	FACULTY OF ENGINEERING YOGYAKARTA STATE UNIVERSITY			
	LAB SHEET (ADVANCED PROGRAMMING)			
	Semester 2	Understand IDE Delphi and Program Algorithm		Classical hours 4 x 50 mins
	No. LSCP/EKO/DEL224/03	Revision : 01	Date : March, 1 2009	Page 1 of 10

1. Competency

After practicing, students will have competencies: knowing, understanding and applying IDE (Integrated Development Environment) Delphi in computer programming.

2. Sub Competencies

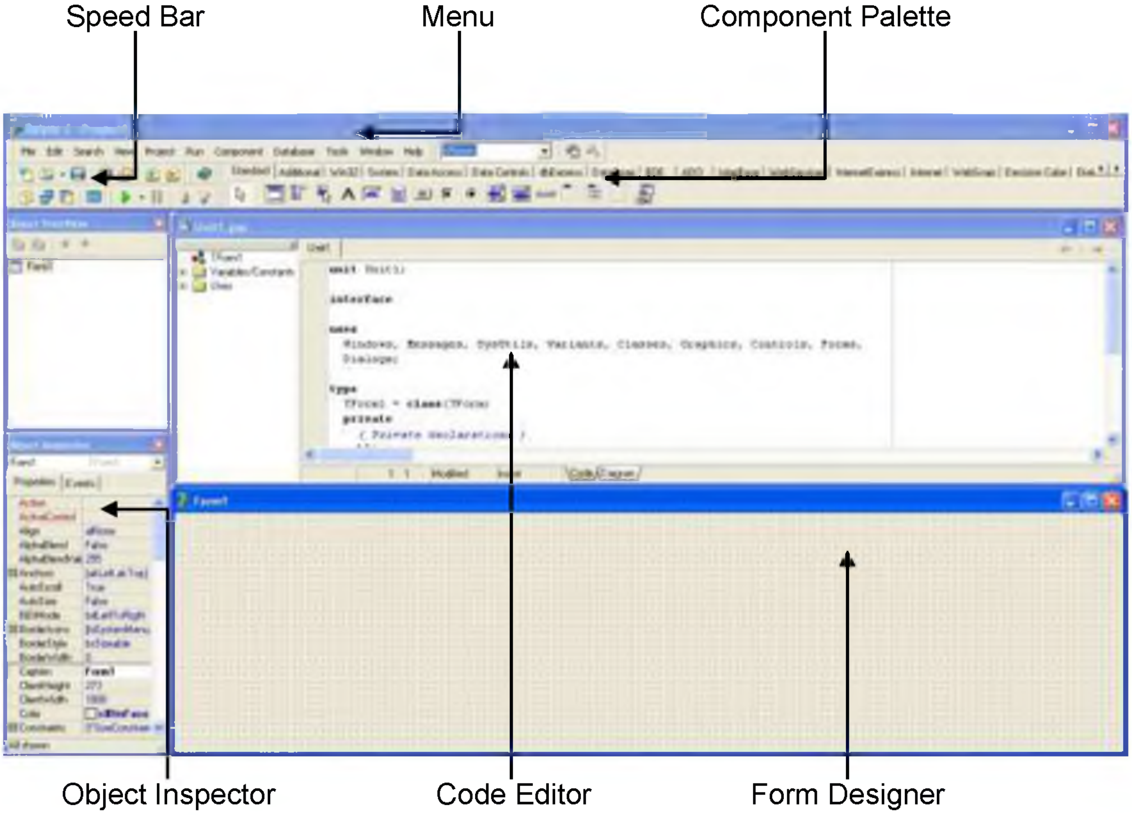
After practicing, students will have sub competencies:

a. Knowing parts of IDE Delphi.
b. Understand function and procedure of each part of IDE Delphi.
c. Applying IDE Delphi to make a simple program.

3. Introduction

3.1. Knowing IDE Delphi

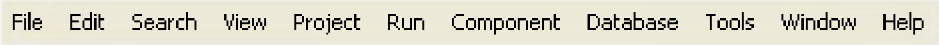
IDE Delphi consists of 6 main parts, which are: Menu, Speed Bar, Component Palette, Form Designer, Code Editor and Object Inspector.



```
unit Unit1;

interface

uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs;

type
  TForm1 = class(TForm)
  private
    { Private declarations }
```

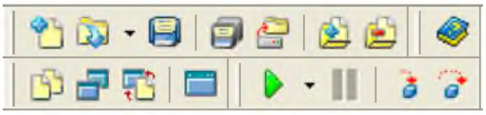
a. Main Menu

Delphi Main Menu have similar function memiliki kegunaan seperti menu pada aplikasi Windows lainnya. From this menu, you can open or save a program, running and searching program, etc. Shortly, everything that connected with IDE Delphi can be called via main menu.



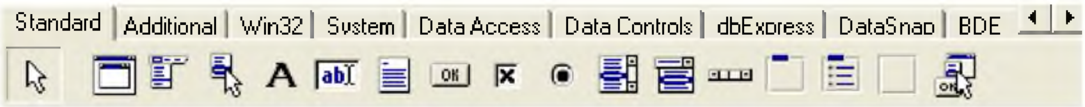
b. Speed Bar

Speed Bar or toolbar contain set of button that have same function with mostly item menu.



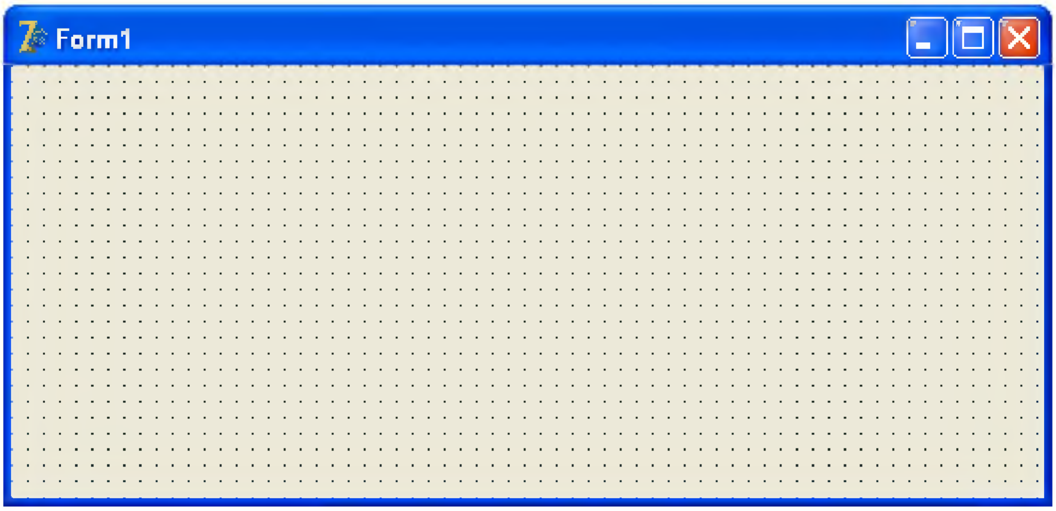
c. Component Palette

Component Palette contains set of icon that represents components of VCL (*Visual Component Library*). VCL is component that can be used to build an application.



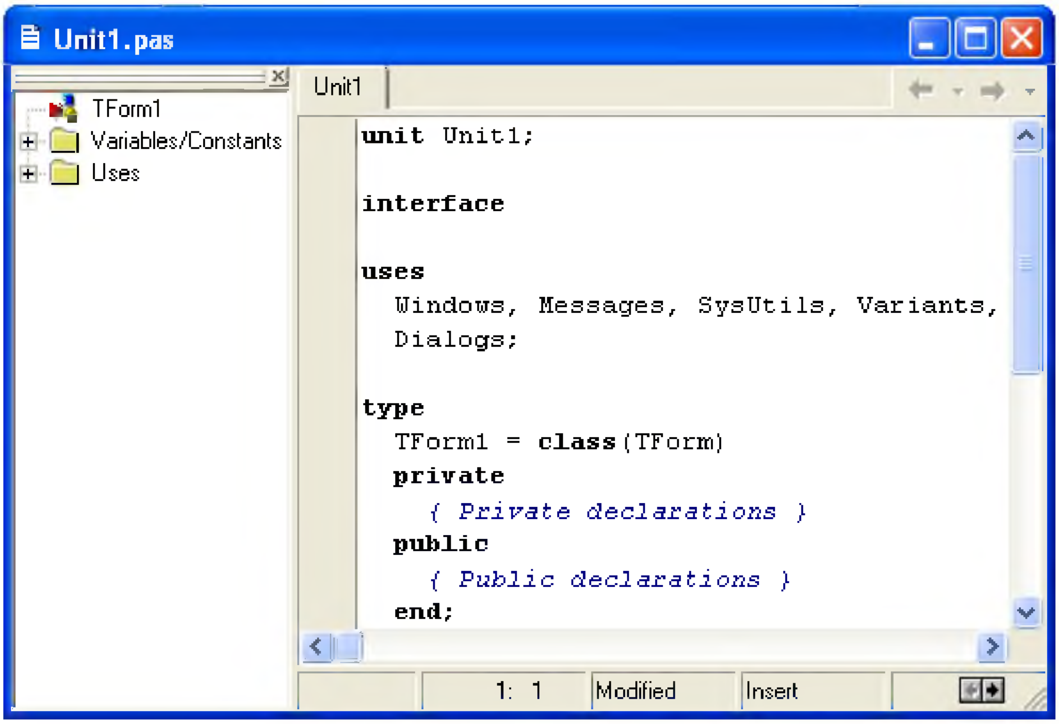
d. Form Designer

Form Designer is a place to design windows application. The Design is placement of components from Component Palette.



e. Code Editor

Code Editor is place to write program in Pascal Language. Code editor has a Code Inspector, so that we don't have to write whole instruction. Delphi has write a basic structure of a program. Look at the picture below:



```
unit Unit1;

interface

uses
  Windows, Messages, SysUtils, Variants,
  Dialogs;

type
  TForm1 = class(TForm)
  private
    { Private declarations }
  public
    { Public declarations }
  end;
```

f. Object Inspector

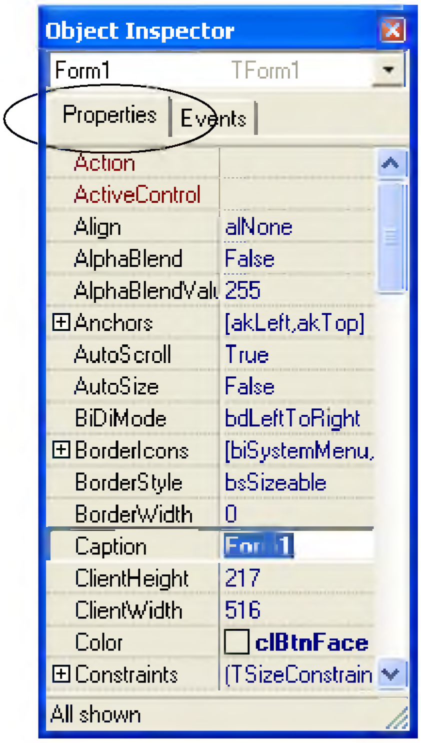
The Object Inspector is the connection between your application's visual appearance and the code that makes your application run.

