Jezyki programowania na platformie .NET

Laboratorium 1 MSIL
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1.b)

```
C:\studies\jpdotnet\lab\lab1-msil>csc ClassA.cs -out:jpdotnet.zad1msil.Normal.dll -t:library
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.


C:\studies\jpdotnet\lab\lab1-msil>csc ClassA.cs -out:jpdotnet.zad1msil.DEB.dll -t:library -debug
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.

C:\studies\jpdotnet\lab\lab1-msil>ls -l
total 35
-rw-r--r-- 1 drwalin 197121   696 Oct 18 20:52 ClassA.2.cs
-rw-r--r-- 1 drwalin 197121   684 Oct 18 20:56 ClassA.cs
-rwxr-xr-x 1 drwalin 197121  4096 Oct 18 21:55 jpdotnet.zad1msil.DEB.dll
-rw-r--r-- 1 drwalin 197121 13824 Oct 18 21:55 jpdotnet.zad1msil.DEB.pdb
-rwxr-xr-x 1 drwalin 197121  3584 Oct 18 21:55 jpdotnet.zad1msil.Normal.dll
-rw-r--r-- 1 drwalin 197121    27 Oct 18 21:11 reset.bat
-rw-r--r-- 1 drwalin 197121   750 Oct 18 21:55 zadanie.bat
-rw-r--r-- 1 drwalin 197121   722 Oct 18 21:51 zadanie.sh

C:\studies\jpdotnet\lab\lab1-msil>
```

1.c)

```
C:\studies\jpdotnet\lab\lab1-msil>csc ClassA.cs -out:jpdotnet.zad1msil.O.dll -t:library -o
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.

C:\studies\jpdotnet\lab\lab1-msil>ls -l
total 39
-rw-r--r-- 1 drwalin 197121   696 Oct 18 20:52 ClassA.2.cs
-rw-r--r-- 1 drwalin 197121   684 Oct 18 20:56 ClassA.cs
-rwxr-xr-x 1 drwalin 197121  4096 Oct 18 21:56 jpdotnet.zad1msil.DEB.dll
-rw-r--r-- 1 drwalin 197121 13824 Oct 18 21:56 jpdotnet.zad1msil.DEB.pdb
-rwxr-xr-x 1 drwalin 197121  3584 Oct 18 21:56 jpdotnet.zad1msil.Normal.dll
-rwxr-xr-x 1 drwalin 197121  3584 Oct 18 21:56 jpdotnet.zad1msil.O.dll
-rw-r--r-- 1 drwalin 197121    27 Oct 18 21:11 reset.bat
-rw-r--r-- 1 drwalin 197121   735 Oct 18 21:56 zadanie.bat
-rw-r--r-- 1 drwalin 197121   722 Oct 18 21:51 zadanie.sh
```

1.d)

```
C:\studies\jpdotnet\lab\lab1-msil>ildasm jpdotnet.zad1msil.Normal.dll /output:Normal.il

C:\studies\jpdotnet\lab\lab1-msil>ildasm jpdotnet.zad1msil.DEB.dll /output:DEB.il

C:\studies\jpdotnet\lab\lab1-msil>ildasm jpdotnet.zad1msil.O.dll /output:O.il
C:\studies\jpdotnet\lab\lab1-msil>ls -l
total 63
-rw-r--r-- 1 drwalin 197121    696 Oct 18 20:52 ClassA.2.cs
-rw-r--r-- 1 drwalin 197121    684 Oct 18 20:56 ClassA.cs
-rw-r--r-- 1 drwalin 197121   5235 Oct 18 22:06 DEB.il
-rw-r--r-- 1 drwalin 197121    700 Oct 18 22:06 DEB.res
-rw-r--r-- 1 drwalin 197121   5234 Oct 18 22:06 Normal.il
-rw-r--r-- 1 drwalin 197121    716 Oct 18 22:06 Normal.res
-rw-r--r-- 1 drwalin 197121   5016 Oct 18 22:06 O.il
-rw-r--r-- 1 drwalin 197121    692 Oct 18 22:06 O.res
-rwxr-xr-x 1 drwalin 197121   4096 Oct 18 22:06 jpdotnet.zad1msil.DEB.dll
-rw-r--r-- 1 drwalin 197121  13824 Oct 18 22:06 jpdotnet.zad1msil.DEB.pdb
-rwxr-xr-x 1 drwalin 197121   3584 Oct 18 22:06 jpdotnet.zad1msil.Normal.dll
-rwxr-xr-x 1 drwalin 197121   3584 Oct 18 22:06 jpdotnet.zad1msil.O.dll
-rw-r--r-- 1 drwalin 197121     27 Oct 18 21:11 reset.bat
-rw-r--r-- 1 drwalin 197121    726 Oct 18 22:05 zadanie.bat
-rw-r--r-- 1 drwalin 197121    722 Oct 18 21:51 zadanie.sh
```


