
-

#####

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<style> body { font-family: "Open Sans", "DejaVu Sans", sans-serif; } </style>

1.

#####, ## # ##### ## ## ##### ## ##
#####, #####¹ ## #####².

#####, ##### ## ##### #####
#####. ##### ## #, ##### ## #
#. ##### ## "#####". ## #, ## #
#, ## # # #, #####-#####
####. ## # # ##### (Turbo) #, #
#. ##### # # # # #
C++, Java ## C#.

- ### ## #####, ##### ## - #, #, #####³, ##### ...
- ### ## ##### ## ## #,
- ### # #####,
- ### # ## #, ## ## ## # # # # #.

#, ##### Free
Pascal Compiler, <http://freepascal.org/> . ## # IDE (#####,
Debugger, ##### # #), #####
Lazarus <http://lazarus.freepascal.org/> . ##### ## # Castle Game Engine,
<https://castle-engine.io/> , ##### # 3D # 2D # #, #####
(Windows, Linux, macOS,
Android, iOS, Nintendo Switch; ##### # # WebGL).

#-##### #, ##### #
#. ## # # #

¹ ##### = Unit

² ##### = Generics

³ ##### = Interface

"##### # #####", #####
#####.

2.

2.1. ##### "Hello world"

```
// Използвайте този ред във всички нови програми
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
// Needed for console programs on Windows,
// otherwise (with Delphi) the default is GUI program without console.
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

```
program MyProgram; // Запишете файла като myprogram.dpr
begin
  WriteLn('Hello world!');
end.
```

#####, ##### # #####.

- ##### FPC #, #####
myprogram.dpr # fpc myprogram.dpr .
- ##### Lazarus, ##### (##### Project → New Project → Simple Program). ##### myProgram # #####-#####
#####. ##### # ##### Run
Compile.
- ##### #, ##### —
#####.

#####, #####
#####-#####
Lazarus
(Project → New Project → Application). — GUI

Lazarus # Free Pascal Compiler #
(XML,
JSON, ...),
Castle Game Engine ##-##### :)

2.2. #####, #####,

```

program MyProgram;

{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}

procedure MyProcedure(const A: Integer);
begin
    WriteLn('A + 10 e: ', A + 10);
end;

function MyFunction(const S: string): string;
begin
    Result := S + 'низове се управляват автоматично';
end;

var
    X: Single;
begin
    WriteLn(MyFunction('Забележка: '));
    MyProcedure(5);

    // Делението с "/" винаги дава резултат float,
    // използвайте "div" за целочислено делене
    X := 15 / 5;
    WriteLn('X сега е: ', X); // научна нотация
    WriteLn('X сега е: ', X:1:2); // 2 десетични знака
end.

```

```

## ## ##### ## #####, ##### ## #####
##### Result. ##### ## ##### ##### Result, #####
##### # ##### ##### #####.

```

```

function MyFunction(const S: string): string;
begin
    Result := S + 'нещо';
    Result := Result + ' още нещо!';
    Result := Result + ' и още!';
end;

```

```

##### ## ## ##### (MyFunction # #####
#####) #####, ## ##### #####. ## ## ##

```

##, ## ## ##### "#####", ##### ## #####
#####. ##### Result
#####, ##### ## ##### ## #####.

#####. ## ##### ## ## ##, ##
() ## ## (##### ## # #####
##). ## ## #####

#####. #####:

```
function SumIntegersUntilZero: Integer;
var
  I: Integer;
begin
  Readln(I);
  Result := I;
  if I <> 0 then
    Result := Result + SumIntegersUntilZero();
end;
```

Exit ## ## ##### ##
end;. ## Exit
##, ##### ## ## ##
Result. ## ## ## Exit(X), ## ## ##
— ##### return X # C-
#####.

```
function AddName(const ExistingNames, NewName: string): string;
begin
  if ExistingNames = '' then
    Exit(NewName);
  Result := ExistingNames + ', ' + NewName;
end;
```


##. #####
(#####
##. #####:

```
var
```

```
Count: Integer;
MyCount: Integer;

function CountMe: Integer;
begin
    Inc(Count);
    Result := Count;
end;

begin
    Count := 10;
    CountMe; // функцията се изпълнява но резултата ѝ се игнорира, Count
сега е 11
    MyCount := CountMe; // резултата от функцията се използва, MyCount става
равно на Count, което сега е 12
end.
```

2.3. ##### (if)

```
##### if .. then ### if .. then .. else ## ## #####
###, ##### # #####. ## ##### ## C-#####
#####, # ##### ## # ##### ## ##### # #####.
```

```
var
    A: Integer;
    B: boolean;
begin
    if A > 0 then
        DoSomething;

    if A > 0 then
        begin
            DoSomething;
            AndDoSomethingMore;
        end;

    if A > 10 then
        DoSomething
    else
        DoSomethingElse;

    // еквивалентно на горното
    B := A > 10;
    if B then
```


A = B (##### **C**, ##### **A == B**). ##### assignment # ##### **:=**.

(#####) ##### ~~#####~~ #####
#####. ##### ## ##### ## #####
#####, ## ## ##### ## ## #####.

#####:

```
var
  A, B: Integer;
begin
  if A = 0 and B <> 0 then ... // НЕКОРЕКТЕН пример
```

#####, ##### #####
and # ##### #: (0 and B). #####
##. #####
=, ##### # ##### **A = (0 and B)**. #####
"type mismatch" ##### ## ##
A = (0 and B) # ##### 0.

#####:

```
var
  A, B: Integer;
begin
  if (A = 0) and (B <> 0) then ...
```

#. ##### (short-circuit evaluation). #####:

```
if MyFunction(X) and MyOtherFunction(Y) then...
```

- ##### #, ## ##### ## ##### **MyFunction(X)**.
- ##### **MyFunction(X)** ##### **false**, ##### ##
(##### ## **false** and **каквото_и_да_е** # ##### **false**),
MyOtherFunction(Y) ##### ## ## #####.
- ##### # ##### # ## **or** #####. #####, ## ## # **true**
(##### ## **true**), ##### ## ## #####.
- ##### # ##### ## ## ## ##

```
if (A <> nil) and A.IsValid then...
```

```
#### ## #####, #### A # nil. ##### nil # ##
##### (##### # #####). ##### null
pointer # #####.
```

2.5. ##### (case)

```
### ##### # ##### # ##### # ##### #
##### case .. of .. end.
```

```
case SomeValue of
  0: DoSomething;
  1: DoSomethingElse;
  2: begin
    IfItsTwoThenDoThis;
    AndAlsoDoThis;
  end;
  3..10: DoSomethingInCaseItsInThisRange;
  11, 21, 31: AndDoSomethingForTheseSpecialValues;
  else DoSomethingInCaseOfUnexpectedValue;
end;
```

```
##### else # ##### default # C-#####
#####). ##### else ##,
#####.
```

```
### C-##### # ##### switch, ##
##### (fall-through) ##.
##### # #####. ## # ##### # ##
##### break. ## #####-#####
## case, #####.
```

2.6.

```
##### # # #####, #####. ##### # #
#####-##### ## enums # #####:)
```


(#####):

```
type
  TAnimalKind = (akDuck, akCat, akDog);
  TAnimals = set of TAnimalKind;
var
  A: TAnimals;
begin
  A := [];
  A := [akDuck, akCat];
  A := A + [akDog];
  A := A * [akCat, akDog];
  Include(A, akDuck);
  Exclude(A, akDuck);
end;
```

2.7. ##### (for, while, repeat, for .. in)

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
{$R+} // включена проверка на диапазона - подходящо за дебъг

var
  MyArray: array [0..9] of Integer;
  I: Integer;
begin
  // инициализация
  for I := 0 to 9 do
    MyArray[I] := I * I;

  // показване
  for I := 0 to 9 do
    WriteLn('Квадрата е ', MyArray[I]);

  // прави същото като горното
  for I := Low(MyArray) to High(MyArray) do
    WriteLn('Квадрата е ', MyArray[I]);

  // прави същото като горното
  I := 0;
  while I < 10 do
  begin
    WriteLn('Квадрата е ', MyArray[I]);
    I := I + 1; // или "I += 1", или "Inc(I)"
```



```
List: TMyClassList;
C: TMyClass;
I: Integer;
begin
List := TMyClassList.Create(true); // true = притежава елементите си
try
for I := 0 to 9 do
begin
C := TMyClass.Create;
C.I := I;
C.Square := I * I;
List.Add(C);
end;

for C in List do
WriteLn('Квадрата на ', C.I, ' е ', C.Square);
finally
FreeAndNil(List);
end;
end.
```

#####, #### ## #####
#####. ##### ##### # ##-#####
:)

2.8. #####,

#####, ##### Write ##
WriteLn. ## ##### ## ##### ## ## ## ##.

"#####" ##### # #####. ## #### ## #####
#####. #####

#####

```
WriteLn('Hello world!');
WriteLn('Може да отпечатате цяло число: ', 3 * 4);
WriteLn('Може да разширите полето на цяло число: ', 666:10);
WriteLn('Може да отпечатате число с плаваща запетая: ', Pi:1:4);
```

##, ##### LineEnding
(## FPC RTL). (Castle Game Engine #### ## ## ##-#####)


```
# #####. ##### # ##### # #### "#####",
##### # ##### # #####. #### #
#####, ##### # ##### # #####
MyStringFormatter(...), ##### # #####
##### # Pi:1:4.##### (# ##### #)
##### # ##### ######), ##### #
#####.
```

3. ##### (Unit-#)

Unit-## ##### # ##### (#####, ##### # #
#####), # ##### # unit-# # #. # #
#. ##### interface,
unit-
implementation ##### # # #
#####. ##### unit-# MyUnit ### myunit.pas (#####
.pas).

```
unit MyUnit;
```

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
```

```
interface
```

```
procedure MyProcedure(const A: Integer);
function MyFunction(const S: string): string;
```

```
implementation
```

```
procedure MyProcedure(const A: Integer);
begin
    WriteLn('A + 10 е равно на: ', A + 10);
end;

function MyFunction(const S: string): string;
begin
    Result := S + 'низовете се управляват автоматично';
end;

end.
```

```
##### myprogram.lpr ( lpr
= Lazarus program file; # Delphi ##### .dpr ). #####
##### #
##### #
.pas # # # # # .pp # unit-# # # # #. #
##### # .pas # unit-# # .lpr # FPC/Lazarus #####.
```

```
##### unit # # # # # uses :
```

```
program MyProgram;

{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}

uses MyUnit;

begin
  WriteLn(MyFunction('Забележка: '));
  MyProcedure(5);
end.
```

```
Unit-# # # # # initialization # finalization.
# # # # # # # # # # # # # # # # # # # # # # # #
##### — #####.
```

```
unit initialization_finalization;

{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}

interface

implementation

initialization
  WriteLn('Hello world!');
finalization
  WriteLn('Goodbye world!');
end.
```

3.1. Unit-#,

```
#### unit # # # # # unit. ##### unit # # # # # #
##### interface # # # # # implementation. #####
```

(#####,...) ## ##
unit. ##### # #-#####, #.#. ##
unit ##### implementation, ##### ## # ##.

unit AnotherUnit;

{\$ifdef FPC**}** **{**\$mode objfpc**}****{**\$H+**}****{**\$J-**}** **{**\$endif**}**

interface

uses Classes;

{ Типът (клас) "TComponent" е дефиниран в unit Classes.

Поради тази причина трябва да използваме uses Classes; по-горе. **}**

procedure DoSomethingWithComponent(**var** C: TComponent);

implementation

uses SysUtils;

procedure DoSomethingWithComponent(**var** C: TComponent);

begin

{ Процедурата FreeAndNil е дефинирана в unit SysUtils.

Тъй като го използваме само в реализацията а не в интерфейсната част,
достатъчно е да използваме uses SysUtils; в секция "implementation". **}**

FreeAndNil(C);

end;

end.

unit-# # #####.
unit-# ## # #####
interface. ##### #, ## ## "#####"
unit, ##### "#####"
unit-#, #####. #####

#####. #####
Makefile #####

#####.

unit-# ### #####, ## ####
implementation. ##### unit A ####
B # ##### ## interface # ## ##### unit B #### ## #####
unit A # ##### ## implementation.

3.2. ##### ## ##### # ##### unit-#

unit-# #### ## ##### ##### # ##### #####. ## ## ####
#####, ##### ## ##### ## ## ##### ## ## #####
#####. # ##### ##### "#####" ##### unit #
uses, ##### ##### ##### ##### #####
unit-#.

unit-# ## ##### #####
unit-# #### ##### # ##### MyUnit.MyIdentifier. ####
#####, # ##### #####
MyUnit # ##### ## unit. ##### ## #####
unit-### # ##### uses, ## ## ## # #####
#####.

program showcolor;

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}  
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