The Object Inspector enables you to:

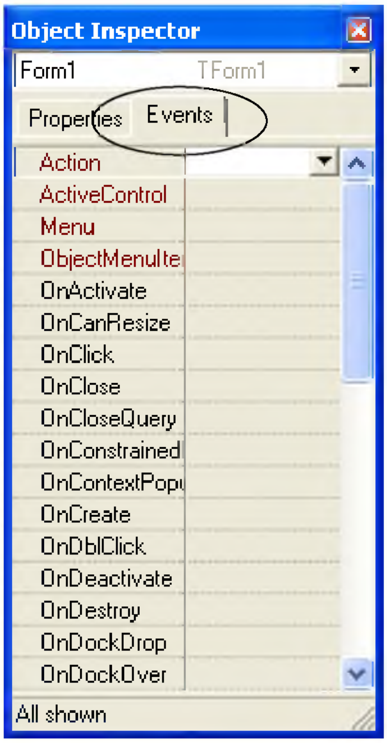
- set design-time properties for components you have placed on a form (or for the form itself).

-Create and help you navigate through event handlers.

-Filter visible properties and events.



Action	
ActiveControl	
Align	alNone
AlphaBlend	False
AlphaBlendValı	255
⊞Anchors	[akLeft,akTop]
AutoScroll	True
AutoSize	False
BiDiMode	bdLeftToRight
⊞BorderIcons	[biSystemMenu,
BorderStyle	bsSizeable
BorderWidth	0
Caption	Form1
ClientHeight	217
ClientWidth	516
Color	□ clBtnFace
⊞Constraints	(TSizeConstrain



Action	
ActiveControl	
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ObjectMenuIte	
OnActivate	
OnCanResize	
OnClick	
OnClose	
OnCloseQuery	
OnConstrained	
OnContextPopı	
OnCreate	
OnDblClick	
OnDeactivate	
OnDestroy	
OnDockDrop	
OnDockOver	

The Object Inspector has two pages:

- Properties page
- Events page

Object Inspector tabs provide a means to switch between the Property page and the Events page of the Object Inspector. To change pages, click the Properties or Events tab.

You can display and filter properties and events by category. By filtering the properties, you can reduce the number of properties visible in the Object Inspector and focus on those which are primarily of interest at the time. You can also more easily locate related properties by viewing them by category. For example, when localizing your application for other countries, you can display only properties that need to be localized by unchecking all categories except Localizable. See Property and event categories in the Object Inspector.

The Object Inspector also includes expanded inline component references that display the properties and events of a referenced component (or a subcomponent) without having to actually select that component.

You can control the colors in which items appear in the Object Inspector and change options that allow you to display an instance list, a status bar, and show read-only properties. To change these settings for the Object Inspector, choose Tools|Environment Options, and click the Object Inspector tab or right-click the Object Inspector and choose Properties.

4. Tools and Materials

- Personal Computer
- Windows XP Operating System
- Borland Delphi 7

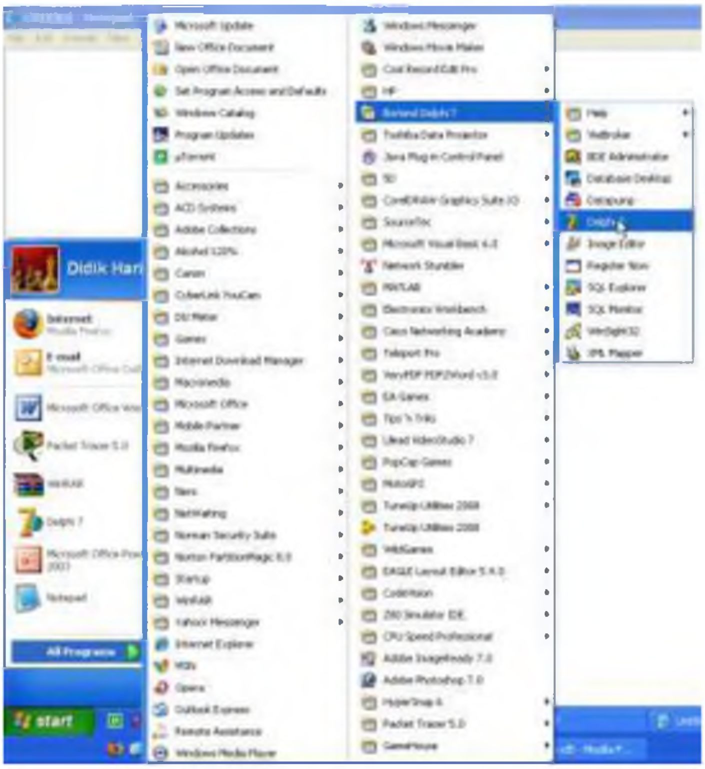
5. Work Safety

a. Before practicing, students should understand the goal and competency of this practice.
b. Read and understand all procedures of this practice carefully.
c. Always keep data from losing causes by extinguished electricity.

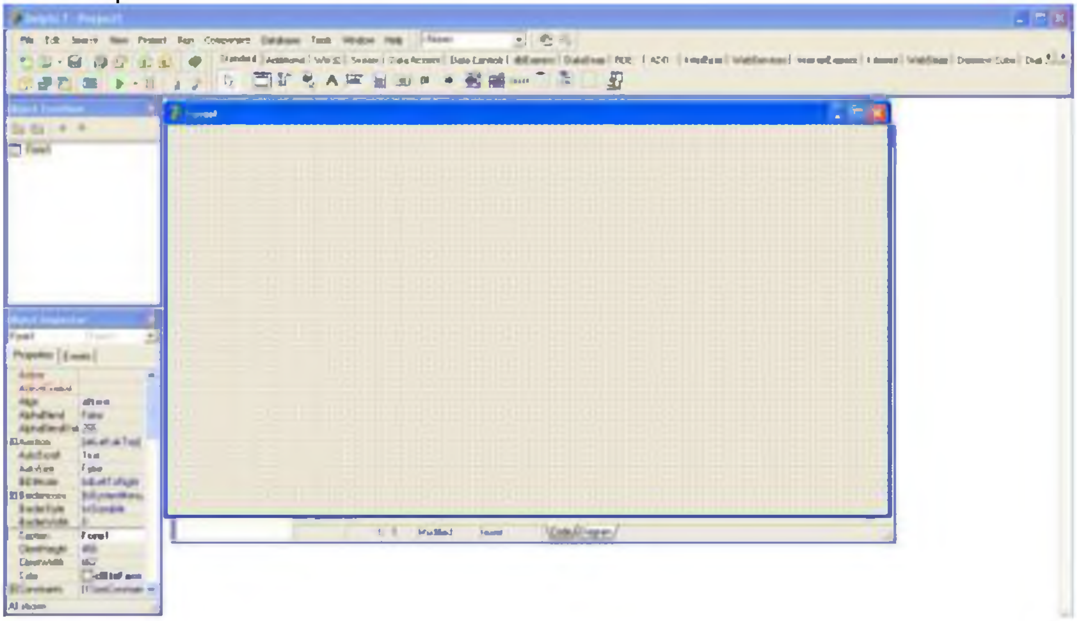
6. Procedures

6.1. Creating Simple Program

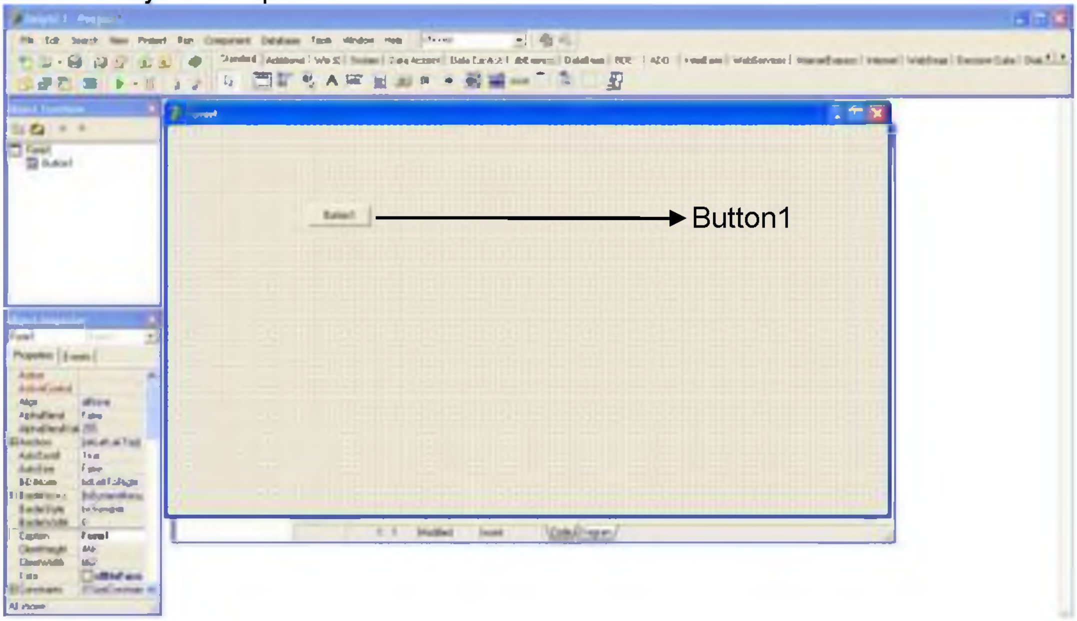
1. Run Borland Delphi 7 on your computer. Click menu start – All Programs – Borland Delphi 7 – Delphi 7.