W plikach skompilowanych domyślnie I w trybie debug są dodatkowe polecenia NOP, a w pliku skompilowanym w trybie optymalizacji dodatkowe NOP nie występują.

1.e)

```
C:\studies\jpdotnet\lab\lab1-msil>ildasm jpdotnet.zad1msil.Normal.dll /output:Normal.il

C:\studies\jpdotnet\lab\lab1-msil>ildasm jpdotnet.zad1msil.DEB.dll /output:DEB.il

C:\studies\jpdotnet\lab\lab1-msil>ildasm jpdotnet.zad1msil.O.dll /output:O.il

C:\studies\jpdotnet\lab\lab1-msil>csc ClassA.2.cs -out:jpdotnet.zad1msil.Normal.2.dll -t:library
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.


C:\studies\jpdotnet\lab\lab1-msil>csc ClassA.2.cs -out:jpdotnet.zad1msil.DEB.2.dll -t:library -debug
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.


C:\studies\jpdotnet\lab\lab1-msil>csc ClassA.2.cs -out:jpdotnet.zad1msil.O.2.dll -t:library -o
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.


C:\studies\jpdotnet\lab\lab1-msil>ildasm jpdotnet.zad1msil.Normal.2.dll /output:Normal.2.il

C:\studies\jpdotnet\lab\lab1-msil>ildasm jpdotnet.zad1msil.DEB.2.dll /output:DEB.2.il

C:\studies\jpdotnet\lab\lab1-msil>ildasm jpdotnet.zad1msil.O.2.dll /output:O.2.il
C:\studies\jpdotnet\lab\lab1-msil>ls -l
total 127
-rw-r--r-- 1 drwalin 197121    696 Oct 18 20:52 ClassA.2.cs
-rw-r--r-- 1 drwalin 197121    684 Oct 18 20:56 ClassA.cs
-rw-r--r-- 1 drwalin 197121   4601 Oct 18 22:24 DEB.2.il
-rw-r--r-- 1 drwalin 197121    708 Oct 18 22:24 DEB.2.res
-rw-r--r-- 1 drwalin 197121   5235 Oct 18 22:24 DEB.il
-rw-r--r-- 1 drwalin 197121    700 Oct 18 22:24 DEB.res
-rw-r--r-- 1 drwalin 197121   4600 Oct 18 22:24 Normal.2.il
-rw-r--r-- 1 drwalin 197121    724 Oct 18 22:24 Normal.2.res
-rw-r--r-- 1 drwalin 197121   5234 Oct 18 22:24 Normal.il
-rw-r--r-- 1 drwalin 197121    716 Oct 18 22:24 Normal.res
-rw-r--r-- 1 drwalin 197121   4409 Oct 18 22:24 O.2.il
-rw-r--r-- 1 drwalin 197121    700 Oct 18 22:24 O.2.res
-rw-r--r-- 1 drwalin 197121   5016 Oct 18 22:24 O.il
-rw-r--r-- 1 drwalin 197121    692 Oct 18 22:24 O.res
-rwxr-xr-x 1 drwalin 197121   4096 Oct 18 22:24 jpdotnet.zad1msil.DEB.2.dll
-rw-r--r-- 1 drwalin 197121  13824 Oct 18 22:24 jpdotnet.zad1msil.DEB.2.pdb
-rwxr-xr-x 1 drwalin 197121   4096 Oct 18 22:24 jpdotnet.zad1msil.DEB.dll
-rw-r--r-- 1 drwalin 197121  13824 Oct 18 22:24 jpdotnet.zad1msil.DEB.pdb
-rwxr-xr-x 1 drwalin 197121   3584 Oct 18 22:24 jpdotnet.zad1msil.Normal.2.dll
-rwxr-xr-x 1 drwalin 197121   3584 Oct 18 22:24 jpdotnet.zad1msil.Normal.dll