```
// И двата unit-а Graphics и GoogleMapsEngine дефинират тип TColor.  
uses Graphics, GoogleMapsEngine;
```

var

```
{ Това не работи както ни се иска, оказва се, че TColor е  
  дефиниран от GoogleMapsEngine. }  
// Color: TColor;  
{ Това работи. }  
Color: Graphics.TColor;
```

begin

```
Color := clYellow;  
WriteLn(Red(Color), ' ', Green(Color), ' ', Blue(Color));
```

end.

unit-### ##### ## ## #####, ## ##### uses #####: ##### # ####
interface # ##### # ##### implementation. ##### unit-# #####
#####, ##### #

```
unit-### ##### # ### implementation ##### ## ##### #####
## unit-# ##### # ##### interface. ## ##### ## ## #####
interface ##### unit-### ##### # interface, ##### ## #####
## #####, # ##### ##### ##### ## ##### ##
#####:
```

```
unit UnitUsingColors;
```

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
```

```
// НЕКОРЕКТЕН пример
```

```
interface
```

```
uses Graphics;
```

```
procedure ShowColor(const Color: TColor);
```

```
implementation
```

```
uses GoogleMapsEngine;
```

```
procedure ShowColor(const Color: TColor);
```

```
begin
```

```
    // WriteLn(ColorToString(Color));
```

```
end;
```

```
end.
```

```
# unit Graphics (## Lazarus LCL) ## ##### ## TColor. ## #####
##### ## ##### unit, ##### ## ## ## #####
##### ShowColor, ##### ## ##### # interface.
##### # ## unit GoogleMapsEngine ##### ## TColor.
##### ## ##### ## implementation, #####
##### TColor ##### # implementation. ##### ##
unit, ##### # #####, ## #####:
```

```
unit UnitUsingColors;
```

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
```

```
// НЕКОРЕКТЕН пример
```

// Ето какво "вижда" компилатора когато се опитва да компилира предишното

interface

uses Graphics;

procedure ShowColor(**const** Color: Graphics.TColor);

implementation

uses GoogleMapsEngine;

procedure ShowColor(**const** Color: GoogleMapsEngine.TColor);

begin

 // WriteLn(ColorToString(Color));

end;

end.

— ##### # implementaton
TColor ## unit Graphics. #### # ## ## #####
GoogleMapsEngine # ##### interface ##### Graphics. ####
unit-# UnitUsingColors ##### ## ##
#####.

unit UnitUsingColors;

{\$ifdef FPC} {\$mode objfpc}{\$H+}{\$J-} {\$endif}

interface

uses Graphics;

procedure ShowColor(**const** Color: TColor);

implementation

uses GoogleMapsEngine;

procedure ShowColor(**const** Color: Graphics.TColor);

begin

 // WriteLn(ColorToString(Color));

end;

8.2, „Callbacks (#####, #####, #####, #####, #####, #####)“, ## ##### “#####”.

“#####”⁴, #####
unit, #####
#####.

#####, #####
(unit-level properties), ## ##### 4.3, „#####“.

4.

4.1.

(classes). ## #####
#####:

- ##### (fields) (##### “#####”),
- ##### (methods) (##### “#####”),
- # ##### (properties) (#####, ##### # #####, ## ##### # ##### (get) # ##### (set) ## #####; ##### # ##### # ##### 4.3, „#####“).
- #####, # ##### # ##### # ##### # ##### # ##### # ##### # ##### # ##### 9.2, „#####”.

type

```
TMyClass = class
  MyInt: Integer; // това е поле
  property MyIntProperty: Integer read MyInt write MyInt; // това е
  СВОЙСТВО
  procedure MyMethod; // това е метод
end;
```

```
procedure TMyClass.MyMethod;
begin
  WriteLn(MyInt + 10);
end;
```

⁴“#####” = wrappers

4.2. ##### (is), ##### (as)

#####.

```
program MyProgram;

{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}

uses
  SysUtils;

type
  TMyClass = class
    MyInt: Integer;
    procedure MyVirtualMethod; virtual;
  end;

  TMyClassDescendant = class(TMyClass)
    procedure MyVirtualMethod; override;
  end;

procedure TMyClass.MyVirtualMethod;
begin
  WriteLn('TMyClass shows MyInt + 10: ', MyInt + 10);
end;

procedure TMyClassDescendant.MyVirtualMethod;
begin
  WriteLn('TMyClassDescendant shows MyInt + 20: ', MyInt + 20);
end;

var
  C: TMyClass;
begin
  C := TMyClass.Create;
  try
    C.MyVirtualMethod;
  finally
    FreeAndNil(C);
  end;

  C := TMyClassDescendant.Create;
  try
    C.MyVirtualMethod;
```

```

finally
    FreeAndNil(C);
end;
end.

```

```

## #####, ## ##
## ## virtual. #####
##### override, # #####
#####. ## ## #####
##### reintroduce (#####
#####).

```

```

## ## ## ##### # #####
## ##### is. ## ## ##
##### as.

```

```

program is_as;

```

```

{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}

```

```

uses SysUtils;

```

```

type
    TMyClass = class
        procedure MyMethod;
    end;

```

```

    TMyClassDescendant = class(TMyClass)
        procedure MyMethodInDescendant;
    end;

```

```

procedure TMyClass.MyMethod;
begin
    WriteLn('MyMethod');
end;

```

```

procedure TMyClassDescendant.MyMethodInDescendant;
begin
    WriteLn('MyMethodInDescendant');
end;

```

```

var
    Descendant: TMyClassDescendant;

```


(####. #####) #####
#####;

2. #####, ## # #####. # #####
#####.

type

TWebPage = **class**

private

FURL: **string**;

FColor: TColor;

function SetColor(**const** Value: TColor);

public

{ Няма начин да се запише директно.

Извикайте метода Load, например Load('http://www.freepascal.org/'),
за да заредите страницата и да установите свойството. }

property URL: **string** **read** FURL;

procedure Load(**const** AnURL: **string**);

property Color: TColor **read** FColor **write** SetColor;

end;

procedure TWebPage.Load(**const** AnURL: **string**);

begin

FURL := AnURL;

NetworkingComponent.LoadWebPage(AnURL);

end;

function TWebPage.SetColor(**const** Value: TColor);

begin

if FColor <> Value **then**

begin

FColor := Value;

// за пример: предизвиква обновяване всеки път при промяна на
стойността

Repaint;

// пак за пример: осигурява, че някаква друга вътрешна инстанция,

// като "RenderingComponent" (каквато и да е тя),

// съдържа същата стойност за Color.

RenderingComponent.Color := Value;

end;

end;

#####, ## ##### ## ## #####, ##### ## ## ##### # ## ##
(#####) ## ##### ## ## ##. #

#####, ##### Color ##### (setter SetColor. ## ##
Color #####
FColor. ##### # #-#####
"#####" #####. #-##### # #####, #####
#####.

##:

1. ##### ## ## ## (# ##### ## ## ## ##
getter);
2. # ##### — ##### ## ## ##### # ## (# ##### ## ## ##
setter).

#####. #####, ## ## ##### Integer
#####, ##### ## ##### ## ## ## Integer ## ## ##
#####, ##### Integer.

#####, ## ##### "getter" # "setter" ## #####
(#####
#####). ## # ##### ## ## ## ##, ##
#-#####

- ##### getter ## ## ##### ## ## ##### (####.
##). #####
(### #####, #####-##### :).

#####

getter## ## #####

#####. ##### # ## ##
"getter".

- ##### setter ##### ## ##### ## ## ##
#####, ## ##### ## getter ## # #####. ## ##
"setter", # ##### #
(exception). ## # ##### ##
#####. ##### #, ## ## MyClass.MyProperty :=
123; ##### ## ## ##, ## MyClass.MyProperty = 123.

- #####, *read-only properties*, #####
- #####, ##### *private* #####
- #####, *set-only property*, ##### :)



unit. ##### — #####

getter # *setter*.

#####

(### *streaming components*)

(stream, #####), #####
#####.

Lazarus ##### (### #####)
xxx.lfm. (# Delphi #####
.dfm). #####
ReadComponentFromTextStream ## unit
LResources. #####
unit FpJsonRtti (##### # JSON #####).

Castle Game Engine: ##### unit CastleComponentSerialize
(##### # FpJsonRtti) ## ##### user-
interface # transformation component hierarchies.

#####:

- ##### (#####
default).

```
##### ## ## ##### ##### # ##### #####
## #####. #### ## ## #####. ##### default #
#### ##### ## #####: "##### ##
#####, ##### ##### #####".
```

- ##### (##### stored).

4.4. ##### - #####

```
# ##### ##### ## ## ##### # #####. ##### ##
##### # ##### try ... except ... end, ##### ## ## # ##### ##### try
... finally ... end.
```

```
{\ifdef FPC} {\$mode objfpc}{\$H+}{\$J-} {\$endif}
{\ifdef MSWINDOWS} {\$apptype CONSOLE} {\$endif}
```

```
program MyProgram;
```

```
uses
    SysUtils;
```

```
type
  TMyClass = class
    procedure MyMethod;
  end;
```

```
procedure TMyClass.MyMethod;
begin
    if Random > 0.5 then
        raise Exception.Create('Raising an exception!');
end;
```

```
var
  C: TMyClass;
begin
  Randomize;
  C := TMyClass.Create;
  try
    C.MyMethod;
  finally
    FreeAndNil(C);
  end;
end.
```


 #####, ## finally ##
 ##### Exit (## / /) ## Break ##
 Continue (## ##).

6, „#####“ ## -#####

4.5.

-#####
 ##### / /

:

public

unit-#.

private

#####.

protected

#####.

private # protected ##
 ##### unit ##
 ##### private ## protected. #####
 ##### strict
 private ## strict protected ##
 ##### 9.1, „#####“.

public. #####
 ## {M+}, ##
 ## {M+}, ##
 TPersistent, ## TComponent
 (TComponent # TPersistent). ##
 # published, ## public, ##
 #####.

published (##
 ##
 ## public, ##
 ##.

4.6.

#####, ## ## #####, ## ##
TObject.

4.7. Self

Self (##) ##### # #####
#####, ## ##### # #####. ##### #
this ## C++, Java # #####.

4.8.

#####, ### #####, ##### ##
#####. # #####
#-####, TMyClass2.MyOtherMethod ##### MyMethod, ##### # #####
TMyClass2.MyMethod.

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}  
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

```
uses SysUtils;
```

```
type
```

```
  TMyClass1 = class  
    procedure MyMethod;  
  end;
```

```
  TMyClass2 = class(TMyClass1)  
    procedure MyMethod;  
    procedure MyOtherMethod;  
  end;
```

```
procedure TMyClass1.MyMethod;  
begin  
  Writeln('TMyClass1.MyMethod');  
end;
```

```
procedure TMyClass2.MyMethod;  
begin  
  Writeln('TMyClass2.MyMethod');  
end;
```

35



```
##### TMyClass2.MyOtherMethod ####, ## ## #####
inherited MyMethod # ##### ## # ##### #
#####.
```

```
###-##### ## ##### ## ##### ## #####
### # #####. ## ##### ##### ## ##### # #####
#####
#####
#####. ##### #-####.
```

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

```
uses SysUtils;
```

```
type
```

```
TMyClass1 = class
    constructor Create;
    procedure MyMethod(const A: Integer);
end;
```

```
TMyClass2 = class(TMyClass1)
    constructor Create;
    procedure MyMethod(const A: Integer);
end;
```

```
constructor TMyClass1.Create;
begin
    inherited Create; // this calls TObject.Create
    Writeln('TMyClass1.Create');
end;
```

```
procedure TMyClass1.MyMethod(const A: Integer);
begin
    Writeln('TMyClass1.MyMethod ', A);
end;
```

```
constructor TMyClass2.Create;
begin
    inherited Create; // this calls TMyClass1.Create
    Writeln('TMyClass2.Create');
end;
```

```
procedure TMyClass2.MyMethod(const A: Integer);
begin
```

```

inherited MyMethod(A); // this calls TMyClass1.MyMethod
Writeln('TMyClass2.MyMethod ', A);
end;

var
  C: TMyClass2;
begin
  C := TMyClass2.Create;
  try
    C.MyMethod(123);
  finally FreeAndNil(C) end;
end.

```

```

#####
### # #####, ### #####:
### # inherited; (##### inherited, #####
##### # #####, ##### # #####). #####
"##### #, #####
#####".

```