2. IDE Delphi will look like this:



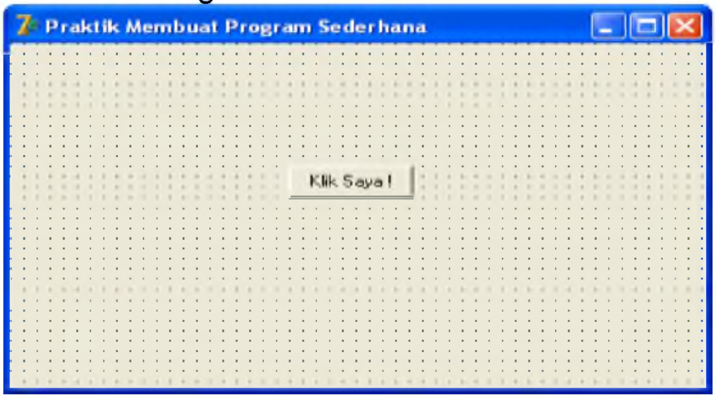
3. in the active Form, choose component Button1 on Tab Standard and place it on form just like picture below:



4. Set each component's properties by selecting component first, then choose properties on Object Inspector, with the value below.

Komponen	Properties	Value
Form1	Caption	Praktik Membuat Program Sederhana
Button1	Caption	Klik Saya !

5. Then the design will look like this:

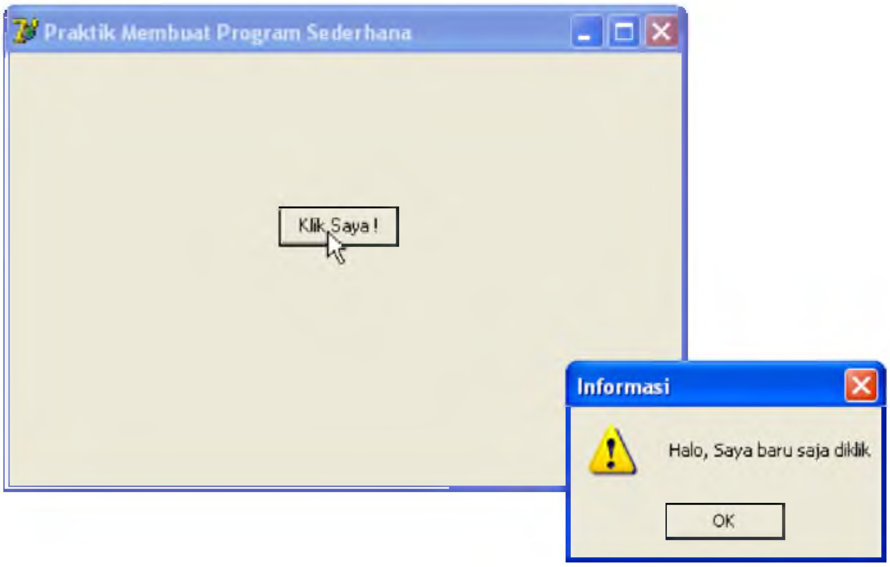


6. Fill program code of Button1 in two ways: a) double click on Button1, or b) select Button1, select Events on Object Inspector, then double click item OnClick. Write these code:

```
procedure TForm1.Button1Click(Sender: TObject);
begin
  Application.MessageBox('Halo, Saya baru saja diklik', 'Informasi', MB_OK or
  MB_ICONEXCLAMATION);
end;
```

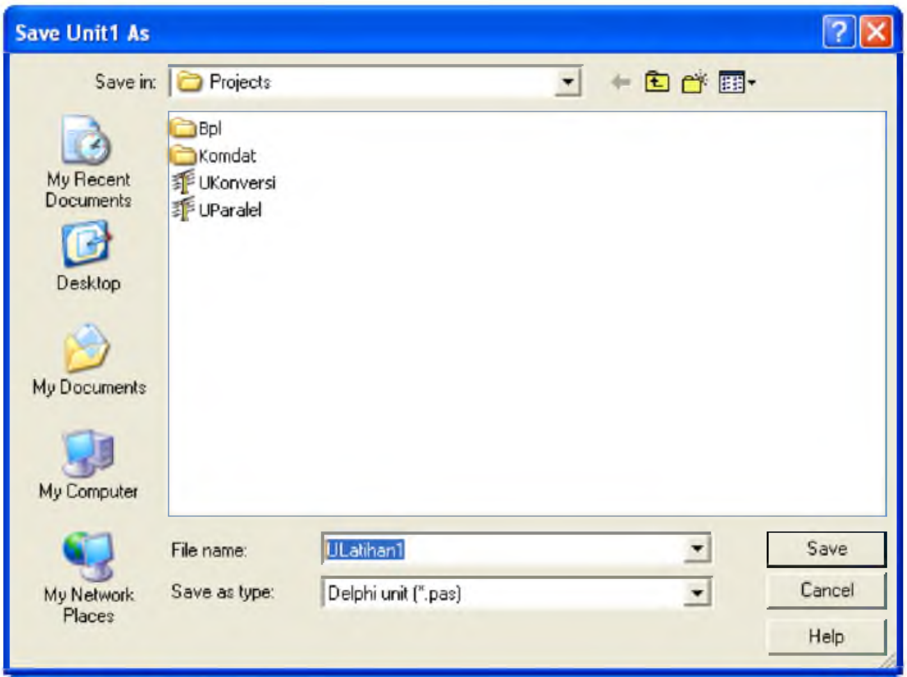
7. Project is ready to run in three ways: a) Click toolbar ▶, or b) via menu Run | Run, or c) push button F9 on keyboard.

8. After program running, click on button 'Klik Saya !', then a message box will showed:



Halo, Saya baru saja diklik

9. Save your project by selecting menu File | Save All. Delphi will show a dialog box and asking you to insert the name of unit in your form. Write ULatihan1.pas and click OK. Delphi will again show dialog box and asking you to insert the name of your project. Fill it with `PLatihan1.dpr` and click OK.

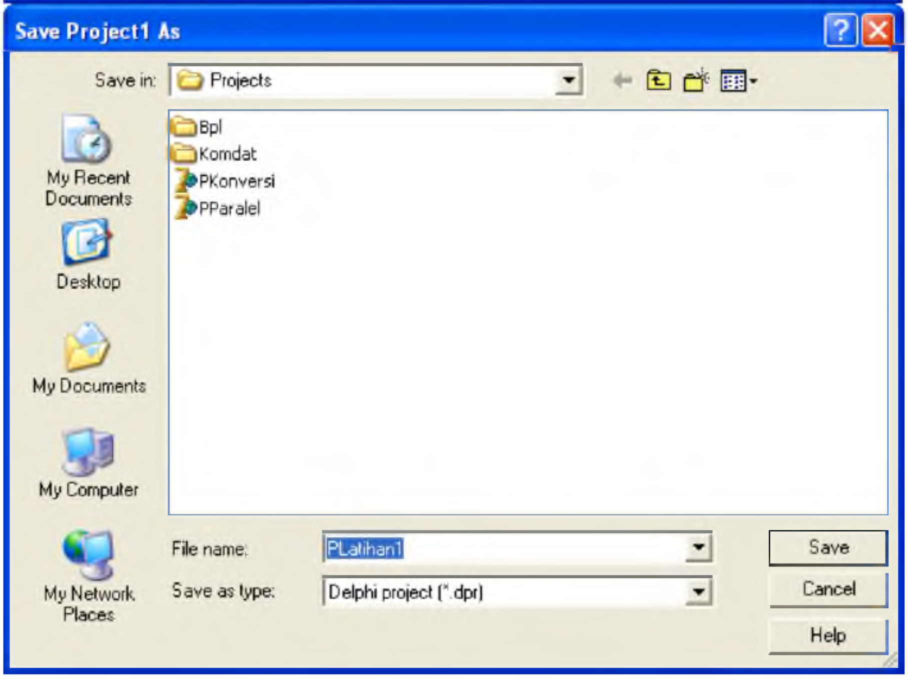


Save Unit1 As

Save in: Projects

File name: ULatihan1

Save as type: Delphi unit (*.pas)



Save Project1 As

Save in: Projects

File name: PLatihan1

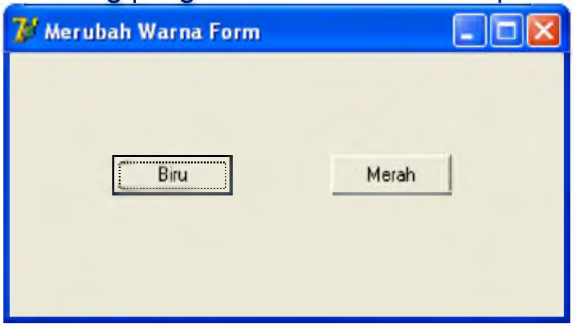
Save as type: Delphi project (*.dpr)

10. Always try to save unit file begin with letter `U__________.pas` and save project file begin with letter `P__________.dpr`. it is useful to distinguish between unit file with project file.

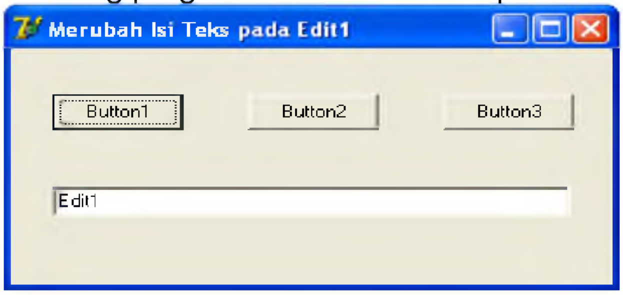
11. Saved project will creating a lot of files, but 3 main files are:
    - `PLatihan1.dpr`, contain main program of your application.
    - `ULatihan.pas`, unit that will handle events on form.
    - `ULatihan.dfm`, list of components and their properties in the form(s).

7. Discussion

a. Create a program with 2 buttons. Change property Caption of those buttons become 'Biru' dan 'Merah'. The request are, 'Biru', then form color will change into blue and if we click 'Merah' button, then form color will change into red.
Running program will look like this picture:



b. Put three Tbutton components and a Tedit component on a form. When Button1 pressed, text on Edit1 will change into 'Pemrograman'. When Button2 pressed, text on Edit1 will change into 'Komputer'. Last, when Button3 pressed, text on Edit1 will be empty.
Running program will look like this picture:



1. Competency

After practicing, students will have competencies: know, understand and applying Data Type and application in Programming.