-rwxr-xr-x 1 drwalin 197121   3584 Oct 18 22:24 jpdotnet.zad1msil.O.2.dll
-rwxr-xr-x 1 drwalin 197121   3584 Oct 18 22:24 jpdotnet.zad1msil.O.dll
-rw-r--r-- 1 drwalin 197121     27 Oct 18 21:11 reset.bat
-rw-r--r-- 1 drwalin 197121    712 Oct 18 22:24 zadanie.bat
-rw-r--r-- 1 drwalin 197121    722 Oct 18 21:51 zadanie.sh
```

```
41
42 .class public auto ansi beforefieldinit JP_NET.Lab1.ClassA
43     extends [mscorlib]System.Object
44 +-- 21 lines: {--
65    IL_0007: ret
66 } // end of method ClassA::set_A
67
68 .method public hidebysig instance void
69     MethodOfClassA() cil managed
70 {
71    // Code size       57 (0x39)
72    .maxstack  3
73    .locals init (class [System]System.Diagnostics.FileVersionInfo V_0,
74          string V_1)
75    IL_0000:  call       class [mscorlib]System.Reflection.Assembly [mscorlib]System.Reflection.Assembly::GetExecu
76    IL_0005:  callvirt   instance string [mscorlib]System.Reflection.Assembly::get_Location()
77    IL_000a:  call       class [System]System.Diagnostics.FileVersionInfo [System]System.Diagnostics.FileVersionIn
78    IL_000f:  stloc.0
79    IL_0010:  ldstr      "{0}.{1}"
80    IL_0015:  ldloc.0
81 +-- 2 lines: IL_0016:  callvirt   instance int32 [System]System.Diagnostics.FileVersionInfo::get_ProductMajorPart
83    IL_0020:  ldloc.0
84    IL_0021:  callvirt   instance int32 [System]System.Diagnostics.FileVersionInfo::get_ProductMinorPart()
85    IL_0026:  box        [mscorlib]System.Int32
86    IL_002b:  call       string [mscorlib]System.String::Format(string,
87                                         object,
88                                         object)
89    IL_0030:  stloc.1
90    IL_0031:  ldarg.0
91    IL_0032:  ldloc.1
92    IL_0033:  call       instance void JP_NET.Lab1.ClassA::PartialMethodOfClassA(object)
93    IL_0038:  ret
94 } // end of method ClassA::MethodOfClassA
95
96 .method private hidebysig instance void
97     PartialMethodOfClassA(object x) cil managed
98 {
99    // Code size       12 (0xc)
100   .maxstack  8
101   IL_0000:  ldstr      "Wydruk z klasy A. {0}"
102   IL_0005:  ldarg.1
103   IL_0006:  call       void [mscorlib]System.Console::WriteLine(string,
                                          object)
104   IL_000b:  ret
105
106 } // end of method ClassA::PartialMethodOfClassA
107
108 .method public hidebysig specialname rtspecialname
109     instance void  .ctor() cil managed
110 {
111   // Code size       7 (0x7)
112   .maxstack  8