```

# #####, ##### inherited ...; #####
## # inherited;.

```

```

##### 1: ##### inherited; # #####
##### # #####. ### #
## (##### # ##### # # const), #####
##### # # #####
#####. #####:

```

```

procedure TMyClass2.MyMethod(A: Integer);
begin
  Writeln('TMyClass2.MyMethod начално ', A);
  A := 456;
  { Това извиква TMyClass1.MyMethod with A = 456,
    независимо от стойността на A подадена на този метод
    (TMyClass2.MyMethod). }
  inherited;
  Writeln('TMyClass2.MyMethod крайно ', A);
end;

```

```

##### 2: ##### MyMethod (## "#####
## #####) ##### #

```



```

    Writeln('Изядохме ябълка');
end;

procedure DoSomethingWithAFruit(const Fruit: TFruit);
begin
    Writeln('Имаме плод от клас ', Fruit.ClassName);
    Writeln('Ядем го:');
    Fruit.Eat;
end;

var
    Apple: TApple; // Забележка: тук също така може да декларирате "Apple:
                    TFruit"
begin
    Apple := TApple.Create;
    try
        DoSomethingWithAFruit(Apple);
    finally FreeAndNil(Apple) end;
end.

```

####

```

Имаме плод от клас TApple
Ядем го:
Изядохме плод

```

```

##### Fruit.Eat ##### TFruit.Eat
# ##### TApple.Eat .

```

```

### ## #####, #####, ## ## ## #####:
##### Fruit.Eat, ##### Fruit ## #####
TFruit.##### Eat # ##### TFruit.### #####
TFruit ## #####, ##### # #####
(TObject # #####). ## ##### (####
TApple,### ## ## ## ##### Fruit # TApple,
TFruit ### ##### TFruit (#### TOrange,## # #####
# #####-###).

```

```

# #####, #####, ## ## ## ##, ## ## ## ##
#####.

```

```

##### ## #####. ### #####
Eat # #####(##### ## ## ##-###), #####

```

```
#####, ##### ## #### #####, ## ##### ## ##### ## #####.
### ##### Fruit ##### ##### ## ##### TApple (#### ##
##### # ##### TFruit), ##### Eat ## ##
##### # TApple.
```

```
# #####, ## ## #####, ##### ##:
```

- ##### (# -#####) #
virtual.
- ##### (#) #
override. ##### ## ##
(# ## ##, # ##).

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

```
uses SysUtils;
```

```
type
```

```
TFruit = class
    procedure Eat; virtual;
end;

TApple = class(TFruit)
    procedure Eat; override;
end;
```

```
procedure TFruit.Eat;
begin
    Writeln('Изядохме плод');
end;
```

```
procedure TApple.Eat;
begin
    Writeln('Изядохме ябълка');
end;
```

```
procedure DoSomethingWithAFruit(const Fruit: TFruit);
begin
    Writeln('Имаме плод от клас ', Fruit.ClassName);
    Writeln('Ядем го:');
    Fruit.Eat;
end;
```



```
var
  Apple: TApple; // Забележка: тук също така може да декларирате "Apple:
  TFruit"
begin
  Apple := TApple.Create;
  try
    DoSomethingWithAFruit(Apple);
  finally FreeAndNil(Apple) end;
end.
```

####

Имаме плод от клас TApple
Ядем го:
Изядохме ябълка

(VMT), #####

Eat, #####
Fruit, #
Eat #####

override, #####

reintroduce. # e #-#####
override, #####
#####.

5.

5.1.

-gl -gh ## FPC ## ##### (https://castle-engine.io/manual_optimization.php#section_memory).

(#

#####),
#####.

5.2.

FreeAndNil(A) unit SysUtils
A # nil, — (destructor) #
nil. #####.

#####:

```
if A <> nil then
begin
  A.Destroy;
  A := nil;
end;
```

FreeAndNil
nil A
"#####"
#####.

A.Free, #####:

```
if A <> nil then
  A.Destroy;
```

A (#####),
nil.

nil. A.Free
Free
"#####"
Self <> nil. ##### (#####
#####).

FreeAndNil(A)
Free Destroy. Castle

Game Engine ##### ## #### #####. #### ##### ## ##### # ####,
`nil`, ## ##### ## #####.

5.3.

#####. ## ##### ##, ##### ## #
##, ## # # # (## #-##### -
#). ##### ## ##### # ##
#####. ##### # # ##### ## `nil`, #####
#-##### ## # ##, ##### `FreeAndNil(A)`.

#####:

uses SysUtils;

type

 TGun = **class**

end;

 TPlayer = **class**

 Gun1, Gun2: TGun;

constructor Create;

destructor Destroy; **override**;

end;

constructor TPlayer.Create;

begin

inherited;

 Gun1 := TGun.Create;

 Gun2 := TGun.Create;

end;

destructor TPlayer.Destroy;

begin

 FreeAndNil(Gun1);

 FreeAndNil(Gun2);

inherited;

end;

##, ##### ##
"#####" ## `TComponent`. ##, ##### #
##. #####

(#### ##
#####, #### ## #####
##-####). ##### ## #####:

uses SysUtils, Classes;

type

TGun = **class**(TComponent)
end;

TPlayer = **class**(TComponent)
Gun1, Gun2: TGun;
constructor Create(AOwner: TComponent); **override**;
end;

constructor TPlayer.Create(AOwner: TComponent);
begin
inherited;
Gun1 := TGun.Create(Self);
Gun2 := TGun.Create(Self);
end;

TComponent. ##### ## ## #####
(##### — ##### # reintroduce.##
#####, ## ## #####, ##### ##
#####, ## ##
#####.)

nil. ##
"#####"
#####. ##### ##
TComponent, ## #####
####, ##### ManualGun :=
TGun.Create(nil);.

OwnsObjects (## ##### true!) ##
TFPGObjectList ## TObjectList. #####:

uses SysUtils, Classes, FGL;

type

TGun = class

end;

TGunList = {\$ifdef FPC}specialize{\$endif} TFPGObjectList<TGun>;

TPlayer = class

 Guns: TGunList;

 Gun1, Gun2: TGun;

constructor Create;

destructor Destroy; **override;**

end;

constructor TPlayer.Create;

begin

inherited;

// Всъщност, стойността true (за OwnsObjects) е зададена по подразбиране

 Guns := TGunList.Create(true);

 Gun1 := TGun.Create;

 Guns.Add(Gun1);

 Gun2 := TGun.Create;

 Guns.Add(Gun2);

end;

destructor TPlayer.Destroy;

begin

{ Трябва да се погрижим за освобождаването на списъка.

Той ще освободи елементите си автоматично. }

 FreeAndNil(Guns);

{ Вече няма нужда да освобождаваме ръчно Gun1, Gun2. Хубав навик е да установим на "nil"

техните препратки, тъй като знаем, че са освободени. В този прост клас и с

този прост деструктор, очевидно е, че те няма да бъдат достъпвани повече --

но правейки така ще ни помогне в случая на по-големи и по-сложни деструктори.

Алтернативно, можем да си спестим декларирането на Gun1 и Gun2,

и вместо това да използваме Guns[0] и Guns[1] в нашия код.

Или да създадем метод Gun1, който връща Guns[0]. }

 Gun1 := **nil**;

 Gun2 := **nil**;

inherited;

end;

```
##### , ## "#####" # ##### # #####
##### # ## ##### , ## #####
## ## #####. ##### Extract ## #####
##### ## ## # ##### # ## #####
##### ## ##### #.
```

```
# Castle Game Engine: ##### TX3DNode #####
##### ## ##### children ##
TX3DNode. ##### X3D #####, TX3DRootNode, ## #####
## ##### TCastleSceneCore. #####
##### - ##### , #####
OwnsXxx.
```

5.4. ##### Destroy

```
##### -#####, ##### , ##
##### деструктор, ##### Destroy.
```

```
## ##### , ## ##
## # #####. ##### -##### # ## ##### , #####
Destroy, ##### ## ##### Free, ## ##
##### FreeAndNil.
```

```
##### Destroy # TObject # ##### , ##
## ##### # ##### override ##
##### (## ##### TObject). ##
##### ## Free. #####
##### ## ##### 4.9, „#####“.
```



```
##### ##
#####.
```

```
##### # #####
##### Create # #####
##### , ## #
#####.
```

```
##### Create # TObject ## #
##### , ##### # override #
#####.
```

```
#####  
#####. #####  
#####.  
  
#####  
##### TComponent. TComponent  
##### Create(AOwner: TComponent)  
#####  
##### TComponent, #####  
##### (#####  
##### override) #####  
#####  
#####  
#####  
#####  
Create(AOwner: TComponent), #####  
#####  
#####  
#####  
Lazarus.
```

5.5.

#####, ### ## ## ##### ### ##### ###
 ##### # #####, # ##### ##### ##### ## ## ## ##### — ##### ##
 ##### ## "#####". ## ## ##### ## ## #####, ### ##### ## ##
 #####, ##### ## # #####. ##### ## ## ##### ## ##### ##
 ##### ## ##### ## ## ##### "#####" (### #####
 ##### ## ## ##### ##### ## ##### ##).

```
##### ## FreeAndNil ### #### ## #####. FreeAndNil
##### nil #### # #####, #### # ##### — #### #### ## #####
##### ##### #####. ##### ##:
```

```
var
    Obj1, Obj2: TObject;
begin
    Obj1 := TObject.Create;
    Obj2 := Obj1;
    FreeAndNil(Obj1);
```

// какво ще се случи ако достъпим тук Obj1 или Obj2?
end;

1. # ##### Obj1 # nil. #####
if Obj1 <> nil then ..., ##
#####

if Obj1 <> nil then
WriteLn(Obj1.ClassName);

Obj1 <> nil # ##### Obj1, ##
#####.

nil #####.

2. # Obj2, ##### nil, ##

(exception), #
#####.

#####:

- #####

TCar #####
TWheel, #, ## wheel #
car #####, # car # wheels #

#####
- # ##### Obj1,
nil ## Obj2. #####
#####
- ###-##### TComponent ##
"#####". #####
#####-## #
nil.


```
## #### ##### ##### ##### ## #####. ## ##
## ##### # #####, ##### ## #####
##### ## #####, # ##### ## ##
##### ## #####.
```

```
#### ##### # ##### ## ## ##### ## TComponent.
##### ## ##### ## ##### ## FreeNotification,
RemoveFreeNotification # ##### ## Notification.
```

```
### #####, ##### ## ## #####, #####
# #####/##### # ##### ## ##### ## setter. #####
#### ## ## ##### # #-#####, ## ## # #####, ##### #
##### :)
```

type

```
TControl = class(TComponent)
end;
```

```
TContainer = class(TComponent)
```

private

```
FSomeSpecialControl: TControl;
```

```
procedure SetSomeSpecialControl(const Value: TControl);
```

protected

```
procedure Notification(AComponent: TComponent; Operation:
TOperation); override;
```

public

```
destructor Destroy; override;
```

```
property SomeSpecialControl: TControl
```

```
read FSomeSpecialControl write SetSomeSpecialControl;
```

```
end;
```

implementation

```
procedure TContainer.Notification(AComponent: TComponent; Operation:
TOperation);
```

begin

```
inherited;
```

```
if (Operation = opRemove) and (AComponent = FSomeSpecialControl) then
```

```
{ set to nil by SetSomeSpecialControl to clean nicely }
```

```
SomeSpecialControl := nil;
```

```
end;
```

```

procedure TContainer.SetSomeSpecialControl(const Value: TControl);
begin
  if FSomeSpecialControl <> Value then
    begin
      if FSomeSpecialControl <> nil then
        FSomeSpecialControl.RemoveFreeNotification(Self);
      FSomeSpecialControl := Value;
      if FSomeSpecialControl <> nil then
        FSomeSpecialControl.FreeNotification(Self);
    end;
end;

destructor TContainer.Destroy;
begin
  { set to nil by SetSomeSpecialControl, to detach free notification }
  SomeSpecialControl := nil;
  inherited;
end;

```

5.6. ##### (Castle Game Engine)

```

#   Castle   Game   Engine   #####   ##   #####
TFreeNotificationObserver ## ##### CastleClassUtils #####
##### ##### ## FreeNotification, RemoveFreeNotification #
##### ## Notification.

#### ##### ##### ## TFreeNotificationObserver ##### ##-
##### ## ##### ## ##### FreeNotification ##### (#####
## #####, ## # ##### ## #####). ## ##-#####, ##### ## # #####
##### ## ##### ## ## ##### ##### ##### #####
TFreeNotificationObserver # ##### ##-##### ## ##### (#####
##### ## FreeNotification # ##### ##### ## ##### #####,
### ##### ## ##### ## ## ##### ##### #####).

