B4x Booklets

# B4A B4i B4J B4R

## B4x Getting started

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#### To search for a given word or sentence use the Search function in the Edit menu.

All the source code and files needed (layouts, images etc.) of the example projects in this booklet are included in the SourceCode folder.

For each program there are three folders. SourceCode MyFirstProgram B4A MyFirstProgram.b4a B4i MyFirstProgram.b4i B4J MyFirstProgram.b4j Both programs MyFirstProgram and SecondProgram are almost the same for B4A, B4i and B4J.

Updated for following versions: B4A version 7.01 B4i version 4.01 B4J version 5.51 B4R version 2.00

Other Booklets: <u>B4x Baisc Language</u> <u>B4x IDE Integrated Development Environment</u> <u>B4x CustomViews</u>

## 1 B4x

B4x is a suite of BASIC programming languages for different platforms.

B4X suite supports more platforms than any other tool

ANDROID | IOS | WINDOWS | MAC | LINUX | ARDUINO | RASPBERRY PI | ESP8266 | AND MORE...



B4A includes all the features needed to quickly develop any type of Android app.



B4i is a development tool for native iOS applications. B4i follows the same concepts as B4A, allowing you to reuse most of the code and build apps for both Android and iOS.



## Java / Windows / Mac / Linux / Raspberry PI

B4J is a **100% free** development tool for desktop, server and IoT solutions. With B4J you can easily create desktop applications (UI), console programs (non-UI) and server solutions.

The compiled apps can run on Windows, Mac, Linux and ARM boards (such as Raspberry Pi).



Arduino / ESP8266

B4R is a **100% free** development tool for native Arduino and ESP8266 programs.

B4R follows the same concepts of the other B4X tools, providing a simple and powerful development tool.

B4R, B4A, B4J and B4i together make the best development solution for the Internet of Things (IoT).

## 2 Getting started B4A

#### B4A is a simple yet powerful development environment that targets Android devices.

B4A language is similar to Visual Basic language with additional support for objects. B4A compiled applications are native Android applications; there are no extra runtimes or dependencies.

Unlike other IDE's, B4A is 100% focused on Android development.

B4A includes a powerful <u>GUI designer</u> with built-in support for multiple screens and orientations. **No XML writing is required.** 

You can develop and <u>debug</u> with:

- a real device connected via B4Abridge
- a real device connected via USBcable
- or an Android emulator.

B4A has a rich set of libraries that make it easy to develop advanced applications. This includes: <u>SQL databases</u>, <u>GPS</u>, <u>Serial ports (Bluetooth)</u>, <u>Camera</u>, <u>XML parsing</u>, <u>Web services</u> (<u>HTTP</u>), <u>Services (background tasks</u>), <u>JSON</u>, <u>Animations</u>, <u>Network (TCP and UDP</u>), <u>Text To Speech</u> (<u>TTS</u>), <u>Voice Recognition</u>, <u>WebView</u>, <u>AdMob (ads)</u>, <u>Charts</u>, <u>OpenGL</u>, <u>Graphics</u> and <u>more</u>.

Android 1.6 and above are supported (including tablets).

## 2.1 B4A Trial version

Look at this page for instructions how to use the trial version: <u>https://www.b4x.com/b4a.html</u>

## 2.2 Installing B4A and Android SDK

B4A depends on two additional (free) components:

- Java JDK

- Android SDK

## 2.2.1 Installing Java JDK

Installation instructions:

The first step should be to install the **Java JDK**, as Android SDK requires it as well. Note that there is no problem with having several versions of Java installed on the same computer.

- Open the Java 8 JDK download link.
- Check the Accept License Agreement radio button.
- Select "Windows x86" or "Windows x64" (for 64 bit machines) in the platforms list.
- Download the file and install it.

#### 2.2.2 Installing Android SDK

The next step is to install the Android SDK and a platform:

- <u>Install the SDK</u>. The SDK doesn't always behave properly when it is installed in a path with embedded spaces (like Program Files). It is recommended to install it to a custom folder similar to C:\Android.

- You should now install the platform tools and at least one platform image. Use the latest one or at least API 8.

You should also install Google USB Driver to be able to connect a physical device with USB. A list of other drivers is available <u>here</u>.

Note that B4A allows you to connect to any device over the local network with <u>B4A-Bridge tool</u>.



A screen similar to this will be shown.

Select the API version you want to download. In the example, I choose API 24. 9

You can select several APIs and install them in parallel.

In this example, API 22 is also selected.

Note that you can install more packages later.

- Press on Install Selected and install both packages.

If you want to connect a device with USB you might also download the Google USB driver.

#### 2.2.3 Installing B4A

- Download and install B4A.
- Open B4A.

#### B4x Getting started

## 2.3 Configure Paths in the IDE

- Open B4A.
- Choose Tools menu Configure Paths.

A Paths Configuration	n	×
javac.exe	C:\Program Files (x86)\Java\jdk1.8.0_77\bin\javac.exe Usually found under C:\Program Files\Java\jdk1.8.x_xx\bin	Browse
android.jar	C:\Android\platforms\android-23\android.jar	Browse
	Usually found under C:\Program Files\Android\android-sdk-windows\platforms \android-x	
Additional Libraries	D:\B4A\AdditionalLibraries	Browse
	(optional) A folder where libraries will be searched for, in addition to the internal libraries folder. Make sure NOT to set it to the B4A libraries folder.	
Shared Modules	D:\B4A\SharedModules	Browse
	(optional) A folder where code modules will be searched for, in addition to the project folder.	
	Cancel Ok	

- Use the browse buttons to locate "javac.exe" and "android.jar" javac is located under <java folder>\bin.

android.jar is located under <android-sdk-windows>\platforms\android-21.

The folder depends on where you installed the Android SDK,

It should be: C:\Android\platforms\android-21\android.jar

or C:\Android\platforms\android-8\android.jar.

The number depends on the Android version you loaded.

On older versions it could be under:

On Windows 64 bit, Java will probably be installed under C:\Program Files (x86).

It is recommended to create a specific folder for Additional libraries. B4A utilizes two types of libraries:

- Standard libraries, which come with B4A and are located in the Libraries folder of B4A.
   These libraries are systematically up dated when you install a new you
  - These libraries are automatically updated when you install a new version of B4A.
- Additional libraries, which are not part of B4A, and are mostly written by members. These libraries should be saved in a specific folder different from the standard libraries folder.

Shared modules: Module files can be shared between different projects and must therefore be saved in a specific folder.

#### **Common errors**

- Windows XP - "Basic4Android.exe Application could not be initialised correctly error 0xc0000135" on start-up. B4A requires .Net Framework 4.0 or above. Windows XP users who didn't install it before should first install the framework.

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## 2.4 Connecting a real device

There are different means to connect a real device:

- USB Needs that the device supports ADB debugging. Need to activate USB Debugging on the device.
- B4A Bridge
  - o via WiFi
  - via Bluetooth till B4A version 4.3 it is no more available since version 5.00.

## 2.4.1 Conneting via B4A-Bridge

It is always recommended to use a real device instead of an Android emulator which is very slow compared to a real device (especially with applications installation).

However not all devices support ADB debugging. This is the reason for the B4A-Bridge tool. B4A-Bridge is made of two components. One component runs on the device and allows the second component which is part of the IDE to connect and communicate with the device. The connection is done over a network (B4A-Bridge cannot work if there is no network available).

Once connected, B4A-Bridge supports all of the IDE features which include: installing applications, viewing LogCat and the visual designer.

Android doesn't allow applications to quietly install other applications, therefore when you run your application using B4A-Bridge you will see a <u>dialog asking for your approval</u>.

## 2.4.1.1 Getting started with B4A-Bridge

First you need to install B4A-Bridge on your device.

B4A-Bridge can be downloaded here: <u>http://www.basic4ppc.com/android/files/b4a\_bridge.apk</u>.

B4A-Bridge is also available on Play Store. Search for: B4A Bridge. Note that you need to allow install of applications from "Unknown sources". This is done by choosing Settings from the Home screen - Manage Applications.

B4A-Bridge requires writable storage card. It is not possible to install applications without it.

## 2.4.1.2 Run B4A-Bridge on your device

Run B4A-Bridge on your device, it will display a screen similar to the picture below.

A <sup>x</sup> ©	💲 🔏 97% 🖻 13:35	
B4A-Bridge		
My IP: 192.168.1.101 Status: ぷ Waiting For connections.		Status will be: Status: 33 Press on Start to listen for connections. Waiting for connections.
START 奈		
Enable FTP Server		START
STOP 📕		Press for wireless connection.
		Status will change to: Waiting for connections.
		Note that B4A-Bridge was written with B4A.
B4A-Bridge v2.31		

#### 2.4.1.3 Wireless connection

In the IDE menu Tools select New IP

If the address already exists click directly on this address.

If this device was already connected before you can simply press F2 to connect it.

Тоо	s Debug Windows Help		_			
	IDE Options	•	¢	= 🗿 Debug		✓ Default ✓ =
ව	B4A Bridge	+		Connect	•	New IP
	Clean Files Folder (unused files) Clean project	Ctrl+P	•	Disconnect Shift File Explorer	+F2	samsung SM-G920F - 192.168.1.101 F2 192.168.1.108
	Configure Paths			What's This?		192.168.1.103

Enter the IP of the device, you find it on top of the B4A-Bridge screen on the device.

In some cases the address displayed may be the mobile network address. In that case you can find the local wireless address in the wireless advanced settings page.

A Enter device IP address X	My IP: 192.168.1.101
IP address (displayed in B4A-Bridge application):           192.168.1.101         Ok         Cancel	Status: 🕉 Waiting For connections.
	Click on Ok, the device is co

You see that the status changed on both, the device and the IDE in the lower left corner.

My IP: 192.168.1.101			
Status: 🗞		8	B4A-Bridge: Connected

B4A-Bridge keeps running as a service until you press on the Stop button.



You can always reach it by opening the notifications screen.



You see B4A-Bridge with the current status.

Note that the Internet permission are automatically added in debug mode.

#### 2.4 Connecing a real device



When you run an application you are required to approve the installation. You will usually see a screens like the picture.

Press on **INSTALL** to install the program.

🖪 A' 🕝	≵ 🗟 📶 93% 🗷 14:13
	MyFirstProgram
	App installed.
	DONE OPEN

If you pressed on **INSTALL** you will see a screen like in picture.

On this screen you should choose **OPEN** to start the application.

If you try to install an existing application signed with a different key, the install will fail (without any meaningful message). You should first uninstall the existing application. Go to the home screen - Settings -Applications - Manage applications - choose the application - Uninstall.

Once you finished developing you should press on the Stop button in B4A-Bridge in order to save battery.

## 2.4.2 Connecting vis USB

You should download Google USB Driver in the <u>Android SDK Manager</u>. If this driver doesn't work you must search for a specific driver for your device.

To be able to connect a device with USB you must activate USB Debugging. This is also need if you use an Emulator.

In this state on some older devices you will not be able to access the SD card from the PC. If you want to access the SD card you must uncheck USB Debugging.

I	Launc	h Settings	Setti	ings
	System			
	Y	Date & time		
	•	Accessibility		
	0	Printing		
	圕	Developer options		In System, select Developer options.
	ψ ♥ ●	) 🛜 🗐 🕫	2:19	
	÷	Developer options	۹	
		On		Select On.
	Take bu	g report		
	Desktop Desktop	backup password full backups aren't currently protected		
	Stay aw Screen w	ake ill never sleep while charging		
	Enable I Capture a	Bluetooth HCI snoop log all bluetooth HCI packets in a file		
	Process Geeky st	: Stats ats about running processes		
	Debuggi	ng		
	USB del Debug m	ode when USB is connected		Check USB Debugging

The device will automatically be recognized by the IDE.

### 2.5 My first B4A program (MyFirstProgram.b4a)

Let us write our first program. The suggested program is a math trainer for kids.

The project is available in the SourceCode folder shipped with this booklet: SourceCode\MyFirstProgram\ B4A\MyFirstProgram.b4a

The look of the screen is different depending on the Android version of the devices, also with Emulators.



Sony xperia z1

Emulator Android version 4.2 Emulator Android version 2.2

On the screen, we will have:

- 2 Labels displaying randomly generated numbers (between 1 and 9)
- 1 Label with the math sign (+)
- 1 EditText view where the user must enter the result
- 1 Button, used to either confirm when the user has finished entering the result or generate a new calculation.
- 1 Label with a comment about the result.

In Android:

- Label is an object to show text.
- EditText is an object allowing the user to enter text.
- Button is an object allowing user actions.

We will design the layout of the user interface with the VisualDesigner and go step by step through the whole process.



When you open the IDE you will see on the top left two Tabs Main and Starter.

	A B4A	• Main ×
	File Edit Designer Project Tools	Is the Main module for B4A which is the normal starting
	: 🗞 😋 🛄 🕷 🔲 V 🖴 о о о	module. Its name cannot be changed.
	: "" = = =	<ul> <li>Starter</li> </ul>
	🖽 Main 🔰 Starter 🗙	Is a Service, which is startet when the program is lauched.
I		

For our first program we don't need this Starter service, so we delete it.



You could also leave the Starter service, the removal is not mandatory.

#### Save the project.

You must save the project before you can run the Designer.

Create a new folder MyFirstProgram and save the project with the name MyFirstProgram.

Γ	AN	ЛуFirstProgram - B4A	Set the Package Name.			
	File	Edit Designer Project Tools Debug Windows He	Plp Fach program needs a package			
	*b	New	name.			
	2	Open Source				
	•	Save Ctrl+	+S			
	苗	Export As Zip	▶ •			
	Project Tools Debug Windows Help					
	*ם	Add New Module				
	<b>*</b> 0	Add Existing Modules				
		Rename Module				
	-	Remove Module				
l		Choose Icon				



Manifest Editor

**Build Configurations** 

A Build Configurations		×
Configuration:	Default	▼ Create New
Configuration Name:	Default	Delete
Package:	b4a.example	
Conditional Symbols		
	Example: Full, NoAds	
		Cancel OK

Ctrl+B

h

The default name is b4a.example.

A Build Configurations	;			×	
Configuration:	Default -		Cre	eate New	
Configuration Name:	Default	]		Delete	We will change it to
Package:	b4a.MyFirstProgram				b4a.MyFirstProgram.
Conditional Symbols		]			And click on OK.
	Example: Full, NoAds				
		Cance	el	ОК	

#### Set the Application Label.

The Application label is the name of the program that will be shown on the device.

On top of the code screen you see these two lines showing two 'regions'.

1 🕀 [	Project Attributes	
8		
9 ⊕ [	Activity Attributes	

1 ∎#Region Project Attributes Regions are code parts which can be collapsed or 9 extended. 10 □ #Region Activity Attributes Clicking on  $\mathbb{H}$  will expand the Region. #FullScreen: False 11 Clicking on  $\square$  will collapse the Region. 12 #IncludeTitle: True Regions are explained in <u>Chapter Collapse a Region</u>. 13 #End Region #Region Project Attributes #ApplicationLabel: B4A Example #VersionCode: 1 #VersionName: 'SupportedOrientations possible values: unspecified, landscape or portrait. #SupportedOrientations: unspecified #CanInstallToExternalStorage: False #End Region #Region Activity Attributes #FullScreen: False #IncludeTitle: True

```
#End Region
```

The default name is B4A Example, but we will change it to MyFirstProgram for naming consistency.

Change this line: #ApplicationLabel: B4A Example to #ApplicationLabel: MyFirstProgram

The other lines are explained in Chapter Code header Project Attributes / Activity Attributes.

#### **Connect a device**

To test the program you should connect a device to the IDE. The best connection is via B4A-Bridge.

It is also possible to connect an <u>Emulator</u>.

On the device run B4A-Bridge. If you haven't it on your device it's the right moment to install it.

4 🖬 🖣 💿 🛛 💈	🕄 📶 🗲 (98%) 12:10					
B4A B4A-Bridge						
My IP: 192 168 1 40						
Status: Disconnected. Press on Start to listen for conne	ections.					
Start - Wireless		Click on	Start - Wire	less		
Start - Bluetooth	Reset Bluetooth					
Make Discoverable						
Stop						
B4A-Bridge v2.12						
1 ^	_					
ψ 🏧 🖬 🏺 🌒 👒						
B4A B4A-Bridge						
Multo 102 168 1 40						
Status: Disconnected.		You will see	Status: Disc Waiting For	onnected. wireless connection	s. on top	
Waiting For wireless connections	<b>.</b>				on top.	
Start - Wireless						
A MyFirstProgram - B4A						
File Edit Designer Project	Tools Debug	Windows Help				
: "D 🖺 🖬 🛱   D' 🗶 Ö]	B4A Bridge	S	•	Connect	g	▼     Default New IP
⊟ Main ×	Clean Files	Folder (unused files)	F	Disconnect	Shift+F2	1021691105
10 E#Region A	Clean proje	ect	Ctrl+P	What's This?		192.168.1.105
11 #FullScre	Configure I	Paths	I	windt's THIS!		192.168.1.40

In the IDE click on the address of the device you want to connect. The address is shown on the B4A-Bridge screen on the device. 21

#### In the IDE run the Designer.



#### The Visual Designer looks like this.

A Visual Designer	-		×
File Add View WYSIWYG Designer Tools Windows			
Views Tree Properties	Abstract Designer		Ŧ
Activity Activity Properties	Match Chosen Variant		•
		L	
Alpha 255			
Files Variants Views Tree			
Script - General			
:□お品っく国習ーをす♪			
1 'All variants script	100%		
3			
	the second secon		
			*
Script - General Script - Variant		Þ	
WYSIWYG status: Disconnected			

There are different windows:

- Views Tree shows all views as a tree.
- Properties shows all properties of the selected view.
- Abstract Designer shows the views on a screen
- Script General allows to 'fine tune' the layouts.

The Designer is explained in detail in the chapter The Designer.

In this first project we will only look at the three first windows.

So we hide the Script- General window to increase the size of the two other windows on top. Click on -.

Script - General : 日 品 合 っ ペ 国 理   垂 垂   P   ト 。 1 'All variants script	Image: Provide state s
And on Auto Hide .	
Script - General	<b>↓ ↓</b> 100%
: 山光白ッく 国 湾 王王 P ト	Float
1 'All variants script	Dock
2 AutoScaleAll	Dock as Document
3	Auto Hide
	Close

#### The Designer will look like this.

A Visual Designer	_		×
File Add View WYSIWYG Designer Tools Windows			
Views Tree Views Tree Properties Abstract Designer			-
Activity Activity Properties Match Chosen Variant			•
▲ Drawabl ColorDra ▼			
Color Defaul			
Alpha 255			
Title Activity			
Animatic 400			
≓ Show Tit √			
Full Scret			
100%			
e e e e e e e e e e e e e e e e e e e			
Files Variants Views Tree		Þ	
WYSIWYG status: Disconnected			

22

#### 2.5 My first B4A program

To shows the views on the device you must connect the device to the Designer.

A Visual Designe	er				
File Add View	WYS	SIWYG Desigr	ner	Tools	V
Views Tree Second	9	Connect		F2	k
Activity		Disconnect	22	ift+F2	_

Wait until the Designer and the device are connected. This can take some time, so be patient.

You will see the state of the Designer here on the bottom of the Designer with the parameters of the connected device:

<b>C</b>	WVSIWVG status: Connected	Device details (02157df2d5b37e15)
	WTSIWTG status, Connected	1440 x 2560, scale = 4 (640 dpi)

Add View	WYSIWYG Designer
AutoO	CompleteEditText
Butto	n
Check	Box
Custo	mView
EditTe	ext
Horizo	ontalScrollView
Image	eView
Label	N
ListVie	ew 1/2

**Views Tree** 

We see the Label with the default name Label1 in following windows:

**Properties** with its default properties. Abstract Designer at its default position and Default dimensions.

ΑV	'isual Designer							-	×
File	Add View WYSIWYG Designer	r	Tools Win	dows					
Scrip	Views Tree	Pr	operties 🔅		•	ņ	Abstract Designer		-
ot - (	<ul> <li>Activity</li> </ul>	4	Main			<b></b>	Match Chosen Variant		•
Gene	☑ Label1		Name	Label1					
eral			Туре	Label			(<``>) (<)		
Scrip			Event Nar	Label1					
ot - V			Parent	Activity	•				
/aria		4	Common	Properties					
1. Et			Horizonta	LEFT	•		LaLel1		Ч
			Vertical A	ТОР	•				
			Left	100					
I	I		-						

)r	operties 2000	*********	•
4	Main		
	Name	Label1	
	Туре	Label	
	Event Nam	Label1	
	Parent	Activity	•
4	Common P	roperties	
	Horizontal	LEFT	•
	Vertical And	ТОР	•
	Left	60	
	Тор	10	
	Width	60	
	Height	60	

Resize and move the Label with the red squares like this.

The new properties Left, Top, Width and Height are directly updated in the Properties window. You can also modify the Left, Top, Width and Height properties directly in the Properties window.

Let us change the properties of this first Label according to our requirements.

By default, the name is Label with a number, here Label1, let us change its name to lblNumber1. The three letters 'lbl' at the beginning mean 'Label', and 'Number1' means the first number. It is recommended to use meaningful names for views so we know directly what kind of view it is and its purpose.

Properties			<b>-</b> 7
⊿ Main			-
	Name	IbINumber1	

Pressing the 'Return' key or clicking elsewhere will update the name in the other windows and change the Event Name property.

Main:	Main module.
Name:	Name of the view.
Туре:	Type of the view. In this case, Label, which is not editable.
Event Name:	Generic name of the routines that handle the events of the Label.
Parent:	Parent view the Label belongs to.





Let us check and change the other properties:

4	<b>Common Propertie</b>	es	
	Horizontal Anchor	LEFT •	Left Top Width and Height are OK
	Vertical Anchor	TOP	Or if the values are not the same you should change them.
	Left	60	
	Тор	10	
	Width	60	
	Height	60	
	Enabled	1	Enabled Visible are OK
	Visible	1	
	Tag		Tag we leave empty
	Text	5	Text, we set a default number, say 5
4	Text Style		
	Typeface	DEFAULT	Typeface, Style are OK
	Style	NORMAL	
	Horizontal Alignm CENTER_HORIZON 🔻		Horizontal Alignment, we set to CENTER_HORIZONTAL
	Vertical Alignment	CENTER_VERTICAL	Vertical Alignment, we leave CENTER_VERTICAL.
	Size	36	Size, we set to so
	Text Color	Default color	We leave all the other properties as they are.
4	Label Properties		
4	Drawable	ColorDrawable	
	Color	Default color	
	Alpha	0	
	Corner radius	0	
	Border Color	#FF000000	
	Border Width	0	

We need a second Label similar to the first one. Instead of adding a new one, we copy the first one with the same properties. Only the Name and Left properties will change.

Right click in the Abstract Designer on IbINumber1 and click on Copy





Click somewhere else in the Abstract Designer and right click again and click on Paste.

The new label covers the previous one.





We see the new label added in the Views Tree.