113   IL_0000:  ldarg.0
114 +-- 9 lines: IL_0001:  call       instance void [mscorlib]System.Object::.ctor()
123 } // end of class JP_NET.Lab1.ClassA
124
125
126 // =============================================================
127
128 // *********** DISASSEMBLY COMPLETE ***********************
129 // WARNING: Created Win32 resource file O.res
0.il [RO]                                95,0-1        Bot O.2.il
-- VISUAL --
```

```
41
42 .class public auto ansi beforefieldinit JP_NET.Lab1.ClassA
43     extends [mscorlib]System.Object
44 +-- 21 lines: {--
65    IL_0007: ret
66 } // end of method ClassA::set_A
67
68 .method public hidebysig instance void
69     MethodOfClassA() cil managed
70 {
71    // Code size       50 (0x32)
72    .maxstack  3
73    .locals init (class [System]System.Diagnostics.FileVersionInfo V_0)
74    IL_0000:  call       class [mscorlib]System.Reflection.Assembly [mscorlib]System.Reflection.Assembly::GetExec
75    IL_0005:  callvirt   instance string [mscorlib]System.Reflection.Assembly::get_Location()
76    IL_000a:  call       class [System]System.Diagnostics.FileVersionInfo [System]System.Diagnostics.FileVersionI
77    IL_000f:  stloc.0
78    IL_0010:  ldstr      "{0}.{1}"
79    IL_0015:  ldloc.0
80 +-- 2 lines: IL_0016:  callvirt   instance int32 [System]System.Diagnostics.FileVersionInfo::get_ProductMajorPar
82    IL_0020:  ldloc.0
83    IL_0021:  callvirt   instance int32 [System]System.Diagnostics.FileVersionInfo::get_ProductMinorPart()
84    IL_0026:  box        [mscorlib]System.Int32
85    IL_002b:  call       string [mscorlib]System.String::Format(string,
86                                         object,
87                                         object)
88    IL_0030:  pop
89    IL_0031:  ret
90 } // end of method ClassA::MethodOfClassA
91




92 .method public hidebysig specialname rtspecialname
93     instance void  .ctor() cil managed
94 {
95    // Code size       7 (0x7)
96    .maxstack  8
97    IL_0000:  ldarg.0
98 +-- 9 lines: IL_0001:  call       instance void [mscorlib]System.Object::.ctor()
107 } // end of class JP_NET.Lab1.ClassA
108
109
110 // =============================================================
111
112 // *********** DISASSEMBLY COMPLETE ***********************
113 // WARNING: Created Win32 resource file O.2.res
                                                        91,0-1        Bot
                                                             1
```