#### # ##### ##, ##### TFreeNotificationObserver, ##
##### ## ##### ##### ##### # #####:

```

```

type
  TControl = class(TComponent)
end;

```

```

TContainer = class(TComponent)
private
    FSomeSpecialControlObserver: TFreeNotificationObserver;
    FSomeSpecialControl: TControl;
    procedure SetSomeSpecialControl(const Value: TControl);
    procedure SomeSpecialControlFreeNotification(const Sender:
TFreeNotificationObserver);
public
    constructor Create(AOwner: TComponent); override;
    property SomeSpecialControl: TControl
        read FSomeSpecialControl write SetSomeSpecialControl;
end;

implementation

uses CastleComponentSerialize;

constructor TContainer.Create(AOwner: TComponent);
begin
    inherited;
    FSomeSpecialControlObserver := TFreeNotificationObserver.Create(Self);
    FSomeSpecialControlObserver.OnFreeNotification := {$ifdef FPC}@{$endif}
SomeSpecialControlFreeNotification;
end;

procedure TContainer.SetSomeSpecialControl(const Value: TControl);
begin
    if FSomeSpecialControl <> Value then
        begin
            FSomeSpecialControl := Value;
            FSomeSpecialControlObserver.Observed := Value;
        end;
end;

procedure TContainer.SomeSpecialControlFreeNotification(const Sender:
TFreeNotificationObserver);
begin
    // set property to nil when the referenced component is freed
    SomeSpecialControl := nil;
end;

```

https://castle-engine.io/custom_components .

- ##### `Exception`. ##### `Exception` ##### `TObject`,
`Message` # #####
#####. #####, #####
`Exception`. #####
#####.
 - ##### (#####) #####, ##### # `E`, ##
`T`. ##### `ESomethingBadHappened`.
 - #####-#####, #####
#####. #####.
- # #####
#####, ##### `raise`, ##### `raise`
`ESomethingBadHappened.Create('Описание на случилото се лошо
нещо.')`.

6.2.

`raise ...`, #####:

type

`EInvalidParameter = class(Exception);`

function `ReadParameter: String;`

begin

`Result := Readln;`

if `Pos(' ', Result) <> 0` **then**

`raise EInvalidParameter.Create('Invalid parameter, space is not
allowed');`

end;

`raise` #####

#####.

`CreateFmt`, #####
`Create(Format(MessageFormat, MessageArguments))`.

#####.

```

type
  EInvalidParameter = class(Exception);

function ReadParameter: String;
begin
  Result := Readln;
  if Pos(' ', Result) <> 0 then
    raise EInvalidParameter.CreateFmt('Невалиден параметър %s, не са  

    позволени интервали.', [Result]);
end;

```

6.3.

#####

```

var
  Parameter1, Parameter2, Parameter3: String;
begin
  try
    Writeln('Въведете 1-ви параметър:');
    Parameter1 := ReadParameter;
    Writeln('Въведете 2-ри параметър:');
    Parameter2 := ReadParameter;
    Writeln('Въведете 3-ти параметър:');
    Parameter3 := ReadParameter;
  except
    // прихващане на EInvalidParameter предизвикан от някое от
    извикванията на ReadParameter
    on EInvalidParameter do
      Writeln('Възникна изключение EInvalidParameter');
    end;
  end;
end;

```

#####, ##### ## ##### ##
 ##### (## ##### E # #####). ## ##### ##
 #####

```

try
  ...
except
  on E: EInvalidParameter do
    Writeln('Възникна изключение EInvalidParameter със съобщение: ' +
    E.Message);

```

end;

#####:

try

...

except

on E: EInvalidParameter do

Writeln('Възникна изключение EInvalidParameter със съобщение: ' +
E.Message);

on E: ESomeOtherException do

Writeln('Възникна изключение ESomeOtherException със съобщение: ' +
E.Message);

end;

##, ##
on :

try

...

except

Writeln('Предупреждение: Възникна изключение');

end;

// ПРЕДУПРЕЖДЕНИЕ: НЕ СЛЕДВАЙТЕ ПРИМЕРА БЕЗ ДА СТЕ ПРОЧЕЛИ ЗАБЕЛЕЖКАТА ПО-
ДОЛУ

// ОТНОСНО "ПРИХВАЩАНЕ НА ВСИЧКИ ИЗКЛЮЧЕНИЯ"

##, #####
##, # ## ## ## ## ##. #####
(#### ## ## Exception
TObject), ## ## ## ## ## ## ## ## ## ##-
##. ##### ##
##, ##### ## ## ## ## ##
##, # ## ## ## ## ## ## ##
##-#####, ## ## ## ## ## ## ## ## ## ##
#####, ## ## ## ## ## ## ## ## ## ##.

- ##### ## ## ## ## ## ## ## ## ## ##? #####
##.
- ##### ## ## ## ## ## ## ## ## ##? ##### ## ## ## ## ## ## ## ## ##
####, ## ## ## ## ## ## ## ## ## ##.

#####

```
try
...
except
  on E: TObject do
    Writeln('Предупреждение: Възникна изключение');
end;
// ПРЕДУПРЕЖДЕНИЕ: НЕ СЛЕДВАЙТЕ ПРИМЕРА БЕЗ ДА СТЕ ПРОЧЕЛИ ЗАБЕЛЕЖКАТА ПО-
ГОРЕ
// ОТНОСНО "ПРИХВАЩАНЕ НА ВСИЧКИ ИЗКЛЮЧЕНИЯ"
```

Exception:

```
try
...
except
  on E: Exception do
    Writeln('Предупреждение: Възникна изключение: ' + E.ClassName + ',
    съобщение: ' + E.Message);
end;
// ПРЕДУПРЕЖДЕНИЕ: НЕ СЛЕДВАЙТЕ ПРИМЕРА БЕЗ ДА СТЕ ПРОЧЕЛИ ЗАБЕЛЕЖКАТА ПО-
ГОРЕ
// ОТНОСНО "ПРИХВАЩАНЕ НА ВСИЧКИ ИЗКЛЮЧЕНИЯ"
```

except ... end,### #
raise E; ,### # E,#####
raise ########:

```
try
...
except
  on E: EInvalidSoundFile do
    begin
      if E.InvalidUrl = 'http://example.com/blablah.wav' then
        Writeln('Предупреждение: зареждането на http://example.com/
        blablah.wav се провали, игнорирайте го')
      else
        raise;
      end;
    end;
end;
```


#####

6.4. Finally (#####)

try .. finally .. end,#####

#####:

```
procedure MyProcedure;  
var  
  MyInstance: TMyClass;  
begin  
  MyInstance := TMyClass.Create;  
  try  
    MyInstance.DoSomething;  
    MyInstance.DoSomethingElse;  
  finally  
    FreeAndNil(MyInstance);  
  end;  
end;
```


MyInstance.DoSomething MyInstance.DoSomethingElse
#####.

MyInstance ##-####, ##### (#### ##
"##### # #####") #####. #####
##:

```
// НЕКОРЕКТЕН ПРИМЕР:  
procedure MyProcedure;  
var  
  MyInstance: TMyClass;  
begin  
  try  
    CallSomeOtherProcedure;  
    MyInstance := TMyClass.Create;
```

```

    MyInstance.DoSomething;
    MyInstance.DoSomethingElse;
finally
    FreeAndNil(MyInstance);
end;
end;

```

```

##### # #####: ### ##### # TMyClass.Create
(#####) ### # #####
## CallSomeOtherProcedure, ##### MyInstance ## ##
#####. ##### ## FreeAndNil(MyInstance) ## ## #####
##### ## MyInstance, #####-##### ## ## ##### # Access
Violation (Segmentation Fault). ##### ## #####
#####, ##### ## #####: ##### ##
##### #####.

```

```

##### # ##### ## ##### ##, ##### #####
##### ## nil (##### ## FreeAndNil #
#####). ##### ##, ##### #####.
##### ##-#####:

```

```

procedure MyProcedure;
var
    MyInstance1: TMyClass1;
    MyInstance2: TMyClass2;
    MyInstance3: TMyClass3;
begin
    MyInstance1 := TMyClass1.Create;
    try
        MyInstance1.DoSomething;

        MyInstance2 := TMyClass2.Create;
        try
            MyInstance2.DoSomethingElse;

            MyInstance3 := TMyClass3.Create;
            try
                MyInstance3.DoYetAnotherThing;
            finally
                FreeAndNil(MyInstance3);
            end;
        finally
            FreeAndNil(MyInstance2);
        end;
    end;

```



```
#####. #####, ## ##### "#####"  
## Application.ProcessMessages, #####  
#####. ##### ## #####  
## TApplicationProperties.OnException.
```

- ## #####, # Castle Game Engine # CastleWindow: #####
#####. #####
"#####" ## Application.ProcessMessages. #####

Application.OnException.
- ##### GUI ##### ## ##### ## #####.
- # ##### ## #####, ##### ## #####
#####, ##### callback ## OnHaltProgram.

7. Run-time

7.1. #####/##### # ##### ##

```
##### ## ##### ## ##### TStream #  
##### ## #####/#####. #####  
##### TStream, #####: TFileStream, TMemoryStream,  
TStringStream.
```

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}  
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

uses

```
SysUtils, Classes;
```

var

```
S: TStream;  
InputInt, OutputInt: Integer;
```

begin

```
InputInt := 666;
```

```
S := TFileStream.Create('my_binary_file.data', fmCreate);
```

try

```
S.WriteBuffer(InputInt, SizeOf(InputInt));
```

finally

```
FreeAndNil(S);
```

end;

```
S := TFileStream.Create('my_binary_file.data', fmOpenRead);
try
  S.ReadBuffer(OutputInt, SizeOf(OutputInt));
finally
  FreeAndNil(S);
end;

WriteLn('Read from file got integer: ', OutputInt);
end.
```

```
# Castle Game Engine: ##### ## ##### Download ##
##### ## ##, ##### ##### URL #####. ## ##
##### ## #####, HTTP # HTTPS #####, Android assets
# #####. ##### ## ## ##### ## ## ## ## ## (#
##### data), ##### URL ##### castle-data:/
xxx. #####:
```

```
EnableNetwork := true;
S := Download('https://castle-engine.io/latest.zip');
```

```
S := Download('file:///home/michalis/my_binary_file.data');
```

```
S := Download('castle-data:/gui/my_image.png');
```

```
## ## #####, ##### ## #####
TCastleTextReader. ### ##### API # ##### # ##
TStream. ##### TCastleTextReader ##### ## ## URL
##### ## ## ## ## ## ## ## ##
TStream.
```

```
Text := TCastleTextReader.Create('castle-data:/my_data.txt');
try
  while not Text.Eof do
    WriteLnLog('NextLine', Text.ReadLn);
  finally
    FreeAndNil(Text);
  end;
```

7.2. ##### (#####, #####),

```
##### # run-time #####
### ##### "#####" ##### (#### TList # TObjectList ## #####
Contrs), ## # ##### (array of TMyType). ## ## #####
###-##### # #####, ##### ## #####
## ##### #####.
```

```
##### ## ##### ## #####,
#####, #####, #####, #####... ##### (##
#####), ## #####
```

```
# ##### ## ##, ##### # FPC:
```

- ##### Generics.Collections (## FPC >= 3.2.0)
- ##### FGL
- ##### GVector (##### # fcl-stl)

```
##### ## ## ##### Generics.Collections. #####
##### ##:
```

- ##### # #####,
- ##### (##### # #####⁵ # ##### #
#####),
- ##### FPC # Delphi,
- ##### # # ##### # #####
(##### Contrs).

```
# Castle Game Engine: ## ##### Generics.Collections #
##### ## ##### Generics.Collections # ## #####!
```

```
###-##### ## Generics.Collections ##:
```

TList

```
##### ## #####
```

TObjectList

```
##### ## #####. ## "#####"
#####, ##### ## ##
#####
```

⁵ ##### = Dictionary, a.k.a. Associative array

TDictionary

#####⁵.

TObjectDictionary

#####⁵, ##### "#####" ##### #/### #####.

TObjectList:

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

uses SysUtils, Generics.Collections;

type

```
TApple = class
    Name: string;
end;
```

```
TAppleList = {$ifdef FPC}specialize{$endif} TObjectList<TApple>;
```

var

```
A: TApple;
Apples: TAppleList;
```

begin

```
Apples := TAppleList.Create(true);
```

try

```
A := TApple.Create;
A.Name := 'my apple';
Apples.Add(A);
```

```
A := TApple.Create;
A.Name := 'another apple';
Apples.Add(A);
```

```
Writeln('Count: ', Apples.Count);
Writeln(Apples[0].Name);
Writeln(Apples[1].Name);
```

```
finally FreeAndNil(Apples) end;
```

end.