2. Sub Competencies

After practicing, students will have sub competencies:

a. Knowing parts of data type.
b. Understand function and procedure of data type.
c. Applying data type in programming.

3. Introduction

3.1. Variable

We often use variables in computer programming. Variables are simply a place to keep data.

Syntax of variable declaration on Delphi is:

```
var
  nama_variabel: tipe_variabel;
```

example:

```
var
  i: integer;
```

To declare several variables with different data type, we only have to write keyword **var** once, like this:

```
var
  i: integer;
  j: real;
  k: char;
```

Here another sample of several variables with same data types:

```
var
  i, j, k: integer;
  a, b, c: char;
```

Variable name on Delphi must follow these rules:

- Name of variable maximum consist of 63 characters. If variable has more than 63 characters, compiler will abandon the remainder character.
- Name of variable can only contain characters, numbers, underscores, and must not begin with number.
- Keyword of Delphi cannot be a variable name, for example **if**, **else**, **for**, etc.

3.2. Data Type

A type is essentially a name for a kind of data. When you declare a variable you must specify its type, which determines the set of values the variable can hold and the operations that can be performed on it. Every expression returns data of a particular type, as does every function. Most functions and procedures require parameters of specific types. In Delphi, it consists of:

- Integer data types.
- Real data types.
- Boolean data types.
- Character data types.
- String data types.

a. Integer types

An integer type represents a subset of the whole numbers. The generic integer types are Integer and Cardinal; use these whenever possible, since they result in the best performance for the underlying CPU and operating system. The table below gives their ranges and storage formats for the current 32-bit Delphi compiler.

Fundamental integer types

Type	Bit	RangeFormat
Shortint	8 bit	-128 .. 127
Smallint	16 bit	-32768 .. 32767
Longint	32 bit	-2147483648 .. 2147483647
Byte	8 bit	0 .. 255
Word	16 bit	0 .. 65535

Generic integer types for 32-bit implementations of Delphi

Type	Bit	RangeFormat
Integer (Delphi 1)	16 bit	-32768 .. 32767
Cardinal (Delphi 1)	16 bit	0 .. 65535
Integer (Delphi 2 s/d 7)	32 bit	-2147483648 .. 2147483647
Cardinal (Delphi 2 s/d 7)	32 bit	0 .. 2147483647

b. Real types

A real type defines a set of numbers that can be represented with floating-point notation. The table below gives the ranges and storage formats for the fundamental real types.

Type	Size in Bit	RangeFormat	Significant Digit
Real	6 bit	$2.9*10^{-39}$ .. $1.7*10^{38}$	11-12
Single	4 bit	$1.5*10^{-45}$ .. $3.4*10^{38}$	7-8
Double	8 bit	$5.0*10^{-324}$ .. $1.7*10^{308}$	15-16
Extended	10 bit	$3.4*10^{-4932}$ .. $1.1*10^{4932}$	19-20
Comp	8 bit	$-2^{63}+1$ .. $2^{63}-1$	19-20
Currency	8 bit	-922337203685477.5808 .. 922337203685477.5807	19-20

c. Boolean types

The four predefined Boolean types are Boolean, ByteBool, WordBool, and LongBool. Boolean is the preferred type. The others exist to provide compatibility with other languages and operating system libraries.

A Boolean variable occupies one byte of memory, a ByteBool variable also occupies one byte, a WordBool variable occupies two bytes (one word), and a LongBool variable occupies four bytes (two words).

Boolean values are denoted by the predefined constants True and False. The following relationships hold.

Data Type	Memori needed
Boolean	1 byte
ByteBool	1 byte
WordBool	2 byte (1 word)
LongBool	4 byte (2 word)

d. Character types

The fundamental character types are AnsiChar and WideChar. AnsiChar values are byte-sized (8-bit) characters ordered according to the locale character set which is possibly multibyte. AnsiChar was originally modeled after the ANSI character set (thus its name) but has now been broadened to refer to the current locale character set.

WideChar characters use more than one byte to represent every character. In the current implementations, WideChar is word-sized (16-bit) characters ordered according to the Unicode character set (note that it could be longer in future implementations). The first 256 Unicode characters correspond to the ANSI characters.

Note

On Linux, wchar_t widechar is 32 bits per character. The 16-bit Unicode standard that Delphi WideChars support is a subset of the 32-bit UCS standard supported by Linux and the GNU libraries. Delphi WideChar data must be widened to 32 bits per character before it can be passed to an OS function as wchar_t.

The generic character type is Char, which is equivalent to AnsiChar. Because the implementation of Char is subject to change, it's a good idea to use the standard function SizeOf rather than a hard-coded constant when writing programs that may need to handle characters of different sizes.

A string constant of length 1, such as 'A', can denote a character value. The predefined function Chr returns the character value for any integer in the range of AnsiChar or WideChar; for example, Chr(65) returns the letter A.

Character values, like integers, wrap around when decremented or incremented past the beginning or end of their range (unless range-checking is enabled). For example, after execution of the code

```
var
  Letter: Char;
  I: Integer;
begin
```

```
    Letter := High(Letter);
    for I := 1 to 66 do
      Inc(Letter);
  end;
```

Letter has the value A (ASCII 65).

e. String types

A string represents a sequence of characters. Delphi supports the following predefined string types.

String types

Type	Maximum length	Memory required	Used for
ShortString	255 characters	2 to 256 bytes	backward compatibility
AnsiString	~2^31 characters	4 bytes to 2GB	8-bit (ANSI) characters, DBCS ANSI, MBCS ANSI, etc.
WideString	~2^30 characters	4 bytes to 2GB	Unicode characters; multi-user servers and multi-language applications

AnsiString, sometimes called the long string, is the preferred type for most purposes.

String types can be mixed in assignments and expressions; the compiler automatically performs required conversions. But strings passed by reference to a function or procedure (as var and out parameters) must be of the appropriate type. Strings can be explicitly cast to a different string type (see Typecasts).

The reserved word string functions like a generic type identifier. For example,

```
var S: string;
```

creates a variable S that holds a string. In the default {$H+} state, the compiler interprets string (when it appears without a bracketed number after it) as AnsiString. Use the {$H-} directive to turn string into ShortString.

The standard function Length returns the number of characters in a string. The SetLength procedure adjusts the length of a string. Comparison of strings is defined by the ordering of the characters in corresponding positions. Between strings of unequal length, each character in the longer string without a corresponding character in the shorter string takes on a greater-than value. For example, "AB" is greater than "A"; that is, 'AB' > 'A' returns True. Zero-length strings hold the lowest values.

You can index a string variable just as you would an array. If S is a string variable and i an integer expression, S[i] represents the ith character--or, strictly speaking, the ith byte--in S. For a ShortString or AnsiString, S[i] is of type AnsiChar; for a WideString, S[i] is of type WideChar. For single-byte (Western) locales, MyString[2] := 'A'; assigns the value A to the second character of MyString. The following code uses the standard AnsiUpperCase function to convert MyString to uppercase.

```
var I: Integer;
begin
  I := Length(MyString);
  while I > 0 do
  begin
    MyString[I] := AnsiUpperCase(MyString[I]);
    I := I - 1;
  end;
end;
```

Be careful indexing strings in this way, since overwriting the end of a string can cause access violations. Also, avoid passing long-string indexes as var parameters, because this results in inefficient code.

You can assign the value of a string constant--or any other expression that returns a string--to a variable. The length of the string changes dynamically when the assignment is made. Examples:

```
MyString := 'Hello world!';
MyString := 'Hello ' + 'world';
MyString := MyString + '!';
MyString := ' ';              { space }
MyString := '';               { empty string }
```

3.3. Constants

Several different language constructions are referred to as "constants". There are numeric constants (also called numerals) like 17, and string constants (also called character strings or string literals) like 'Hello world!'. Every enumerated type defines constants that represent the values of that type. There are predefined constants like True, False, and nil. Finally, there are constants that, like variables, are created individually by declaration.

Declared constants are either true constants or typed constants. These two kinds of constant are superficially similar, but they are governed by different rules and used for different purposes.
Pendeklarasian konstanta dilakukan dengan sintaks berikut:

```
const
  nameof_konstanta = valueof_konstanta;
```

example:

```
const
  Maksimum    = 10;
  LogNatural  = 2.718281828;
  Bahasa      = 'Object Pascal';
```

We could determine the type of constant. It called typed constanta.
example:

```
const
  Maksimum    : integer = 10;
  LogNatural  : double = 2.718281828;
  Bahasa      : ShortString = 'Object Pascal';
```

4. Tools and Materials

- Personal Computer
- Windows XP Operating System
- Borland Delphi 7

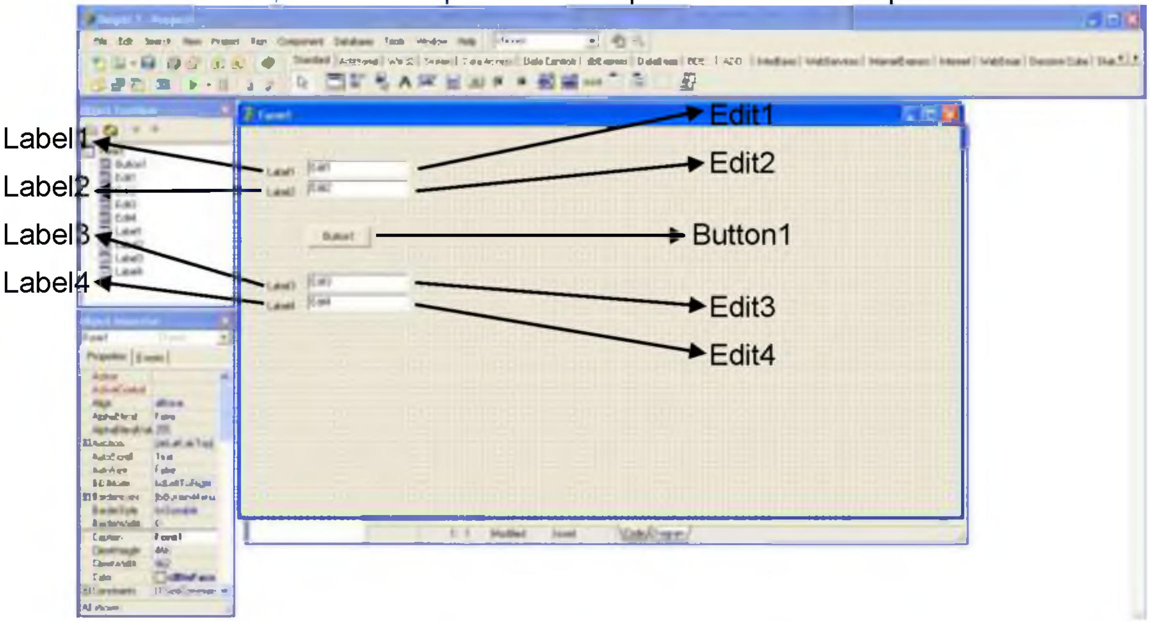
5. Work Safety

a. Before practicing, students should understand the goal and competency of this practice.
b. Read and understand all procedures of this practice carefully.
c. Always keep data from losing causes by extinguished electricity.