Nie ma śladu po metodzie po usunięciu jej implementacji w skompilowanej bibliotece.

2.b)

```
C:\studies\jpdotnet\lab\lab1-msil>csc ProgA.cs -out:jpdotnet.zad1msil2.Normal.exe -r:jpdotnet.zad1msil.Normal.dll
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.

C:\studies\jpdotnet\lab\lab1-msil>jpdotnet.zad1msil2.Normal.exe
Wydruk z klasy A. 0.0
```

2.c)

```
IL_000e:  ldloc.0
IL_000f:  ldc.i4.1
IL_0010:  callvirt    instance void [jpdotnet.zad1msil.Normal]JP_NET.Lab1.ClassA::set_A(int32)
IL_0015:  nop
IL_0016:  ldloc.0
IL_0017:  ldc.i4.2
IL_0018:  stfld       int32 [jpdotnet.zad1msil.Normal]JP_NET.Lab1.ClassA::b
IL_001d:  ret
```

2.e,f)

```
C:\studies\jpdotnet\lab\lab1-msil>jpdotnet.zad1msil2.Normal.exe
Wydruk z klasy A. 0.0
```

3.a)

```
C:\studies\jpdotnet\lab\lab1-msil>ngen install jpdotnet.zad1msil2.Normal.exe
Microsoft (R) CLR Native Image Generator - Version 4.8.4320.0
Copyright (c) Microsoft Corporation.  All rights reserved.
1>    Compiling assembly C:\studies\jpdotnet\lab\lab1-msil\jpdotnet.zad1msil2.Normal.exe (CLR v4.0.30319) ...
2>    Compiling assembly jpdotnet.zad1msil.Normal, Version=0.0.0.0, Culture=neutral, PublicKeyToken=null (CLR v4.0.30319) ...
```

3.b)

This PC > Local Disk (C:) > Windows > assembly > NativeImages_v4.0.30319_64 > jpdotnet.za7d2bc6eb# > 06e8f189c71db17066ff5c961d8fe1a6

Name	Date modified	Type	Size	
jpdotnet.zad1msil2.Normal.ni.exe	2022-10-18 23:05	Application	9 KB	
jpdotnet.zad1msil2.Normal.ni.exe.aux	2022-10-18 23:05	AUX File	1 KB	

4.a, 4.b)

```
104        // Code size       14 (0xe)
105        .maxstack  8
106        IL_0000:  nop
107        IL_0001:  ldstr       "Wydruk z klasy A. po kompilacji. {0}"
108        IL_0006:  ldarg.1
109        IL_0007:  call        void [mscorlib]System.Console::WriteLine(string,
110                                                                        object)
111        IL_000c:  nop
112        IL_000d:  ret
113    } // end of method ClassA::PartialMethodOfClassA
zad4.il
```

4.c)

```
C:\studies\jpdotnet\lab\lab1-msil>ilasm -dll -out=jpdotnet.zad1msil.Normal.dll zad4.il

Microsoft (R) .NET Framework IL Assembler.  Version 4.8.9065.0
Copyright (C) Microsoft Corporation.  All rights reserved.
Assembling 'zad4.il'  to DLL --> 'jpdotnet.zad1msil.Normal.dll'
Source file is ANSI

Assembled method jpdotnet.zad1msil.Normal.ClassA::get_A
Assembled method jpdotnet.zad1msil.Normal.ClassA::set_A
Assembled method jpdotnet.zad1msil.Normal.ClassA::MethodOfClassA
Assembled method jpdotnet.zad1msil.Normal.ClassA::PartialMethodOfClassA
Assembled method jpdotnet.zad1msil.Normal.ClassA::.ctor
Creating PE file

Emitting classes:
Class 1:        jpdotnet.zad1msil.Normal.ClassA

Emitting fields and methods:
Global
Class 1 Fields: 2;      Methods: 5;
Resolving local member refs: 5 -> 5 defs, 0 refs, 0 unresolved

Emitting events and properties:
Global
Class 1 Props: 1;
Resolving local member refs: 0 -> 0 defs, 0 refs, 0 unresolved
Writing PE file
Operation completed successfully

C:\studies\jpdotnet\lab\lab1-msil>
```

4.d)

```
C:\studies\jpdotnet\lab\lab1-msil>jpdotnet.zad1msil2.Normal.exe
Wydruk z klasy A po kompilacji. 0.0

C:\studies\jpdotnet\lab\lab1-msil>
```

5.a)

```
C:\studies\jpdotnet\lab\lab1-msil>csc ProgA.cs ClassA.cs ClassB.cs -out:jp.z1_5.exe
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.


C:\studies\jpdotnet\lab\lab1-msil>jp.z1_5.exe
Wydruk z klasy A. 0.0
```

5.b)

```
C:\studies\jpdotnet\lab\lab1-msil>csc ClassA.cs -t:module -out:ClassA.netmodule
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.


C:\studies\jpdotnet\lab\lab1-msil>csc ClassB.cs -t:module -out:ClassB.netmodule
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.
```

5.c)

```
C:\studies\jpdotnet\lab\lab1-msil>csc ProgA.cs -t:exe -addmodule:ClassA.netmodule -addmodule:ClassB.netm
odule -out:jp.z1_5c.exe
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.


C:\studies\jpdotnet\lab\lab1-msil>jp.z1_5c.exe
Wydruk z klasy A. 0.0
```