```
#####5, #####5 #####5 #####5 #####5 #/### #####5,
#####5 #####5 # #####5 (#####5. #####5 #####5 Sort # IndexOf).
#####5 # Generics.Collections #####5 ## #####5.
#####5 ## #####5 # #####5 ## #####5 #####5, #####5 ## #####5 (#
```

, ##### #
 ##### IndexOf).

, ##### #
 ##### IComparer .
 ##### callback #
 TComparer<T>.Construct , ##### callback #
 IComparer . #####

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

```
{ If GENERICS_CONSTREF is defined, then various routines used with
Generics.Collections
  (like callbacks we pass to TComparer, or OnNotify callback or Notify
virtual method)
  should have "constref" parameter, not "const".
  This was the case of FPC<= 3.2.0, FPC changed it in
https://gitlab.com/freepascal.org/fpc/source/-/commit/693491048bf2c6f9122a0d8b044ad0e55382354d .
  It is also applied to FPC fixes branch 3.2.3 and later 3.2.4(rc1). }
```

```
{$ifdef VER3_0} {$define GENERICS_CONSTREF} {$endif}
{$ifdef VER3_2_0} {$define GENERICS_CONSTREF} {$endif}
{$ifdef VER3_2_2} {$define GENERICS_CONSTREF} {$endif}
```

```
uses SysUtils, Generics.Defaults, Generics.Collections;
```

```
type
  TApple = class
    Name: string;
  end;
```

```
TAppleList = {$ifdef FPC}specialize{$endif} TObjectList<TApple>;
```

```
function CompareApples(
  {$ifdef GENERICS_CONSTREF}constref{$else}const{$endif}
  Left, Right: TApple): Integer;
begin
  Result := AnsiCompareStr(Left.Name, Right.Name);
end;
```

```
type
  TAppleComparer = {$ifdef FPC}specialize{$endif} TComparer<TApple>;
var
```



```

A: TApple;
L: TAppleList;
begin
  L := TAppleList.Create(true);
  try
    A := TApple.Create;
    A.Name := '11';
    L.Add(A);

    A := TApple.Create;
    A.Name := '33';
    L.Add(A);

    A := TApple.Create;
    A.Name := '22';
    L.Add(A);

    L.Sort(TAppleComparer.Construct({$ifdef FPC}@{$endif} CompareApples));

    Writeln('Count: ', L.Count);
    Writeln(L[0].Name);
    Writeln(L[1].Name);
    Writeln(L[2].Name);
  finally FreeAndNil(L) end;
end.

```

TDictionary #####, ##### map (key → value), ####
 ##### associative array. ##### API # ##### TDictionary # C#.
 ### #####, ##### →#####.

#####, #####:

```

{$mode objfpc}{$H+}{$J-}
uses SysUtils, Generics.Collections;

type
  TApple = class
    Name: string;
  end;

  TAppleDictionary = {$ifdef FPC}specialize{$endif} TDictionary<String,
  TApple>;

var
  Apples: TAppleDictionary;

```

```

A, FoundA: TApple;
ApplePair: {$ifdef FPC} TAppleDictionary.TDictionaryPair {$else}
TPair<String, TApple> {$endif};
AppleKey: string;
begin
Apples := TAppleDictionary.Create;
try
  A := TApple.Create;
  A.Name := 'моята ябълка';
  Apples.AddOrSetValue('ключ за ябълка 1', A);

  if Apples.TryGetValue('ключ за ябълка 1', FoundA) then
    Writeln('Намерена ябълка с ключ "ключ за ябълка 1" с име: ' +
      FoundA.Name);

  for AppleKey in Apples.Keys do
    Writeln('Намерен ключ за ябълка: ' + AppleKey);
  for A in Apples.Values do
    Writeln('Намерена ябълка с име: ' + A.Name);
  for ApplePair in Apples do
    Writeln('Намерен ключ за ябълка->име на ябълка: ' +
      ApplePair.Key + '->' + ApplePair.Value.Name);

  { Долният ред също работи, но може да се използва само да
    зададе стойност на *съществуващ* ключ в речника.
    Вместо това обикновено се използва AddOrSetValue
    за да се зададе или добави нов ключ ако е необходимо. }
  // Apples['ключ за ябълка 1'] := ... ;

  Apples.Remove('ключ за ябълка 1');

  { Забележете, че TDictionary не притежава елементите си
    и трябва да ги освобожавате ръчно.
    Може да използвате TObjectDictionary за да имате автоматичен
    режим за притежание. }
  A.Free;
finally FreeAndNil(Apples) end;
end.

```

```

TObjectDictionary ##### #/### #####, #####
##### # # #. ##### # # #
##### #/##### # #. # #, #
# # #, ##### Integer (#.#. # #)

```

```
## Integer, # ##### doOwnsKeys), ## ##### #####
#####.
```

```
##### ## ##### TObjectDictionary # ##### #-####.
##### # memory leak detection, #####. ##### fpc -gl -gh
generics_object_dictionary.dpr, ## ## ##, ## #####
### #####.
```

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

```
uses SysUtils, Generics.Collections;
```

```
type
```

```
  TApple = class
    Name: string;
  end;
```

```
  TAppleDictionary = {$ifdef FPC}specialize{$endif}
  TObjectDictionary<String, TApple>;
```

```
var
```

```
  Apples: TAppleDictionary;
  A: TApple;
  ApplePair: {$ifdef FPC} TAppleDictionary.TDictionaryPair {$else}
  TPair<String, TApple> {$endif};
```

```
begin
```

```
  Apples := TAppleDictionary.Create([doOwnsValues]);
  try
    A := TApple.Create;
    A.Name := 'my apple';
    Apples.AddOrSetValue('apple key 1', A);
```

```
    for ApplePair in Apples do
      Writeln('Found apple key->value: ' +
        ApplePair.Key + '->' + ApplePair.Value.Name);
```

```
    Apples.Remove('apple key 1');
  finally FreeAndNil(Apples) end;
end.
```

```
### ##### ## ##### FGL #####
Generics.Collections, ###-##### ## FGL ##:
```

TFPGList

#####.

TFPGObjectList

#####. ##### "#####"
#####.

TFPGMap

#####⁵.

FGL, TFPGList ##### # #####, #####
(=). ### TFPGMap #####
"##-#####" (>) # "##-#####" (<). ###
#####, #####
(#####), ## #####
8.9, „#####“.

Castle Game Engine ##### CastleGenericLists, #####
TGenericStructList # TGenericStructMap. ##
TFPGList # TFPGMap, ## #####
(##### # #####
#####). ##
6.3 ##### CastleGenericLists # ##### (deprecated) #
Generics.Collections #####.

8.3, „#####“.

7.3. #####: TPersistent.Assign

:=
#####.

var

X, Y: TMyObject;

begin

X := TMyObject.Create;

Y := X;

// X и Y сега са два указателя към една и съща инстанция

Y.MyField := 123; // ще се промени също и X.MyField

FreeAndNil(X);

end;

```
## ## ##### ##### ## ##### ## ##### ##, #####  
##### # ## ##### ##### ## TPersistent, # ## ##### #####  
Assign. ##### ## ##### ##### ## TMyObject, ## ## ##  
##### ## #####:
```

```
var  
  X, Y: TMyObject;  
begin  
  X := TMyObject.Create;  
  Y := TMyObject.Create;  
  Y.Assign(X);  
  Y.MyField := 123; // това не променя X.MyField  
  FreeAndNil(X);  
  FreeAndNil(Y);  
end;
```

```
## ## #####, ##### # ##### ## ##### Assign ##### ##  
##### ##### ## #####. ##### ##### ##  
Assign, ## ## ##### ## #####, ##### ## ## ##### ##  
####.
```

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}  
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

```
uses  
  SysUtils, Classes;
```

```
type  
  TMyClass = class(TPersistent)  
  public  
    MyInt: Integer;  
    procedure Assign(Source: TPersistent); override;  
  end;
```

```
  TMyClassDescendant = class(TMyClass)  
  public  
    MyString: string;  
    procedure Assign(Source: TPersistent); override;  
  end;
```

```
procedure TMyClass.Assign(Source: TPersistent);  
var  
  SourceMyClass: TMyClass;
```

```

begin
  if Source is TMyClass then
    begin
      SourceMyClass := TMyClass(Source);
      MyInt := SourceMyClass.MyInt;
      // Xxx := SourceMyClass.Xxx; // копирайте още полета ако е
      необходимо ...
    end else
      { Поради това, че TMyClass е директен наследник на TPersistent,
        той извиква inherited САМО когато не знае как да обработи Source.
        Виж коментарите по-долу. }
      inherited Assign(Source);
end;

procedure TMyClassDescendant.Assign(Source: TPersistent);
var
  SourceMyClassDescendant: TMyClassDescendant;
begin
  if Source is TMyClassDescendant then
    begin
      SourceMyClassDescendant := TMyClassDescendant(Source);
      MyString := SourceMyClassDescendant.MyString;
      // Xxx := SourceMyClassDescendant.Xxx; // копирайте още полета ако е
      необходимо ...
    end;

    { Поради това, че TMyClassDescendant има предшественик, който вече е
      заменил Assign (in TMyClass.Assign), той извиква inherited ВНАГИ,
      за да позволи TMyClass.Assign да копира останалите полета.
      Виж коментарите по-долу за детайлно обяснение. }
    inherited Assign(Source);
end;

var
  C1, C2: TMyClass;
  CD1, CD2: TMyClassDescendant;
begin
  // тест TMyClass.Assign
  C1 := TMyClass.Create;
  C2 := TMyClass.Create;
  try
    C1.MyInt := 666;
    C2.Assign(C1);
    WriteLn('C2 state: ', C2.MyInt);
  finally

```

```

    FreeAndNil(C1);
    FreeAndNil(C2);
end;

// test TMyClassDescendant.Assign
CD1 := TMyClassDescendant.Create;
CD2 := TMyClassDescendant.Create;
try
    CD1.MyInt := 44;
    CD1.MyString := 'blah';
    CD2.Assign(CD1);
    WriteLn('CD2 state: ', CD2.MyInt, ' ', CD2.MyString);
finally
    FreeAndNil(CD1);
    FreeAndNil(CD2);
end;
end.

```

```

##### # ##-##### ## ##### AssignTo # #####a #####, #####
## ##### Assign # #####a, ## #####.

##### #####, ##### inherited # ##### Assign.###
### #####:

##### ##### # ##### TPersistent.(### ## # #####
## TPersistent, ## ##### Assign.)
# ##### inherited
(## TPersistent.Assign) ##### ##
# #####.

##### ##### Assign.
# ##### inherited (## ##### Assign). #####
inherited # #####.

## ## ##### (##### # ## ##
##### inherited ## Assign) # ## ##
##### AssignTo, ## TPersistent.Assign #
TPersistent.AssignTo #####:

```

```

procedure TPersistent.Assign(Source: TPersistent);
begin
    if Source <> nil then
        Source.AssignTo(Self)

```

```

else
    raise EConvertError...
end;

procedure TPersistent.AssignTo(Destination: TPersistent);
begin
    raise EConvertError...
end;

```



```

##### TPersistent.#####
##### FPC #####, #####,
#####
#####.

```

#####, ##### ##

- ##### Assign, ##### AssignTo ## ## #####
- ##### #####, ## ##### TPersistent, ##### (#####) ## #####. ##### Assign ## ##### RTTI (#####) ## ##, #####

```

##### TApple, ##### TApple.Assign
##### ## ## #####, #####
## TApple (## ## TApple, ##### TFruit). # ##,
##### TApple.Assign ##### Source is
TApple # #####, #####, #####. #####
##### inherited, ## ## TFruit ##
#####.

```

```

### #####, ## ## TFruit.Assign # TApple.Assign ##
#####, ##### ##

```

- ##### TApple ## TApple.Assign, ## ##
- ##### TOrange ## TApple.Assign, ## ## TFruit.

- ##### Twerewolf ## TApple.Assign, ##
(##### TApple.Assign ## ##
TFruit.Assign, ##### TPersistent.Assign, #####
#####).



```
#####, ## ##### TPersistent, ##
##### published,## ##
## ##### TPersistent.
## ##### # ##### # #####
published.### ##### # ## # #####
## #####, ##### ## public.
##### 4.5, „#####“.
```

8.

8.1.

