meal.

Input example: "Hot Dog", 2

Output: " 2 x Hot Dog 3$"

2. You have consumed X amount of Mbps on Wikipedia and Y amount of Mbps on memes. The cost of visiting Wikipedia is 0,10$ per Mb and the cost for watching memes is 0,05$ per Mb. If total consumption is more than 100$ print "Too much consumption". If watching meme consumption is greater than reading Wikipedia consumption print "WOW MANY MEMES", "SUCH LOL"(in new line). Create a program that:
   a. Reads X (Wikipedia Mb consumption) and Y(watching meme Mb consumption)
   b. Calculates the total consumption.
   c. If total consumption greater than 100$ print proper message If watching meme consumption is greater than reading Wikipedia articles print proper messages

3. An internet cafe has 2 ways of charging. If the user is a member pays 2$/hour, Else the user pays 5$. Find if someone is a member or not and calculate the price based on how many hours the user spend. If the user is a member the tax is 10% else the tax is 20%. Create a program that:
   a. Reads how many hours the user spend
   b. Check if is a member.
   c. Add the proper tax fee.
   d. Print the total amount the user must pay Output: "The user is a member stayed 2 hours for 2$/hour plus the 10% the total amount is 4.4$"

4. You want to buy something from Amazon. The seller charges different prices for shipping cost based on location. For US it's 5$ for Europe it's 7$ for Canada it's 3$ for other places it's 9$. Create a program that:
   a. Reads the cost of the product.
   b. Reads your location.
   c. Print the amount of money you must pay.
   d. Output: "You have to pay 23$, 20$ for the product and 3$ for shipping cost".

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5. A company sells a product for 0.70 € a piece if up to 200 pieces are ordered and for 0.50 € a piece if more than 200 pieces are ordered. Read the number of pieces ordered and calculate their value.

6. A cell phone company has the following billing policy.

Fixed cost 25$	
Call duration(in seconds)	Charge($/per second)
1-500	0,01
501-800	0,008
801+	0,005

Create a program that:

    a. Reads how many seconds was the calls duration.
    b. Calculates the monthly bill for the subscriber.
    c. Prints the total amount.
    d. Output: "total amount: 48$"
    e. Notice that that the charge for the first 500 seconds it's 0,01$ then for the next 501 to 800 seconds it's 0,008 and then it's 0,005$

7. In the qualifying races in the long jump at the Olympic Games, an athlete makes 3 initial attempts and if he has a performance of more than 7.50 meters, then he is entitled to continue and make another 3 more attempts. Read the first 3 attempts of an athlete and print a message whether he is entitled to continue or not and if he is entitled to find and print the best effort of the athlete.

You can use method Visible = True or False to hide or show labels, textFields and Buttons.

8. In a municipality there are parking spaces for a short period of time. Parking charges are staggered, as shown in the table below:

Parking time	Charge per hour
Up to 1 hour 3.50 €	
The next 2 hours	8.00 €
The next 2 hours	12.00€
Over 5 hours	15.00 €

Make a program that reads the duration someone left his car in parking and calculates the total cost.

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