Now we add a 3rd Label for the math sign. We copy once again lblNumber1. In the Abstract Designer right click on lblNumber1, click on Copy Click somewhere else, right click again and click on Paste



#### 29

N	low let us add an	EditText view	ν.					
	Add View WYSIW)	G Designer	In the I	Designer Add View men	u			
	AutoComplete	EditText	click o	n EditText .				
1	Button		_					
	CheckBox				Desition it halow the three			
	CustomView		blNu	mber1blMathSign(blNumber2	Labels and change its name to			
	EditText	N	1		edtResult. 'edt' means			
	HorizontalScrol	IView		edt	EditText and 'Result' for its			
					purpose.			
			•/	111				
	Main		[					
	Name	edtResult		Let us change these pr	operties			
	Туре	EditText		Name to edtResu	lt			
	Event Name	edtResult						
	Parent	Activity	•					
4	Common Properti	es						
	Horizontal Anchor	LEFT	•					
	Vertical Anchor	ТОР	•					
	Left	60						
	Тор	70	<b>‡</b>					
	Width	180						
	Height	60						
	Enabled	1						
	Visible	1						
	Tag							
	Text							
4	Text Style							
	Typeface	DEFAULT	•					
	Style	NORMAL	•					
	Horizontal Alignm	ITER_HORIZONT	AL 🔻	Horizontal Alignment to CENTER HORIZONTAL				
	Vertical Alignment	CENTER_VERTIC	AL 🔻	g				
	Size	30		Text Size to 30				
	Text Color	Default co	lor					
	Password			Input Type to NUMBE	RS			
	Single Line	1		Hint Text to Enter res	sult			
	Input Type	NUMBERS	•	Setting Input Type to I	NUMBERS lets the user enter only			
	Hint Text	Enter result		numbers.				
	Hint Color	Default co	lor	Hint Tort reasons (1	a taut above in the Edit			
	Wrap	1		no text is entered. After	r making these changes, you should			
	Force Done			see something like this				

#### 2.5 My first B4A program

#### B4x Getting started



Now, let's add the Button which, when pressed, will either check the result the user supplied as an answer, or will generate a new math problem, depending on the user's input.



Position it below the EditText view. Resize it and change following properties:

Set the properties like below.

-	Main					
	Name	btnAction		Name	to	btnAction
	Туре	Button				
	Event Name	btnAction				
	Parent	Activity	•			
	Common Propert	ies				
	Horizontal Anchor	LEFT	•			
	Vertical Anchor	ТОР	•			
	Left	100				
	Тор	140				
	Width	100	÷			
	Height	60				
	Enabled	<b>J</b>				
	Visible	<b>J</b>				
	Tag			Toxt	to	OK (with a space between $O$ and $K$ )
	Text	ОК		Text	10	O K (with a space between O and K)
4	Text Style					
	Typeface	DEFAULT	•			
	Style	NORMAL	•			
	Horizontal Alignm	CENTER_HORIZON	•			
	Vertical Alignment	CENTER_VERTICAL	•			
	Size	24		Text Size to	0 2	4
	Text Color	Default color				

Let us add the last Label for the comments. Position it below the Button and resize it.

4	Main			
	Name	lblComments		
	Туре	Label		Change the following properties:
	Event Name	IblComments		Name to IblComments
	Parent	Activity	•	
4	Common Propertie	es		
	Horizontal Anchor	LEFT	•	
	Vertical Anchor	ТОР	•	
	Left	50		
	Тор	210		
	Width	200		
	Height	80		
	Enabled	<b>J</b>		
	Visible	<b>J</b>		
	Tag			
	Text			
4	Text Style			
	Typeface	DEFAULT	•	
	Style	NORMAL	•	
	Horizontal Alignm	CENTER_HORIZON	•	Horizontal Alignment CENTER HORIZONTAL
	Vertical Alignment	CENTER_VERTICAL	•	
	Size	20		
	Text Color	#000000		
4	Label Properties			Text Color to #000000 We set the Text Color property to Plack (#000000)
4	Drawable	ColorDrawable	•	We set the Text color property to black ( $\pi$ 000000).
	Color	#FFFFF		Color to #FFFFFF
	Alpha	255		Alpha to 255
	Corner radius	0		By default, the Label background color is black and
	Border Color	#FF000000		transparent.
	Border Width	0		We set it to white and opaque $Alpha = 255$ .
_				



And on a device or Emulator.



Sony xperia z1





#### Let us save the layout in a file.

File	Add View	WYSIWYG Desi			
*1	New				
2	Open				
•	Save	Ctrl+S	In the File menu click	on Save As	and save it with the
	Save As		name 'Main'.		and save it with the
	Remove Lay	out V			
1					
Α	Create New La	ayout	×		
Layout name					
М	ain		Ok Cancel	Click on Ok .	

To write the routines for the project, we need to reference the Views in the code. This can be done with the *Generate Members* tool in the Designer.

A Main - Visual Designer		In the Tools menu click on
File Add View WYSIWYG Designer	Tools Windows	Generate Members to open the
Views Tree	Generate Members	generator.
<ul> <li>Activity</li> </ul>	Change Grid	1
IblNumber1	Send To UI Cloud F6	
A Generate Members		×
Selected views will be declared in the glo Selected events will be added as subs.	bals sub.	
▷ □ Activity		
✓ ✓ btnAction		
Down		
Up		
Click		
LongClick		
▷ 🕑 edtResult		
IblComments		
IblMathSign		
▷ 🕑 IblNumber1		
▷ 🗹 lblNumber2		
Select All Views Clear Select	Generate Members	

The Generate Members tool automatically generates references and subroutine frames.

Here we find all the views added to the current layout.

We check all views and check the Click event for the btnAction Button.

Checking a view  $\triangleright \square \text{edtResult}$  generates its reference in the Globals Sub routine in the code. This is needed to make the view recognized by the system and allow the autocomplete function.

```
Private btnAction As Button
Private edtResult As EditText
Private lblComments As Label
Private lblMathSign As Label
Private lblNumber1 As Label
Private lblNumber2 As Label
```

Clicking on an event of a view *Click* generates the Sub frame for this event.

#### Sub btnAction\_Click

#### End Sub

Click on Generate Members to generate the references and Sub frames.

Now we go back to the IDE to enter the code.

First, we need our Activity to load our layout file. Within the "Activity\_Create" sub, do the following. You can remove the lines in green.

We will enter this line of code Activity.LoadLayout("Main").

- Enter 'A', as soon as you begin typing the autocomplete function shows you all keywords beginning with 'a'.

27	ĢSι	<pre>ub Activity_Create(</pre>	Fir	stTime As Boolean)
28		Α		
29	Ø	Abs		Abs (Number As Double) As Double
30	Ø	ACos		Returns the absolute value.
32	e 🎯	ACosD		

- Continue typing 'Act'.

27	<pre>Sub Activity_Create(FirstTime As Boolean)</pre>
28	Act
29	Activity As Activity
30 31	Activity_Create

- Press 'Return' or click on Activity

```
27 Sub Activity_Create(FirstTime As Boolean)
28 Activity
29 End Sub
```

- We have the word Activity, now enter a dot.



- The autocomplete function shows all the possible properties of the view.

- Enter 'L' , and the autocomplete function shows the properties beginning with 'L'



- Press the down arrow key, and LoadLayout will be highlighted with the online help for the given property or method.

27	<mark>⊡ Sub</mark>	Acti	vity_Create(	FirstTime As Boolean)
28	Ad	ctivi	ty.L	
29	End	Sub	GetView	
30	⊡ Sub	Activ	🔎 Height	
32		ACCI	🕸 Initialize	
33	End	Sub	💿 Invalidate	
34			Invalidate2	
35	Sub	Acti	Invalidate3	ed As Boolean)
36			IsInitialized	
37	End	Sub	🔎 Left	
39			LoadLayout	LoadLayout (LayoutFile As String) As LayoutValues
40				Loads a layout file (.bal).
41				Returns the LayoutValues of the actual layout variant that was loaded.

- Press 'Return' to add LoadLayout.

```
27 Sub Activity_Create(FirstTime As Boolean)
28 Activity.LoadLayout
29 End Sub
```

- Press '(' to display the online help showing the needed properties for the method.

```
27 Sub Activity_Create(FirstTime As Boolean)
28 Activity.LoadLayout(
29 LoadLayout (LayoutFile As String) As LayoutValues
30 End Sub
31 Loads a layout file (.bal).
32 Sub Activity_Resume
```

```
- Enter "Main")
```

```
Sub Activity_Create(FirstTime As Boolean)
Activity.LoadLayout("Main")
End Sub
```

We want to generate a new problem as soon as the program starts. Therefore, we add a call to the New subroutine.

```
Sub Activity_Create(FirstTime As Boolean)
   Activity.LoadLayout("Main")
   New
End Sub
```

Generating a new problem means generating two new random values between 1 and 9 (inclusive) for Number1 and Number2, then showing the values using the lblNumber1 and lblNumber2 'Text' properties.
To do this we enter following code: In Sub Globals we add two variables for the two numbers.

Public Number1, Number2 As Int End Sub

And the 'New' Subroutine:

```
Sub New
Number1 = Rnd(1, 10)
Number2 = Rnd(1, 10)
IblNumber1.Text = Number1
IblNumber2.Text = Number1
IblComments.Text = "Enter the result"
    & CRLF & "and click on OK"
edtResult.Text = ""
Enter the result"
    Sets edtResult.Text to empty
End Sub
```

The following line of code generates a random number from '1' (inclusive) to '10' (exclusive): Rnd(1, 10)

```
The following line displays the comment in the lblComments view:
lblComments.Text = "Enter the result" & CRLF & "and click on OK"
CRLF is the LineFeed character.
```

Now we add the code for the Button click event.

We have two cases:

When the Button text is equal to "O K" (with a space between O and K), it means that a new problem is displayed, and the program is waiting for the user to enter a result and press the Button.
When the Button text is equal to "NEW", it means that the user has entered a correct answer and when the user clicks on the Button a new problem will be generated.

```
Sub btnAction_Click
  If btnAction.Text = "0 K" Then
        If edtResult.Text = "" Then
        Msgbox("No result entered","E R R O R")
        Else
        CheckResult
        End If
    Else
        New
        btnAction.Text = "0 K"
    End If
End Sub
```

If btnAction.Text = "O K" Then checks if the Button text equals "O K"

If yes then we check if the EditText is empty.

If yes, we display a MessageBox telling the user that there is no result in the EditText view. If no, we check if the result is correct or if it is false.

If no then we generate a new problem, set the Button text to "O K" and clear the EditText view.

The last routine checks the result.

```
Sub CheckResult
    If edtResult.Text = Number1 + Number2 Then
        lblComments.Text = "G O O D result" & CRLF & "Click on NEW"
        btnAction.Text = "N E W"
    Else
        lblComments.Text = "W R O N G result" & CRLF & "Enter a new result" & CRLF & "and click OK"
    End If
End Sub
```

With If edtResult.Text = Number1 + Number2 Then we check if the entered result is correct.

```
If yes, we display in the lblComments label the text below:

'G O O D result'

'Click on NEW'

and we change the Button text to "N E W ".

If no, we display in the lblComments label the text below:

W R O N G result

Enter a new result

and click OK
```

On the left side of the editor you see a yellow line. This means that the code was modified.

```
63
   □Sub CheckResult
       If edtResult.
64
         lblComments.
65
         btnAction.Te
66
       Else
67
         lblComments.
68
       End If
69
70
    End Sub
71
```

If we click on to save the project the yellow line becomes green showing a modified code but already saved. You can also press Ctrl + S to save the project.



If we leave the IDE and load it again the green line disappears.

39

Let us now compile the program and transfer it to the Device. In the IDE on top click on :

A MyFirstProgram - B4A									
File	Edit	Designer	Project	Tools	Debug	Windows	Help		
: *b	<u></u>	1 H D	ងដា "	२ ९ G	0	2 프	<u>₹</u> 1 ►	s. s.	G

The program is going to be compiled.

A Compile & Rapid Debug (Build: Default)	×
Convert byte code - optimized dex. (1.12s) Packaging files. (0.45s) Copying libraries resources (0.00s) Signing package file (debug key). (1.26s) ZipAlign file. (0.25s) Installing file to device. (0.33s) Installing with B4A-Bridge.	
Cancel	lose

When the Close button becomes enabled as in message box, above, the compiling and transfer is finished.

Looking at the device, you should see something similar to the image below, with different numbers.



The screenshot may look different depending on the device and the Android version.

Of course, we could make aesthetic improvements in the layout, but this was not the main issue for the first program.

#### 2.5 My first B4A program



On a real device, you need to use the virtual keyboard. Click on the EditText view to show the keyboard.

On some devices the current layout has the disadvantage that the comment label is covered by the virtual keyboard.

This will be improved in the next chapter, 'Second program', where we create our own keyboard.

#### 2.6 Second B4A program (SecondProgram.b4a)

The project is available in the SourceCode folder: SourceCode\SecondProgram\B4A\SecondProgram.b4a



Improvements to "My first program".

We will add a numeric keyboard to the layout to avoid the use of the virtual keyboard.

Create a new folder called "SecondProgram". Copy all the files and folders from MyFirstProgram to the new SecondProgram folder and rename the program files MyFirstProgram.b4a to SecondProgram.b4a and MyFirstProgram.b4a.meta to SecondProgram.b4a.meta.

Load this new program in the IDE.

We need to change the Package Name.

Proje	ect Tools Debug	Windows	Help				
*o *o	Add New Module Add Existing Modu	Iles	F	In the IDI	E Pro	ject menu.	
_	Rename Module Remove Module			Click on	Build	l Configuratio	ns
	Choose Icon						
	Build Configuration		Ctrl+B				
	Manifest Editor	1					
							1
Α	Build Configurations					×	
Co	onfiguration:	Default		•	С	reate New	
Co	onfiguration Name:	Default				Delete	
Pa	ckage:	b4a.Second	IProgram			Delete	Change the Package name to
Co	onditional Symbols						b4a.SecondProgram.
		Example: Ful	l, NoAds				
				С	ancel	OK	Click on OK.

Then we must change the ApplicationLabel on the very top of the code.

```
#Region Project Attributes
    #ApplicationLabel: SecondProgram
```

We want to replace the edtResult EditText view by a new Label. Run the Visual Designer. If you want you can already connect the device or an Emulator.

In the Abstract Designer, click on the edtResult view.



	blNumber1	blMathSign(blNumber LaL el1	er2	Move i and res	t between the upper labels and the button ize it.
Pr	operties coordecessor		<b>→</b> ‡	Modify the follo	owing properties:
4	Main				
	Name	lblResult		Name	to IbIResult
	Туре	Label	_		
	Event Name	lblResult	_		
	Parent	Activity	•		
4	Common Propert	es			
	Horizontal Anchor	LEFT	•		
	Vertical Anchor	ТОР	•	Change the Left	, Top, Width and Height properties if
	Left	100		they are not the	same as in the image.
	Тор	70			
	Width	100			
	Height	60			
	Enabled	1			
	Visible	1			
	Tag				
	Text			Text	to " " blank character
4	Text Style				
	Typeface	DEFAULT	•		
	Style	NORMAL	•		
	Horizontal Alignm	CENTER_HORIZON	•		
	Vertical Alignment	CENTER_VERTICAL	•		
	Size	36			
	Text Color	<b>I</b> #000000		Text Color	to Black #000000
4	Label Properties				
4	Drawable	ColorDrawable	•		
	Color	J #FFFFF		Color	to White #FFFFF
	Alpha	255		Alpha	to 255
	Corner radius	5			
	Border Color	#FF000000		Corner Radius	to 5
	Border Width	0	<b>v</b>		

	blNumber1bl	MathSign(blNumber2 IblResult		Now we add a Panel for the keyboard buttons.
]	lbl	Comments Pa.el1		Position and resize it as in the image.
	Main Name Type Event Name Parent	pnlKeyboard Panel pnlKeyboard Activity	» <b>↓</b> ₽	Change its Name to pnlKeyboard "pnl" for Panel, the view type.
4	Panel Properties Drawable Color Alpha Corner radius Border Color Border Width	ColorDrawable ColorDrawable  #8C8C8C  255  0  #FF000000  0	▼ 	Change Color to #8C8C8C Corner radius to 0



Ì	btnAction AutoCom Button	pleteEditText	ж	Add View Cut	Ctrl+X	Right click on and click on And click on	the pnlKeyboard Add View Button
ļ	CheckBox CustomVi EditText	ew .	ට ඩ	Copy Paste	Ctrl+C Ctrl+V	to add a new b	outton.
	btnAction	IlKey loard But On1	ł	The new	button is ac	lded.	
Pr	operties booossesses		oo 🔶	p       Change the	following	properties	
	Main	htn0			10110 (1115)	properties.	
	Тира	Putton		Name	to btn0		
	Type	btnEvent		Event name	to btnE	Event	
	Event Name	DUNEVENU	-				
	Parent	pnlKeyboard •	•				
1	Common Propert	Ies					
		LEFI	•				
			•	Left	to 0		
	Len	120		Тор	to 120		
	Top	120		Width	to 55		
	Width	55		Height	to 55		
	Height	55					
	Enabled						
	Visible	•					
	lag	0		Tag	to 0		
	Text	0		Text	to 0		
1	Text Style	DEFAULT	_				
	Typerace		-				
	Style		*				
	Horizontal Alignm	CENTER_HORIZO	× √				
	Vertical Alignment	CENTER_VERTICA	<b>↓L ▼</b>		4- 04		
	Size	24		Size TextColor to	to 24 Black #0000	000	
	Text Color	<b>I</b> #000000					



0

If you have connected a device the button looks now like this.

## 2.6 Second B4A program

]	b	ر بر ل	Add Vi Cut Copy	iew		Ctrl+X Ctrl+C	Now we d beside but Right clic	luplicate btn0 and position the new one tton btn0 with a small space. k on btn0 and click on Copy.
ļ	bt	n0		よ ご む	Add View Cut Copy Paste Duplicate	5	Ctrl+X Ctrl+C Ctrl+V Ctrl+D	Click on the pnlKeyboard view and click on Paste. Move the new Button next to the previous one.
	оре Ма Л Ту Ем	erties ain ame /pe /ent N arent	ame	btn But btn pn	1 ton Event IKeyboard	···· • • • • • • • • • • • • • • • • •	Change the Name	following properties: to btn1
Aı	Ta Te nd t	ng ext the re	sult.	1			Tag Text	to 1 to 1
In	the	Abs	tract D	Design	ner		and	on the device.

Let us add 8 more Buttons and position them like in the image.

btnA	Action			
btn5	btn6	pni btn7oard	btn8	btn9
btn0	btn1	btn2	btn3	btn4

JL

Change following properties:							
Name btn2, btn3, btn4 etc.							
Tag	2	,	3	,	4	etc.	
Text	2	,	3	,	4	etc.	

· ·

48

btnBS			btnA	ction
btn5	btn6	pini btn7oard	btn8	btn9
btn0	btn1	btn2	btn3	btn4

To create the BackSpace button, duplicate one of the number buttons, and position it like in the image.

Resize and position btnAction.

Change the pnlKeyboard Color to Black #000000.

Change their Name, Tag, Text and Color properties as below.

	btn	nBS <			
Pr	operties popposses		•	ф,	Pr
4	Main				4
	Name	btnAction			
	Туре	Button			
	Event Name	btnAction			
	Parent	pnlKeyboard	•		
4	Common Proper	ties			4
	Horizontal Ancho	DI LEFT	•		
	Vertical Anchor	ТОР	•		
	Left	180			
	Тор	0			
	Width	115			
	Height	55			
	Enabled	1			
	Visible	1			
	Tag				
	Text	ОК			
4	<b>Button Propertie</b>	es			
4	Drawable	StatelistDrawable	•		
	<ul> <li>Enabled Drawa</li> </ul>	a GradientDrawable	•		
	Corner radi	u 5			
	Orientation	TOP_BOTTOM	•		
	First Color	#FF8EFF8E			
	Second Col	c 📕 #FF0A800A			
	Disabled Draw	ColorDrawable	•		
	<ul> <li>Pressed Drawa</li> </ul>	al GradientDrawable	•		
	Corner radi	u 5			
	Orientation	TOP_BOTTOM	•		
	First Color	#FF0A800A			
	Second Col	c #FF8EFF8E			

		btnAction	ΟK		
Pr	operti	es accordence		•	џ
4	Main	1			
	Nam	ie	btnBS		
	Туре	<sup>5</sup>	Button		
	Even	it Name	btnEvent		
	Pare	nt	pnlKeyboard	•	
4	Com	mon Properti	es		
	Hori	zontal Ancho	LEFT	•	
	Verti	ical Anchor	ТОР	•	
	Left		0		
	Тор		0		
	Widt	th	55		
	Heig	ht	55		
	Enab	oled	1		
	Visib	ole	1		
	Tag		BS		
	Text		<		
4	Butte	on Properties			
4	Drav	vable	StatelistDrawable	•	
	▲ Er	nabled Drawa	GradientDrawable	•	
		Corner radiu	5		
		Orientation	TOP_BOTTOM	•	
		First Color	#FFC7C7FF		
		Second Colc	#FF4F4FFF		
	⊳ D	isabled Drawa	ColorDrawable	•	
	⊿ Pr	ressed Drawal	GradientDrawable	•	
		Corner radiu	5		
		Orientation	TOP_BOTTOM	•	
		First Color	#FF4F4FFF		
		Second Colc	#FFC7C7FF		

Set the Color property of panel pnlKeyboard to Black.



Now we will update the code.

Ouick Search

First, we must replace the edtResult by lblResult because we replaced the EditText view by a Label.

```
19 ⊑Sub Globals
20
       Private btnAction As Button
       Private edtResult As EditText
21
                                             Double click on edtResult to select it.
       Private lblCom ents As Label
22
       Private lblMathSigne As Label
23
Edit
     Designer
              Project Tools
                             Debug W
🖁 Cut
                              Ctrl+X
    Cut Line
                              Ctrl+Y
    Duplicate Line
                              Ctrl+D
🗗 Сору
                              Ctrl+C
🗂 Paste
                              Ctrl+V
                                        In the Edit menu click on Find / Replace or press F3.
5
   Undo
                              Ctrl+Z
 Redo
                         Ctrl+Shift+Z
    Move Line(s) Up
                             Alt+Up
    Move Line(s) Down
                           Alt+Down
    Find / Replace
                                 F3
                      hà
```

Ctrl+F

The finished new layout. In the Abstract Designer and on the device.

#### 2.6 Second B4A program

A Find / Replace	c
🛃 Quick Find 🕼 Quick Repla	ne -
Find what:	
edtResult	
Replace with:	
lblResult	Enter 'lblResult' in the Replace with field
Look in:	-
Document	· _
+ Find options	7
Find Next Replace	
Replace All	Click on Replace All

We also need to change its view type form EditText to Label.

#### Private lblResult As Label

Now we write the routine that handles the Click events of the Buttons. The Event Name for all buttons, except btnAction, is "btnEvent". The routine name for the associated click event will be btnEvent\_Click. Enter the following code:

#### Sub btnEvent\_Click

#### End Sub

We need to know what button raised the event. For this, we use the Sender object which is a special object that holds the object reference of the view that generated the event in the event routine.

Sub btnEvent_Click Private btnSender As Butt	To have access to the properties of the view that raised the on event we declare a local variable
htsCondon Condon	Private btnSender As Button.
bthsender = sender	Alla set bunsender = Sender.
Select btnSender.Tag	Then, to differentiate between the backspace button and
Case "BS"	the numeric buttons we use a Select / Case / End Select
Case Else	structure and use the Tag property of the buttons.
End Select	Remember, when we added the different buttons we
End Sub	set their Tag property to BS, 0, 1, 2 etc.
Select btnSender.Tag Case "BS" Case Else	sets the variable to test. checks if it is the button with the "BS" tag value. handles all the other buttons.

Now we add the code for the numeric buttons. We want to add the value of the button to the text in the lblResult Label.

```
Select btnSender.Tag
Case "BS"
Case Else
    lblResult.Text = lblResult.Text & btnSender.Text
End Select
End Sub
```

This is done in this line lblResult.Text = lblResult.Text & btnSender.Text

The "&" character means concatenation, so we just append to the already existing text the value of the Text property of the button that raised the event.

Now we add the code for the BackSpace button.

```
Select btnSender.Tag
Case "BS"
If lblResult.Text.Length >0 Then
lblResult.Text = lblResult.Text.SubString2(0, lblResult.Text.Length - 1)
End If
Case Else
lblResult.Text = lblResult.Text & btnSender.Text
End Select
End Sub
```

When clicking on the BS button we must remove the last character from the existing text in lblResult.

However, this is only valid if the length of the text is bigger than 0. This is checked with: If lblResult.Text.Length >0 Then

```
To remove the last character we use the SubString2 function.
lblResult.Text = lblResult.Text.SubString2(0,lblResult.Text.Length - 1)
```

SubString2(BeginIndex, EndIndex) extracts a new string beginning at BeginIndex (inclusive) until EndIndex (exclusive).