5.d)

Left panel:
```
27  .hash algorithm 0x00008004
28  .ver 0:0:0:0
29 }
30 .module jp.z1_5.exe
31 // MVID: {77276C47-F690-47FF-8DA9-F6A2F9963FE2}

32 .imagebase 0x00400000
33 .file alignment 0x00000200
34 .stackreserve 0x00100000
35 .subsystem 0x0003      // WINDOWS_CUI
36 .corflags 0x00000001   // ILONLY
37 // Image base: 0x06B0000
```

Right panel:
```
28  .hash algorithm 0x00008004
29  .ver 0:0:0:0
30 }
31 .file ClassA.netmodule
32   .hash = (08 A9 1A AB B6 ED D0 DE E4 17 6B 23 A4 8B DB 09   // ..........k#....
33            B2 DD 2E EC )                                     // ....
34 .file ClassB.netmodule
35   .hash = (66 D6 5F A4 6C 4C 12 05 81 0C 0B B5 50 61 22 3A   // f.._lL.......Xa":
36            6C E4 6E CF )                                     // l.n.
37 .class extern public JP_NET.Lab1.ClassA
38 {
39   .file ClassA.netmodule
40   .class 0x02000002
41 }
42 .class extern public JP_NET.Lab1.ClassB
43 {
44   .file ClassB.netmodule
45   .class 0x02000002
46 }
47 .module jp.z1_5c.exe
48 // MVID: {E1A49F82-852E-41F2-8935-F7207F161C1B}
49 .imagebase 0x00400000
50 .file alignment 0x00000200
51 .stackreserve 0x00100000
52 .subsystem 0x0003      // WINDOWS_CUI
53 .corflags 0x00000001   // ILONLY
54 // Image base: 0x073C0000
```

Left panel (lower):
```
61     IL_0016:  ldloc.0
62     IL_0017:  ldc.i4.2
63     IL_0018:  stfld     int32 JP_NET.Lab1.ClassA::b
64     IL_001d:  ret
65   } // end of method Program::Main
66
67   .method public hidebysig specialname rtspecialname
68           instance void  .ctor() cil managed
69   {
70 +---  4 lines: Code size       8 (0x8)---------------
74     IL_0006:  nop
75     IL_0007:  ret
76   } // end of method Program::.ctor
77
78 } // end of class JP_NET.Lab1.Program
79
80 .class public auto ansi beforefieldinit JP_NET.Lab1.ClassA
81        extends [mscorlib]System.Object
82 {
83   .field private int32 _a
84   .field public int32 b
85   .method public hidebysig specialname instance int32
86           get_A() cil managed
87   {
88     // Code size       7 (0x7)
89     .maxstack  8
90     IL_0000:  ldarg.0
91     IL_0001:  ldfld     int32 JP_NET.Lab1.ClassA::_a
92     IL_0006:  ret
93   } // end of method ClassA::get_A
94
95   .method public hidebysig specialname instance void
96           set_A(int32 'value') cil managed
97   {
98     // Code size       8 (0x8)
99     .maxstack  8
100    IL_0000:  ldarg.0
101    IL_0001:  ldarg.1
102    IL_0002:  stfld     int32 JP_NET.Lab1.ClassA::_a
103    IL_0007:  ret
104  } // end of method ClassA::set_A
105
106  .method public hidebysig instance void
107          MethodOfClassA() cil managed
108  {
109    // Code size      61 (0x3d)
110    .maxstack  3
111    .locals init (class [mscorlib]System.Reflection.Assembly V_0,
112             class [System]System.Diagnostics.FileVersionInfo V_1,
113             string V_2)
114    IL_0000:  nop
115    IL_0001:  call       class [mscorlib]System.Reflection.Assembly [mscorlib]System.Reflection.Assembly::GetExecu
116    IL_0006:  stloc.0
117    IL_0007:  ldloc.0
118    IL_0008:  callvirt   instance string [mscorlib]System.Reflection.Assembly::get_Location()
119    IL_0009:  call       class [System]System.Diagnostics.FileVersionInfo [System]System.Diagnostics.FileVersionIn
120    IL_0012:  stloc.1
121    IL_0013:  ldstr      "{0}.{1}"
122    IL_0018:  ldloc.1
```