```
##### # #-##### (#####, #####, #####) ##### ## ##
#####, #####.
```

```
##### (#### # #####) #####
#####, ##### # #####.
#### # #####, ##### ## ## #####
##### # ##### #-##### ## # ##### (###
#### # # ##### # ##### # #####).
##### ## # ##### — ## ##### (
#### # ##### # #####, #####
## #####.
```

```
##### ## #####:
```

```
function SumOfSquares(const N: Integer): Integer;
```

```
function Square(const Value: Integer): Integer;
```

```
begin
```

```
Result := Value * Value;
```

```
end;
```

```
var
```

```
I: Integer;
```

```
begin
```

```
Result := 0;
```



```

function Add(const A, B: Integer): Integer;
begin
    Result := A + B;
end;

function Multiply(const A, B: Integer): Integer;
begin
    Result := A * B;
end;

type
    TMyFunction = function (const A, B: Integer): Integer;

function ProcessTheList(const F: TMyFunction): Integer;
var
    I: Integer;
begin
    Result := 1;
    for I := 2 to 10 do
        Result := F(Result, I);
    end;

var
    SomeFunction: TMyFunction;
begin
    SomeFunction := @Add;
    WriteLn('1 + 2 + 3 ... + 10 = ', ProcessTheList(SomeFunction));

    SomeFunction := @Multiply;
    WriteLn('1 * 2 * 3 ... * 10 = ', ProcessTheList(SomeFunction));
end.

```

- #####: ##### ## # of object #####.

```

{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}

```

```

uses
    SysUtils;

type
    TMyMethod = procedure (const A: Integer) of object;

    TMyClass = class
        CurrentValue: Integer;

```



```

{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}

{$ifndef FPC}
    {$message warn 'Delphi does not allow addition on types that are generic
    parameters'}
    begin end.
{$endif}

uses SysUtils;

type
    generic TMyCalculator<T> = class
        Value: T;
        procedure Add(const A: T);
    end;

procedure TMyCalculator.Add(const A: T);
begin
    Value := Value + A;
end;

type
    TMyFloatCalculator = {$ifdef FPC}specialize{$endif}
    TMyCalculator<Single>;
    TMyStringCalculator = {$ifdef FPC}specialize{$endif}
    TMyCalculator<string>;

var
    FloatCalc: TMyFloatCalculator;
    StringCalc: TMyStringCalculator;
begin
    FloatCalc := TMyFloatCalculator.Create;
    try
        FloatCalc.Add(3.14);
        FloatCalc.Add(1);
        WriteLn('FloatCalc: ', FloatCalc.Value:1:2);
    finally
        FreeAndNil(FloatCalc);
    end;

    StringCalc := TMyStringCalculator.Create;
    try
        StringCalc.Add('something');
        StringCalc.Add(' more');
    end;
end;

```

```

    WriteLn('StringCalc: ', StringCalc.Value);
finally
    FreeAndNil(StringCalc);
end;
end.

```

#####, ##### ## #####
#####:

```

{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}

{$ifndef FPC}
    {$message warn 'Delphi does not support global generic functions'}
    begin end.
{$endif}

```

```

uses SysUtils;

```

```

{ Note: this example requires FPC 3.1.1 (will not compile with FPC 3.0.0
  or older). }

```

```

generic function Min<T>(const A, B: T): T;
begin
    if A < B then
        Result := A else
        Result := B;
end;

begin
    WriteLn('Min (1, 0): ', specialize Min<Integer>(1, 0));
    WriteLn('Min (3.14, 5): ', specialize Min<Single>(3.14, 5):1:2);
    WriteLn('Min (''a'', ''b''): ', specialize Min<string>('a', 'b'));
end.

```

7.2, „##### (#####), #####“
#####, #####.

8.4. Overloading

```

##### ## ## (#### # ##### # #####) # #### # ####
###, ##### ## #####. ## ##### ## #####

```

#####, #####, #####.

overloading-##### FPC #####, #####, #####
 ##### # ##### (##### unit) #
 ##### # ##### # ##### # #-
 #####. #####, ##### # ##### Foo(Integer)
 # Foo(string) # ##### # ##### Foo(Float), #####
 ##### Foo(Float)
 ##### (##### --- #####
 #####). #####, #####
 overload.

8.5.

#####:

- ##### (#####),
- ##### # #,
- #####.

#####. #####
 #####... #####
 #####. #####
 #####, ##### "#####"
 ##### Pascal. ##### "#####".

unit PreprocessorStuff;

{\$ifdef FPC} {\$mode objfpc}{\$H+}{\$J-} {\$endif}

interface

{\$ifdef FPC}

{ Това е дефинирано само ако се компилира с FPC, не с други компилатори
 (напр. Delphi). }

procedure Foo;

{\$endif}

{ Дефиниране на константата NewLine. Тук може да видите как нормалния
 синтаксис на Паскал

се "чупи" с препроцесорните директиви. Когато компилирате за Unix (вкл. Linux, Android, Mac OS X), компилатора вижда това:

```
const NewLine = #10;
```

Когато компилирате за Windows, компилатора вижда това:

```
const NewLine = #13#10;
```

За други операционни системи, кодът няма да се компилира, защото компилатора вижда това:

```
const NewLine = ;
```

Хубаво е, че компилирането се проваля в този случай -- така ако трябва да пригледите програмата към ОС, която не е Unix или Windows, компилатора ще ви припомни да изберете конвенция за нов ред (newline) за тази система. }

const

```
  NewLine =  
    {$ifdef UNIX} #10 {$endif}  
    {$ifdef MSWINDOWS} #13#10 {$endif} ;
```

```
{$define MY_SYMBOL}
```

```
{$ifdef MY_SYMBOL}
```

```
procedure Bar;  
{$endif}
```

```
{$define CallingConventionMacro := unknown}
```

```
{$ifdef UNIX}  
  {$define CallingConventionMacro := cdecl}  
{$endif}
```

```
{$ifdef MSWINDOWS}  
  {$define CallingConventionMacro := stdcall}  
{$endif}
```

```
procedure RealProcedureName;
```

```
  CallingConventionMacro; external 'some_external_library';
```

implementation

```
{$include some_file.inc}
```

```
// $I е съкращение за $include
```

```
{ $I some_other_file.inc }
```

end.

```
##### .inc # ##
####:
```

- #####, ##### "#####" #####. ##### myconfig.inc ### #####:

```
{ $ifdef FPC }
  { $mode objfpc }
  { $H+ }
  { $J- }
  { $modeswitch advancedrecords }
  { $ifdef VER2 }
    { $message fatal 'This code can only be compiled using FPC version
    >= 3.0.' }
  { $endif }
{ $endif }
```

```
#### { $I myconfig.inc } ###
#####.
```

- ##### unit ##, ##### unit ##, ##### - ##### unit ##, ##### unit-#, ## unit ##, ##### "#####", ## unit-###, ##### unit # "##### UI #####", ## unit ## UI #####, ## uses ##### (### UI ## UI #####). ## myunit.pas ## ##, #####, ##### ##, #####.

1. ##### unit # #####-#####. ## ##:

```
{$ifdef UNIX} {$I my_unix_implementation.inc} {$endif}
{$ifdef MSWINDOWS} {$I my_windows_implementation.inc} {$endif}
```

```
##### # # # - ##### # ##### # # # # #
{$ifdef UNIX}, {$ifdef MSWINDOWS}, ##### # #####
### (##### # #####, ### # #####). # # # # #
##### # # - #####. ##### # # ##### # # #
# - #####, ### ##### # # ##### # # -Fi #
FPC, # # # ##### # # ##### # # #
#####. ##### # # # # # # # # # #
{$I my_platform_specific_implementation.inc} # ##### # #
#####, ##### # # ##### # # #####.
```

8.6.

Record # ##### # # # # #. ##### # # # # #, #####
class: ##### # # # # #. ##### # # # # # struct # C-
#.

```
### ##### {$modeswitch advancedrecords}, #####
##### # # # # # # # # # #. ##### # # # # # # #
##### # # # # #, ##### # # # # # # # # # #
##### # # # # #.
```

```
{$ifdef FPC}
  {$mode objfpc}{$H+}{$J-}
  {$modeswitch advancedrecords}
{$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

type

```
TMyRecord = record
public
  I, Square: Integer;
  procedure WriteLnDescription;
end;
```

procedure TMyRecord.WriteLnDescription;

begin

```
  WriteLn('Square of ', I, ' is ', Square);
```

end;

var

A: array [0..9] of TMyRecord;

R: TMyRecord;

I: Integer;

begin

for I := 0 to 9 do

begin

A[I].I := I;

A[I].Square := I * I;

end;

for R in A do

R.WriteLineDescription;

end.

"####", # ## "####" — #####
#####.

#####

- #####

#####

- #####
##

- #####

packed record. #####

API,

#

(#####
##, ##### ## ##
#####).

- ##### case #####, ##### unions # C-
#####. ## ##### ## ## ##### ## ##
##, # #####. ##### #-#####
#####. # #####, #####
#####).

8.7.

Turbo Pascal ##### #####, #####
##, ##### object. #####
"#####" # "#####".

- ##### / ##### # ##
/ #####.
- ## ## ##### # ## #####, #####
"#####" ## #
(#####) ## ##, ##### ##
#####.
- #####, ##### #
— #####
##, ## ##, ##

(###. #####). ##### #-#####
#####.

8.8.

TMyRecord ## ^TMyRecord # ##
PMyRecord. ##-#####
#####:

type

```

PMyRecord = ^TMyRecord;
TMyRecord = record
    Value: Integer;
    Next: PMyRecord;
end;
```

, ## ##### (### PMyRecord ##
 # ##### TMyRecord , ##### TMyRecord ##
 ## PMyRecord). ##### # ##
 ##### , ##### ##
 type .

 ##### New # Dispose ### (## #-##### , #####)
 ##### GetMem # FreeMem. ## ## , #####
 ##### , ##### ^ (например `MyInteger :=
 MyPointerToInteger^). ## ## , #####
 ##### @ (##### MyPointerToInteger := @MyInteger).

Pointer , ##### void* # C-##### .###
 # ##### # #####
 ### #####.

, ## ##### class ##### , #####
 ##### ^ ### @ , ## ## . #####
 ##### , ##### , ## ## :

type

```

TMyClass = class
    Value: Integer;
    Next: TMyClass;
end;
```

8.9.

 #####
 #####:

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}

{$ifndef FPC}
  {$message warn 'Delphi does not support global operator overloading'}
  begin end.
{$endif}
```

```
uses
  StrUtils;

operator* (const S: string; const A: Integer): string;
begin
  Result := DupeString(S, A);
end;

begin
  WriteLn('bla' * 10);
end.
```

```
#####
# #####-#####
#####, # #####
## #####.
```

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}

{$ifndef FPC}
  {$message warn 'Delphi does not support global operator overloading'}
  begin end.
{$endif}
```

```
uses
  SysUtils;

type
  TMyClass = class
    MyInt: Integer;
  end;

operator* (const C1, C2: TMyClass): TMyClass;
begin
```

```

    Result := TMyClass.Create;
    Result.MyInt := C1.MyInt * C2.MyInt;
end;

```

```

var
    C1, C2: TMyClass;
begin
    C1 := TMyClass.Create;
    try
        C1.MyInt := 12;
        C2 := C1 * C1;
        try
            WriteLn('12 * 12 = ', C2.MyInt);
        finally
            FreeAndNil(C2);
        end;
    finally
        FreeAndNil(C1);
    end;
end.

```

```

##### # ## ##### - #####
##### ## ## #####, ##### ## ## ##
##### ## #####.