6. Procedures

6.1. Praktik Penggunaan Tipe Bilangan Bulat

1. Run Borland Delphi 7 on your computer.
2. In active form, select components and place on form like picture below:

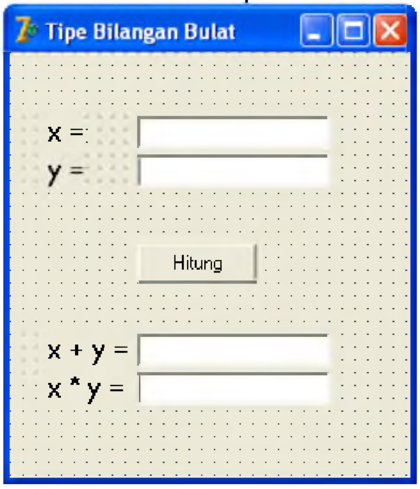


3. Set the properties of each components as follow:

Component	Properties	Value
Form1	Caption	Tipe Bilangan Bulat
Label1	Caption	x =
	Font - Size	12
	Font - Style - fsBold	True
Label2	Caption	y =
	Font - Size	12
	Font - Style - fsBold	True
Label3	Caption	x + y =
	Font - Size	12
	Font - Style - fsBold	True
Label1	Caption	x * y =
	Font - Size	12
	Font - Style - fsBold	True

Edit1	Text	*<empty>*
Edit2	Text	*<empty>*
Edit3	Text	*<empty>*
Edit4	Text	*<empty>*
Button1	Caption	Hitung

4. The result is like picture below:

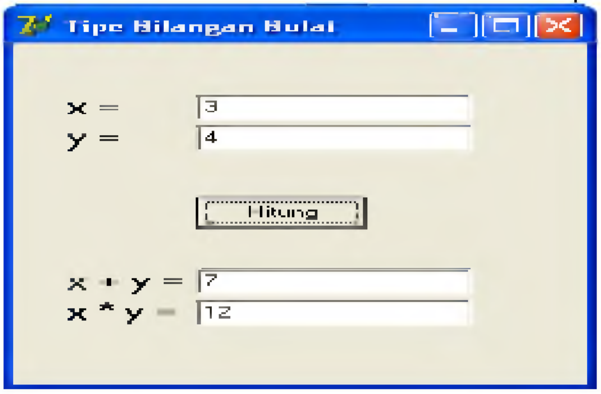


5. Double Click on Button1, then write code program as follow:

```
procedure TForm1.Button1Click(Sender: TObject);
var
  x, y, z: integer;
begin
  x := StrToInt(Edit1.Text);
  y := StrToInt(Edit2.Text);

  z := x + y;
  Edit3.Text := IntToStr(z);

  z := x * y;
  Edit4.Text := IntToStr(z);
end;
```

6. Run project by clicking toolbar ▶ or press F9 on your keyboard.

7. After program running, entry the number 3 and 4 sequentially on Edit1 and Edit2, then click button Hitung. We can see that on Edit3 will show result 3 + 4 = 7 and on Edit4 will show result 3 * 4 = 12 like picture below:



Tipe Bilangan Bulat

x = 3

y = 4

Hitung

x + y = 7

x * y = 12

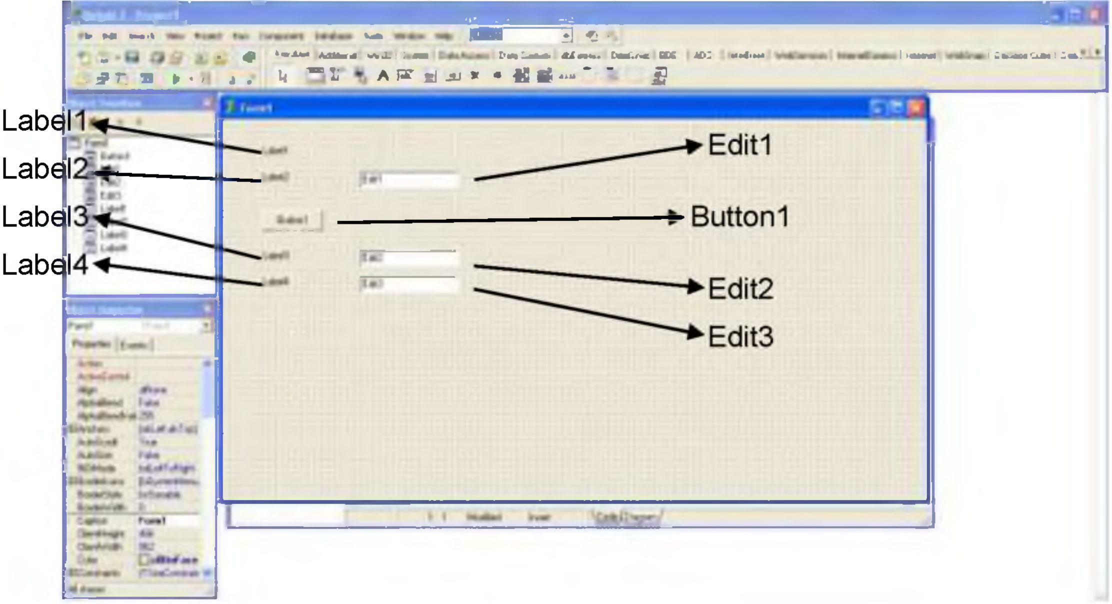
8. Try to entry another number on Edit1 dan Edit2 just like step 7.

9. Save your project as TipeData1.

6.2. Applying Real Type on Programming

1. Run Borland Delphi 7 on your computer.

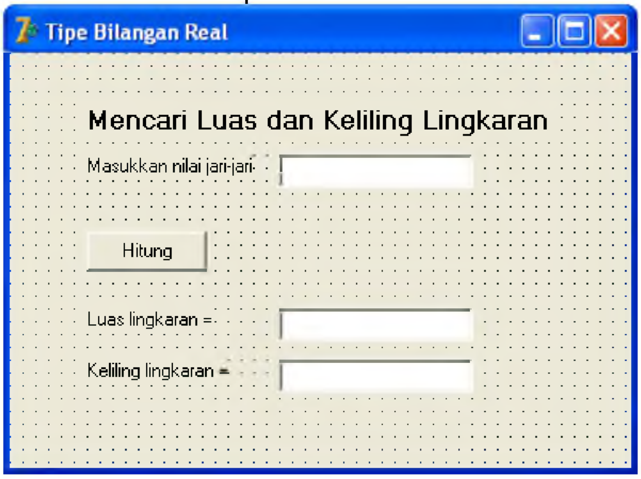
2. In active form, select components and place on form like picture below:



3. Set the properties of each components as follow:

Component	Properties	Value
Form1	Caption	Tipe Bilangan Real
Label1	Caption	Mencari Luas dan Keliling Lingkaran
	Font - Size	12
	Font - Style - fsBold	True
Label2	Caption	Masukkan nilai jari-jari
Label3	Caption	Luas lingkaran =
Label4	Caption	Keliling lingkaran =
Edit1	Text	*<empty>*
Edit2	Text	*<empty>*
Edit3	Text	*<empty>*
Button1	Caption	Hitung

4. The result is like picture below:



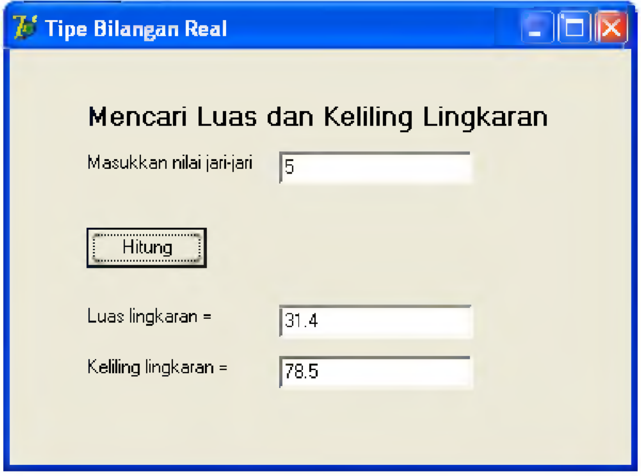
5. Double Click on Button1, then write code program as follow :

```
procedure TForm1.Button1Click(Sender: TObject);
var
  jari_jari: real;
  luas_lingkaran: real;
  keliling_lingkaran: real;
const
  phi = 3.14;
begin
```

```
    jari_jari := StrToFloat(Edit1.Text);

    luas_lingkaran := 2 * phi * jari_jari;
    Edit2.Text := FloatToStr(luas_lingkaran);

    keliling_lingkaran := phi * jari_jari * jari_jari;
    Edit3.Text := FloatToStr(keliling_lingkaran);
  end;
```

6. Run project by clicking toolbar ▶ or press F9 on your keyboard.

7. After program running, entry the number 5 on Edit1, click button Hitung, then Edit2 will show circle vast as 31,4 and Edit3 will show circle around equal to 78,5 like shown below:



Tipe Bilangan Real

Mencari Luas dan Keliling Lingkaran

Masukkan nilai jari-jari: 5

Luas lingkaran = 31.4

Keliling lingkaran = 78.5

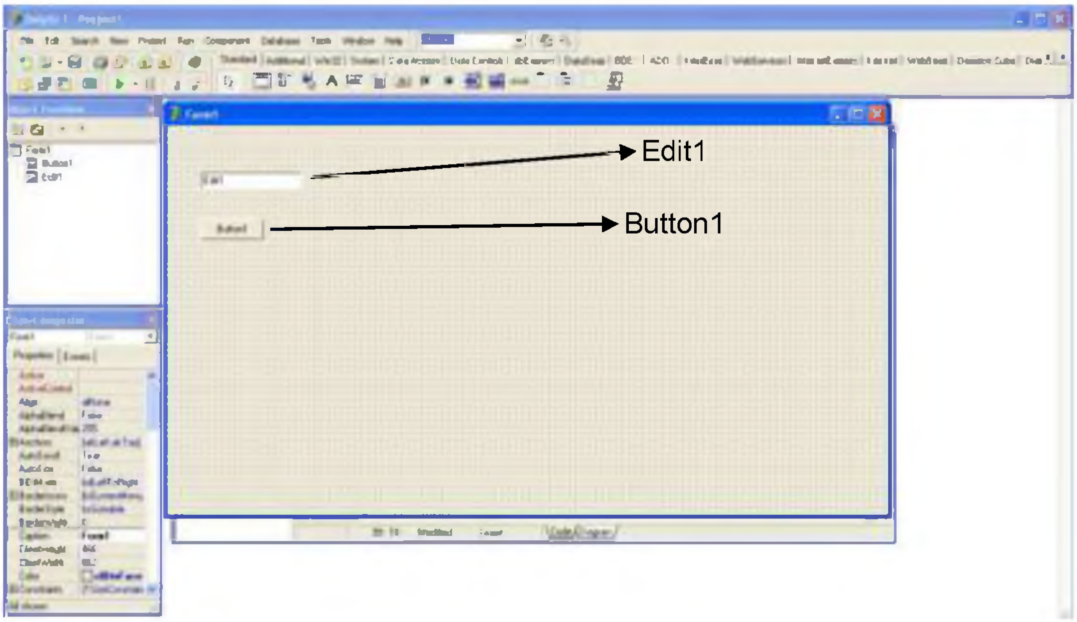
8. Try to entry another number on Edit1 dan Edit2 just like step 7.

9. Save your project as TipeData2.

6.3. Applying Boolean Type on Programming

1. Run Borland Delphi 7 on your computer.

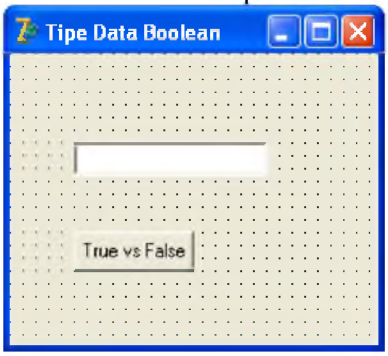
2. In active form, select components and place on form like picture below:



3. Set the properties of each components as follow:

Komponen	Properties	Value
Form1	Caption	Tipe Data Boolean
Edit1	Text	*<empty>*
Button1	Caption	True vs False

4. The result is like picture below:



5. Double Click on Button1, then write code program as follow :

```
procedure TForm1.Button1Click(Sender: TObject);
begin
 if(gantian = False) then
 begin
   gantian := True;
   Edit1.Text := 'Nilai Boolean = True';
 end
 else
 begin
   gantian := False;
   Edit1.Text := 'Nilai Boolean = False';
 end;
end;
```

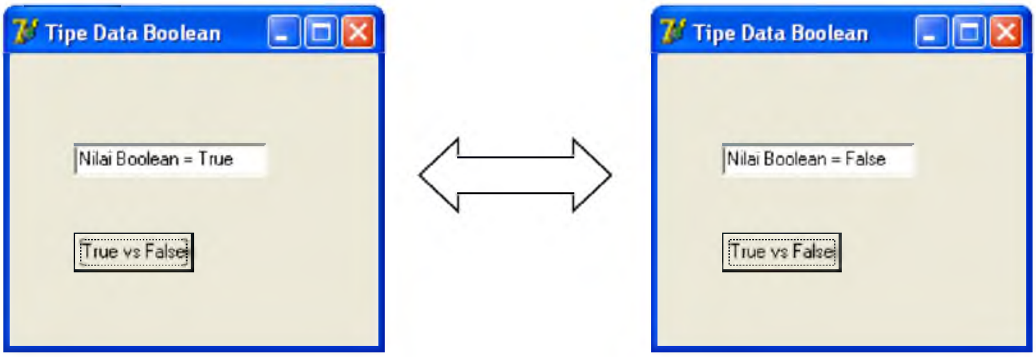
6. Add variable ***gantian*** on global variabel declaration as follow:

```
var
 Form1: TForm1;
 gantian: boolean;

implementation

{$R *.dfm}
```

Write this code

7. Run project by clicking toolbar or press F9 on your keyboard.

8. After program running, press the button once, then edit1 will show message ‘Nilai Boolean = True’, press again the button, edit1 will show message ‘Nilai Boolean = False’, etc. this will happen everytime you press the button.



Nilai Boolean = True

True vs False

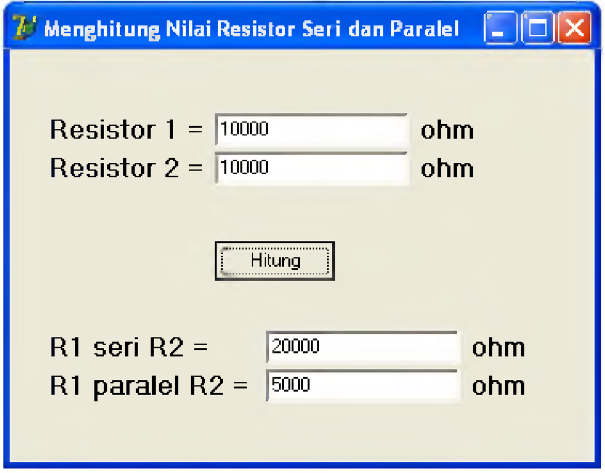
Nilai Boolean = False

True vs False

9. Save your project as TipeData3.

7. Discussion

a. Create a program to count resistance of two resistor installed both serial and parallel with configuration just like picture below:



Menghitung Nilai Resistor Seri dan Paralel

Resistor 1 = 10000 ohm
Resistor 2 = 10000 ohm

R1 seri R2 = 20000 ohm
R1 paralel R2 = 5000 ohm

b. Create a program to perform temperatur conversion from Celcius to Farenheit with formula F = (9/5 x C) + 32, and from Fahrenheit to Celcius with formula C = 5/9 x (F – 32) !

	FACULTY OF ENGINEERING YOGYAKARTA STATE UNIVERSITY			
	LAB SHEET (ADVANCED PROGRAMMING)			
	Semester 2	Branching/Conditional Structure in Programming		Classical hours 8 x 50 mins
	No. LSCP/EKO/DEL224/03	Revision : 01	Date : March, 1 2009	Page 1 of 13

1. Competency

After practicing, students will have competencies: know, understand and applying branch structure in Programming.

2. Sub Competencies

After practicing, students will have sub competencies:

a. Knowing concept of branch structure.
b. Understand function and procedure of branch structure.
c. Creating computer program with branch structure.

3. Introduction

Conditional or branch structure used to turn the flow of a process. It is very useful, espescially for complex program. Basically, there are 3 commands in conditional structure, they are:

a. IF – THEN
b. IF – THEN – ELSE
c. CASE – OF

3.1. IF – THEN

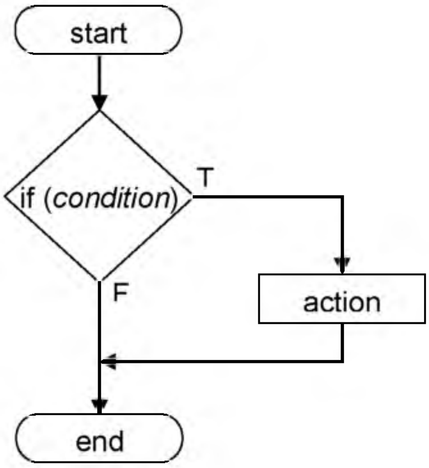
"IF command" used to select a single condition. If the condition true, then the statement in its block will be processed. If not, program will process nothing. The syntax of an **"IF...THEN"** statement is

```
if expression then statement
```

Where expression returns a Boolean value. If expression is true, then statement is executed; otherwise it is not. For example,

```
if J <> 0 then Result := I/J;
```

Flowchart of IF – THEN is:



3.2. Perintah IF – THEN – ELSE

The syntax of an if...then...else statement is

```
If expression then statement1 else statement2
```

Where expression returns a Boolean value. If expression is true, then statement1 is executed; otherwise statement2 is executed. For example,

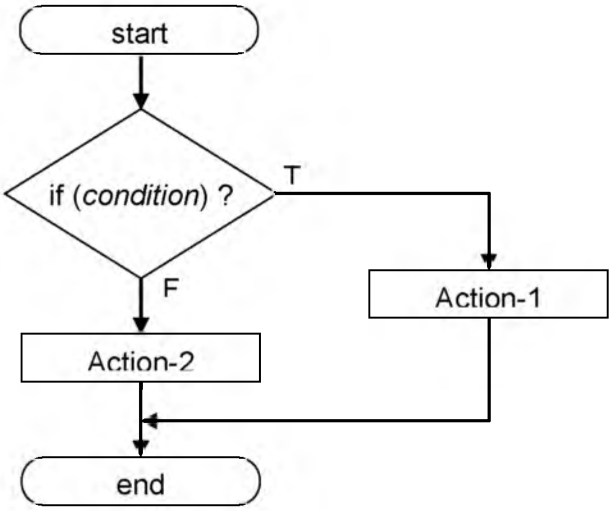
```
if J = 0 then Exit
else
Result: = I/J;
```

The then and else clauses contain one statement each, but it can be a structured statement. For example,

```
if J <> 0 then
begin
  Result := I/J;
  Count := Count + 1;
end
else if Count = Last then
  Done := True
else
  Exit;
```

Notice that there is never a semicolon between the then clause and the word else. You can place a semicolon after an entire if statement to separate it from the next statement in its block, but the then and else clauses require nothing more than a space or carriage return between them. Placing a semicolon immediately before else (in an if statement) is a common programming error.

Flowchart of IF – THEN – ELSE command is:



another syntax of IF – THEN – ELSE command is:

```
if (kondisi percabangan) then
begin
  ……; {aksi-1}
end
else
begin
  ……; {aksi-2}
end;
```

3.3. CASE – OF Command

CASE – OF command generally used to condition with many branches. The case statement may provide a readable alternative to deeply nested if conditionals. A case statement has the form

```
Case selectorExpression of
 caseList1: statement1;
   ...
 caseListn: statementn;
end
```

Where selector Expression is any expression of an ordinal type (string types are invalid) and each case List is one of the following:

A numeral, declared constant, or other expression that the compiler can evaluate without executing your program. It must be of an ordinal type compatible with selectorExpression. Thus 7, True, 4 + 5 * 3, 'A', and Integer('A') can all be used as caseLists, but variables and most function calls cannot. (A few built-in functions like Hi and Lo can occur in a caseList. See Constant expressions.)