Now the whole routine is finished.

```
Sub btnEvent_Click
Private btnSender As Button
btnSender = Sender
Select btnSender.Tag
Case "BS"
If lblResult.Text.Length >0 Then
lblResult.Text = lblResult.Text.SubString2(0,lblResult.Text.Length - 1)
End If
Case Else
lblResult.Text = lblResult.Text & btnSender.Text
End Select
End Sub
```

We can try to improve the user interface of the program by adding some colors to the lblComments Label.

Let us set:

- Yellow for a new problem

- Light Green for a GOOD answer

- Light Red for a WRONG answer.

Let us first modify the New routine, where we add the line lblResult.Text = "".

```
Sub New
Number1 = Rnd(1, 10)
Number2 = Rnd(1, 10)
IblNumber1.Text = Number1
IblNumber2.Text = Number2
IblComments.Text = "Enter the result" & CRLF & "and click on OK"
IblComments.Color = Colors.RGB(255,235,128)
IblResult.Text = ""
Enter Sub
```

And in the CheckResult routine we add lines 76 and 80.

```
Sub CheckResult
If lblResult.Text = Number1 + Number2 Then
    lblComments.Text = "G 0 0 D result" & CRLF & "Click on NEW"
    lblComments.Color = Colors.RGB(128,255,128) ' light green color
    btnAction.Text = "N E W"
Else
    lblComments.Text = "W R 0 N G result" & CRLF & "Enter a new result" & CRLF & "and click OK"
    lblComments.Color = Colors.RGB(255,128,128) ' light red color
End If
End Sub
```



Another improvement would be to hide the '0' button to avoid entering a leading '0'. For this, we hide the button in the New subroutine in line btn0.Visible = False.

```
Sub New
Number1 = Rnd(1, 10)
Number2 = Rnd(1, 10)
IblNumber1.Text = Number1
IblNumber2.Text = Number1
IblComments.Text = "Enter the result" & CRLF & "and click on OK"
IblComments.Color = Colors.RGB(255,235,128)
IblResult.Text = ""
Sets lblResult.Text to empty
btn0.Visible = False
End Sub
```

In addition, in the btnEvent\_Click subroutine, we hide the button if the length of the text in lblResult is equal to zero and show it if the length is greater than zero, lines 98 to 102.

```
Sub btnEvent_Click
  Private btnSender As Button
  btnSender = Sender
  Select btnSender.Tag
  Case "BS"
     If lblResult.Text.Length >0 Then
       lblResult.Text = lblResult.Text.SubString2(0,lblResult.Text.Length - 1)
     End If
  Case Else
     lblResult.Text = lblResult.Text & btnSender.Tag
  End Select
  If lblResult.Text.Length = 0 Then
     btn0.Visible = False
  Else
     btn0.Visible = True
  End If
End Sub
```

As we are accessing btn0 in the code we need to declare it in the Globals routine.

Modify line 25 like below:

```
Private btnAction, btn0 As Button
```

Run the program to check the result.

## 3 Getting started B4i

## B4i is a simple yet powerful development environment that targets Apple devices (iPhone, iPad etc.).

The B4i language is similar to Visual Basic and B4A language.

B4i compiled applications are native iOS applications; there are no extra runtimes or dependencies. Unlike other IDE's, B4i is 100% focused on iOS.

B4i includes a powerful GUI designer, built-in support for multiple screens and orientations. You can develop and debug with a real device.

iOS 7 and above are supported.

What you need:

- The B4i program, this is a Windows program running on a PC.
- The Java SDK on the PC, free
- An Apple developer license, cost 99\$ per year.
- A device for testing.
- The Basi4i-Bridge program on the device, free
- A Mac builder to compile the program, this be either
  - A Mac computer with the Mac Builder program, on local wifi.
  - The hosted Mac Builder service over Internet, cost 26\$ per year
- A Mac computer or a MacInCloud service to distribute the program

Links to tutorials in the forum: Local Mac Builder Installation Creating a certificate and provisioning profile Installing B4i-Bridge and debugging first app

## 3.1 Installing B4i

#### 3.1.1 Installing Java JDK

B4i depends on the free Java JDK component

#### If you are already using B4A you can skip this chapter.

Installation instructions:

The first step should be to install the **Java JDK**, as B4i requires it. Note that there is no problem with having several versions of Java installed on the same computer.

- Open the Java 8 JDK download link.
- Check the Accept License Agreement radio button.
- Select "Windows x86" or "Windows x64" (for 64 bit machines) in the platforms list.
- Download the file and install it.

#### 3.1.2 Installing B4i

Download and install the B4i file on your computer.

iOS compilation requires an Apple Mac computer. Developers have two options with B4i:

- Use a local Mac machine connected over the local network. For this you should also download the <u>Mac builder</u> and install it.
- Use our hosted builder rental service. <u>Hosted Mac Builder installation</u>. The builder service allows you to develop iOS applications without a Mac computer. All of the development steps can be done with the builder service except of the final step which is uploading the application to Apple App Store. This step requires a Mac or a service such as MacInCloud.

Note that the builder is currently limited to projects of up to 15mb.

Copy the license file *b4i-license.txt* to the B4i folder and to a safe place on the computer for backup. Note that this is not a text file, do not open it with a text editor.

When you first run B4i you will be asked to enter your e-mail address, the one you used when you purchased it B4i.

You find it also in the mail you received with the B4i file.

Registratio	n X
?	Please enter the email address used when purchasing B4i. Contact support@basic4ppc.com if you require any assistance.
	ОК

Enter the e-mail address.

Registration	
Email address:	
	Ok Cancel

You get a confirmation window that B4i is registered.

Contact <a href="mailto:support@basic4ppc.com">support@basic4ppc.com</a> if you require any assistance.

#### 3.1.3 Mac Builder installation

iOS compilation requires an Apple Mac computer. Developers have two options with B4i:

- Use a local Mac machine connected over the local network.

- Use our hosted builder rental service.

Link to the tutorial in the forum: Local Mac Builder Installation.

These instructions explain how to install the builder on a local Mac machine.

1. Install Java JDK 8: <u>http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html</u>

- 2. Install Xcode 6.
- 3. Download and unzip the B4i-Builder.
- 4. Open a terminal and navigate to B4i-Builder folder.
- 5. Run it with: java -jar B4iBuildServer.jar

6. Set the builder IP address in the IDE under Tools - Build Server - Server Settings

#### Notes & Tips

- By default ports numbers 51041 (http) and 51042 (https) are used.

- The firewall should be either disabled or allow incoming connections on these two ports.

- You can test that the server is running by going to the following link: http://<server ip>:51041/test

- You can kill the server with: http://<server ip>:51041/kill

- It is recommended to set your Mac server ip address to a static address. This can be done in your router settings or in the Mac under Network settings.

- A single Mac builder can serve multiple developers as long as they are all connected to the same local network. Note that you are not allowed to host builders for developers outside of your organization.

#### Multiple IPs.

When the server is started it takes the first IP address reported by the OS and uses it as its own IP address. You can see this address in the server messages.

In most cases this is the correct address. However if it is not the correct IP address then the server will not be usable.

In that case you need to explicitly set the correct address:

- Open the key folder and delete all files.

- Edit key.txt and change it to:

## 3.1.4 Hosted Mac builder service (optional)

If you have bought the *hosted Mac builder service* you got a mail with your user ID.

Link to the tutorial in the forum:

#### You must enter it in the IDE.

Тоо	s Debug Windows Help			_
	IDE Options		۲	🖙 = 👌 Debug
ര	Device IP Address		•	
	Build Server		Þ	Server Settings
	Clean Files Folder (unused files) Clean project Configure Paths	Ctrl+P		Build B4i-Bridge App Build Release App Download Last Build
<del></del> 0	Private Sign Key			Create Push Store

#### Enter the ID.

i Build Server Settings X		i Build Server Settings		
User Id:	XXXXX	User Id:	xxxxx	
Use Hosted Buil	der	☑ Use Hosted Builder		
Server Ip:	63.135.170.51	Server Ip:	63.135.170.51	
Server Port (https):	51042	Server Port (https):	51042	
Debug Architecture: <ul> <li>32-bit</li> <li>64-bit</li> </ul>		Debug Architecture: 🖲 32-bit 🔿 64-bit		
Run Installed Apps Automatically (slower)		Run Installed Apps Automatically (slower)		
	Cancel OK		Cancel	

Don't forget to check Use Hosted Builder if you use the Hosted Builder Service!

## 3.2 Configure Paths in the IDE

i B4i Run the IDE. File Edit Designer Project Debug Windows Help Tools **IDE** Options 🗄 ち 🍟 💾 🗰 🗗 🗶 ሮን ۲ In the Tools menu click on Configure Paths. Device IP Address ۲ 🗄 Main 🗙 **Build Server** • Clean Files Folder (unused files) 'Code module 1 2 ■ #Region Pro Clean project Ctrl+P 9 Configure Paths 10 **Sub Process** h 'These gld 🗝 Private Sign Key 11 'Public va 12 Color Picker 4 Public Apr 13 Paths Configuration  $\times$ javac.exe C:\Program Files (x86)\Java\jdk1.8.0\_77\bin\javac.exe Browse Usually found under C:\Program Files\Java\jdk1.8.x\_xx\bin **Keys Folder** D:\B4i\Keys Browse A folder for the keys related files. Additional Libraries D:\B4i\AdditionalLibraries Browse (optional) A folder where libraries will be searched for, in addition to the internal libraries folder. Shared Modules D:\B4i\SharedModules Browse (optional) A folder where code modules will be searched for, in addition

Then you need to configure the different paths in the IDE.

#### javac.exe:

Enter the folder of the javac.exe file.

#### Keys folder:

Create a special folder for the Keys, for example C:\B4i\Keys.

to the project folder.

#### Additional libraries:

Create s specific folder for additional libraries, for example C:\B4i\AdditionalLibraries.

Cancel

Ok

#### **Shared Modules**:

Create s specific folder for shared modules, for example C:\B4i\SharedModules.

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#### 3.3 Creating a certificate and provisioning profile

Don't panic!

While this process can be a bit annoying it is not too complicated and you can always delete the keys and start from scratch (which is not always the case in Android).

Note that you must first register with Apple as an iOS developer (costs \$99 per year). The whole process is done on a Windows computer.

In order to install an app on an iOS device you need to create a certificate and a provisioning profile.

The certificate is used to sign the application. The provisioning profile, which is tied to a specific certificate, includes a list of devices that this app can be installed on.

The video shows the steps required for creating and downloading a certificate and provisioning profile.

There are two steps which are not shown in the video and are also required before you can create a provisioning profile:

- Create an App ID. This step is quite simple. Just make sure that you create a wildcard id.

- Add one or more devices. You will need to find the devices UDID for that.

Link to the tutorial in the forum: Creating a certificate and provisioning profile.

#### 3.3.1 UDID

Devices are recognized by their UDIDs. There are two ways to get the device UDID:

1. If iTunes is installed then you can find it in iTunes.

The first time, connect your device with the USB cable to the computer.

Run iTunes, you should see on top this icon  $\square$ . It can take a while before you see it.



Click on  $\Box$  and you get this screen:

	-  प्र <sup>4</sup> 📫
Fichier Modifier Présentation Commandes	Store Aide
🗇 🎜 🗖 🖵 🚥 🚺	iPhone de l
iPhone de KChristl ▲ 16 Go 96 % 💷 +	iPhone 6
Réglages ^	
🔲 Résumé	Capacité : 12.14 Go
Apps	Numéro de téléphone : +41 79 819 20 04
Musique	Numero de serie : C35NJ921G5MN
Now click on <b>Explosited in to get the</b>	ne UDID.
Capacité : 12.14 Go	
UDID: 83143A54052F8EEDA81C3A0F0	0 04 0812B4AE6E7F8EB5
Right click on 83143A54052F8EEDA81C3A	to copy the UDID.
UDID : 83143A54052F8EE Copier	6E7F8EB5
2. Use an online service such as this one: h	http://get.udid.io/

## 3.3.2 Certificate and Provisioning Profile

Main steps:

- 1. Set a new keys folder in the IDE.
- 2. Create a key by choosing Tools Private Sign Key
- 3. Create and download the certificate as demonstrated in the video. You will need to upload the CSR file that was created in step 2.

Note that you can choose either **iOS App Development** or **App Store and Ad Hoc** in the certificate page.

4. Create and download a provisioning profile.

#### 3.4 Installing B4i-Bridge and debugging first app

B4i-Bridge is an application that you install on the device. It has three purposes:

- 1. Launch the installation process when needed.
- 2. Run the installed app (when installation is not needed).
- 3. The bridge is also the WYSIWYG visual designer.

You need to install B4i-Bridge once. It is done from the device browser.

Link to the tutorial in the forum: Installing B4i-Bridge and debugging first app.

#### 3.5 Install the B4I certificate

Open Safari (device browser) and navigate to: <u>www.b4x.com/ca.pem</u> Follow the instructions.

You can see at any time the profile in Settings / General / Profile.

#### 3.6 Set the package name based on the provision app id

Run B4i, load a project or use the default project and set the package name based on the provision app ID.

In the	Project	menu cl	ick on	Build Config	gurations .				
Proje	ct Tools	Debug	Window	ıs Help					
*ם	Add New M	lodule		+					
<b>*</b> 0	Add Existing	g Module	S						
	Rename Mo	dule							
-	Remove Mo	odule							
	Build Config	gurations	Ν	Ctrl+B					
+	Compile & I	Run	μ2,	F5	The win	ndow	below is s	shown	1:
i B	uild Configu	rations						×	
Cor	figuration:	D	efault		•		Create New	/	Change the Package name
Cor	nfiguration N	lame: D	efault				Delete		according to the provision
Pac	kage:	b	4i.examp	le					app ID.
Cor	nditional Sym	nbols							
		Ex	ample: Fu	III, NoAds					
						Cancel	OK		
Exan	nple in my	case:	Package	:	anywhere	esoftwa	are.b4i.exan	nple	7

	3.6.	1 Install Build B4i-Br	ridge					
]	n th	e Tools menu click on Bu	uild Server	and	click on	Build B4i-Bi	idge App	).
	Tool	s Debug Windows Help		_				
		IDE Options	+	¢	- ð D	ebug		
	ව	Device IP Address	+					
		Build Server	+		Server Set	ttings		
		Clean Files Folder (unused files)			Build B4i-	Bridge App	N	
		Clean project	Ctrl+P		Build Rele	ase App	43	
		Configure Paths			Download	d Last Build		
	<del></del> 0	Private Sign Key			Create Pu	sh Store		

#### You get the compilation window.

i Compile (Build: Default)	
B4i version: 3.00 Parsing code. (0.00s) Compiling code. (0.02s) Building designer app. (0.01s) Building Xcode project (0.11s) Sending data to remote compiler. (5.91s) Open mobile Safari and navigate to: 63.135.170.51:51041/ abcdefg Then click on the Install button. Troubleshooting: 1. Make sure that B4I certificate is installed (www.b4x.com/ca.pem). 2. Make sure that the provisioning file includes the target device UDID. 3. Check the link for typos. Completed successfully.	
Cancel	

#### The code you see will be different!







Close Safari.

# **3.6.3 Install B4i-Bridge and run it** Click on this B4i-Bridge icon

finally the B4i-Bridge icon B4i-Bridge

Tips:

- You don't need to wait for the installation animation to complete. Once the animation starts you can click on the app icon.

- If the installation is stuck in the "waiting" step for more than 10 or 15 seconds then uninstall it and install it again.

- B4i-Bridge must be in the foreground for it to be able to start an installation or to run the application. In most cases it will be in the foreground automatically. If it is not in the foreground then you need to click on it to bring it to the foreground.

## 3.7 My first B4i program (MyFirstProgram.b4i)

Let us write our first B4i program. The suggested program is a math trainer for kids.

The project is available in the SourceCode folder shipped with this booklet: SourceCode\MyFirstProgram\B4i\MyFirstProgram.b4i

<b>≯</b>	11:56	🖬 100 % 💼 <del>/</del>
	Page	
	7 +	7
	Enter re	sult
	ОК	
	Enter the re and click o	esult n OK

On the screen, we will have:

- 2 Labels displaying randomly generated numbers (between 1 and 9)
- 1 Label with the math sign (+)
- 1 TextField where the user must enter the result
- 1 Button, used to either confirm when the user has finished entering the result or generate a new calculation.
- 1 Label with a comment about the result.

#### In iOS:

- Label is an object to show text.
- TextField is an object allowing the user to enter text.
- Button is an object allowing user actions.

We will design the layout of the user interface with the Designer, the Abstract Designer and on a Device and go step by step through the whole process.

The Designer manages the different objects of the interface.

The AbstractDesigner shows the positions and sizes of the objects and allows moving or resizing them on the screen.

On the Device we see the real result.



## Save the project.

**Run the IDE** 

i N	i MyFistProgram - B4i							
File	Edit	Designer	Project	Tools	Debug	Windows	Help	
*b	New							
2	Open	Source						
•	Save					Ct	trl+S	
苗	Expor	t As Zip	L.				•	

You must save the project before you can run the Designer.

Create a new folder MyFirstProgram and save the project with the name MyFirstProgram.

#### Set the Package Name.

Each program needs a package name.

In the menu Project click on Build Configurations.



#### This window appears:

i Build Configurations	3	×
Configuration:	Default	Create New
Configuration Name:	Default	Delete
Package:	b4i.example	
Conditional Symbols		]
	Example: Full, NoAds	
		Cancel OK

The default name is b4i.example. We will change it to anywheresoftware.b4i.MyFirstProgram.

i Build Configurations	5		×
Configuration:	Default	•	Create New
Configuration Name:	Default		Delete
Package:	anywheresoftware.b4i.MyFirstProgram		
Conditional Symbols			
	Example: Full, NoAds		
		Cancel	ОК

#### Set the Application Label.

The Application label is the name of the program that will be shown on the device.

On top of the code screen you see the 'region' Project Attributes.

Regions are code parts which can be collapsed	1 2 9	'Code module ®#Region Project Attributes
or extended at the right. Clicking on  → will expand the Region. Clicking on → will collapse the Region. Regions are explained in <u>Collapse a Region</u> .	1 2 3 4 5 6 7	<pre>'Code module □ #Region Project Attributes     #ApplicationLabel: B4i Exa     #Version: 1.0.0     'Orientation possible valu     #iPhoneOrientations: Portr     #iPadOrientations: Portrai</pre>
<pre>#Region Project Attributes     #ApplicationLabel: B4i Example     #Version: 1.0.0     'Orientation possible values: Portrait, I PortraitUpsideDown     #iPhoneOrientations: Portrait, Landscapel     #iPadOrientations: Portrait, LandscapeLet #End Region The default name is B4i Example, but we will change</pre>	8 Lef ft,	#End Region dscapeLeft, LandscapeRight and t, LandscapeRight LandscapeRight, PortraitUpsideDown to MyFirstProgram for naming consistency.
Change this line:		

#ApplicationLabel: B4i Example
to
 #ApplicationLabel: MyFirstProgram

The other lines are explained in Code header Project Attributes / Attributes.

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## In the IDE run Build B4i-Bridge App.

IDE	menu Tools / Build Ser	ver /	Bu	ild E	34i-Bridge App	
Тоо	ls Debug Windows Help					
	IDE Options	•	1	¢	Debug	
ര	Device IP Address	•	ļ			
	Build Server	Þ			Server Settings	
	Clean Files Folder (unused files)				Build B4i-Bridge App	Ν
	Clean project	Ctrl+P	ľ		Build Release App	h
	Configure Paths		_		Download Last Build	

#### You get this screen.

i Compile (Build: Default)	×
Sending data to remote compiler. (6.395)	<b></b>
Then click on the Install button.	
<ol> <li>Make sure that B4I certificate is installed (www.b4x.com/ca.pem).</li> <li>Make sure that the provisioning file includes the target device UDID.</li> </ol>	
3. Check the link for typos.	
	<b>~</b>
Cancel	Close



On the device run B4i-Bridge

On the screen you see the IP address of the device.

IP address 192.168.1.60 Waiting for IDE to connect to B4i-Bridge	2
In the IDE click on Tools /	Device IP Address / New IP
Tools Debug Windows Help	
IDE Options	🕨 🖙 🔹 🕥 Debug
Device IP Address	► New IP

#### 3.7 My first B4i program

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#### Enter the IP address:

Enter device IP address		×
IP address (displayed in B4i-Bridge application	n):	
192.168.1.60	Ok	Cancel

Click on Ok

You will see this screen on the device (only the upper part is shown).



#### In the IDE open the Designer.



#### The Designer looks like this.

i Visual Designer		-		x
File Add View Tools Windows				
Views Tree 🗸 🖡	Properties ••••••••••••••••••••••••••••••••••••	Abstract Designer		-
Main	Main Properties	Match Chosen Variant		•
	Handle Resi: 🗹			
	Background #FFF5F5F5 💌			
Files Variants Views Tree				
Script - General	••••••••••••••••••••••••••••••••••••••			
□よ白ッペ国階→●▼→		100%		
1 'All variants script		<b></b>		
3				
		and the second		
<	▼  }	and the second		
Script - General Script - Variant		4	Þ	
WYSIWYG status: Connected     Device details     375 x 667, sca	(192.168.1.60) ale = 1 (160 dpi)			

Note that in the bottom left of the Designer window you see the connection status:

	ര	WYSIWYG status: Connected	Device details (192.168.1.60) 375 x 667, scale = 1 (160 dpi)
--	---	---------------------------	---

#### You may see

WYSIWYG status: Trying to connect. Make sure that B4i-Bridge is started (192.168.1.60)

if the device is not connected.

With the Designer we have also the Abstract Designer which shows the layout not exactly WYSIWYG but the positions and size of the different objects. Only the top of the image is shown.

Abstract Designer	-
Match Chosen Variant	•

The dark gray area represents the screen area of the connected device.

Now we will add the 2 Labels for the numbers. In the Designer, add a Label.



The label appears in the Abstract Designer, in the Views Tree window and its default properties are listed in the Properties window.





Resize and move the Label with the red squares like this.



You can follow the layout on the device.

At the moment we see only Lab... The background color is by default transparent. Lab... stays for Label1



The new properties Left, Top, Width and Height are directly updated in the Properties window.

You can also modify the Left, Top, Width and Height properties directly in the Properties window.

Let us change the properties of this first Label according to our requirements.

By default, the name is Label with a number, here Label1, let us change its name to lblNumber1.

The three letters 'lbl' at the beginning mean 'Label', and 'Number1' means the first number.

It is recommended to use significant names for views so we know directly what kind of view it is and its purpose.

Pr	operties accordences		•	д
4	Main			
	Name	lblNumber1		
	Туре	Label		
	Event Name	Label1		
	Parent	Main	•	

#### We have now:

Properties				џ
4	Main			
	Name	lblNumber1		
	Туре	Label		
	Event Name	lblNumber1		
	Parent	Main	•	

Main :	main module.
Name :	name of the view.
Type :	type of the view. In this case, Label,
which is not editable.	
Event Name :	generic name of the routines that handle
the events of the Label.	
Parent :	parent view the Label belongs to.

Pressing the 'Return' key or clicking elsewhere will also change the Event Name property.
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Let us check and change the other properties:

4	Common Propert	ties						
	Horizontal Anchc	LEFT 🔻						
	Vertical Anchor	тор 💌						
	Left	80	Set Left, 7	Set Left, Top, Width and Height to the values in the pict				
	Тор	10						
	Width	50						
	Height	50						
	Visible	1	Visible is	checked.				
	Tag							
	Background Colo	#00FFFFFF						
	Alpha Level	1.0						
4	Border Propertie	s	vve leave	the default colors.				
	Border Color	#000000						
	Border Width	0						
	Corner Radius	0						
4	Label Properties							
4	Font							
	Font	DEFAULT •	We leave	We leave the default Font.				
	Size	36	Text Size,	we set it to so.				
	Text	5	Text set	Text set to 5				
	Text Color	Default color						
	Multiline							
	Adjust Font Size							
	Text Alignment	Center 🔹	Set Text A	Alignment to Center.				
			_	→ 중 11:01 🖬 93 % 💼 +				
	INum	he		(Bridge) Page				
				(				
		-		5				
				0				

And the result in the Abstract Designer

and on the device.