```

```

{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}

{$ifndef FPC}
    {$message warn 'Delphi does not support global operator overloading'}
    begin end.
{$endif}

```

```

uses SysUtils;

```

```

type
    TMyRecord = record
        MyInt: Integer;
    end;

```

```

operator* (const C1, C2: TMyRecord): TMyRecord;
begin
    Result.MyInt := C1.MyInt * C2.MyInt;
end;

```



```
var
  R1, R2: TMyRecord;
begin
  R1.MyInt := 12;
  R2 := R1 * R1;
  WriteLn('12 * 12 = ', R2.MyInt);
end.
```

```
## ##### ## ##### ## ##### ## ##### {$modeswitch
advancedrecords} # ## ##### ##### class operator #####
# #####. ##### ## ## ##### #####, #####
##### ## ##### ## ##### (#### TFPGList, #####
##### ## ##### ## #####) # #####. # #####
##### "#####" ##### ## ##### (#### # # #####) #####
##### (##### # # ##### # ####, ##### TFPGList) # #####
##### ## ##### ## specialize TFPGList<TMyRecord>.
```

```
{$ifdef FPC}
  {$mode objfpc}{$H+}{$J-}
  {$modeswitch advancedrecords}
{$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}

{$ifndef FPC}
  {$message warn 'Delphi does not have FGL unit'}
  begin end.
{$endif}
```

```
uses
  SysUtils, FGL;
```

```
type
  TMyRecord = record
    MyInt: Integer;
    class operator+ (const C1, C2: TMyRecord): TMyRecord;
    class operator= (const C1, C2: TMyRecord): boolean;
  end;

class operator TMyRecord.+ (const C1, C2: TMyRecord): TMyRecord;
begin
  Result.MyInt := C1.MyInt + C2.MyInt;
end;
```

```

class operator TMyRecord.= (const C1, C2: TMyRecord): boolean;
begin
    Result := C1.MyInt = C2.MyInt;
end;

type
    TMyRecordList = {$ifdef FPC}specialize{$endif} TFPGList<TMyRecord>;

var
    R, ListItem: TMyRecord;
    L: TMyRecordList;
begin
    L := TMyRecordList.Create;
    try
        R.MyInt := 1;    L.Add(R);
        R.MyInt := 10;   L.Add(R);
        R.MyInt := 100;  L.Add(R);

        R.MyInt := 0;
        for ListItem in L do
            R := ListItem + R;

        WriteLn('1 + 10 + 100 = ', R.MyInt);
    finally
        FreeAndNil(L);
    end;
end.

```

9.

9.1.

private #####, ## ##### (### #####) ## # ##### #####
 #####, # ##### # #####. ##### ##### #####: #####
 # ##### ##### ## ##### # ##### # #####. ##### ##### ##
 C++ ## ##### ## ####, ## ##### ##### # ##### ## "#####"⁶. ####
 ##### # ##### # ## ##### ##### # #####
 ##### # # ##### ## #### #####.

⁶ ##### = friends

#####, ##### # #####, ##### #
#, # -##### # ##### **strict**
private. ##### # ##### (#####) ##### #
#####. #####.

— ##### **protected** #####, # ##### #
"#####" # #####, ##### **strict**
protected, # # ##### # #####.

9.2. ##### #

(const) ###
(type). # ##### # # #
#, # #
private (##### # #), ##### #
#####.

#, # #
var.

```

type
  TMyClass = class
  private
    type
      TInternalClass = class
        Velocity: Single;
        procedure DoSomething;
      end;
  var
    FInternalClass: TInternalClass;
  public
    const
      DefaultVelocity = 100.0;
    constructor Create;
    destructor Destroy; override;
  end;

constructor TMyClass.Create;
begin
  inherited;
  FInternalClass := TInternalClass.Create;
  FInternalClass.Velocity := DefaultVelocity;
  FInternalClass.DoSomething;

```

```
end;

destructor TMyClass.Destroy;
begin
    FreeAndNil(FInternalClass);
    inherited;
end;

{ забележете, че дефиницията на метода долу има префикс
  "TMyClass.TInternalClass". }
procedure TMyClass.TInternalClass.DoSomething;
begin
end;
```

9.3.

####, ##### - ##### (TMyClass),
#####.

```
type
    TEnemy = class
        procedure Kill;
        class procedure KillAll;
    end;

var
    E: TEnemy;
begin
    E := TEnemy.Create;
    try
        E.Kill;
    finally FreeAndNil(E) end;
    TEnemy.KillAll;
end;
```

- #####
9.4, „#####“.

4.5, „#####
#####“ ##### private or protected #####.

MyInstance := TMyClass.Create(...);.

```
#####, ## # ##### ##### ## ## ##### ##### # ##### ## #####
## ##### ##### # ##### ## ##### ##### #####. ##### # #####
##### ## "#####" #####, ##### ##### (####. #####
## ## ##### #####) ##### ## # ##### #####
##### (####. ### #####).
```

9.4.

```
##### ### ##### ## ##### ## ##### ##### ## ##### ##
#####, ##### ## ##### ##### ## ##### ## #####, ## ##
##### ##### ##### ## ##### ## #####. ##### # ##, ##### ##### class
of TMyClass.
```

type

```
TMyClass = class(TComponent)
end;
```

```
TMyClass1 = class(TMyClass)
end;
```

```
TMyClass2 = class(TMyClass)
end;
```

```
TMClassRef = class of TMClass;
```

var

```
C: TMyClass;  
ClassRef: TMyClassRef;
```

begin

```
// Obviously you can do this:
```

```
C := TMyClass.Create(nil); FreeAndNil(C);  
C := TMyClass1.Create(nil); FreeAndNil(C);  
C := TMyClass2.Create(nil); FreeAndNil(C);
```

// В допълнение, използвайки препратки към клас, може да направите и следното:

```
ClassRef := TMyClass;  
C := ClassRef.Create(nil); FreeAndNil(C);
```

```
ClassRef := TMyClass1;  
C := ClassRef.Create(nil); FreeAndNil(C);
```

```
ClassRef := TMyClass2;
C := ClassRef.Create(nil); FreeAndNil(C);
end;
```

```
##### -#####.
##### -
#####.
#####.
```

```
type
  TMyClass = class(TComponent)
    class procedure DoSomething; virtual; abstract;
  end;

  TMyClass1 = class(TMyClass)
    class procedure DoSomething; override;
  end;

  TMyClass2 = class(TMyClass)
    class procedure DoSomething; override;
  end;

  TMyClassRef = class of TMyClass;
```

```
var
  C: TMyClass;
  ClassRef: TMyClassRef;
begin
  ClassRef := TMyClass1;
  ClassRef.DoSomething;

  ClassRef := TMyClass2;
  ClassRef.DoSomething;

  { Това ще предизвика изключение по време на изпълнение
    защото DoSomething е абстрактен в TMyClass. }
  ClassRef := TMyClass;
  ClassRef.DoSomething;
end;
```

```
##### (##
#####),
##### ClassType.#### ClassType # TClass,
```

class of TObject. #####

TObject.

ClassType #####

Clone, #####
7.3, „#####: TPersistent.Assign“
"#####"

TComponent, #####
TComponent.Create(AOwner: TComponent).

type

```
TMyClass = class(TComponent)
    procedure Assign(Source: TPersistent); override;
    function Clone(AOwner: TComponent): TMyClass;
end;
```

```
TMyClassRef = class of TMyClass;
```

```
function TMyClass.Clone(AOwner: TComponent): TMyClass;
```

begin

```
// Това трябва винаги да създаде инстанция точно от клас TMyClass:
//Result := TMyClass.Create(AOwner);
// Това може потенциално да създаде инстанция от наследник на TMyClass:
Result := TMyClassRef(ClassType).Create(AOwner);
Result.Assign(Self);
```

end;

9.5.

(#####).
(##
#####).
Self #
#####: #####
(#####
#####).

#####, #####
#####. ##### ## ## ## ##:

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
```

type

```
TMyCallback = procedure (A: Integer);
```

```
TMyClass = class
```

```
  class procedure Foo(A: Integer);
```

```
end;
```

```
class procedure TMyClass.Foo(A: Integer);
```

```
begin
```

```
end;
```

var

```
  Callback: TMyCallback;
```

begin

```
  // Грешка: TMyClass.Foo не е съвместим с TMyCallback
```

```
  Callback := {$ifdef FPC} @TMyClass(nil).Foo {$else}
```

```
  TMyClass.Foo {$endif};
```

end.



```
### ## # ##### Delphi ##### ## #####  
TMyClass.Foo ##### TMyClass(nil).Foo #####  
# # #####. ##### ## ## ##, ## TMyClass.Foo  
##### ##-##### # ##### ##-  
##### ##. ##### ## TMyClass(nil).Foo  
# ##... ## ##### (#####) # ##### ObjFpc,  
##### # #####.
```

```
### #####, ##### ## TMyClass.Foo ##  
Callback ##-##### # ##### Delphi, #####  
#####.
```

```
##### ## ## ##, ##### ## Callback ## ##  
# ##### Foo. #####, ##### Foo ## ##  
##### implicit ##### ## ##.
```


 TMyCallback = procedure (A: Integer) of
 object; .

static.
 / , , ,
 (##
).
 (#####)
 :.

{\$ifdef FPC} {\$mode objfpc}{\$SH+}{\$J-} {\$endif}
 {\$ifdef MSWINDOWS} {\$apptype CONSOLE} {\$endif}

type
 TMyCallback = procedure (A: Integer);

 TMyClass = class
 class procedure Foo(A: Integer); static;
 end;

 class procedure TMyClass.Foo(A: Integer);
 begin
 end;

 var
 Callback: TMyCallback;
 begin
 Callback := @TMyClass.Foo;
 end.

9.6.

class var
 ##
 ##
 ##

 #####
 class property ##### property # getter

/ ### setter, ##### 9.5, „#####“.

(### 4.3, „#####“), #####
 ## #####, #####. ## #####
 ## #####.

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

type

```
TMyClass = class
strict private
  // Alternative:
  // FMyProperty: Integer; static;
  class var
    FMyProperty: Integer;
  class procedure SetMyProperty(const Value: Integer); static;
public
  class property MyProperty: Integer
    read FMyProperty write SetMyProperty;
end;
```

```
class procedure TMyClass.SetMyProperty(const Value: Integer);
begin
  Writeln('MyProperty changes!');
  FMyProperty := Value;
end;
```

```
begin
  TMyClass.MyProperty := 123;
  Writeln('TMyClass.MyProperty is now ', TMyClass.MyProperty);
end.
```

9.7.

a. #####
 ## ##### MyInstance.MyMethod(...). ##
 ##### ## ##
 Action # ##### X, ##### `X.Action(...)`.

 ##### TMyClass, ## ## TMyClass.


```
##### # Object Pascal #, ## # #####, ## ##### ##### # ##### #  
#####, ##### ## ##### #####. #### # #####, ##### #####  
##### ##### ##### ## # #####, #.#. ##### ## ##### ## #####  
#####, ##### ## ##### ##### ##### ## #####. ##### ##### #  
#####, ## ##### ##### #####, ##### ##### ##### FreeAndNil.
```

```
## # ##### ## ##### # ##### #, ## ##### ## ##### #  
##### ##### ##### ##### ## ##### ## #####.  
#####, ## # ##### ##### ##### ## ##### ## nil, ##### ##### ##  
0 # #####.
```

```
#### ## ##### ## ##### ## ##### ## #####:
```

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}  
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

uses

```
SysUtils;
```

type

```
TGun = class  
end;
```

```
TPlayer = class  
    Gun1, Gun2: TGun;  
    constructor Create;  
    destructor Destroy; override;  
end;
```

```
constructor TPlayer.Create;
```

```
begin
```

```
    inherited;  
    Gun1 := TGun.Create;  
    raise Exception.Create('Предизвикано изключение от конструктор!');  
    Gun2 := TGun.Create;
```

```
end;
```

```
destructor TPlayer.Destroy;
```

```
begin
```

```
    { в случай, че конструктора крашне, бихме могли  
      да имаме ситуация с Gun1 <> nil и Gun2 = nil. Справете се с това.  
      ... Всъщност в случая FreeAndNil ще се справи без  
      допълнителни усилия от наша страна, защото FreeAndNil проверява  
      дали инстанцията е nil преди да извика деструктора. }
```

```

FreeAndNil(Gun1);
FreeAndNil(Gun2);
inherited;
end;

begin
  try
    TPlayer.Create;
  except
    on E: Exception do
      WriteLn('Уловено ' + E.ClassName + ': ' + E.Message);
    end;
  end.

```

10.

10.1. ##### (CORBA)

(API⁷), ## ##, ## ##
 #####. ##### ## ##
 #####, ## ## ## ##.

##, #####
 ##### # ##### ## ##. ####
 ##### ## ## ##, #####
 ## ##, ## ## ## ##. #####
 ##### # C++.

CORBA ##### # #####
 ## ##### # Java (<https://docs.oracle.com/javase/tutorial/java/concepts/interface.html>) ## C# (<https://msdn.microsoft.com/en-us/library/ms173156.aspx>).