A sub range having the form First. Last, where First and Last both satisfy the criterion above and First is less than or equal to Last.

A list having the form item1, ..., itemn, where each item satisfies one of the criteria above.

Each value represented by a caseList must be unique in the case statement; subranges and lists cannot overlap. A case statement can have a final else clause:

```
case selectorExpression of
   caseList1: statement1;
   ...
   caseListn: statementn;
   else
   statements;
end
```

where statements is a semicolon-delimited sequence of statements. When a case statement is executed, at most one of statement1 ... statementn is executed. Whichever caseList has a value equal to that of selectorExpression determines the statement to be used. If none of the caseLists has the same value as selectorExpression, then the statements in the else clause (if there is one) are executed.

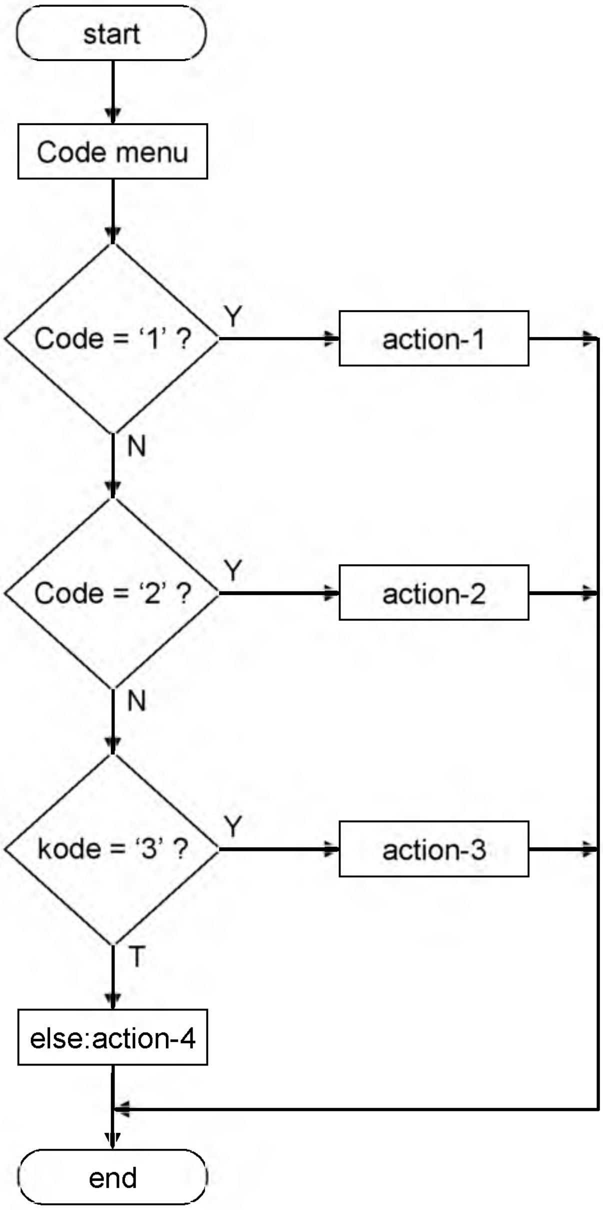
The case statement

```
case I of
  1..5: Caption := 'Low';
  6..9: Caption := 'High';
  0, 10..99: Caption := 'Out of range';
else
  Caption := '';
end;
```

is equivalent to the nested conditional

```
if I in [1..5] then
  Caption := 'Low'
  else if I in [6..10] then
    Caption := 'High'
    else if (I = 0) or (I in [10..99]) then
      Caption := 'Out of range'
      else
        Caption := '';
```

flowchart of CASE – OF command is:



Bentuk sintaks dari perintah CASE – OF adalah sebagai berikut:

```
case (parameter) of
   nilai_1: ......; {aksi-1}
   nilai_2: ......; {aksi-2}
   nilai_3: ......; {aksi-3}
else
   ......; {aksi-4}
end;
```

4. Tools and Materials

- Personal Computer
- Windows XP Operating System
- Borland Delphi 7

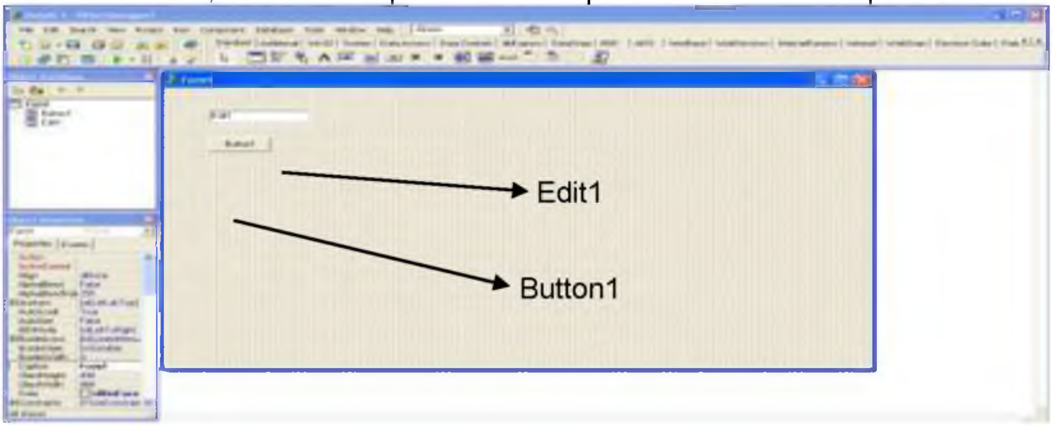
5. Work Safety

a. Before practicing, students should understand the goal and competency of this practice.
b. Read and understand all procedures of this practice carefully.
c. Always keep data from losing causes by extinguished electricity.

6. Procedures

6.1. IF – THEN Practice

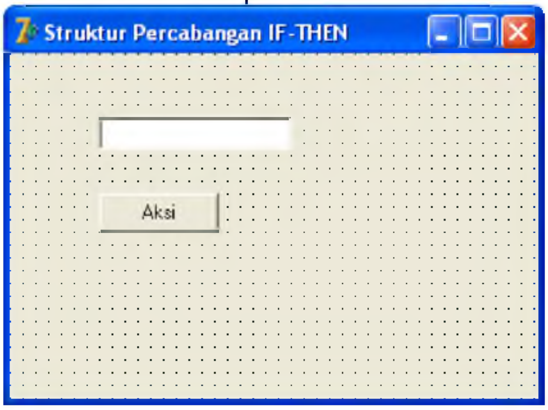
1. Run Borland Delphi 7 on your computer.
2. In active form, select components and place on form like picture below:



3. Set the properties of each components as follow:

Komponen	Properties	Value
Form1	Caption	Struktur Percabangan IF-THEN
Edit1	Text	*(dikosongi)*
Button1	Caption	Aksi

4. The result is like picture below:

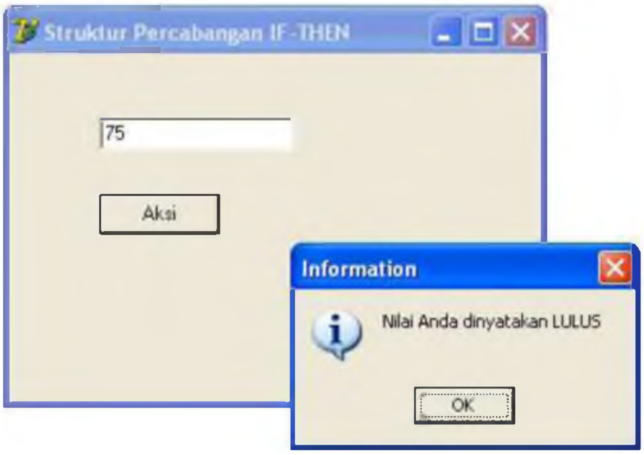


5. Double Click on Button1, then write code program as follow:

```
procedure TForm1.Button1Click(Sender: TObject);
var
  nilai: integer;
begin
  nilai := StrToInt(Edit1.Text);
  if (nilai >= 70) then
  begin
    MessageDlg('Nilai Anda dinyatakan LULUS', mtInformation, [mbOk], 0);
  end;
end;
```

6. Run project by clicking toolbar ▶ or press F9 on your keyboard.

7. After program running, entry the number 75 into Edit1. Then press button Aksi. A popup message wil show:



Nilai Anda dinyatakan LULUS

8. Entry value 50 into Edit1. Then press button Aksi. What would happen?

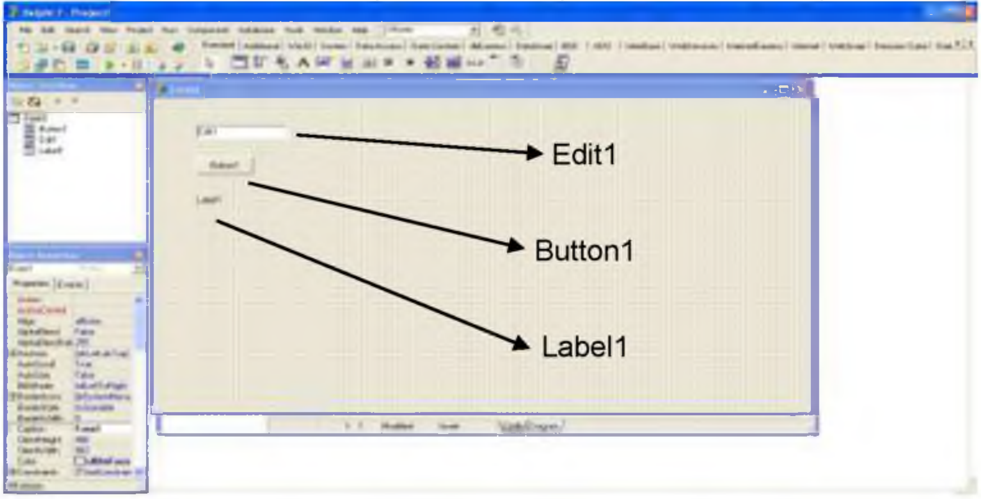
9. Try to input another value (0 - 100) into Edit1, then press button Aksi. What would happen?