We need a second Label similar to the first one. Instead of adding a new one, we copy the first one with the same properties. Only the Name and Left properties will change.

	iews Tree Main IblNumł Label1	Add View Cut Copy Paste Duplicate Undo	<ul> <li>↓</li> <li>↓</li> </ul>	Ctrl+X Ctrl+C Ctrl+V Ctrl+V Ctrl+D Ctrl+Z	Right click on lblNumber1 and click on Duplicate in the popup menu. The new label covers the previous one.					
Pro	operties accesses		00 🔶							
4	Main		[							
	Name	lblNumber2		Let us position the new Label and change its name to lblNumber2.						
	Туре	Label								
	Event Name	lblNumber2								
	Parent	Main	•	Change the r	name to lblNumber2.					
4	Common Proper	rties								
	Horizontal Anche	c LEFT	•							
	Vertical Anchor	ТОР	•	<b>-</b>						
	Left	180								
	Тор	10		The Loft pror	porty to 190					
	Width	50		The Len prop	perty to 180.					
	Height	50								
	Visible	1								
	Tag									
	Background Cole	o 💽 #00FFFFFF								
	Alpha Level	1.0								
	PINU	imber blNu	umber							

And the result in the Abstract Designer

and on the device.

Let us now add a 3rd Label for the math sign. We copy once again lblNumber1. Right click on lblNumber1 in the Abstract Designer and click Duplicate on in the popup menu.



The new label covers IbINumber1.

Position it between the first two Labels and change its name to lblMathSign, its Text property to '+'.

	+ ≎	11:18	🖙 99 % 💼 <del>/</del>
olNumb€ La∎∋l1 Number		(Bridge) Pag	je
		5 + 3	5

And the result in the Abstract Designer

and on the device.

Add View	Tools	Windows	
Activit	yIndicat	or	
Buttor	n		Now let us add a TextField view.
DateP	icker		In the Designer Add View menu
ImageView			click on TextField
Label			
Panel			
Progr	essView		
Scroll	View		
Segm	entedCo	ntrol	
Slider			
Stepp	er		
Switch	ı		
TextFi	eld	2	
TextVi	ew	$\mathcal{U}$	

Position it below the three Labels and change its name to txfResult. 'txf' means TextField and 'Result' for its purpose.

## 3.7 My first B4i program

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Pr	operties addressed		-	Change these prop	erties
4	Main			Vame	to tyfResult
	Name	txfResult	_ '	Name	
	Туре	TextField	_		
	Event Name	txfResult	_		
	Parent	Main •			
4	Common Proper	ties			
	Horizontal Ancho	LEFT	_		
	Vertical Anchor	ТОР •	L	_eft, Top, Width and	Height.
	Left	70	_		
	Тор	70			
	Width	170			
	Height	50			
	Visible	1			
	Tag				
	Background Colo	#00FFFFFF			
	Alpha Level	1.0			
4	Border Propertie	S			
	Border Color	#000000			
	Border Width	1	E	Border Width	to 1
	Corner Radius	0			
	Text Properties		l		
4	Font				
	Font	DEFAULT			
	Size	30	ר	Fext Size	to 30
	Text Color	Default color			
	Text Alignment	Center •	1	Text Alianment	to Center
4	TextField Proper	ties	1.1	loke / lighthone	
	Text				
	Hint Text	Enter result	H	Hint Text	to Enter result
	Border Style	ROUNDEDRECT •	ŀ	Hint Text represent	s the text shown in the TextField view if no tex
	Adjust Font Size		i	s entered.	
	Show Clear Butto	1			
	Enabled	1			
4	Text Input Prope	erties			
	Autocorrection N	DEFAULT			
	SpellCheck Mode	DEFAULT		/ · · · -	
	Autocapitalizatio	NONE •		Keyboard Type	to NUMBER_PAD
	Keyboard Type	NUMBER_PAD	-  <sup>2</sup>	Setting Input Type	to NUMBER_PAD lets the user enter only
	Keyboard Appea	DEFAULT	-  r	numbers.	
	Return Key	DEFAULT		A.C. 1	1 1 11
	,		A	Atter making these	changes, you should see something like this.



## 3.7 My first B4i program

Add View	Tools	Windows				
ActivityIndicator						
Button						
DatePicker 🗸						

Now, let's add the Button which, when pressed, will either check the result the user supplied as an answer, or will generate a new math problem, depending on the user's input.

Pr	operties popposition							
4	Main		Position it halow	the TextField view Perize it and change following				
	Name	btnAction	proportion:	properties:				
	Туре	Button	properties.					
	Event Name	btnAction	Namo	to htm Action				
	Parent	Main 🔹	INALLE					
4	Common Proper	rties						
	Horizontal Anch	C LEFT 🔻						
	Vertical Anchor	тор 🔹						
	Left 110		Left. Top. Width an	d Height.				
	Тор	140						
	Width 100		-1					
	Height	50						
	Visible 🖉							
	Tag							
	Background Cole	#FFBDBBBB	Background Color	to #FFBDBBBB				
	Alpha Level	1.0						
4	Border Properti	es						
	Border Color	#000000						
	Border Width	1	Border Width	to 1				
	Corner Radius	5						
	Enabled	1						
4	Button Properti	es						
	Text	ОК	Text	to OK (with a space between O and K)				
	Style	Custom •						
	Text Color	#000000						
	Pressed Text Col	c #FFFFF						
	Background Ima	ç <b>-</b>						
	Pressed Backgro	ι 🗸						
4	Font							
	Font	DEFAULT •						
	Size	24	Text Size	to 24				
	Tint Color	Default color						
	IN	lumbenlMathSignINu	<b>→</b> mber	(Bridge) Page				



Pr	operties popposition		Let us add the last Label for the comments. Position it below the
4	Main		Button and resize it.
	Name	lblComments	
	Туре	Label	Change the following properties:
	Event Name	lblComments	Name to IblComments
	Parent	Main 🔹	
4	Common Proper	rties	
	Horizontal Ancho	C LEFT 🔻	
	Vertical Anchor	тор 🔻	
	Left	60	Left, Top, Width and Height.
	Тор	200	
	Width	200	
	Height	80	
	Visible	<b>√</b>	
	Tag		
	Background Cold	a 🔄 #00FFFFFF	
	Alpha Level	1.0	
4	Border Propertie	25	
	Border Color	#000000	
	Border Width	1	Border Width to 1
	Corner Radius	0	
4	Label Properties		
4	Font		
	Font	DEFAULT 🔻	
	Size	20	Text Size to 20
	Text		
	Text Color	Default color	Multiling to True (checked)
	Multiline	1	wullime to true (checked)
	Adjust Font Size	· 🗌	Text Alignment, to Center
	Text Alignment	Center 🔹	

And the result.



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# 3.7 My first B4i program

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Now we save the layout in a file.

	File	Add View	Tools	Window			
	*1	New					
	2	Open					
	•	Save	Ct	rl+S			
		Save As	Ν				
Click on		Remove Lay	out		and cave it u	with the nan	ne 'Main'

Create New Layout		×
Layout name		
Main	Ok	Cancel

Click on Ok

To write the routines for the project, we need to reference the Views in the code. This can be done with the *Generate Members* tool in the Designer.

The Generate Members tool automatically generates references and subroutine frames.

	Tools	Windows				
	(	ienerate Mem Change Grid	bers	5		
Click on	S	iend To UI Clo	ud F	6	to open the gene	erator.
i Generat	e Membe	ers				×
Selected vie Selected eve	ws will b ents will b	e declared in the be added as sub	e globals os.	sub.		
▲ J btn/	Action					
	Elick					
	ongClick	C				
	omment	5				
	umber1					
▷ 🖉 IbIN	umber2					
⊳ 🖉 txfR	esult					
	S	elect All Views	Clear S	elected	Generate Members	

Here we find all the views added to the current layout.

We check all views and check the Click event for the btnAction Button.

Checking a view  $\triangleright$  IblComments generates its reference in the Globals Sub routine in the code. This is needed to make the view recognized by the system and allow the autocomplete function.

Private	btnAction As Button	
Private	lblComments As Label	
Private	lblMathSign As Label	
Private	lblNumber1 As Label	
Private	lblNumber2 As Label	
Private	txfResult As TextField	
		<ul> <li>Image: State Stat</li></ul>
	▶ 🗹 btnAction	Click
Clicking on	blComments shows all events for the selected view	LongClick
Clicking on	an event of a view Click generates the Sub frame	for this event.

Sub	btnAction	Click
200	o cinic croil	

#### End Sub

Click on Generate Members to generate the references and Sub frames, then close the window ×.

Now we go back to the IDE to enter the code.

On the top of the program code we have:

```
Sub Process_Globals
    'These global variables will be declared once when the application starts.
    'Public variables can be accessed from all modules.
    Public App As Application
    Public NavControl As NavigationController
    Private Page1 As Page
    Private btnAction As Button
    Private lblComments As Label
    Private lblMathSign As Label
    Private lblNumber1 As Label
    Private lblNumber2 As Label
    Private txfResult As TextField
End Sub
```

These lines are automatically in the project code. Public App As Application Public NavControl As NavigationController Private Page1 As Page

iOS needs an Application, a NavigationControl and at least one Page, the details are explained in the chapter <u>Process life cycle</u>.

Below the code above we have the Application\_Start routine which is the first routine called when the program starts.

The content below is also added automatically in each new project.

```
Private Sub Application Start (Nav As NavigationController)
  NavControl = Nav
  Page1.Initialize("Page1")
  Page1.Title = "Page 1"
  Page1.RootPanel.Color = Colors.White
  NavControl.ShowPage(Page1)
End Sub
                                 > Sets NavControl as the NavigationController
NavControl = Nav
Page1.Initialize("Page1") > Initializes Page1, "Page1" is the generic EventName of Page1.
                                 > Sets the Page Title
Page1.Title = "Page 1"
                                        > Sets the background color to white.
Page1.RootPanel.Color = Colors.White
NavControl.ShowPage(Page1)
                                 > Shows Page1 on the device.
```

First, we need our program to load the layout file we defined in the previous pages. The file must be loaded onto the RootPanel of Page1, we load it just before NavControl.ShowPage(Page1) We take advantage of the autocomplete and in-line help features of B4i.

Enter P in a new line 29.



We see RootPanel highlighted, and besides the list the in-line help with the syntax for the property and an explanation.

#### 83

```
Click on Return to validate.
       Page1.RootPanel.Color = Colors.White
28
       Page1.RootPanel
29
       NavControl.ShowPage(Page1)
30
                                                      Enter a dot "."
28
       Page1.RootPanel.Color = Colors.White
29
       Page1.RootPanel.
                                                     Again we get a drop-down list with the
       NavControl.Sh ACTION_DOWN
30
                                                     properties of a Panel.
31
     End Sub
                         🔑 action_move
32
                         🔑 action_up
                                                     With the Down key go down to LoadLayout.
   Private Sub Page
33
                         AddView
34
                         👂 Alpha
     End Sub
35
36
                         BringToFront
                                                     Again we see the syntax and the
37

    Private Sub App

                         🔎 Color
                                                     explanation.
38
                         GetAllViewsRecursive
39
     End Sub
                         0
                           GetView
40
       Page1.RootPanel.Color = Colors.White
28
29
       Page1.RootPanel.
       NavControl.Sh
30
                                                .
                           Height
     End Sub
31
                        ଚ
                          Initialize
32
                           IsFocused
   Private Sub Page
                                                    Height As Int)
33
                        IsInitialized
34
                        🔑 Left
35
     End Sub
36
                        LoadLayout
                                                    LoadLayout (LayoutFile As String) As LayoutValues

□ Private Sub App
37
                                                    Loads a layout file to the panel.
                        ىر
                           NumberOfViews
38
                        \odot
                           RemoveAllViews
39
     End Sub
                        Ø
                           RemoveViewAt
                                                \overline{\mathbf{w}}
40
       Page1.RootPanel.Color = Colors.White
28
                                                     Click on Return to validate.
29
       Page1.RootPanel.LoadLayout
       NavControl.ShowPage(Page1)
30
                                                     Enter "(".
28
       Page1.RootPanel.Color = Colors.White
       Page1.RootPanel.LoadLayout(
29
30
       NavControl.ShowPage(Page1)
                                         LoadLayout (LayoutFile As String) As LayoutValues
     End Sub
31
                                         Loads a layout file to the panel.
32
```

The in-line help shows what to do and the explanation.

```
Page1.RootPanel.Color = Colors.White
Page1.RootPanel.LoadLayout("Main")
NavControl.ShowPage(Page1)
Complete the line with the layout file name.
The file extension is not needed.
The file name "Main" is between quotes
because it is a String.
```

The yellow line in the left border shows that a modification was made in the code. As soon as you save the code the yellow line will be changed to a green line. We want to generate a new problem as soon as the program starts. Therefore, we add a call to the New subroutine in Application\_Start.

```
Private Sub Application_Start (Nav As NavigationController)
NavControl = Nav
Page1.Initialize("Page1")
Page1.Title = "Page 1"
Page1.RootPanel.Color = Colors.White
NavControl.ShowPage(Page1)
```

New

End Sub

New is displayed in red because the 'New' routine has not yet been defined.

Generating a new problem means generating two new random values between 1 and 9 (inclusive) for Number1 and Number2, then showing the values using the lblNumber1 and lblNumber2 'Text' properties.

To do this we enter following code: In Sub Process\_Globals we add two variables for the two numbers.

```
Private Number1, Number2 As Int
End Sub
```

And the 'New' Subroutine:

```
Private Sub New
Number1 = Rnd(1, 10)
Number2 = Rnd(1, 10)
IblNumber1.Text = Number1
IblNumber2.Text = Number2
IblComments.Text = "Enter the result"
    & CRLF & "and click on OK"
    txfResult.Text = ""
End Sub
```

The following line of code generates a random number from '1' (inclusive) to '10' (exclusive) : Rnd(1, 10)

In this line Number1 = Rnd(1, 10) ' Generates a random number between 1 and 9 The text after the quote, ' Generates..., is considered as a comment. It is good practice to add comments explaining the purpose of the code.

The following line displays the comment in the lblComment view: lblComments.Text = "Enter the result" & CRLF & "and click on OK" CRLF is the LineFeed character. Now we add the code for the Button click event.

We have two cases:

- When the Button text is equal to "O K", it means that a new problem is displayed, and the program is waiting for the user to enter a result and press the Button.

- When the Button text is equal to "NEW", it means that the user has entered a correct answer and when the user clicks on the Button a new problem will be generated.

#### Private Sub btnAction\_Click

```
If btnAction.Text = "0 K" Then
    If txfResult.Text="" Then
        Msgbox("No result entered","E R R 0 R")
    Else
        CheckResult
    End If
Else
        New
        btnAction.Text = "0 K"
End If
End Sub
```

If btnAction.Text = "O K" Then checks if the Button text equals "O K"

If yes then we check if the TextField is empty.

If yes, we display a MessageBox telling the user that there is no result in the TextField view. If no, we check if the result is correct or if it is wrong.

If no then we generate a new problem, set the Button text to "O K" and clear the TextField view.

The last routine checks the result.

```
Private Sub CheckResult
    If txfResult.Text = Number1 + Number2 Then
        lblComments.Text = "G O O D result" & CRLF & "Click on NEW"
        btnAction.Text = "N E W"
    Else
        lblComments.Text = "W R O N G result" & CRLF & "Enter a new result" & CRLF & "and click OK"
    End If
End Sub
```

With If txfResult.Text = Number1 + Number2 Then we check if the entered result is correct.

If yes, we display in the lblComments label the text below: 'G O O D result' 'Click on NEW' and we change the Button text to "N E W ". If no, we display in the lblComments label the text below: W R O N G result Enter a new result and click OK

## 3.7 My first B4i program

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Let us now compile the program and transfer it to the Device. In the IDE on top click on :



The program is going to be compiled.





Looking at the device, you should see something similar to the image below when you first run the program.

208.52.154.96 install "MyFi	would like to rstProgram"
Cancel	Install

Touch on **Install**. Then you will see somewhere on the device the icon

of the program **E** My Firster, touch it to run the program.

Then you should see something similar to the image on the left, with different numbers.

Of course, we could make aesthetic improvements in the layout, but this was not the main issue for the first program.



## 3.8 Second B4i program (SecondProgram.b4i)

The project is available in the SourceCode folder: SourceCode\SecondProgram\B4i\SecondProgram.b4i.

Improvements to "My first program".

- Independent numeric keyboard to avoid the use of the virtual keyboard.
- Colors in the comment label.

Create a new folder called "SecondProgram". Copy all the files and folders from MyFirstProgram to the new SecondProgram folder and rename the program file MyFirstProgram.b4i to SecondProgram.b4i and MyFirstProgram.meta to SecondProgram.meta.

<b>+</b>	10 Calc	<sup>0:21</sup> Traine	🖙 99 % 💼	Load	l thi	s new	progran	n in th	e IDE.	
				Run	the	Design	ner.			
	5 -	+ {	€	Wer	need	to cha	ange the	Pack	age Na	ime.
Г			In th	e IL		me me	enu.			
	Enter the and clic	he res	ult OK	Clicl	c on	Build	Configura	ations		
		-		Proje	ect	Tools	Debug	Wind	ows H	Help
<			ОК	*ם	Ado	d New N	1odule			•
			<b>*</b> D	Ado	d Existin	g Module	s			
5		8 9		Rer	name Mo	odule				
1 2	2	3 4	-	Rer	nove M	odule				
					Bui	ld Confi	nurations	Ν	Ctrl	+ R
					Dui		gurutions	3	Cui	
					Cor	mpile &	Kun			F5
i Buil	d Configu	rations	5							×
Confi	guration:		Default				•	Cr	eate Nev	N
Confi	guration N	ame:	Default						Delete	
Packa	ige:		anywheresoft	ware.b4	4i.Se	condPro	gram			
Cond	itional Sym	nbols								
			Example: Full,	NoAds						
							Ca	incel	OK	

OK

Then we must change the ApplicationLabel on the very top of the code.

```
#Region Project Attributes
    #ApplicationLabel: SecondProgram
```

We want to replace the txfResult TextField view by a new Label. In the Abstract Designer, click on the txfResult view.



Right click somewhere else and click on Paste.

The new label covers lblNumber1.

Pr	operties		Modify the following properties:			
4	Main		would y the following properties.			
	Name	lblResult	Name to IblResult			
	Туре	Label	Name to biresuit			
	Event Name	lblResult				
	Parent	Main 🔹				
4	Common Proper	ties				
	Horizontal Ancho	LEFT 🔻				
	Vertical Anchor	тор 🔹				
	Left	70	Left, Top, Width, Height			
	Тор	70				
	Width	180				
	Height	50				
	Visible	1				
	Tag					
	Background Cold	#00FFFFF				
	Alpha Level	1.0				
4	Border Propertie	s				
	Border Color	#000000				
	Border Width	1	Boarder Width to 1			
	Corner Radius	0				
4	Label Properties					
4	Font					
	Font	DEFAULT 🔻				
	Size	36				
	Text		Text to "" no character			
	Text Color	Default color				
	Multiline					
	Adjust Font Size					
	Text Alignment	Center 🔹				



	and the second				
	əlNu	mbenIMathSig <mark>pIN</mark> u	umber		Let us add a
		txfResult			
		btnAction			
		<b>IbI</b> Comments			
		Pa.el1			Position and
1	• 	1.1.1			
Pr	operties		000 👻		
4	Main	lie la la			
	Name	pnlKeyboard		Change its	Name to pplKevi
	Туре	Panel		"pnl" for Pa	nel, the view ty
	Event Name	pnlKeyboard		-	-
	Parent	Main	•		
4	Border Propert	ies			
	Border Color	#000000			
	Border Width	1		Change	

Panel for the keyboard buttons.

resize it as in the image.

board ype.

0

Border Propertie	es		
Border Color	#000000		
Border Width	1	Change	
Corner Radius	0	Corner radius	to





Click on the pnlKeyboard panel to select it.

4	Border Properti	es			
	Border Color	#000000			
	Border Width	1	Boarder \	Nidth	to 1
	Corner Radius	5	Corner R	adius	to 5
	Enabled	1			
4	Button Properti	ies	[		
	Text	0	Tout	to 0	
	Style	Custom 🔻	Text	10 0	
	Text Color	#000000			
	Pressed Text Co	lc #FFFFFF			
	Background Ima	aç 🔻			
	Pressed Backgro	ou 🗸			
4	Font		-		
	Font	DEFAULT •			
	Size	28	Size	to 28	3
	Tint Color	Default color	-		
			L		
	1				
	btn0				The button
l					

The button looks now like this.

Let us duplicate btn0 and position the new one beside button btn0.



B4x Getting started

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Add 8 more Buttons and position them like in the image.

Change following properties:						
Name	bt	n2,	btn3,	b	tn4	etc.
Tag	2	,	3	,	4	etc.
Text	2	,	3	,	4	etc.

btnBS			btnA	ction
btn5	btn6	onlk <b>bţn7</b> 5ard	btn8	btn9
btn0	btn1	btn2	btn3	btn4

To create the BackSpace button, duplicate one of the number buttons, and position it in the top left corner.

Resize and position btnAction.

Change their Name, Tag, Text and Color properties as below.

<

btnBS	

Properties	
A Main	199995 🚽
Name btnBS	
Type Button	
Event Name btnEvent	
Parent pnlKeyboard	•
Common Properties	
Horizontal Anchc LEFT	•
Vertical Anchor TOP	•
Left 0	
Тор О	
Width 50	
Height 50	
Visible 🗸	
Tag BS	
Background Colo 🗧 #FF7E88FA	4
Alpha Level 1.0	
Border Properties	
Border Color #000000	
Border Width 1	
Corner Radius 5	
Enabled	
Button Properties	
Text <	
Style Custom	•
Text Color #000000	
Pressed Text Colc #FFFFFF	
Background Imac	•
Pressed Backgrou	•
Font	
Font DEFAULT	•
Font DEFAULT Size 28	•

	btnAction	ΟK
Pr	operties	
4	Main	
	Name	btnAction
	Туре	Button
	Event Name	btnAction
	Parent	pnlKeyboard 🔹
4	Common Propert	ies
	Horizontal Anchc	LEFT •
	Vertical Anchor	тор 💌
	Left	180
	Тор	0
	Width	110
	Height	50
	Visible	1
	Tag	
	Background Colo	#FF03F86D
	Alpha Level	1.0
4	Border Propertie	s
	Border Color	#000000
	Border Width	1
	Corner Radius	5
	Enabled	1
4	<b>Button Propertie</b>	s
	Text	ОК
	Style	Custom 🔹
	Text Color	#000000
	Pressed Text Cold	#FFFFF
	Background Imag	•
	Pressed Backgrou	•
4	Font	
	Font	DEFAULT •
	Size	24
	Tint Color	Default color



The finished new layout on the device.

If you had connect the device since the beginning you could have followed all the evolutions of the layout on the device.

Now we will update the code.

First, we must replace the txfResult by lblResult because we replaced the TextField view by a Label.



3.8 Second B4i program	98
i Find / Replace ×	
Quick Find	
Find what: txfResult	
Replace with: IblResut	The Find / Replace window is displayed.
Look in: Document •	
+ Find options	
Find Next Replace Replace All	Click on Replace All and close the window.

We also need to change its view type form TextField to Label.

## Private lblResult As Label

Now we write the routine that handles the Click events of the Buttons. The Event Name for all buttons, except btnAction, is "btnEvent". The routine name for the associated click event will be btnEvent\_Click. Enter the following code:

## Private Sub btnEvent\_Click

## End Sub

We need to know what button raised the event. For this, we use the Sender object which is a special object that holds the object reference of the view that generated the event in the event routine.