```

{$ifdef FPC}
  {$mode objfpc}{$H+}{$J-}
  {$interfaces corba} // See below why we recommend CORBA interfaces
{$else}
  {$message warn 'Delphi does not support CORBA interfaces, only COM, that
change how memory is managed. This example is not valid in Delphi.'}
  begin end.
{$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}

```

⁷ API = Application Program Interface

uses

SysUtils, Classes;

type

IMyInterface = **interface**

['{79352612-668B-4E8C-910A-26975E103CAC}']

procedure Shoot;

end;

TMyClass1 = **class**(IMyInterface)

procedure Shoot;

end;

TMyClass2 = **class**(IMyInterface)

procedure Shoot;

end;

TMyClass3 = **class**

procedure Shoot;

end;

procedure TMyClass1.Shoot;

begin

WriteLn('TMyClass1.Shoot');

end;

procedure TMyClass2.Shoot;

begin

WriteLn('TMyClass2.Shoot');

end;

procedure TMyClass3.Shoot;

begin

WriteLn('TMyClass3.Shoot');

end;

procedure UseThroughInterface(I: IMyInterface);

begin

Write('Shooting... ');

I.Shoot;

end;

var

C1: TMyClass1;

```

C2: TMyClass2;
C3: TMyClass3;
begin
  C1 := TMyClass1.Create;
  C2 := TMyClass2.Create;
  C3 := TMyClass3.Create;
  try
    if C1 is IMyInterface then
      UseThroughInterface(C1 as IMyInterface);
    if C2 is IMyInterface then
      UseThroughInterface(C2 as IMyInterface);
    // The "C3 is IMyInterface" below is false,
    // so "UseThroughInterface(C3 as IMyInterface)" will not execute.
    if C3 is IMyInterface then
      UseThroughInterface(C3 as IMyInterface);
  finally
    FreeAndNil(C1);
    FreeAndNil(C2);
    FreeAndNil(C3);
  end;
end.

```

10.2. ##### CORBA # COM

"CORBA"?

CORBA # #####. ##-##### ## ## ##### #####. #####
 ##### ## "`#####`". ##### ## #####
 ##### ## #####, ## ##### ## ## #####
 ##### API.

#####, ## ##### ##### ## ## #####
 ##### CORBA (Common Object Request Broker Architecture) (see https://en.wikipedia.org/wiki/Common_Object_Request_Broker_Architecture), ## ## ##
 ##### ## ##### # ##.

{\$interfaces corba} ?

#, ##### ## ##### COM #####. ##### ##
 ## ##### # {\$interfaces com}, ## ##### # # #####
 ##### # # #####.

COM #####, ##### ## ## ##
 ##### # #####. CORBA ##### # ##### ## ##
 ##### ## ## ## C# ## Java. COM #####

#####.

interface # ## interface(ISomeAncestor), #.#. ## ##

#####.

COM #####?

COM #####
IUnknown _ . ##### IUnknown:

- ##### _AddRef #
_ReleaseRef . #####
(reference-counting).
- ##### QueryInterface .
- ##### COM (Component Object Model).

COM #####?

COM "#####"

#####.

: reference-counting, ##
(# ##), # #####

#####) # #####
#####.

- ##### (#####
#####).
- #####
#####.
- ##### COM.

#####:

- ##### API #####, #####

(#####), ##### COM #####
#####. #####
_AddRef # _ReleaseRef #####, #####

#####.

- ##### API #####, #####

(smart pointers) #####
#####.

CORBA #
{\$interfaces corba} #####
#####.

Delphi ##### COM ##### COM
Delphi.

CORBA?

_AddRef / _ReleaseRef. #####
IUnknown. #####
COM
#####.

10.3. GUIDs

GUID ##### ['{ABCD1234-...}'], #####

#####.

GUID #####
COM ##### CORBA. #####

GUID.

GUID, #####
is. # ##### true, #####
#

Supports(ObjectInstance, IMyInterface) ## #####, ##
 ##### GUID. #####
 ##### CORBA, ## COM, ## FPC 3.0.0.

GUID ##
 ##### Lazarus ##### GUID (##### Ctrl
 + Shift + G # #####).
<https://www.guidgenerator.com/>.

 ##### CreateGUID # GUIDToString # RTL. #####:

```
{$ifdef FPC} {$mode objfpc}{$H+}{$J-} {$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

```
uses
  SysUtils;
var
  MyGuid: TGUID;
begin
  Randomize;
  CreateGUID(MyGuid);
  WriteLn(['' + GUIDToString(MyGuid) + '']);
end.
```

10.4. ##### (COM)

COM #####:

1. ##### COM (##### Windows, ##### Unix ##### XPCOM,
 ##### Mozilla),
2. ##### (#####
 #####).

COM #####
 ## ##### COM #####.

#####, ##:

- ##### _AddRef,
 _Release # QueryInterface. ##
 ## #####.

reference-counting ## COM
(##### ## ##### # # ##### - #####
#####).

TInterfacedObject ##### ##
#####.

TComponent ##### ##
##. # **Castle
Game Engine** ## ## #####
TNonRefCountedInterfacedObject #
TNonRefCountedInterfacedPersistent ## ##, ##### [https://
github.com/castle-engine/castle-engine/
blob/0519585abc13e8386cdae5f7dfef6f9659dc9b57/src/base/
castleinterfaces.pas](https://github.com/castle-engine/castle-engine/blob/0519585abc13e8386cdae5f7dfef6f9659dc9b57/src/base/castleinterfaces.pas) .

- ##### ## ##### ## ## #####, ##### ## ## ##
#####. ##### ##
(### ## ## ## reference-
counted, ##### # ### ##### _AddRef ## ## ## ##...), ## ##
##, ##### ##
##. ##### "7.7 #####" # #####
FPC (<http://freepascal.org/docs-html/ref/refse47.html>).

###-##### ## ##### ## COM ##### #:

- ## #####, ## ## reference-counted,
- ## ##### TInterfacedObject ,
- # ## ##### ## #####, #####
#####,
#####.

#####:

```
{$ifdef FPC}
  {$mode objfpc}{$H+}{$J-}
  {$interfaces com}
{$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

uses

SysUtils, Classes;

type

IMyInterface = **interface**

['{3075FFCD-8EFB-4E98-B157-261448B8D92E}']

procedure Shoot;

end;

TMyClass1 = **class**(TInterfacedObject, IMyInterface)

procedure Shoot;

end;

TMyClass2 = **class**(TInterfacedObject, IMyInterface)

procedure Shoot;

end;

TMyClass3 = **class**(TInterfacedObject)

procedure Shoot;

end;

procedure TMyClass1.Shoot;

begin

WriteLn('TMyClass1.Shoot');

end;

procedure TMyClass2.Shoot;

begin

WriteLn('TMyClass2.Shoot');

end;

procedure TMyClass3.Shoot;

begin

WriteLn('TMyClass3.Shoot');

end;

procedure UseThroughInterface(I: IMyInterface);

begin

Write('Shooting... ');

I.Shoot;

end;

var

C1: IMyInterface; // COM се грижи за унищожаването

C2: IMyInterface; // COM се грижи за унищожаването

C3: TMyClass3; // Вие трябва да се погрижите за унищожаването

begin

```

C1 := TMyClass1.Create as IMyInterface;
C2 := TMyClass2.Create as IMyInterface;
C3 := TMyClass3.Create;
try
  UseThroughInterface(C1); // няма нужда от оператор "as"
  UseThroughInterface(C2);
  if C3 is IMyInterface then
    UseThroughInterface(C3 as IMyInterface); // това няма да се изпълни
  finally
    { Променливи C1 и C2 излизат от обхват и тук би трябвало да се
      унищожат автоматично.

      За разлика от тях, C3 е инстанция, която не се управлява от
      интерфейс
      и трябва да се унищожи ръчно. }
    FreeAndNil(C3);
  end;
end.

```

10.5. ##### COM

```

##### # #####, ##### # ##### #
TComponent (### ##### TNonRefCountedInterfacedObject
# TNonRefCountedInterfacedPersistent), ##### #
##### # COM #####. ##### # ##### #
##### # ##### # ##### # ##### #.

```

```

##### # ##### # ##### # #####,
##### # ##### # ##### # #####. #####, #
##### typecast Cx as IMyInterface ##### #
#####, ##### # ##### # ##### #.
##### # ##### #-##### UseInterfaces #
##### # ##### # ##### # (##### #
### #, # ##### # ##### # ##### #.

```

```

## # #####, ##### # #-##### CORBA
#####, ## # e ##### #.

```

```

{$ifdef FPC}
  {$mode objfpc}{$H+}{$J-}
  {$interfaces com}
{$endif}
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}

```

uses

SysUtils, Classes;

type

IMyInterface = **interface**

['{3075FFCD-8EFB-4E98-B157-261448B8D92E}']

procedure Shoot;

end;

TMyClass1 = **class**(TComponent, IMyInterface)

procedure Shoot;

end;

TMyClass2 = **class**(TComponent, IMyInterface)

procedure Shoot;

end;

TMyClass3 = **class**(TComponent)

procedure Shoot;

end;

procedure TMyClass1.Shoot;

begin

WriteLn('TMyClass1.Shoot');

end;

procedure TMyClass2.Shoot;

begin

WriteLn('TMyClass2.Shoot');

end;

procedure TMyClass3.Shoot;

begin

WriteLn('TMyClass3.Shoot');

end;

procedure UseThroughInterface(I: IMyInterface);

begin

Write('Shooting... ');

I.Shoot;

end;

var

C1: TMyClass1;


```
##### ## # ##### ## CORBA #####.
```

```
## ##### #a## ##### # ##### ##### # ##
##### #####. ##### # ## # ##### ##### ## #### TMyClass,
##### ##### ## ##### #### #####, ##### # ##### #
#### # TMyClass, ## TMyClass ##### ##### ##### # ##
#####. ##### ## ##### ##### ## #### # #####
#####.
```

```
### ### #####: ### Cx # ##### #### (###
TMyClass2), ##### # ###, ##### ## # ##### ##
#####. #### ## ##### ## ## ##### ## ####
# #####, ##### (##### ## #####) #####
####.
```

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```
{$ifdef MSWINDOWS} {$apptype CONSOLE} {$endif}
```

```
// {$interfaces corba} // забележете, че "as" конверсии за CORBA няма да  
се компилират
```

```
uses Classes;
```

```
type
```

```
IMyInterface = interface  
[ '{7FC754BC-9CA7-4399-B947-D37DD30BA90A}' ]  
    procedure One;  
end;
```

```
IMyInterface2 = interface(IMyInterface)  
[ '{A72B7008-3F90-45C1-8F4C-E77C4302AA3E}' ]  
    procedure Two;  
end;
```

```
IMyInterface3 = interface(IMyInterface2)  
[ '{924BFB98-B049-4945-AF17-1DB08DB1C0C5}' ]  
    procedure Three;  
end;
```

```
TMyClass = class(TComponent, IMyInterface)  
    procedure One;  
end;
```

```
TMyClass2 = class(TMyClass, IMyInterface, IMyInterface2)  
    procedure One;  
    procedure Two;  
end;
```

```
procedure TMyClass.One;  
begin  
    Writeln('TMyClass.One');  
end;
```

```
procedure TMyClass2.One;  
begin  
    Writeln('TMyClass2.One');  
end;
```

```
procedure TMyClass2.Two;  
begin  
    Writeln('TMyClass2.Two');
```

end;

procedure UseInterface2(**const** I: IMyInterface2);

begin

 I.One;

 I.Two;

end;

procedure UseInterface3(**const** I: IMyInterface3);

begin

 I.One;

 I.Two;

 I.Three;

end;

var

 My: IMyInterface;

 MyClass: TMyClass;

begin

 My := TMyClass2.Create(**nil**);

 MyClass := TMyClass2.Create(**nil**);

 // Това не може да с компилира, не е известно дали My е IMyInterface2.

 // UseInterface2(My);

 // UseInterface2(MyClass);

 // Това се компилира и работи.

 UseInterface2(IMyInterface2(My));

 // Това не може да с компилира. Преобразуването InterfaceType(ClassType)
се проверява при компилация.

 // UseInterface2(IMyInterface2(MyClass));

 // Това се компилира и работи.

 UseInterface2(My **as** IMyInterface2);

 // Това се компилира и работи.

 UseInterface2(MyClass **as** IMyInterface2);

 // Това се компилира но не работи при изпълнение, с грозно "Access
violation".

 // UseInterface3(IMyInterface3(My));

 // Това не може да с компилира. Преобразуването InterfaceType(ClassType)
се проверява при компилация.

 // UseInterface3(IMyInterface3(MyClass));

```
// Това се компилира но не работи при изпълнение, с хубаво
"EInvalidCast: Invalid type cast".
// UseInterface3(My as IMyInterface3);
// Това се компилира но не работи при изпълнение, с хубаво
"EInvalidCast: Invalid type cast".
// UseInterface3(MyClass as IMyInterface3);

writeln('Край');
end.
```

11.

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AsciiDoc ## <https://github.com/modern-pascal/modern-pascal-introduction>. ##### #

GitHub ## ## ##### ## michalis@castle-engine.io⁸. ##### WEB ##### # <https://michalis.xyz/>. ##### # #####
Documentation ## Castle Game Engine website <https://castle-engine.io/>.

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Thank you for reading!

#####, 2023

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