10. Save your project as Percabangan1.

6.2. Praktik IF – THEN – ELSE

1. Create a new project in Delphi.

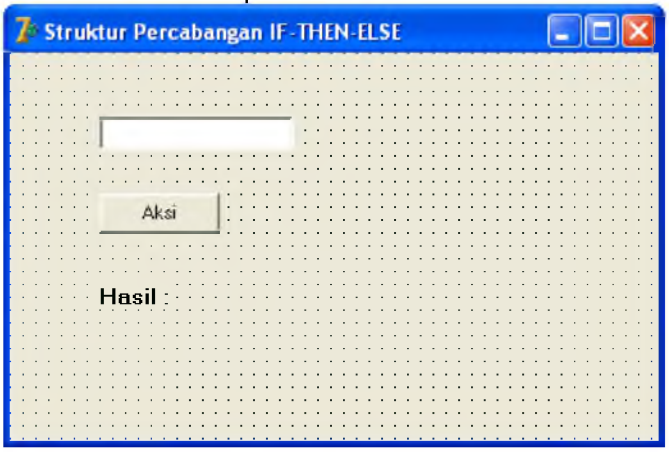
2. In active form, select components and place on form like picture below:



3. Set the properties of each components as follow :

Component	Properties	Value
Form1	Caption	Struktur Percabangan IF-THEN-ELSE
Edit1	Text	*(dikosongi)*
Button1	Caption	Aksi
Label1	Caption	Hasil :
	Font - Size	10
	Font - Style - fsBold	True

4. The result is like picture below:

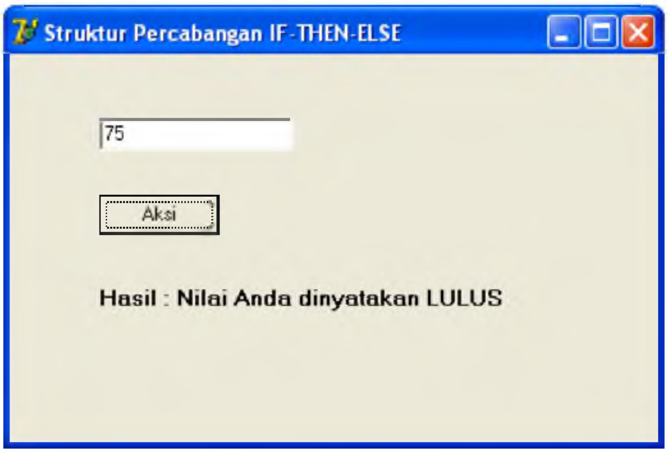


5. Double Click on Button1, then write code program as follow:

```
procedure TForm1.Button1Click(Sender: TObject);
var
  nilai: integer;
begin
  nilai := StrToInt(Edit1.Text);
  if (nilai >= 70) then
  begin
    Label1.Caption := 'Hasil : Nilai Anda dinyatakan LULUS';
  end
  else
  begin
    Label1.Caption := 'Hasil : Nilai Anda dinyatakan TIDAK LULUS';
  end;
end;
```

6. Run project by clicking toolbar ▶ ▾ or press F9 on your keyboard.

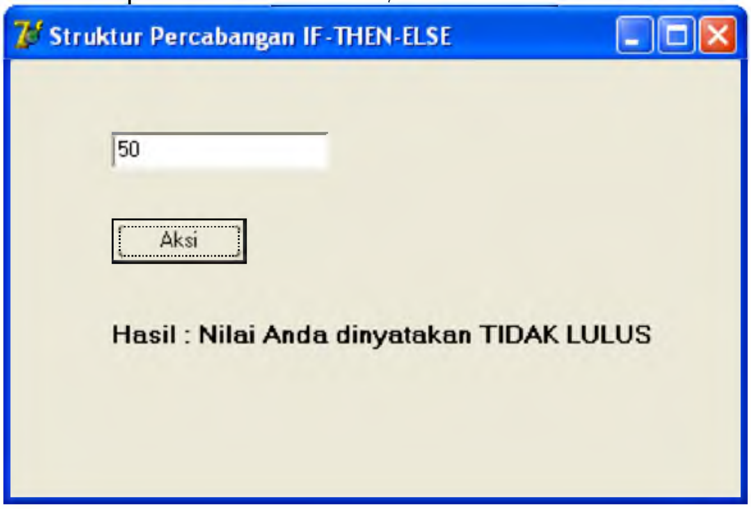
7. Input value 75 into Edit1. Press button Aksi. The result will be shown like below:



75

Hasil : Nilai Anda dinyatakan LULUS

8. If value input is less than 70, than the result will be shown like below:



50

Hasil : Nilai Anda dinyatakan TIDAK LULUS

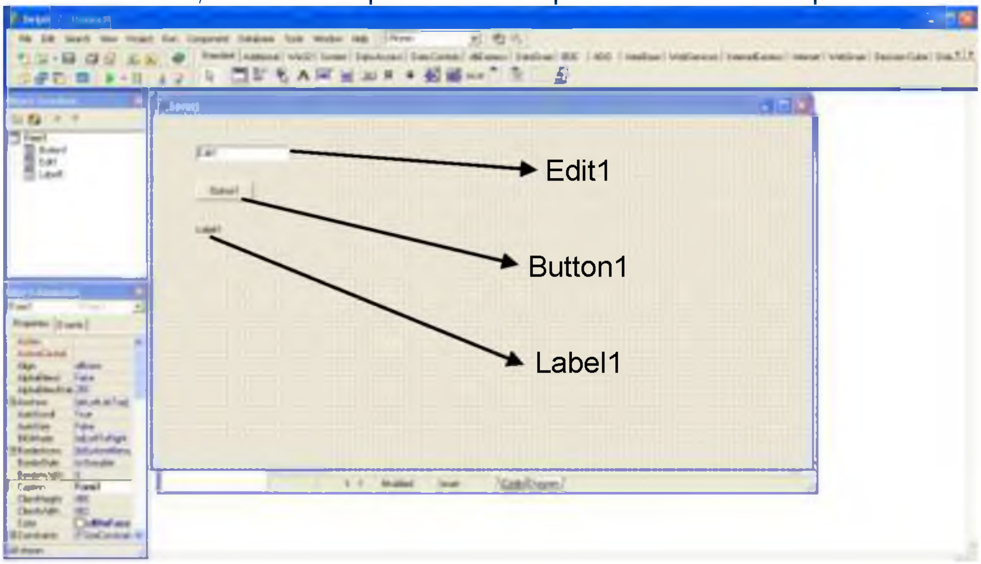
9. Try to input another value (0 - 100) into Edit1, then press button Aksi. What would happen?

10. Save your project as Percabangan2.

6.3. Practicing CASE – OF

1. Create a new project in Delphi.

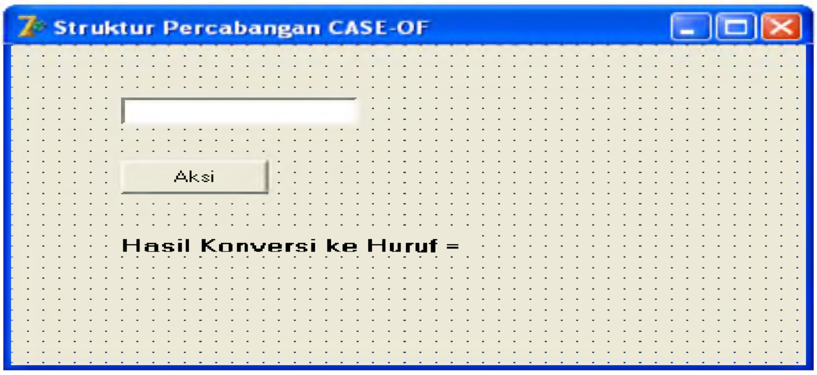
2. In active form, select components and place on form like picture below :



3. Set the properties of each components as follow:

Component	Properties	Value
Form1	Caption	Struktur Percabangan CASE-OF
Edit1	Text	*(dikosongi)*
Button1	Caption	Aksi
Label1	Caption	Hasil Konversi ke Huruf =
	Font - Size	10
	Font - Style - fsBold	True

4. The result is like picture below::

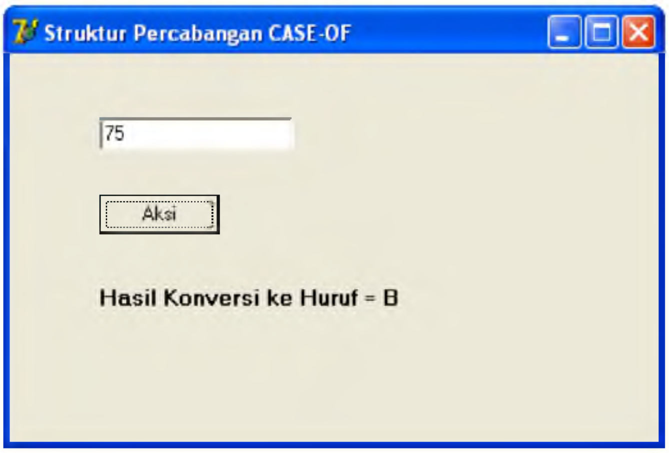


5. Double Click on Button1, then write code program as follow :

```
procedure TForm1.Button1Click(Sender: TObject);
var
  nilai: integer;
begin
  nilai := StrToInt(Edit1.Text);
  case nilai of
    0..40: Label1.Caption := 'Hasil Konversi ke Huruf = D';
    41..65: Label1.Caption := 'Hasil Konversi ke Huruf = C';
    66..75: Label1.Caption := 'Hasil Konversi ke Huruf = B';
    76..100: Label1.Caption := 'Hasil Konversi ke Huruf = A';
  else
    Label1.Caption := 'Hasil Konversi ke Huruf = ';
  end;
end;
```

6. Run project by clicking toolbar ▶ or press F9 on your keyboard.

7. Input value 75 into Edit1. Press button Aksi. The result will be shown like below:



Struktur Percabangan CASE-OF

75

Hasil Konversi ke Huruf = B

8. Try to input another value (0 - 100) into Edit1, then press button Aksi. What would happen?

9. Save your project as Percabangan3.

7. Discussion

a. Create an algorithm in a form of *flowchart* and the program to determine the biggest number between two integer!

b. Create an algorithm in a form of *flowchart* and the program to determine the smallest number between 3 integer input!

c. Create an algorithm in a form of *flowchart* and the program to determine whether the input is a positive integer or negative integer!