Private Sub btnEvent_Click Dim btnSender As Button	To have access to the properties of the view that raised the event we declare a local variable Dim htnSender As Button
btnSender = Sender	And set btnSender = Sender.
Select btnSender.Tag	Then, to differentiate between the backspace button and
Case "BS"	the numeric buttons we use a Select / Case / End Select
Case Else	structure and use the Tag property of the buttons.
End Select	Remember, when we added the different buttons we
End Sub	set their Tag property to BS, 0, 1, 2 etc.
Select btnSender.Tag	Select sets the variable to test.
Case "BS"	Checks if it is the button with the "BS" tag value.
Case Else	Handles all the other buttons.

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Now we add the code for the numeric buttons. We want to add the value of the button to the text in the lblResult Label.

```
Select btnSender.Tag
Case "BS"
Case Else
    lblResult.Text = lblResult.Text & btnSender.Text
End Select
End Sub
```

This is done in this line lblResult.Text = lblResult.Text & btnSender.Text

The "&" character means concatenation, so we just append to the already existing text the value of the Text property of the button that raised the event.

```
Now we add the code for the BackSpace button.
   Select btnSender.Tag
   Case "BS"
        If lblResult.Text.Length > 0 Then
        lblResult.Text = lblResult.Text.SubString2(0, lblResult.Text.Length - 1)
        End If
   Case Else
        lblResult.Text = lblResult.Text & btnSender.Text
   End Select
End Sub
```

When clicking on the BS button we must remove the last character from the existing text in lblResult. However, this is only valid if the length of the text is bigger than 0. This is checked with: If lblResult.Text.Length > 0 Then

```
To remove the last character we use the SubString2 function.
lblResult.Text = lblResult.Text.SubString2(0,lblResult.Text.Length - 1)
```

SubString2(BeginIndex, EndIndex) extracts a new string beginning at BeginIndex (inclusive) until EndIndex (exclusive).

```
Now the whole routine is finished.
Private Sub btnEvent_Click
  Private btnSender As Button
  btnSender = Sender
  Select btnSender.Tag
  Case "BS"
     If lblResult.Text.Length >0 Then
        lblResult.Text = lblResult.Text.SubString2(0,lblResult.Text.Length - 1)
     End If
  Case Else
     lblResult.Text = lblResult.Text & btnSender.Text
  End Select
End Sub
In Sub btnAction Click we add, at the end, lblResult.Text = "" to clear the text.
  Else
     New
     btnAction.Text = "0 K"
     lblResult.Text = ""
  End If
End Sub
```

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We can try to improve the user interface of the program by adding some colors to the lblComments Label.

Let us set:

- Yellow for a new problem

- Light Green for a GOOD answer

- Light Red for a WRONG answer.

We first modify the New routine, where we add this line lblComments.Color = Colors.RGB(255,235,128)

```
Private Sub New
Number1 = Rnd(1, 10)
Number2 = Rnd(1, 10)
IblNumber1.Text = Number1
IblNumber2.Text = Number1
IblComments.Text = "Enter the result" & CRLF & "and click on OK"
IblComments.Color = Colors.RGB(255,235,128)
IblResult.Text = ""
Enter the result.Text to empty
End Sub
```

And in the CheckResult routine we add the two lines with lblComments.Color =...

```
Private Sub CheckResult

If lblResult.Text = Number1 + Number2 Then
    lblComments.Text = "G 0 0 D result" & CRLF & "Click on NEW"
    lblComments.Color = Colors.RGB(128,255,128) ' light green color
    btnAction.Text = "N E W"
Else
    lblComments.Color = Colors.RGB(255,128,128) ' light red color
    lblComments.Text = "W R 0 N G result" & CRLF & "Enter a new result" & CRLF & "and click 0K"
End If
End Sub
```

And we give the program a more meaningful title by adding Page1.Title = "Calc Trainer" in Application\_Start just before NavControl.ShowPage(Page1).



Another improvement would be to hide the '0' button to avoid entering a leading '0'. For this, we hide the button in the New subroutine with line btn0.Visible = False.

```
Private Sub New
  Number1 = Rnd(1, 10)
                                ' Generates a random number between 1 and 9
  Number2 = Rnd(1, 10)
                               ' Generates a random number between 1 and 9
                                ' Displays Number1 in label lblNumber1
  lblNumber1.Text = Number1
                             ' Displays Number2 in label 1blNumber2
  lblNumber2.Text = Number2
  lblComments.Text = "Enter the result" & CRLF & "and click on OK"
  lblComments.Color = Colors.RGB(255,235,128)
                                                   ' yellow color
  lblResult.Text = ""
                                ' Sets lblResult.Text to empty
  btn0.Visible = False
End Sub
```

```
We see that btn0 is in red, this means that this object is not recognized by the IDE.
btn0.Visible = False
```

```
So we must declare it, by adding btn0 into line 17:
Private btnAction, btn0 As Button
```

```
Now btn0 is no more in red.
btn0.Visible = False
```

In addition, in the btnEvent\_Click subroutine, we hide the button if the length of the text in lblResult is equal to zero and show it if the length is greater than zero.

```
Private Sub btnEvent Click
  Dim btnSender As Button
  btnSender = Sender
  Select btnSender.Tag
  Case "BS"
     If lblResult.Text.Length >0 Then
       lblResult.Text = lblResult.Text.SubString2(0,lblResult.Text.Length - 1)
     End If
  Case Else
     lblResult.Text = lblResult.Text & Send.Tag
  End Select
  If lblResult.Text.Length = 0 Then
     btn0.Visible = False
  Else
     btn0.Visible = True
  End If
End Sub
```

# 4 Getting started B4J

B4J is a **100% free** development tool for desktop, server and IoT solutions.

With B4J you can easily create desktop applications (UI), console programs (non-UI) and server solutions.

The compiled apps can run on Windows, Mac, Linux and ARM boards (such as Raspberry Pi).

The B4J language is like Visual Basic and B4A language.

B4J includes a powerful GUI designer, built-in support for multiple screens and orientations.

What you need:

- The B4J program, this is a Windows program running on a PC.
- The Java SDK on the PC, free.

## 4.1 Installing B4J

## 4.1.1 Installing Java JDK

B4J depends on the free Java JDK component.

## If you are already using B4A or B4i you can skip this chapter.

Installation instructions:

The first step should be to install the **Java JDK**, as B4J requires it. Note that there is no problem with having several versions of Java installed on the same computer.

- Open the Java 8 JDK download link.
- Check the Accept License Agreement radio button.
- Select "Windows x86" or "Windows x64" (for 64 bit machines) in the platforms list.
- Download the file and install it.

## 4.1.2 Installing B4J

Download and install the B4J file on your computer.

As B4J is for free, there is no license file needed like for B4A and B4i.

## 4.2 Configure Paths in the IDE

Then you need to configure the different paths in the IDE.



J Paths Configuration	1	×
javac.exe	C:\Program Files (x86)\Java\jdk1.8.0_77\bin\javac.exe	Browse
	Usually found under C:\Program Files\Java\jdk1.8.x_xx\bin	
Additional Libraries	D:\B4J\AdditionalLibraries	Browse
	(optional) A folder where libraries will be searched for, in addition to the internal libraries folder. Make sure NOT to set it to the B4A libraries folder.	
Shared Modules	D:\B4J\SharedModules	Browse
	(optional) A folder where code modules will be searched for, in addition to the project folder.	
	Cancel Ok	

## javac.exe:

Enter the folder of the javac.exe file.

## Additional libraries:

Create s specific folder for additional libraries, for example C:\B4J\AdditionalLibraries.

## **Shared Modules:**

Create s specific folder for shared modules, for example C:\B4J\SharedModules.

# 4.3 My first program (MyFirstProgram.b4j)

Let us write our first program. The suggested program is a math trainer for kids.

The project is available in the SourceCode folder shipped with this booklet: SourceCode\MyFirstProgram\B4J\MyFirstProgram.b4j



On the screen, we will have:

- 2 Labels displaying randomly generated numbers (between 1 and 9)
- 1 Label with the math sign (+)
- 1 TextField where the user must enter the result
- 1 Button, used to either confirm when the user has finished entering the result or generate a new calculation.
- 1 Label with a comment about the result.

## In B4J:

- Label is an object to show text.
- TextField is an object allowing the user to enter text, like EditText in B4A.
- Button is an object allowing user actions.

We will design the layout of the user interface with the Designer, the Abstract Designer and a Form on the screen.

We will go step by step through the whole process.

The Designer manages the different objects of the interface.

The Abstract Designer shows the positions and sizes of the objects and allows moving or resizing them on the screen.

On the Form, we see the real result.

## Save the project.

**Run the IDE** 

J MyFirstProgram - B4J							
File	Edit	Designer	Project	Tools	Debug	Windows	Help
*∆	New						
2	Open S	Source					- 1
•	Save		Ν			Ctrl	+S
畄	Export	As Zip	2				•

You must save the project before you can run the Designer.

Create a new folder MyFirstProgram and save the project with the name MyFirstProgram.

## Set the Package Name.

Each program needs a package name.

In the menu Project click on Build Configurations



This window appears:

J Build Configurations	;	×
Configuration:	Default •	Create New
Configuration Name:	Default	Delete
Package:	b4j.example	
Conditional Symbols		]
	Example: Full, NoAds	
		Cancel OK

The default name is b4j.example. We will change it to b4j.MyFirstProgram.

J Build Configurations	ŝ	×
Configuration:	Default 🗸	Create New
Configuration Name:	Default	Delete
Package:	b4j.MyFirstProgram	
Conditional Symbols		
	Example: Full, NoAds	
	[	Cancel OK

## Set the Form size.

The Form size is the size of the main window, called Form, shown on the PC screen.

On top of the code you see Region Project Attributes.

Regions are code parts which can be collapsed or extended.

1	■#Region Project Attributes
5	
1	⊟#Region Project Attributes
2	#MainFormWidth: 600
3	#MainFormHeight: 600
4	#End Region

Here we can define the size of the project main window called Form. The default values are Width = 600 and Height = 400.

We change these to Width = 400 and Height = 600.

#Region Project Attributes
 #MainFormWidth: 400
 #MainFormHeight: 600
#End Region

## In the IDE open the Designer.



# 4.3 My first B4J program

J Form (WYSIWYG Designer)	_		×	
				We get a WYSIWYG Form.
🕿 Connected	600 x 60	0 Versior	n: 1.20	

And the Designer looks like this.

J Visual Designer			-	×
File Add View WYSIWYG Designer Tools	Windows			
Variants	Properties	💂 📮 Script - Variant Script - General Abstract Designer		-
600 x 600, scale = 1 (160 dpi)	Main Properties	Match Chosen Variant		-
	Handle Resize Ever 🖌			
	Form Title Form	(*) «		
	Orientation INHERIT	•		
	Background ColorDrawable	•		
	Color Default color			
	Extra CSS			
	lcon	•		
	Border Properties			
	Border Color #000000			
	Border Width 0			
	Corner Radius 0	100%		
		С. Ф		
New Variant Remove Selected				-
Files Variants Views Tree				•
WYSIWYG status: Connected Device de     600 x 600	etails () ), scale = 1 (160 dpi)			

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Note that in the bottom left of the Designer window you see the connection status to the WYSIWYG Form:

ര	WVSIWVG status: Connected	Device details ()
	WYSIWIG Status, Connected	600 x 600, scale = 1 (160 dpi)

If you close the WYSIWYG Form you will see this status:

W//SIM//C status Disconnected	Device details ()
WYSIW IG status. Disconnected	600 x 600, scale = 1 (160 dpi)

With the Designer, we have also the Abstract Designer which shows the layout not exactly WYSIWYG but the positions and size of the different objects. Only the top of the image is shown.

Abstract Designer		
Match Chosen Varia	ant	•
» (ب)		

The dark gray area represents the screen area of the connected 'device' which is the WYSIWYG Form.

The default screen size variant is 600 \* 600, we define a new variant with the same values, 400 \* 600, as in the Project Attributes.



In this window click on Other: and enter the two values.

J Create New Layout Variant				×
Standard values:				
○ 600x600, scale=1	Other:	Width	400	
		Height	600	
		Scale	1.0	
			Cancel	Ok
### 4.3 My first B4J program

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Click on Remove Selected to remove the 600 \* 600 variant.

Variants	•	<b>џ</b>
400 x 600, scale = 1 (160 dpi)		

Click on Views Tree to show the Views Tree window.

New Variant		Remove Sel	ected
Files	Variants	Views Tree	
Script	- General	Vie Doccorrocc	ws Tree

Views Tree	 •	<b>џ</b>
Main		

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Now we will add the 2 Labels for the numbers. In the Designer, add a Label.

Add View WYSIWYG Design	In the IDE menu Add View click on Label
Button	
Canvas	
CheckBox	
ChoiceBox	
ColorPicker	
ComboBox	
CustomView	
DatePicker	
HTMLEditor	
ImageView	The Label appears in the Abstract Designer, in the Views Tree window
Label N	and its default properties are listed in the Properties window.
ListView 45	

Views Tree account account account of the test of	Properties 2000000000000000000000000000000000000	• џ
▲ Main	⊿ Main	-
✓ Label1	Name Label1	
	Type Label	
	Event Name Label1	
	Parent Main	•
	Common Properties	
	Horizontal Anc LEFT	•
	Vertical Anchor TOP	•
	Left 100	
	Top 100	
	Width 100	
	Height 30	
	Enabled 🗸	-
		_

J Form (WYSIWYG Designer)	_	$\times$
Text		

And in the WYSIWYG Form.

Resize and move the Label with the red squares like this.



Pr	operties		Ψ.
4	Main		<b></b>
	Name	Label1	
	Туре	Label	
	Event Name	Label1	
	Parent	Main 🔹	
4	Common Prope	erties	
	Horizontal Anc	LEFT •	
	Vertical Anchor	TOP •	
	Left	100	
	Тор	70	
	Width	60	
	Height	60	
	Enabled	1	
	Visible	1	
	Tag		

The new properties Left, Top, Width and Height are directly updated in the Properties window.

You can also modify the Left, Top, Width and Height properties directly in the Properties window.

Let us change the properties of this first Label, per our requirements.

By default, the name is Label with a number, here Label1. Let us change its name to lblNumber1.

The three letters 'bl' at the beginning mean 'Label', and 'Number1' means the first number.

It is recommended to use significant names for nodes so we know directly what kind of node it is and its purpose.

Pr	Properties 🗸 🗸		
4	Main		
	Name	IbINumber1	
	Туре	Label	
	Event Name	Label1	
	Parent	Main 🔻	

Pressing the 'Return' key or clicking elsewhere will also change the Event Name property.

Properties	· 🚽	ļ
⊿ Main	-	^
Name	IbINumber1	
Туре	Label	
Event Name	lbINumber1	
Parent	Main 🔻	

Main :	Main module.
Name :	name of the node.
Туре :	type of the node. In this case, Label,
	which is not editable.
Event Name :	generic name of the routines that handle
	the events of the Label.
Parent :	parent node the Label belongs to.



And the result in the Abstract Designer

and on the WYSIWYG Form.

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We need a second Label, like the first one. Instead of adding a new one, we copy the first one with the same properties. Only the Name and Left properties will change.



Let us now add a 3rd Label for the math sign. We copy once again lblNumber1. Right click on lblNumber1 in the Abstract Designer and click on Duplicate in the popup menu.



The new label covers IbINumber1.

Position it between the first two Labels and change its name to lblMathSign and its Text property to '+'.





And the result in the Abstract Designer

and on the WYSIWYG Form.

Add View	w WYSIWYG Design	
But	ton	
Can	vas	Now let us add a TextField node
Che	ckBox	Add View
Cho	iceBox	In the Designer menu
Col	orPicker	click on lextred.
Cor	nboBox	
Scro	ollPane	
Slid	er	
Spli	tPane	
Tab	eView	
Tab	Pane	
Text	Area	
Text	Field	Position it below the three Labels and change its name to txfResult
Tog	gleButton	'txf' means TextField and 'Result' for its purpose.
Tree	View	
Web	View	

A Main       Change these properties.         Name       to to to the soult         Type       Testfield         Event Name       to to the soult         Parent       Main         Common Properties       •         Horizontal Anc       LEFT         Vertical Anchor TOP       •         Left       90         Top       150         Width       200         Height       50         Enabled       Optimum         Visible       Optimum         Drawable       Color         Color       Opfinut color         About Properties       •         Border Color       ● Promotit         Border Color       ● Promotit         ToolTip       -         Context Menu       -         * Text Properties       •         ToolTip       -         Context Menu       -         * Text Properties       •         ToolTip       -         Context Menu       -         * TextField Properties       -         Password Field       -         Password Field Properties       -         Password Field Pr	Pro	operties		
Name totResult   Type TextField   Event Namin •   Parent Main   • Common Properties   Horizontal Anchor TOP •   Left 90   Top 150   Writidl Anchor TOP •   Left 90   Top 150   Writidl Anchor TOP •   Left 90   Top 150   Writidl Anchor TOP •   Left 90   Top 100   Height 50   Enabled •   Visible •   Tag •   Border Properties   Border Properties   Border Width 1   Border Width 1   Contro Properties   ToolTip   Prompt to Enter result   Size 30   Boid •   Italic •   Entable •   Password Field •   Number Differuit   Italic •   Password Field •   Italic •   Password Field •   Italic •   Password Field <th>4</th> <th>Main</th> <th></th> <th>Change these properties.</th>	4	Main		Change these properties.
Text Name       to Enter result         Prompt       To State         Enter result       Size         Italic </th <th></th> <th>Name</th> <th>txfResult</th> <th>Name to txfResult</th>		Name	txfResult	Name to txfResult
Event Name       tdResult         Parent       Main         Common Properties         Horizontal Anc. LEFT         Yertical Anchor TOP         Left       90         Top       150         Writh       200         Height       50         Enabled       Oravable         Color       Opfeaticolor         Alpha Level       10         Extra CSS       -         Shadow       Border Properties         Border Properties       -         ToolTip       -         Control Properties       -         Text       -         Font       DEFAULT         Size       to 30         Bold       -         Italic       -         Password Field       -         Vertical Properties       -         Font       DEFAULT         Size       to 30         Bold       -         Halic       -         Password Field       -         Fortmet/Broperties       -         Password Field       -         Size       to 30         After making these changes, you sho		Туре	TextField	
Parent       Main         4       Oramon Properties         Horizontal Anc       LEFT         Vertical Ancio TOP       Vertical Ancio TOP         Left       90         Top       150         Width       200         Background Properties       Image: ColorDravable         Shadow       Image: ColorDravable         Strate: Color Image: ColorDravable       Image: ColorDravable         Contradius 0       Image: ColorDravable         Text Froperties       Image: ColorDravable         Font       Image: ColorDravable         Font       Image: ColorDravable         Size       Image: ColorDravabl		Event Name	txfResult	
Common Properties     Horizontal Anc. LEFT     Vertical Anchor TOP     Left     90     Top     150     Width     200     Height     50     Color     Tag     Prosenble     ColorPorable     Color ○ Default color     Apha Level     10     Extra CSS       Border Properties     Border Color     Border Width     1     Comer Radius 0     Concreations     Border Width     1     Comer Radius 0     Prompt     Enter result     Prompt     Enter result     Prompt     Enter result     Prompt     Text Fried Properties     Size     30     Boid     latic     Editable     Z     taking these changes, you should see something lik     Size     to     Size     Size     to     Size		Parent	Main 🔹	
Horizontal Anc LEFT       •         Vertical Anchor TOP       •         Left       90         Top       150         Width       200         Height       50         Enabled       •         Visible       •         Drawable       ColorTawable         Color       •         Apha Level       •         Border Color       •         Border Color       •         Border Color       •         Border Color       •         Context Menu       •         Context Menu       •         *       Text Properties         Font       •         Font       •         Font       •         Font       •         Font       •         Size       30         Bold       •         Italic       •         Prompt       to Enter result         Prompt tenter result       •         Fort       •         Font       •         Font       •         Font       •         Font       •         Bold <th>4</th> <th>Common Prope</th> <th>erties</th> <th></th>	4	Common Prope	erties	
Vertical Anchor TOP       •         Left. Top, Width and Height.         Top 150         Width 200         Enabled         Visible         Dravable         Color Dravable         Color Dravable         Color Dravable         Color Dravable         Stadow         Border Properties         Border Properties         ToolTip         Control Properties         ToolTip         Control Properties         ToolTip         Control Properties         Text Properties         Text Properties         Text Size         Prompt       to Enter result         Prompt       to Enter result         Prompt trepresents the text shown in the TextField node if entered.         Size       to 30         After making these changes, you should see something lik         Size       to 30         After making these changes, you should see something lik         Image: the sout       Image: the sout         Image: the sout		Horizontal Anc	LEFT •	
Left, Top, Width and Height. Top 150 Width 200 Height 50 Enabled Visible Tag • Deckeycound Properties • Drawable ColorDwabbe Color Properties Border Color # 400000 Border Width 1 Comer Radius 0 • Shadow • Border Properties Text TooTip Context Menu • font DEFAULT • font DEFAULT • Size 30 Bold • taxifield Properties • Border Toperties • font DEFAULT • font DEFAULT • font DEFAULT • font DEFAULT • font DEFAULT • font DEFAULT • fort OWNSWYG Designer • fort OWNSWYG Designer • fort Default • fort INT • fort INT • fort INT • fort INT • fort OWNSWYG Designer • fort INT • for	-	Vertical Anchor	тор 🗸	
Top 150   Width 200   Height 50   Enabled Image: ColorDravable    Tag Image: ColorDravable    Color Image: ColorDravable    Color Image: ColorDravable    Color Image: ColorDravable    Color Image: ColorDravable    Shadow Image: ColorDravable    Border Properties Image: ColorDravable    Border Width 1   Control Properties Image: ColorDravable    Text Image: ColorDravable    Control Properties Image: ColorDravable    ToolTip Image: ColorDravable    Context Menu Image: ColorDecent    Font Image: ColorDecent    Font Image: ColorDecent    Size 30   Boid Image: ColorDecent    Size 30   Boid Image: ColorDecent    Password Field Image: ColorDecent    Intermed Image: ColorDecent    Password Field Image: ColorDecent    Intermed Image: ColorDecent    Intermed Image: ColorDecent    Password Field Image: ColorDecent    Intermed Image: ColorDecent    Intermed Image: ColorDecent    Password Field Image: ColorDecent    Intermed Image: ColorDecent    Image: ColorDecent  Image: ColorDecent    Image: ColorDecent  Image: ColorDecent    Image: ColorDecent  Image: ColorDecent <th></th> <th>Left</th> <th>90</th> <th>Left, Top, Width and Height.</th>		Left	90	Left, Top, Width and Height.
Victin       200         Height       50         Enabled       Visible         Tag       Image: ColorDrawable          Color       Orawable ColorDrawable          Color       Orawable          Shadow       Border Properties         Border Color       Fonder Static color         Appla Level       10         Default color       Fonder Static color         Aborder Color       Fondowow         Border Color       Fondowow         Border Color       Fondowow         Control Properties       Fond         ToolTip	-	Тор	150	
Height 50         Enabled         Yisible         Tag         Barder Properties         Orlow Default color         Alpha Level         10         Extra CSS         Shadow         Border Properties         Border Color         Border Color         Color         Color         Shadow         Border Width         Control Properties         ToolTip         ToolTip         Control Properties         ToolTip         Fext Properties         ToolTip         Font         DEFAULT         Size         30         Boid         Italic         Editable         After making these changes, you should see something lik         FextField Properties         Password Field         VMumber VMMathigre VNumber         Model         Form (WVSWVG Designer)         Size         Torm (WVSWVG Designer)         Size         Size         Prompt         Form (WVSWVG Designer)         Size		Width	200	
Text       Image: Text         Border Properties       Color Default color         Alpha Level 10       Extra CSS         Shadow       Border Properties         Border Color @ e00000       Border Width 1         Control Properties       ToolTip         ToolTip       Image: Text         Control Properties       ToolTip         ToolTip       Image: Text         Prompt       Enter result         Size       to 30         After making these changes, you should see something lik         Ensword Field       Image: TextField Properties         Pessword Field       Image: TextField Properties         ToolType       Form (WYSIWYG Designer)         Image: TextField Properties       Image: TextField Properties         Pessword Field       Image: TextField Properties         TextField Properties       Enter result	-	Height	50	
Instants   Visible   Tag   Background Properties   Drawable   Color   Orawable   Color   Orawable   Color   Orawable   Color   Orawable   Shadow   Border Vidth 1 Context Menu Context Menu Context Menu Fext Prompt Fext Prompt Fext Prompt Context Menu Font DEFAULT Size Bold Intalic Enter result Prompt represents the text shown in the TextField node if entered. Size to 30 After making these changes, you should see something lik Form (WYSIWYG Designer) Strafecult Form (WYSIWYG Designer) Strafecult Torm (WYSIWYG Designer) Strafecult The strain of the str		Enabled	50	
Tag         Background Properties         Drawable         Color         Color         Alpha Level         10         Extra CSS         Border Properties         Border Color         Border Color         Border Color         Border Color         Border Color         Border Width         Control Properties         Text         Prompt         Enter result         Prompt title         Font         DEFAULT         Size         Size         Bold         Italic         Pasksword Field           Found           Prompt title         Default           Font           Prompt tepresents the text shown in the TextField node if entered.         Size       to 30		Visible		
Background Properties Drawable ColorDrawable Color Default color Alpha Level 1.0 Extra CSS Border Color #000000 Border Width 1 Comer Radius 0 Control Properties ToolTip Context Menu   Frext Properties Frext  Frext  Frext  Frompt Enter result Prompt to Enter result Prompt to Enter result Prompt represents the text shown in the TextField node if entered. Size to 30 Bold Bold Bold Bold Bold Bold Bold Bold	-		V	
Background Properties            Drawable ColorDrawable ~         Cotor → Default color         Alpha Level 10         Extra CSS          Shadow         Border Properties          Border Color ● #000000          Border Width 1          Context Menu                 Font         Prompt Enter result         Prompt Enter result         Prompt trepresents the text shown in the TextField node if entered.         Size 30         Bold         Itatic         Bold         Itatic         Password Field                bNumber bMath Sign bNumber?             tofResult		lag		
Drawable       Color/Drawable         Color          Color          Alpha Level       1.0         Extra CSS	4	Background Pro	operties	
Color       Image: Color image	1	Drawable	ColorDrawable 🔻	
Alpha Level 1.0 Extra CSS Shadow Border Properties Border Width 1 Corner Radius 0 Control Properties ToolTip Context Menu Font DEFAULT Font DEFAULT Size 30 Bold Ltalic Password Field DINUmber DIMAINSign DINumber? DINUmber DIMAINSign DINumber? DIRECT		Color	Default color	
Extra CSS		Alpha Level	1.0	
Shadow          Border Properties         Border Color         Border Width         Control Properties         ToolTip         ToolTip         Control Properties         ToolTip         Text         Prompt         Enter result         Prompt         Enter result         Prompt         Control DEFAULT         Size         30         Bold         Italic         Password Field         Password Field         Italic         <		Extra CSS		
▲ Border Properties         Border Color       # #000000         Border Width       1         Control Properties       0         ToolTip          Control Properties          ToolTip          Context Menu          Prompt       Enter result         Prompt tepresents the text shown in the TextField node if entered.         Size       to 30         Bold          Italic          Password Field          Infumber       bMathSigrbNumber?         Influmber          Influmber       bMathSigrbNumber?         Influe          Influe          Influe          Influe          Influe          Influe          Influe	⊳	Shadow		
Border Color #000000   Border Width 1   Control Properties ToolTip   ToolTip   Context Menu   Prompt Enter result   Font DEFAULT   Font DEFAULT   Size 30   Bold   Italic   Editable   Password Field   VIResult   Italic   Password Field   Italic   Form (WYSIWYG Designer)   Size   Italic   Enter result   Form (WYSIWYG Designer)   Italic   Italic   Enter result   Italic	4	Border Propert	ies	
Border Width 1   Corner Radius 0 <b>Control Properties</b> ToolTip   ToolTip   Context Menu   Prompt to Enter result Prompt to Enter result Prompt to Enter result Prompt represents the text shown in the TextField node if entered. Size 30 Bold Italic Editable Password Field DNumber: DIMathSign DINumbers to rResult Difference Difference Difference Difference Difference Difference Text Text Form (WYSIWYG Designer) Text <		Border Color	#000000	
Corner Radius       0         ✓ Control Properties       ToolTip         ToolTip          Context Menu          ✓ Text Properties          Text          Prompt       Enter result         Font       DEFAULT         Size       30         Bold          Ltalic          Password Field          Variable          biNumber/blMathSigr/blNumberz       5         txfResult		Border Width	1	Border Width to 1
<ul> <li>Control Properties         <ul> <li>ToolTip</li> <li>Context Menu</li> <li>Text menu</li> <li>Text</li> <li>Prompt Enter result</li> <li>Font</li> <li>DEFAULT</li> <li>Size 30</li> <li>Bold</li> <li>Italic</li> <li>Editable</li> <li>After making these changes, you should see something lik</li> </ul> </li> <li>Form (WYSIWYG Designer) - □ ×</li> </ul>		Corner Radius	0	
ToolTip   Context Menu   Text   Prompt   Enter result   Font   Font   DEFAULT   Size   30   Bold   Italic   Editable   Password Field   Password Field INUmber blMathSigt blNumber2   txfResult   Prompt to Enter result Tormpt represents the text shown in the TextField node if entered. Size 30 Bold Total Context of the state of the	4	Control Propert	ties	
Context Menu   Text Properties   Text   Prompt   Enter result   Font   DEFAULT   Size   30   Bold   Italic   Editable   Password Field   Password Field INUmber blMathSigr blNumber2   txfResult   Prompt to Enter result Tormoty represents the text shown in the TextField node if entered. Size 30 Bold </th <th></th> <th>ToolTip</th> <th></th> <th></th>		ToolTip		
<ul> <li>Text Properties         <ul> <li>Text</li> <li>Fort</li> <li>Font</li> <li>Font</li> <li>DEFAULT</li> <li>Size</li> <li>30</li> <li>Bold</li> <li>Italic</li> <li>Editable</li> <li>After making these changes, you should see something lik</li> </ul> </li> <li>After making these changes, you should see something lik</li> <li>I corr (WYSIWYG Designer)</li> <li>Y form (WYSIWYG Designer)</li> <li>X for making the se changes, you should see something lik</li> </ul>		Context Menu		
Text   Prompt   Font   DEFAULT   Size   30   Bold   Italic   Editable   Password Field   Password Field   blNumber1blMathSigrblNumberz   txfResult   Prompt to Enter result Prompt to Enter result Prompt represents the text shown in the TextField node if entered. Size to 30 Bold Bo	4	Text Properties		
Prompt Enter result   Font DEFAULT   Size 30   Bold		Text		
Font   Font   Font   DEFAULT   Size   30   Bold   Italic   Editable   After making these changes, you should see something lik Form (WYSIWYG Designer) Form (WYSIWYG Designer) Stress Form (WYSIWYG Designer) Form (WYSIWYG Designer) Form (WYSIWYG Designer) Kesult Enter result		Prompt	Enter result	
Font       DEFAULT       Prompt represents the text shown in the TextField node if entered.         Size       30       Size       to 30         Bold       Italic       Editable       After making these changes, you should see something lik         Italic       Form (WYSIWYG Designer)       Image: Size something lik         Image: TextField Properties       Form (WYSIWYG Designer)       Image: Size something lik         Image: BilNumber BilMathSigrbilNumber2       Image: Size something lik       Image: Size something lik         Image: Size something bilNumber       Image: Size something lik       Image: Size something lik         Image: Size something bilNumber       Image: Size something lik       Image: Size something lik         Image: Size something bill       Image: Size something lik       Image: Size something lik         Image: Size something bill       Image: Size something lik       Image: Size something lik         Image: Size something bill       Image: Size something lik       Image: Size something lik         Image: Size something something lik       Image: Size something lik       Image: Size something lik         Image: Size something something something something lik       Image: Size something lik       Image: Size something lik         Image: Size something somethi		Font	Litter result	Prompt to Enter result
entered. Size 30 Bold Italic Editable I After making these changes, you should see something lik After making these changes, you should see something lik Form (WYSIWYG Designer) - × Form (WYSIWYG Designer) - × Form (WYSIWYG Designer) - × Form (WYSIWYG Designer) - ×		Font		Prompt represents the text shown in the TextField node if no text is
Size to 30 Bold Italic Editable Password Field blNumber blMathSigrblNumber2 txfResult Size to 30 After making these changes, you should see something lik		Font		entered.
Bold Italic Interview of the sector of the s		Size	30	Size to 30
Italic   Editable   Image: Constraint of the sector o		BOID		
Arter making tilese changes, you should see something it.		Italic		After making these changes, you should see compathing like this
<ul> <li>TextField Properties</li> <li>Password Field</li> <li>blNumber1blMathSigrblNumber2</li> <li>txfResult</li> <li>Form (WYSIWYG Designer)</li> <li>TextField Properties</li> <li>Form (WYSIWYG Designer)</li> <li>Form</li></ul>		Editable	1	After making mese changes, you should see something like uns.
Password Field       Image: Second State Sta	4	TextField Prope	erties	
blNumber1blMathSigrblNumber2 txfResult		Password Field		
		bIN	umber1blMathSigrblNu txfResult	mber2 5 + 5 Enter result

# 4.3 My first B4J program

Add View WYSIWYG Design			Now, let's add the Button which, when pressed, will either check the result the user supplied as an answer, or generate a new math problem, depending on the user's input.				
Pr	operties Main	•••••••••••••••••••••••••••••••••••••••	Position it below the TextField node. Resize it and change following				
	Name	btnAction	properties:				
	Туре	Button					
	Event Name	btnAction	Name to btnAction				
	Parent	Main 🔹	•				
4	Common Prop	erties					
Horizontal Anc LEFT 🔹			•				
	Vertical Anchor	ТОР	-				
	Left	140	Left, Top, Width and Height.				
	Тор	250					
	Width	100					
	Height	50					
	Enabled	1					
	Visible	1					
	Tag						
4	Background Pr	operties					
	Drawable	ColorDrawable					
	Color	#FFBDBBBB	Background Color to #FFBDBBBB				
	Alpha Level	1.0					
	Extra CSS						
	Shadow						
	Border Propert	ies					
	Border Color	#000000					
	Border Width	0					
	Corner Radius	0					
4	Control Proper	ties					
	ToolTip						
	Context Menu						
	Text Properties						
	Text	ок .	Text to OK (with a space between O and K)				
	FontAwesome						
	Material Icons						
	Wrap Text						
	Toxt Color						
	Alignment						
	Font	CENTER					
	Font		Result (pictures reduced size)				
	Sizo	24	Font Size to 24				
	Size	24	J Form (WYSIWYG Designer) − □ ×				
	BOIG						
	iune -		blNumber blMathSigrblNumber2 bdResult btrAction btrActi				

# 4.3 My first B4J program

Pr	operties		Let us add the last Label for the comments. Position it below the				
4	Main		Button and resize it.				
	Name	IblComments					
	Туре	Label	Change the following properties:				
	Event Name	IblComments	Name to IblComments				
	Parent	Main 🔹					
4	Common Prope	erties					
	Horizontal Anc	LEFT 🔻					
	Vertical Anchor	TOP 🔻					
	Left	80	Left, Top, Width and Height.				
	Тор	350					
	Width	240					
	Height	110					
	Enabled	1					
	Visible	1					
	Tag						
4	Background Pr	operties					
4	Drawable	ColorDrawable 🔻					
	Color	Default color					
	Alpha Level	1.0					
	Extra CSS						
⊳	Shadow						
4	Border Propert	ies					
	Border Color	#000000					
	Border Width	1	Border Width to 1				
	Corner Radius	0					
4	Control Properties						
	ToolTip						
	Context Menu						
4	Text Properties						
	Text		Text empty				
	FontAwesome		Text empty				
	Material Icons						
	Wrap Text						
	Text Color	Default color					
	Alignment	CENTER •					
	Font						
	Font	DEFAULT -	Font Size to 20				
	Size	20					
	Bold						
	Italic						

And the result.

	J Form (WYSIWYG Designer) — 🗆 🗙
blNumber1blMathSigrblNumber2 bxfResult	5 + 5
btnAction	Enter result O K
IblComments	
	Connected 400 x 516 Version: 1.20

Now we save the layout in a file.

File	Add View	WYSIWYG Des		
то С	Open			
μ.	Save	Ctrl+S		
	Save As			
	Remove Layo	out	and save it w	ith the name 'Main'.
lew L	ayout		×	
ne				
			Ok Cancel	
	File	File       Add View         1       New         1       Open         1       Save         2       Save As         2       Remove Layout         New       Save	File Add View WYSIWYG Des   1 New   2 Open   2 Save Ctrl+S   Save As Save As   Remove Layout Save As	File Add View WYSIWYG Desi   Image: Save As Open   Image: Save As Image: Save As   Image: Save As Image:



To write the routines for the project, we need to reference the Views in the code. This can be done with the *Generate Members* tool in the Designer.

The Generate Members tool automatically generates references and subroutine frames.

J Generate Members X	Clickon
Selected views will be declared in the globals sub. Selected events will be added as subs.	Tools Windows
<ul> <li>btnAction</li> <li>Action</li> <li>Resize (Width As Double, Height As Double)</li> <li>MouseClicked (EventData As MouseEvent)</li> <li>MouseMoved (EventData As MouseEvent)</li> <li>MousePragged (EventData As MouseEvent)</li> <li>MousePressed (EventData As MouseEvent)</li> <li>FocusChanged (HasFocus As Boolean)</li> <li>IblComments</li> <li>IblMathSign</li> <li>IblNumber1</li> <li>IblNumber2</li> <li>ItsfResult</li> </ul>	Generate Members Change Grid to open the generator.
Select All Views Clear Selected Generate Members	

Here we find all the nodes added to the current layout.

We check all nodes and check the MouseClicked event for the btnAction Button.

Checking a node  $\triangleright$  IblComments generates its reference in the Globals Sub routine in the code. This is needed to make the node recognized by the system and allow the autocomplete function.

Private btnAction As Button Private lblComments As Label Private lblMathSign As Label	
Private lblNumber1 As Label	
Private lblNumber2 As Label	
Private txfResult As TextField	
	✓ ✓ btnAction
↓ ✓ btnAction	Resize (Width
Clicking on IblComments shows all events for the selected node	MouseClicked
Clicking on an event of a node generates the Sub frame	for this event.

Sub	btnAction	Click

End Sub

Click on Generate Members to generate the references and Sub frames, then close the window ×.

Now we go back to the IDE to enter the code.

On the top of the program code we have:

```
Sub Process_Globals

Private fx As JFX

Private MainForm As Form

Private btnAction As Button

Private lblComments As Label

Private lblMathSign As Label

Private lblNumber1 As Label

Private lblNumber2 As Label

Private txfResult As TextField

End Sub
```

These lines are automatically in the project code. Private fx As JFX Private MainForm As Form

B4J needs a MainForm, and the JFX library for the nodes, details in chapter Process life cycle.

Below the code above we have the AppStart routine which is the first routine executed when the program starts.

The content below is also added automatically in each new project.

```
Sub AppStart (Form1 As Form, Args() As String)
MainForm = Form1
'MainForm.RootPane.LoadLayout("Layout1") 'Load the layout file.
MainForm.Show
End Sub
MainForm = Form1 > Sets Form1 to the variable MainForm.
'MainForm.RootPane.LoadLayout("Layout1") > Loads a layout file if needed.
MainForm.Show > Shows the MainForm
```

First, we need our program to load the layout file we defined in the previous pages. The file must be loaded onto the MainForm.RootPane, we uncomment the line 'MainForm.RootPane.LoadLayout("Layout1") and change the layout file name.

```
Sub AppStart (Form1 As Form, Args() As String)
MainForm = Form1
MainForm.RootPane.LoadLayout("Main") 'Load the layout file.
MainForm.Show
End Sub
```

We want to generate a new problem as soon as the program starts. Therefore, we add a call to the New subroutine in AppStart.

```
Sub AppStart (Form1 As Form, Args() As String)
MainForm = Form1
MainForm.RootPane.LoadLayout("Main") 'Load the layout file.
MainForm.Show
New
```

End Sub

New is displayed in red because the 'New' routine has not yet been defined. Generating a new problem means generating two new random values between 1 and 9 (inclusive) for Number1 and Number2, then showing the values using the lblNumber1 and lblNumber2 'Text' properties.

To do this we enter following code: In Sub Process\_Globals we add two variables for the two numbers.

```
Private Number1, Number2 As Int
End Sub
```

And the 'New' Subroutine:

```
Private Sub New
Number1 = Rnd(1, 10)
Number2 = Rnd(1, 10)
IblNumber1.Text = Number1
IblNumber2.Text = Number2
IblComments.Text = "Enter the result" & CRLF & "and click on OK"
txfResult.Text = ""
Enter Sub
```

The following line of code generates a random number from '1' (inclusive) to '10' (exclusive) : Rnd(1, 10)

In this line Number1 = Rnd(1, 10) ' Generates a random number between 1 and 9 The text after the quote, ' Generates..., is considered as a comment. It is good practice to add comments explaining the purpose of the code.

The following line displays the comment in the lblComment node: lblComments.Text = "Enter the result" & CRLF & "and click on OK" CRLF is the LineFeed character. Now we add the code for the Button click event.

We have two cases:

- When the Button text is equal to "O K", it means that a new problem is displayed, and the program is waiting for the user to enter a result and press the Button.

- When the Button text is equal to "NEW", it means that the user has entered a correct answer and when the user clicks on the Button a new problem will be generated.

```
Private Sub btnAction_Click
    If btnAction.Text = "0 K" Then
        If txfResult.Text="" Then
            lblComments.Text = "No result entered" & CRLF & "Enter a result" & CRLF & "and click on OK"
        Else
            CheckResult
        End If
    Else
            New
            btnAction.Text = "0 K"
        End If
End If
End Sub
```

If btnAction.Text = "O K" Then checks if the Button text equals "O K".

If yes, we check if the TextField is empty.

If yes, we display a message in the comment field telling the user that there is no result in the TextField node.

If no, we check if the result is correct or if it is wrong.

If no, we generate a new problem, set the Button text to "O K" and clear the TextField node.

The last routine checks the result.

```
Private Sub CheckResult
    If txfResult.Text = Number1 + Number2 Then
        lblComments.Text = "G O O D result" & CRLF & "Click on NEW"
        btnAction.Text = "N E W"
        Else
        lblComments.Text = "W R O N G result" & CRLF & "Enter a new result" & CRLF & "and click OK"
        End If
End Sub
```

With If txfResult.Text = Number1 + Number2 Then we check if the entered result is correct.

If yes, we display in the lblComments label the text below:

'G O O D result' 'Click on NEW' and we change the Button text to "N E W ". If no, we display in the lblComments label the text below: W R O N G result Enter a new result and click OK 123

Let us now compile and run the program.

In the IDE on top click on 🕨 :

J MyFirstProgram - B4J						
File Edit	Designer	Project	Tools	Debug	Windows Help	)
: 🐿 當 💾	۵ 🗄	ችዐን	৫ 😋	• 0	'표 '왜 <del>-</del> 표 판-	Run (F5)

The program is going to be compiled.

J Compile & Rapid Debug (Build: Default)	×	
Compiling code. (0.02s) Compiling layouts code. (0.00s) Organizing libraries. (0.00s) Compiling generated Java code. (0.57s) Compiling debugger engine code. (0.48s) Running application. (0.01s) Completed successfully.	<u>م</u> 	When you see 'Completed successfully.' as in the message box, the compiling and transfer is finished.
	Cancel Close	
Form – – – ×	Then you should see some with different numbers. Of course, we could make layout, but this was not the program.	thing like the image on the left, aesthetic improvements in the main issue for the first

### 4.3 My first B4J program



## 4.4 Second B4J program (SecondProgram.b4j)

The project is available in the SourceCode folder: SourceCode\SecondProgram\SecondProgram.b4j.

Improvements to "My first program".

- Independent numeric keyboard to avoid the use of the PC keyboard.
- Colors in the comment label.

Create a new folder called "SecondProgram". Copy all the files and folders from MyFirstProgram to the new SecondProgram folder and rename the program file MyFirstProgram.b4j to SecondProgram.b4j and MyFirstProgram.b4j.meta to SecondProgram.b4j.meta.

Calc Trainer			_		×
Γ	6	+	2	1	
	Ente and	r the ro click o	esult n OK		
<			0	K	
5	6	7	8	9	
(	1	2	3	4	

Load this new program in the IDE.

Run the Designer.

We need to change the Package Name.

In the IDE Project menu. Click on Build Configurations					
Proj	ect	Tools	Debug	Windows	6 Help
*ם	Add	d New M	odule		•
*0	Add Existing Modules				
	Rename Module				
-	<ul> <li>Remove Module</li> </ul>				
	Buil	d Config	gurations		Ctrl+B
•	Cor	npile &	Run	N	F5

J Build Configurations	S	×
Configuration:	Default 🔹	Create New
Configuration Name:	Default	Delete
Package:	b4j.SecondProgram	
Conditional Symbols		
	Example: Full, NoAds	
	[	Cancel OK

Change the Package name to b4j.SecondProgram and click on OK.

Ł

We want to replace the txfResult TextField node by a new Label. In the Abstract Designer, click on the txfResult node.

]	INur لکھ ا	mber1blMat txfR. Add View Cut Copy	thSigr b _sult	INumbe	er2 Ctrl+X Ctrl+C	•	Right click on txfResult and click on	Cut _
piNu	nb.	er JIMathSi Add View	igr blNu	ımber2		•		
	*	Cut			Ctrl+X		Right click on lblNumber1 and click on	Duplicate
		Сору			Ctrl+C			
	Ċ.	Paste			Ctrl+V	_		
	~	Duplicate	2	3	CtrI+D			
T	~	Undo			Cu1+2			
		ol <b>LaLei1</b> er	JIMath	nSigr bl	Number2		The new label covers IbINumber1.	

Pr	operties		•	
1	Main			Modify the following properties:
	Name	IblResult		
	Туре	Label		Name to IblResult
	Event Name	IblResult		
	Parent	Main	-	
1	Common Prope	erties		
	Horizontal Anc	LEFT	•	
	Vertical Anchor	ТОР	-	
	Left	110		
	Тор	150		Left, Top, Width, Height
	Width	180		
	Height	50		
	Enabled	1		
	Visible	1		
	Тад			
1	Background Pre	operties		
4	Drawable	ColorDrawable	•	
	Color	Default colo	r	
	Alpha Level	1.0		
	Extra CSS		[	
>	Shadow			
1	Border Propert	ies		
	Border Color	#000000		
	Border Width	1		Border Width to 1
	Corner Radius	0		
1	<b>Control Proper</b>	ties		
	ToolTip			
	Context Menu			
1	<b>Text Properties</b>	;		
	Text			Text to "" no character
	FontAwesome			
	Material Icons			
	Wrap Text			
	Text Color	Default colo	r	
	Alignment	CENTER	-	
4	Font			
	Font	DEFAULT	•	
	Size	36		
	Bold			
	Italic			

blNum	ber1blMathSigr <mark>blNun</mark>	nber2
	IblResult	
	IblResult btnAction	
		]
	IblComments	
	Pane1	

B4x Getting started

Let us add a Pane for the keyboard buttons.

Position and resize it as in the image.

Pr	operties		-	
4	Main			
	Name	pnlKeyboard		Change
	Туре	Pane		"nnl" fo
	Event Name	pnlKeyboard		pin it
	Parent	Main	•	
4	Border Propert	ties		
	Border Color	#000000		
	Border Width	1		Change

Corner Radius 0

Change its Name to pnlKeyboard pnl" for Panel), the node type.

Change Corner radius to 0





Pr	operties		~			
4	Main		Change following properties:			
	Name	btn0	Name to htm			
	Туре	Button	Event name to btnEvent			
	Event Name	btnEvent				
	Parent	pnlKeyboard 🔹				
4	Common Prope	erties				
	Horizontal Anc	LEFT •				
	Vertical Anchor	TOP 🔻				
	Left	0	Left to 0			
	Тор	120	Top to 120			
	Width	50	Width to 50			
	Height	50	Height to 50			
	Enabled	$\checkmark$				
	Visible	1				
	Тад	0	Tag to 0			
4	Background Pro	operties				
4	Drawable	ColorDrawable 🔻				
	Color	🕑 📰 #B7FA7EA9	Background Color to #B7FA7EA9			
	Alpha Level	1.0				
	Extra CSS					
⊳	Shadow					



#### The button looks now like this.





Add 8 more Buttons and position them like in the image.

btn5	btn6	pnlk <b>btn7</b> oa	rd btn8	btn9	Change Name	e follov btn2,	ving btn3	g prope 3, btn4	rties: etc.
btn0	btn11	btn2	btn3	btn4	Text	∠, 2,	3 3	, 4 , 4	etc. etc.

btnBS			btnA	Action
btn5	btn6 J	pnlk <b>btn7</b> oard	btn8	btn9
btn0	btn11	btn2	btn3	btn4

To create the BackSpace button, duplicate one of the number buttons, and position it in the top left corner.

Resize and position btnAction.

Change their Name, Tag, Text and Color properties as below.

	btnE	ss <	
Pr	operties		Ŧ
4	Main		
	Name	btnBS	
	Туре	Button	
	Event Name	btnEvent	
	Parent	pnlKeyboard	•
4	Common Prope	erties	
	Horizontal Anc	LEFT	•
	Vertical Anchor	ТОР	•
	Left	0	
	Тор	0	
	Width	50	
	Height	50	
	Enabled	1	
	Visible	1	
	Tag	BS	
4	Background Pro	operties	
4	Drawable	ColorDrawable	•
	Color	#FF7E88FA	
	Alpha Level	1.0	
	Extra CSS		
⊳	Shadow		
4	Border Propert	ies	
	Border Color	#000000	
	Border Width	1	
	Corner Radius	5	
4	Control Propert	ties	
	ToolTip		
	Context Menu		
4	Text Properties		
	Text	<	
	FontAwesome		
	Material Icons		
	Wrap Text		
	Text Color	Default cold	or
	Alignment	CENTER	•
4	Font		
	Font	DEFAULT	•
	Size	22	
	Bold		
	Italic		

bti	nAction	Οĸ
Pr	operties	•••••••••••••••
4	Main	
	Name	btnAction
	Туре	Button
	Event Name	btnAction
	Parent	pnlKeyboard 🔹 🔻
4	Common Prope	erties
	Horizontal Anc	LEFT •
	Vertical Anchor	TOP •
	Left	180
	Тор	0
	Width	110
	Height	50
	Enabled	$\checkmark$
	Visible	$\checkmark$
	Tag	
4	Background Pro	operties
4	Drawable	ColorDrawable 🔻
	Color	FF03F86D #FF03F86D
	Alpha Level	1.0
	Extra CSS	
⊳	Shadow	
4	Border Properti	ies
	Border Color	#000000
	Border Width	1
	Corner Radius	5
4	Control Propert	ties
	ToolTip	
	Context Menu	
4	<b>Text Properties</b>	
	Text	ОК
	FontAwesome	
	Material Icons	
	Wrap Text	
	Text Color	Default color
	Alignment	CENTER •
	Font	
	Font	DEFAULT -
	Size	26
	Bold	

J Form (WYSIWYG Designer) —		
5 + 5		The finished new layout in the WYSIWYG form. You could have followed all the evolutions of the layout in the WYSIWYG form.
< 0 5 6 7 8 0 1 2 3	K 9 4	
≈ Connected 398 x 56	4 Version: 1.20	

Now we will update the code. First, we must replace the txfResult by lblResult because we replaced the TextField node by a Label.

10	Private lblC	omments As La	pel
11	Private lblM	athSign As La	el
12	Private lblN	umber1 As Lab	Double click on txfResult to select it.
13	Private lblN	umber2 As Lab	el
14	Private txfR	esult As Text	ield
Edit	t Designer Project	Tools Debug	v
ж	Cut	Ctrl+X	
	Cut Line	Ctrl+Y	
	Duplicate Line	Ctrl+D	
- D	Сору	Ctrl+C	
പ	Paste	Ctrl+V	
ິ	Undo	Ctrl+Z	
୯	Redo	Ctrl+Shift+Z	
	Move Line(s) Up	Alt+Up	
	Move Line(s) Down	Alt+Down	
	Find / Replace	N F3	Find ( Deplace
٩	Quick Search	۲۲۲ Ctrl+F	Click on ring replace.

1	36	
-	~ ~	

J Find / Replace X	
P Quick Find 🔓 Quick Replace	
Find what: txfResult	
Replace with:	
IblResult	The Find / Replace window is displayed.
Look in:	
Document •	
+ Find options	
Find Next Replace	Click on Replace All and close the window
Replace All	and close the window.

We also need to change its node type form TextField to Label.

#### Private lblResult As Label

Now we write the routine that handles the Click events of the Buttons. The Event Name for all buttons, except btnAction, is "btnEvent". The routine name for the associated click event will be btnEvent\_Click. Enter the following code:

#### Private Sub btnEvent\_MouseClicked

#### End Sub

We need to know what button raised the event. For this, we use the Sender object which is a special object that holds the object reference of the node that generated the event in the event routine.

Private Sub btnEvent_MouseClick the	To have access to the properties of the node that raised
Private btnSender As Button	event we declare a local variable
	Private btnSender As Button.
btnSender = Sender	And set btnSender = Sender.
Select btnSender.Tag	Then, to differentiate between the backspace button and
Case "BS"	the numeric buttons we use a Select / Case / End Select
Case Else	structure and use the Tag property of the buttons.
End Select	Remember, when we added the different buttons we
End Sub	set their Tag property to BS, 0, 1, 2 etc.
Select btnSender.Tag	Select sets the variable to test.
Case "BS"	Checks if it is the button with the "BS" tag value.
Case Else	Handles all the other buttons.

Now we add the code for the numeric buttons. We want to add the value of the button to the text in the lblResult Label.

```
Select btnSender.Tag
Case "BS"
Case Else
    lblResult.Text = lblResult.Text & btnSender.Text
End Select
End Sub
```

This is done in this line lblResult.Text = lblResult.Text & btnSender.Text

The "&" character means concatenation, so we just append to the already existing text the value of the Text property of the button that raised the event.

```
Now we add the code for the BackSpace button.
   Select btnSender.Tag
   Case "BS"
        If lblResult.Text.Length > 0 Then
            lblResult.Text = lblResult.Text.SubString2(0, lblResult.Text.Length - 1)
        End If
   Case Else
        lblResult.Text = lblResult.Text & btnSender.Text
   End Select
End Sub
```

When clicking on the BS button we must remove the last character from the existing text in lblResult. However, this is only valid if the length of the text is bigger than 0. This is checked with: If lblResult.Text.Length > 0 Then

```
To remove the last character, we use the SubString2 function.
lblResult.Text = lblResult.Text.SubString2(0, lblResult.Text.Length - 1)
```

SubString2(BeginIndex, EndIndex) extracts a new string beginning at BeginIndex (inclusive) until EndIndex (exclusive).

```
Now the whole routine is finished.
Private Sub btnEvent_MouseClicked (EventData As MouseEvent)
Private btnSender As Button
btnSender = Sender
Select btnSender.Tag
Case "BS"
    If lblResult.Text.Length >0 Then
        lblResult.Text = lblResult.Text.SubString2(0,lblResult.Text.Length - 1)
    End If
Case Else
    lblResult.Text = lblResult.Text & btnSender.Text
End Select
In Sub btnAction_MouseClicked we add, at the end, lblResult.Text = "" to clear the text.
```

```
In sub_bthAction_HouseClicked we add, at the end, ibiResult.text = _____to clear the text
Else
     New
     bthAction.Text = "0 K"
     lblResult.Text = ""
End If
End Sub
```

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We can try to improve the user interface of the program by adding some colors to the lblComments Label.

Let us set:

- Yellow for a new problem

- Light Green for a GOOD answer

- Light Red for a WRONG answer.

We first modify the New routine, where we add this line CSSUtils.SetBackgroundColor(lblComments, fx.Colors.RGB(255,235,128)) We need to use the CSSUtils library for that! See next page how to add a library.

```
Private Sub New
Number1 = Rnd(1, 10)
' Generates a random number between 1 and 9
Number2 = Rnd(1, 10)
' Generates a random number between 1 and 9
lblNumber1.Text = Number1
' Displays Number1 in label lblNumber1
lblNumber2.Text = Number2
' Displays Number2 in label lblNumber2
lblComments.Text = "Enter the result" & CRLF & "and click on OK"
CSSUtils.SetBackgroundColor(lblComments, fx.Colors.RGB(255,235,128))' yellow color
lblResult.Text = ""
' Sets lblResult.Text to empty
End Sub
```

And in the CheckResult routine we add the two lines with CSSUtils.SetBackgroundColor...

```
Private Sub CheckResult

If lblResult.Text = Number1 + Number2 Then
    CSSUtils.SetBackgroundColor(lblComments, fx.Colors.RGB(128,255,128)) ' light green color
    lblComments.Text = "G 0 0 D result" & CRLF & "Click on NEW"
    lblComments.Style = "-fx-background-color: palgreen;" ' palegreen color
    btnAction.Text = "N E W"
Else
    CSSUtils.SetBackgroundColor(lblComments, fx.Colors.RGB(255,128,128)) ' light red color
    lblComments.Text = "W R 0 N G result" & CRLF & "Enter a new result" & CRLF & "and click 0K"
End If
End Sub
```

And we give the program a more meaningful title by adding MainForm.Title = "Calc Trainer" in AppStart just after MainForm.Show.



Add the CSSUtils library to the project.



The libraries are ordered by alphabetic order.

The use of libraries is detailed in the Libraries chapter.

Another improvement would be to hide the '0' button to avoid entering a leading '0'. For this, we hide the button in the New subroutine with line btn0.Visible = False.

```
Private Sub New
  Number1 = Rnd(1, 10)
                                ' Generates a random number between 1 and 9
  Number2 = Rnd(1, 10)
                               ' Generates a random number between 1 and 9
                                ' Displays Number1 in label lblNumber1
  lblNumber1.Text = Number1
                            ' Displays Number2 in label lblNumber2
  lblNumber2.Text = Number2
  lblComments.Text = "Enter the result" & CRLF & "and click on OK"
  lblComments.Color = Colors.RGB(255,235,128)
                                                   ' yellow color
  lblResult.Text = ""
                                ' Sets lblResult.Text to empty
  btn0.Visible = False
End Sub
```

```
We see that btn0 is in red, this means that this object is not recognized by the IDE.
btn0.Visible = False
```

```
So we must declare it, by adding btn0 into line 9:
Private btnAction, btn0 As Button
```

```
Now btn0 is no more in red.
btn0.Visible = False
```

In addition, in the btnEvent\_MouseClicked subroutine, we hide the button if the length of the text in lblResult is equal to zero and show it if the length is greater than zero.

```
Private Sub btnEvent MouseClicked (EventData As MouseEvent)
  Dim btnSender As Button
  btnSender = Sender
  Select btnSender.Tag
  Case "BS"
     If lblResult.Text.Length > 0 Then
       lblResult.Text = lblResult.Text.SubString2(0,lblResult.Text.Length - 1)
     End If
  Case Else
     lblResult.Text = lblResult.Text & Send.Tag
  End Select
  If lblResult.Text.Length = 0 Then
     btn0.Visible = False
  Flse
     btn0.Visible = True
  End If
End Sub
```

# 5 Getting started B4R

B4R - The simplest way to develop native, powerful Arduino programs.

B4R follows the same concepts of the other B4X tools (B4A, B4i, B4J), providing a simple and powerful development tool.

Compiled apps run on Arduino compatible boards.

### 5.1 Installing Arduino IDE

B4R needs the installation of Arduino IDE version 1.6.7+.

Download Arduino IDE from this link: https://www.arduino.cc/en/Main/Software and install it.

You should not install Arduino 1.6.12 because there is a bug.

You should not install Arduino from this site: http://www.arduino.org/downloads It wont work.

### 5.2 Install Microsoft .Net Framework

On most computers Microsoft .Net Framework is already preinstalled.

If it is not the case, you must install either:

- <u>.Net Framework 4.5.2</u> for Windows Vista +
- <u>.Net Framework 4.0</u> for Windows XP

## 5.3 Install and configure B4R

- Download and install B4R.
- Open B4R.
- Choose Tools menu Configure Paths.

Tools		Windows	Help		
IDE Options					
	Board Selector				
	С	lean project	Ctrl+P		
	Configure Paths		is		
2	С	olor Picker	<i>N</i>		

R Paths Configuration ×				
Arduino.exe	C:\Program Files (x86)\Arduino\arduino.exe			
Additional Libraries	D:\B4R\AdditionalLibraries			
	(optional) A folder where libraries will be searched for, in addition to the internal libraries folder.			
Shared Modules	D:\B4R\SharedModules	Browse		
	(optional) A folder where code modules will be searched for, in addition to the project folder.			
	Cancel Ok			

- Use the Browse button to locate "arduino.exe". The path will depend on where you installed the Arduino IDE.

It is recommended to create a specific folder for Additional Libraries. B4R utilizes two types of libraries:

- Standard libraries, which come with B4R and are located in the Libraries folder of B4R.
  - These libraries are automatically updated when you install a new version of B4R.
- Additional libraries, which are not part of B4R, should be saved in a specific folder different from the standard libraries folder.
   More details in Chapter Additional libraries folder.

You may also define a special folder for Shared Modules.

A same Code Module can be shared between different projects without the need to load it in the project folder.

# 5.4 Connecting a board

When you connect a board to the PC with the USB cable Windows will load the driver and display the Serial port used.

## 5.5 Select a Board

Run B4R.

Tools	Windows Help		
I	DE Options	•	
	Board Selector		Click on Board Selector.
(	Clean project Ctri+1	)	
(	Configure Paths		The window below will be displayed
4	Color Picker		The window below will be displayed.

R Board Selector		×
Board Type:	Arduino/Genuino Uno	•
Serial Port:	COM7 Arduino Uno	Refresh
Baud Rate:	115200	•
Logs:	● IDE ○ B4J Serial Connector ○ None	
	Cancel	OK

Select the Board Type in the drop down list. Select the Serial Port and select the Baud Rate.

If only one board is connected it will automatically be recognized.

You will see only boards which are connected.

Depending on the board type several other properties can be set.

R Board Selector		×
Board Type:	WeMos D1 R2 & mini	•
CpuFrequency	160	•
FlashSize	4M3M	•
UploadSpeed	921600	•
Serial Port:	COM47	▼ Refresh
Baud Rate:	115200	•
Logs:	● IDE ○ B4J Serial Connector ○ None	
		Cancel OK
In this chapter I will explain some basic functions of the Arduino UNO board which may be useful for beginners.

The Arduino UNO board is the basic board of the Arduino family.

There exist other more advanced boards.

- Arduino DUE •
- Arduino MEGA
- Arduino MICRO
- see Compare board specs. etc.

Additional boards called 'Shields' can be clipped onto the Arduino boards.

- Arduino Wi-Fi Shield 101 •
- Arduino Ethernet Shield
- etc.

# The Arduino UNO:

The source of the information in this chapter is a summary from the Arduino site.



Digital Input / Output pins

Power pins Analog Input pins

# 5.6.1 Power supply

The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V).

Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board (see the pins below). We don't advise it.

# 5.6.2 Pins

The Arduino UNO has 3 pin sockets:

- Power pins.
- Digital Input / Output pins.
- Analog Input pins.

# 5.6.3 Power pins

The Power pins are:

- **GND** Power ground, 2 pins.
- VIN Power supply input.
- The input voltage to the Uno board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin. Voltage 7 12 V.
- **5V** 5 Volt reference voltage. **Don't provide the power to this pin!** This pin outputs a regulated 5V from the regulator on the board.
- **3.3V** 3.3 Volt reference voltage. **Don't provide the power to this pin!** A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

# • RESET

Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

## • IOREF

This pin on the Uno board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.

## 5.6.3.1 Digital Input / Output pins

Each of the 14 digital pins on the Uno can be used as an input or output, using the *pinMode* method, *DigitalRead* and *DigitalWrite* functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller.

In addition, some pins have specialized functions:

- Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- PWM: ~3, ~5, ~6, ~9, ~10, and ~11. These numbers have this "~" prefix. They can provide 8-bit PWM (<u>Pulse Width Modulation</u>) outputs with the *AnalogWrite* function allowing to modulate the brightness of a LED (Light Emitting Diode) or run DC motors at different speeds.
   A value of 0 means always OFE and 255 means always ON

A value of 0 means always OFF and 255 means always ON.

Usage:

pinTest3.AnalogWrite(Value As UInt)

pinTest3.AnalogWrite(196)

After *AnalogWrite* the pin will generate a steady square wave of the specified duty cycle until the next call to *AnalogWrite* (or a call to *DigitalRead* or *DigitalWrite* on the same pin). The frequency of the PWM signal on most pins is approximately 490 Hz. On the Uno and similar boards, pins 5 and 6 have a frequency of approximately 980 Hz. Pins 3 and 11 on the Leonardo also run at 980 Hz.

• LED 13: There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

## 5.6.3.2 Analog input pins

The Arduino UNO has 6 Analog input pins A0 to A5 with 10 bit analog to digital converters (0 to 1023 resolution).

The reference voltage is 5 Volt allowing a resolution of 4.9 mV per unit.

While the main function of the analog pins for most Arduino users is to read analog sensors, the analog pins also have all the functionality of general purpose input/output (GPIO) pins (the same as digital pins 0 - 13).

## 5.6.4 Input modes INPUT / INPUT\_PULLUP

If you have your pin configured as an INPUT, and are reading a switch, when the switch is in the open state the input pin will be "floating", resulting in unpredictable results. In order to assure a proper reading when the switch is open, a pull-up or pull-down resistor must be used. The purpose of this resistor is to pull the pin to a known state when the switch is open. A 10 K ohm resistor is usually chosen, as it is a low enough value to reliably prevent a floating input, and at the same time a high enough value to not draw too much current when the switch is closed.

The INPUT\_PULLUP mode adds an internal pull up resistor no need to add one externally.

With a pull up resistor the pin returns False when the switch is closed because it sets the input to 0 Volt.

5.6.5 Basic Pin functions

### 5.6.5.1 Initialize

Initializes a pin.

Pin.Initialize(Pin As Byte, Mode As Byte)

**Pin** is the pin number.

- 0, 1, 2, 3 etc. for digital pins
- Pin.A0, Pin.A1, Pin.A2 etc. for analog pins.

Mode is one of the three connection modes:

- MODE\_INPUT
- MODE\_INPUT\_PULLUP adds an internal pull up resistor.
- MODE\_OUTPUT

Example1: Initialize digital pin 3 as input. Private pinTest1 As Pin pinTest1.Initialize(3, pinTest1.MODE\_INPUT)

Example2: Initialize digital pin 3 as input with pull up resistor. Private pinTest2 As Pin pinTest2.Initialize(3, pinTest2.MODE INPUT PULLUP)

Example3: Initialize digital pin 3 as output. Private pinTest3 As Pin pinTest3.Initialize(3, pinTest3.MODE\_OUTPUT)

Example4: Initialize analog pin 3 as input. Private pinTest4 As Pin pinTest4.Initialize(pinTest4.A4, pinTest4.MODE\_INPUT)

The analog pins, on the Arduino UNO, can also be accessed with numbers, like: pinTest4.Initialize(18, pinTest4.MODE\_INPUT)

 $\begin{array}{l} {\rm Pin.A0} = 14 \\ {\rm Pin.A1} = 15 \\ {\rm Pin.A2} = 16 \\ {\rm Pin.A3} = 17 \\ {\rm Pin.A4} = 18 \\ {\rm Pin.A5} = 19 \end{array}$ 

Initializing an analog pin as output works like a digital output pin.

### 5.6.5.2 DigitalRead

Reads the current digital value of a pin. The return value is True or False.

Pin.DigitalRead returns a Boolean.

There are two input modes depending on the input signal.

- Pin.MODE\_INPUT
- Pin. MODE\_INPUT\_PULLUP adds an internal pullup resistor for use with a switch.

Example:

```
Private pinTest1 As Pin
pinTest1.Initialize(3, pinTest.MODE_INPUT)
```

Private Value As Boolean Value = pinTest1.DigitalRead

The Arduino uses internally 0 and 1 for a boolean variable. Log("State: ", Value) Will write either 0 for False or 1 for True in the Logs. In the code you can use False and True.

### 5.6.5.3 DigitalWrite

Writes a Boolean value to the given pin. It can be used for all digital pins and also all analog pins.

Pin.DigitalWrite (Value As Boolean)

Example:

```
Private pinTest3 As Pin
pinTest3.Initialize(3, pinTest3.MODE_OUTPUT)
```

```
pinTest3.DigitalWrite(True) directly with the value.
pinTest3.DigitalWrite(Value) with a variable.
```

### 5.6.5.4 AnalogRead

AnalogRead reads the current value of an analog pin. The return value is an UInt with values between 0 and 1023 (10 bits). The reference voltage is 5V.

```
Example:
Private pinPot As Pin
pinPot.Initialize(pinPot.A4, pinPot.MODE_INPUT)
```

```
Private Value As UInt
Value = pinPot.AnalogRead
```

### 5.6.5.5 AnalogWrite

AnalogWrite writes a Byte value to the given pin. AnalogWrite has nothing to do with the analog pins nor with AnalogRead.

AnalogWrite can only be used on the digital pins  $\sim 3$ ,  $\sim 5$ ,  $\sim 6$ ,  $\sim 9$ ,  $\sim 10$ , and  $\sim 11$  on the Arduino UNO, the pins with the  $\sim$  prefix.

### Pin.AnalogWrite (Value As UInt)

Example: we use digital pin ~3 which allows PWM.

```
Private pinTest3 As Pin
pinTest3.Initialize(3, pinTest3.MODE_OUTPUT)
```

pinTest3.AnalogWrite(145) directly with the value. pinTest3.AnalogWrite(Value) with a variable, Value must be a UInt variable.

## 5.7 First example programs

All the projects were realized with the Arduino Starter Kit.

The diagrams for the projects were realized with the Fritzing software.

When we run the IDE we get the default code like below. The #Region Project Attributes is normally collapsed; these attributes are explained in the <u>Code header Project Attributes</u> chapter.

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```
#Region Project Attributes
  #AutoFlushLogs: True
  #CheckArrayBounds: True
  #StackBufferSize: 300
#End Region
Sub Process Globals
   'These global variables will be declared once when the application starts.
   'Public variables can be accessed from all modules.
  Public Serial1 As Serial
End Sub
Private Sub AppStart
  Serial1.Initialize(115200)
  Log("AppStart")
End Sub
Public Serial1 As Serial
                                 Defines the serial interface with the computer.
                                 Initializes the serial port with a Baud rate of 115200 Hertz.
Serial1.Initialize(115200)
                                 Shows AppStart in the Logs when the program starts.
Log("AppStart")
```

All the projects were realized with the Arduino Starter Kit.

The sketches for the projects were realized with the Fritzing software.

# 5.7.1 Button.b4r

Let us write our first program.

It's similar to Erels Button example from the forum. It uses a pushbutton switch and the Led 13 on the Arduino UNO board.

The project Button.b4r is available in the SourceCode folder.

- Open B4R.
- Save the project as Button in a folder with the name Button.
- Build the board with the pushbutton and the wires.
- Connect the Arduino to the PC.
- Write the code.
- Run the program.

# 5.7.1.1 Sketch



Material:

• 1 pushbutton switch

Connect one Arduino **GND** (ground) pin to the ground **GND** line of the breadboard. Then connect one pin of the pushbutton switch to the ground line.

And connect the other pin of the pushbutton to pin **A5** of the Arduino analog pins.

We could have connected the first pin of the pushbutton directly to the **GDN** pin of the Arduino, but the connection in the image is ready for the next examples.

We could also have used one of the digital pins instead of the analog pin.

5.7.1.2 Code

```
Sub Process_Globals

Public Serial1 As Serial

Private pinButton As Pin 'pin for the button

Private pinLED13 As Pin 'pin for LED 13 on the Arduino

End Sub
```

We declare the pins for the pushbutton and the on board Led 13.

```
Private Sub AppStart
Serial1.Initialize(115200)
Log("AppStart")
pinButton.Initialize(pinButton.A5, pinButton.MODE_INPUT_PULLUP)
'Using the internal pull up resistor to prevent the pin from floating.
pinButton.AddListener("pinButton_StateChanged")
pinLED13.Initialize(13, pinLED13.MODE_OUTPUT)
End Sub
```

We initialize pinButton, as the analog pin A5, with pinButton.A5 and set the input mode to pinButton.MODE\_INPUT\_PULLUP. We need a pullup resistor to prevent the pin from floating, MODE\_INPUT\_PULLUP connects an internal pull up resistor.

We add pinButton.AddListener("pinButton\_StateChanged"), to generate a StateChanged event when the state of pin pinButton changes which means that the pushbutton is pressed or released.

We initialize pinLED13, as the onboard Led as digital pin 13 and set the output mode to pinLED13.MODE\_OUTPUT.

```
Sub pinButton_StateChanged (State As Boolean)
Log("State: ", State)
'state will be False when the button is clicked because of the PULLUP mode.
pinLED13.DigitalWrite(Not(State))
End Sub
```

We add a Log, Log("State: ", State), to display the state in the Logs.

We write the State to the digital output of the on board led, pinLED13.DigitalWrite(Not(State)).

We write Not(State) because State will be False when the pushbutton is pressed because of the PULLUP mode.

Click on **b** or press F5 to run the code.

When you press the pushbutton, led 13 on the Arduino UNO will be ON and when you release the pushbutton led 13 will be OFF.

# 5.7.2 LedGreen.b4r

For this project we use a copy of the Button project.

Create a new LedGreen folder, copy the files of the Button project and rename the Button.xxx files to LedGreen.xxx.

We add a green Led which can be switched on and off with the button from the first example.

The project LedGreen.b4r is available in the SourceCode folder.

# 5.7.2.1 Sketch



Material:

- 1 pushbutton switch
- 1 green LED
- $1\ 220\ \Omega$  resistor

We keep the mounting of the pushbutton switch from the first example.

One pin on the **GND** line of the breadboard. The other pin to digital pin **7** on the Arduino.

### And we

- Add a green Led on the breadboard.
- Connect the cathode (-) via a 220  $\Omega$  resistor to the ground **GND** line of the breadboard.
- Connect the anode (+) to digital pin 7.

5.7.2.2 Code

```
Sub Process_Globals

Public Serial1 As Serial

Private pinButton As Pin 'pin for the button

Private pinLEDGreen As Pin 'pin for the green Led

Private LightOn = False As Boolean

End Sub
```

We keep the definition of pinButton.

```
We change the definition
Private pinLED13 As Pin
to
Private pinLEDGreen As Pin
for the green Led
```

We add a global boolean variable LightOn which is True when the light is ON.

```
Private Sub AppStart
Serial1.Initialize(115200)
pinButton.Initialize(pinButton.A5, pinButton.MODE_INPUT_PULLUP)
'Using the internal pull up resistor to prevent the pin from floating.
pinButton.AddListener("pinButton_StateChanged")
pinLEDGreen.Initialize(7, pinLEDGreen.MODE_OUTPUT)
End Sub
```

We leave the code for pinButton.

We initialize pinLEDGreen as digital pin 7 and set the output mode to pinLEDGreen.MODE\_OUTPUT.

```
Private Sub pinButton_StateChanged (State As Boolean)
    If State = False Then 'remember, False means button pressed.
    LightOn = Not(LightOn)
    pinLEDGreen.DigitalWrite(LightOn)
    End If
End Sub
```

Every time State is False, pushbutton pressed, we change the variable LightOn and write it to pinLEDGreen.

## 5.7.3 LedGreenNoSwitchBounce.b4r

For this proejct we use exactly the same circuit as LedGreen.b4r.

The only difference is in the code.

The project LedGreenNoSwitchBounce.b4r is available in the SourceCode folder.

The pushbutton switch we use in our projects has a problem called bouncing. The signal of a mecanical switch is not clean, the switch has several bounces which are interpreted by the the digital inputs as several state changes. If we have an even number of state changes it is similar to having done nothing.

But we want only one state change per button press.

Image of switch bouncing (<u>source Wikipedia</u>):



The switch bounces between on and off several times before settling.

To solve this problem we don't react in the pinButton\_StateChanged routine on state changes within a given time.

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## 5.7.3.1 Sketch



Material:

- 1 pushbutton switch
- 1 green LED
- 1 220 Ω resistor

We keep the mounting of the pushbutton switch from the first example. One pin on the **GND** line of the breadboard. The other pin to digital pin **7** on the Arduino.

And we

- Add a green Led on the breadboard.
- Connect the cathode (-) via a 220  $\Omega$  resistor to the ground **GND** line of the breadboard.
- Connect the anode (+) to digital pin 7.

## 5.7.3.2 Code

The code is almost the same as LedGreen.b4r.

```
Sub Process_Globals

Public Serial1 As Serial

Private pinButton As Pin

Private pinLEDGreen As Pin

Private LightOn = False As Boolean

Private BounceTime As ULong

Private BounceDelay = 10 As ULong

End Sub
```

We add two new variables:  ${\tt BounceTime}\xspace$  and  ${\tt BounceDelay}\xspace$ 

```
Private Sub AppStart
Serial1.Initialize(115200)
  'Using the internal pull up resistor to prevent the pin from floating.
    pinButton.Initialize(pinButton.A5, pinButton.MODE_INPUT_PULLUP)
    pinButton.AddListener("pinButton_StateChanged")
    pinLEDGreen.Initialize(7, pinLEDGreen.MODE_OUTPUT)
End Sub
```

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Same as LedGreen.b4r

New pinButton\_StateChanged routine:

Every time State is False, pushbutton pressed:

- We check if the time between the current state change and the first state change. If the time is shorter than BounceDelay, which means a bounce, we do nothing. If the time is longer than BounceDelay, which means a real state change, we execute the code.
- We change the variable LightOn and write it to pinLEDGreen.
- Set the new BounceTime.

#### **Help tools** 6

To find answers to many questions about B4A the following tools are very useful.

#### 6.1 Search function in the forum



In the upper left corner you find the searchbox for the forum. Depending on the window size it can be on the top right side.

Enter a question or any keywords and press 'Return'.

The function shows you the posts that match your request.

Example: Enter the keyword ScrollView : ScrollView



A list of the result is displayed below the search box.

Click on an item to show the thread.

## And the result:

## Search Results

Filter	Object documentation: ScrollView
B4A Tutorial (301)	DAA Likuwa [Class] Custom List/Gow A flowible list based on Carell/Gow Evel as the core
B4A Example (49)	B4A Library [Class] CustomListview - A flexible list based on Scroliview - Erei Jul 15, 2012
B4A Library (429)	the items. CustomListView is an implementation of a list based on ScrollView. CustomListViewThe
B4A Code Snippet (39)	link: 1. Dim sv As <b>ScrollView</b> = yourcustomlistview.As <b>View</b> sv.Color = ? 'insert here the same color
B4A Class (19)	used
B4A Question (8727)	link: similar to the above code. ETA : Ah, actually I forgot CustomListView is based on ScrollView - I
Java Question (214)	link: http://www.b4x.com/android/forum/threads/class-customlistview-a-flexible-list-based-
B4i Tutorial (23)	on-scrollview
B4i Library (21)	
B4i Code Snippet (9)	B4A Tutorial Creating a table view based on ScrollView - Erel Dec 17, 2010
B4i Question (373)	main <b>views</b> . The header row is made of a panel with labels. The main cells component is made of a
B4J Tutorial (27)	ScrollView with labels as the cells. You can modify the code to change the table appearance. Some
B4J Library (20)	link: I.Initialize("") ScrollView1.Initialize(100%x) I = Table.GetView(Row * NumberOfColumns +
B4J Code Snippet (3)	Col)
B4J Question (255)	link: When i click on a Row, how can i get the typed Information out of the <b>Scrollview</b> ? i want to fill
Bug? (142)	
<b>Tool</b> (13)	B4A Tutorial ScrollView examples summary - klaus Mar 27, 2011
Wish (206)	There are many <b>ScrollView</b> examples on the forum, I made a summary of them for my own use and I
Beta (10)	based on <b>ScrollView</b> with separation lines it is a <b>ScrollView</b> http://www.basic4ppc.com/android

On the left you have a list of forums which you can filter.

Click on the title to show the selected post.

# 6.2 B4x Help Viewer

This program shows xml help files. It was originally written by Andrew Graham (agrham) for B4A. I modified it, with Andrews' agreement, to show B4A, B4J, B4i and B4R xml help files.

The program can be <u>downloaded</u> from the forum.

C\\Program Files (x86)\\Anywhere Software\B4A\V6_30\Libraries\core.xml	-		$\times$
Activity V ACTION_DOWN (F) V Libraries Addnl. ? J B <sub>VA</sub> 💮 🍎 💿 B4A 🔿 B4i	⊖ B4J	⊖ <b>B</b> 4	R
Basic4Android / Basic4iOS / Basic4Java Library Help version 3.0			
Press the browse button and select the XML file describing the library you want to explore. The 'Libraries' and 'Addnl' buttons both remember their last path. The 'Libraries' and 'Addnl' paths are set automatically on startup if possible.			
On selecting a library the library description in the xml, if any, will be displayed. On selecting an object the object description in the xml, if any, will be displayed.			
The XML file for the Basic4Android language is Core.xml and is located in the Libraries folder. Core.xml is loaded on startup if it can be located.			
The Basic4Android language keywords are displayed under 'KEYWORDS' in Core.xml. The Basic4Android string keywords are displayed under 'String' in Core.xml.			
Press the '?' button to search the loaded XML file for events, fields, methods or properties. Press the '↓' button to iconise this application to the system tray, click the icon to restore it. Press the 'B4A' Android button to go to the Basic4android web forum page. Press the green Android button to get web help for Android packages. Press the 'Apple' Android button to get web help for iOS packages.			
Select the product you want the help for.			

constants

# On top we find:

Activity ~ ACTION_DOV	VN (	F) V Libraries Addnl	. ? 📘 🧠 📫 🍏 🖲 B4A 🔿 B4i 🔿 B4J 🔿 B4R
C:\Program Files (x86)\Anywhe	re	Software\B4A\V6_30\Libraries\cor	
Activity	~	ACTION_DOWN (F)	
Activity	^		In the upper left corner a drop down
AutoCompleteEditText		defined Activity object.	list shows the different objects
B4AApplication		your application.	included in the selected library.
Bit		cle related event: Activity_Creat	
Bitmap		on about activities and processe	
BitmapDrawable		<u>vities-life-cycle.html</u> .	
Button		I	

+0	C·\Program	Files	(x86)	Anywhere	Software	R44\V6	30\Libraries	core yml
•	C. (Floglan	11162	(100)	Anywhere	Soltware	UTA VU	JUTINIAILES	(core.xiiii

Activity ~	ACTION_DOWN (F)	~	Besides the objects list
Each activity module include a pred Activity is the main component of y Activities have three special life cyd See this tutorial for more information tutorials/6487-android-process-activity You can add and remove views to t	ACTION_DOWN (F) ACTION_MOVE (F) ACTION_UP (F) ActionBarHomeClick (E) AddMenuItem (M) AddMenuItem2 (M) AddMenuItem3 (M) AddView (M)	^	<ul> <li>you find another drop down list with the</li> <li>methods(M)</li> <li>events(E)</li> <li>properties(P)</li> <li>fields(F) consta for the selected object.</li> </ul>
You can also load a layout file with	Background (P)		for the selected object

Libraries	Select the standard library to display.
Addnl.	Select the additional library to display.
?	Search engine to find the object for a given keyword.
↓	Closes B4AHelp
B <sub>40</sub>	Launches the forum 'Online Community'.
-	Launches the Android Developers site.
Ú	Launches the iOS developer's site.
O B4A	B4A help files.
B4i     B4i	B4i help files.
⊖ B4J	B4J help files.
⊖ B4R	B4R help files.

# 6 Help Tools

Libraries

Standard libraries

Select Basic4Android XML file					×
← → × ↑ 📙 « Anywhere So	ftware > B4A > V6_30 > Libraries	~ Ū	Rechercher da	ans : Libraries	Q
Organiser 👻 Nouveau dossier				☷ ▾ 🔟	?
✓ Anywhere Software	^ Nom ^	Modifie	e le	Туре	^
✓ <mark>B</mark> 4A	Accessibility.xml	21.09.20	)16 15:23	Document XML	
> 📙 Trial	Administrator.xml	21.09.20	)16 15:23	Document XML	
> V5_80	Animation.xml	21.09.20	016 15:23	Document XML	
> V6 000	🗋 Audio.xml	21.09.20	)16 15:23	Document XML	
> V6.00	B4XEncryption.xml	21.09.20	016 15:23	Document XML	
× 002	Camera.xml	21.09.20	)16 15:23	Document XML	
V6_002	ContentResolver.xml	21.09.20	016 15:23	Document XML	
V6_30	Core.xml	21.09.20	016 15:23	Document XML	
Libraries	DateUtils.xml	21.09.20	016 15:23	Document XML	
Themes	Daydream.xml	21.09.20	016 15:23	Document XML	
> V6_301	GameView.xml	21.09.20	)16 15:23	Document XML	
> 📙 B4i	GPS.xml	21.09.20	)16 15:23	Document XML	~
DAI	v <				>
Nom du fichier :		~	XML files (*.x	ml)	$\sim$
			Ouvrir	Annuler	
					.::
Select the library to display a	and click on Ouvrir (Open).				
Here 🦳 « Anywhere Software	> B4A > V6_30 > Libraries	v Ū	you can se	elect the direc	ctory
where the standard libraries a	are saved.	-			5

Once selected the directory is saved for the next start of the program.

# 6 Help Tools

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## Addnl.

Additional libraries.

The same also for the additional libraries.

🚏 Select Basic4Android XML file				×	
← → × ↑ <mark> </mark> > CePC > [	)ata (	D:) > B4A > AdditionalLibraries	✓ ♂ Recherche	er dans : AdditionalL 🔎	
Organiser 👻 Nouveau dossier				E 🕶 🔲 💡	
✓ B4A	^	Nom	Modifié le	Туре	^
AdditionalLibraries		ABExtDrawing.xml	08.08.2012 16:25	Document XML	
> 📙 B4A_BLE		ABPhysicsEngine.xml	26.07.2011 11:32	Document XML	
> 📙 B4A_Chat		ABWifi.xml	12.09.2011 10:11	Document XML	
> 📙 B4xHelp		ABZipUnzip.xml	23.12.2010 13:53	Document XML	
Co DC A Data (Dr)					
Here Here	) >	B4A > AdditionalLibraries	you ca	n select the	
directory for the additional	libr	aries.	-		

## 6 Help Tools

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Search engine for the selected library	/.			
Search for Object, Event, Field, Method or Property		×		
Enter the object or member to search for. The search is partial and case-insensitive.	Ar	OK nnuler	Example: Selected library: Enter <i>DrawRect</i>	Core
DrawRect				
Found 2 items Canvas - DrawRect (M) Canvas - DrawRectRotated (M)		And We g	the result. get the object Canvas a	nd two methods.
ΟΚ				



Click on an item in the list to show its help.

ОΚ Click on to leave the search result list.

# 6.3 Help documentation - B4A Object Browser

This is also a standalone Windows program showing the help files of libraries.

It has been written by Vader and can be downloaded here.

A pdf documentation on how to use the program is part of the download.

Fichier Voir Outils Aide   Image: Voir Outils Aide   Image: Voir Outils Evénements   Autorisations Autorisations   Image: Voir Evénements Autorisations   Image: Voir Image: Voir Image: Voir   Nom cout List Vew   Propriétaire activity     Classes Méthodes, Propriétés, Champs     Output: Stream <ul> <li>AddSingleLine2</li> <li>AddSingleLine2</li> <li>AddSingleLine2</li> <li>AddSingleLine2</li> <li>AddSingleLine2</li> <li>AddSingleLine3</li> <li>AddSingleLine4</li> </ul> AddSingleLine <ul> <li>Type</li> <li>methode</li> <li>Panel</li> </ul> Image: List/Wew <ul> <li>Image: List/Wew</li> <li>Image: List/Web</li> <li>Image: List/Web</li> <li>Image: List/Web</li> <li>Image: List/Web</li> <li>Image: List/Web</li> <li>Image: List/Web</li> </ul>	🔁 Explorateur d'objets B4a		_ 🗆 🗙		
Image New Very Proprietar       Image New Very Very Very Very Very Very Very Very	Fichier Voir Outils Aide	2			
CRechercher>       Image New         Détails de classe       Autorisations         Annotation       Valeur         Encopsule l'objet       Simple List Vew         Nom       List Vew/Wrapper         Nom cout       List Vew         Propriétaire       activity         Classes       Méthodes, Propriétés, Champs         Classes       Méthodes, Propriétés, Champs         Classes       Méthodes, Propriétés, Champs         Add SingleLine       Add SingleLine         Add TwoLinesAndBitmap       Add TwoLinesAndBitmap         Add TwoLinesAndBitmap       Add TwoLinesAndBitmap         Add TwoLinesAndBitmap       Add SingleLine         Map       Background       Bing ToFrort         Matcher       Standard       AddSingleLine         Matcher       Read Bitmap       AddSingleLine         Map       Background       Standard         AddSingleLine       AddSingleLine       MediaPlayer         Notification       AddSingleLine       MediaPlayer         Read Bittion       Add SingleLine       MediaPlayer         Read Netwer       Scoil/Vew       List Vew 1 AddSingleLine ("Sunday")       Imathematication         Scoil/Vew       Scoil/Vew       List Ve	9 🖬 🗎 🗐 🖓 🌐 🕇				
Détails de classe       Autorisations         Annotation       Valeur         Encapsule l'objet       Simple List View         Nom       List View         Nom cout       List View         Propriétaire       activity         Classes       Méthodes, Propriétés, Champs         Classes       Méthodes, Propriétés, Champs         Classes       Méthodes, Propriétés, Champs         Add SingleLine 2       Add SingleLine 2         Add TwoLiness       Add TwoLiness         Input Siream       Add TwoLinesAndBitmap         Add TwoLinesAndBitmap       Add TwoLinesAndBitmap         Add TwoLinesAndBitmap       Add TwoLinesAndBitmap         Add TwoLinesAndBitmap       Add TwoLinesAndBitmap         Map       Background         Matcher       Standard         Matcher       Standard         AddSingleLine       AddSingleLine         Map       AddSingleLine         AddSingleLine       AddSingleLine         AddSingleLine       AddSingleLine         PropressBar       AddSingleLine         Parel       Parel         Parel       Add SingleLine         PropressBar       AddSingleLine ("Sunday")         ListVev 1.AddS	<rechercher></rechercher>		۵		
Annotation       Valeur       Automations         Encapsule l'objet       Simple List Vew       ItemClock (Postion As Int, Value As Object)       ItemClock (Postion As Int, Value As Object)         Nom       List Vew Wrapper       Methodes, Propriétés, Champs         Classes         Méthodes, Propriétés, Champs             AddSingleLine             AddTwoLines2             AddTwoLinesAndBitmap2 <td <="" <td="" colspan="2" td=""><td>Détails de classe</td><td> #</td><td></td></td>	<td>Détails de classe</td> <td> #</td> <td></td>		Détails de classe	#	
Encapsule Tobjet SmpleList Vew Nom List Vew Wrapper Nom cout List Vew Wrapper Propriétaire activity Classes Méthodes, Propriétés, Champs Classes Méthodes, Propriétés, Champs Classes Méthodes, Propriétés, Champs Classe Méthodes, Propriétés, Champs Méthodes, Proprietés, Champs Méthode, Proprietés, Champs Méthodes, Proprietés, Champs Méthode, Prop	Annotation Valeur	Evenements Autonsations			
Classes     Méthodes, Propriétés, Champs            GradientDrawable HorizontalScrollV IngeView IngeView IngeView Intent Labol LayoutValues List Uist View Map Matcher Matcher Matcher Panel Panel Panel Panel RediaPlayer Notfication RediaPlayer Notfication RediaPlayer Scollview Scollview Scollview SeekBar Uist View - Add SingleLine Matcher         SeekBar View - Add SingleLine Matcher         SeekBar View - Add SingleLine Matcher         SeekBar         View - Add SingleLine	Encapsule l'objet Simple List View Nom List View Wrapp Nom court List View Propriétaire activity	ItemLongClick (Position As Int, Value As Object)			
Gradient Drawable Horizontal Scroll Vi hurdt Stream Add Single Line Add Single Line Add Two Lines A Add Two Lines A Add Two Lines A Add Two Lines A Add Two Lines And Bitmap A Add Single Line Add Sin	Classes	Méthodes, Propriétés, Champs			
	GradientDrawable HorizontalScrollVi HorizontalScrollVi HorizontalScrollVi LimageView InputStream Label LavoutValues List List ListView Map Matcher MediaPlayer Notification OutputStream Panel Path ProgressBar RadioButton Rect RadioButton Rect ScrollView ScrollView	AddSingleLine AddSingleLine AddTwoLines AddTwoLines2 AddTwoLinesAndBitmap AddTwoLinesAndBitmap AddTwoLinesAndBitmap2 Background AddTwoLinesAndBitmap2 Clear Clear Clear Color Standard AddSingleLine Type méthode Description Adds a single line item. Example: ListView1.AddSingleLine("Sunday")			

6.4 Useful links

## 6.4.1 B4A

A useful link for layout graphics. <u>Android cheat sheet for graphic designers</u>

Android Developers. Design Develop Distribute

Android Developers searching for any request.



In the upper right corner you find the search field.

Enter *View* in the field:

# **Results for View**

All	View   Android Developers
Design	zero-sized View that can be used to lazily inflate layout
Training	developer.android.com/reference/android/view/View.html
Guides	Avec libellé <u>Reference</u>

Click on the link View | Android Developers.

And you get all the information about Views.



# 6.4.2 B4i

iOS developers:

# 6.4.3 B4J

# 6.4.4 B4R

## Arduino HomePages:

https://www.arduino.cc/en/Guide/HomePage

<u>Eichier Édition Affichage H</u> istorique <u>M</u> arque-pages <u>Q</u> utils <u>?</u>						-	_		$\times$
Solution → Getting Started × +									
( I https://www.arduino.cc/en/Guide/HomePage	C, C,	<b>Q</b> , Rechercher		☆	Ê	◙	ŧ	Â	≡
ΘO			Q		Ô	SIGN	I IN	Ξ	î
Getting Started with Ardui	no and	Genuino	pro	od	luc	cts			
0									

The Arduino Software (IDE) allows you to write programs and upload them to your board. In the Arduino Software page you will find two options:

- ADK

- Due - Esplora

# 6.5 Books

## B4A book

Written by Philip Brown under the pseudo Wyken Seagrave.



http://pennypress.co.uk/b4a-book/

## MagBook Build your own Android App.

Written by Nigel Whitfield.



http://www.magbooks.com/product/build-your-own-android-app/