Right panel (lower):
```
78     IL_0016:  ldloc.0
79     IL_0017:  ldc.i4.2
80     IL_0018:  stfld     int32 [.module ClassA.netmodule]JP_NET.Lab1.ClassA::b
81     IL_001d:  ret
82   } // end of method Program::Main
83
84   .method public hidebysig specialname rtspecialname
85           instance void  .ctor() cil managed
86   {
87 +---  4 lines: Code size       8 (0x8)---------------
91     IL_0006:  nop
92     IL_0007:  ret
93   } // end of method Program::.ctor
94
95 } // end of class JP_NET.Lab1.Program
96
```

Status bars:
```
z1_5.il                              60,1      42% z1_5c.il                                       77,1      93%
```

5.e)

```
C:\studies\jpdotnet\lab\lab1-msil>csc ProgA.cs -t:module -out:ProgA.netmodule -r:jpdotnet.zad1msil.Norma
l.dll
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.
```

5.f)

```
C:\studies\jpdotnet\lab\lab1-msil>al ClassA.netmodule ClassB.netmodule ProgA.netmodule -t:exe -out:jp.z5
f.exe -main:JP_NET.Lab1.Program.Main
Microsoft (R) Assembly Linker version 14.8.3928.0
Copyright (C) Microsoft Corporation. All rights reserved.


C:\studies\jpdotnet\lab\lab1-msil>jp.z5f.exe
Wydruk z klasy A. 0.0


C:\studies\jpdotnet\lab\lab1-msil>
```

5.g)

6.a)

```
C:\studies\jpdotnet\lab\lab1-msil>sn -k paraKluczy.snk

Microsoft (R) .NET Framework Strong Name Utility   Version 4.0.30319.0
Copyright (c) Microsoft Corporation.   All rights reserved.

Key pair written to paraKluczy.snk
```

6.c)

```
C:\studies\jpdotnet\lab\lab1-msil>csc AssemblyInfo.cs ClassA.cs -t:library -out:jp.z6c.dll
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.
```

6.d)

```
C:\studies\jpdotnet\lab\lab1-msil>csc AssemblyInfo.cs ClassA.cs -t:library -out:jp.z6c.dll
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.


C:\studies\jpdotnet\lab\lab1-msil>csc ProgA.cs -out:jp.z6d.exe -r:jp.z6c.dll
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.


C:\studies\jpdotnet\lab\lab1-msil>csc AssemblyInfo.cs ClassA.cs -t:library -out:jp.z6c.dll
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.


C:\studies\jpdotnet\lab\lab1-msil>jp.z6d.exe

Unhandled Exception: System.IO.FileLoadException: Could not load file or assembly 'jp.z6c, Version=1.0.0
.0, Culture=neutral, PublicKeyToken=null' or one of its dependencies. The located assembly's manifest de
finition does not match the assembly reference. (Exception from HRESULT: 0x80131040)
   at JP_NET.Lab1.Program.Main()

C:\studies\jpdotnet\lab\lab1-msil>
```

6.e)

```
C:\studies\jpdotnet\lab\lab1-msil>csc ProgA.cs -out:jp.z6d.exe -r:jp.z6c.dll
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.


C:\studies\jpdotnet\lab\lab1-msil>jp.z6d.exe
Wydruk z klasy A. 1.0

C:\studies\jpdotnet\lab\lab1-msil>
```

6.f)

```
C:\studies\jpdotnet\lab\lab1-msil>sn -v jp.z6c.dll

Microsoft (R) .NET Framework Strong Name Utility  Version 4.0.30319.0
Copyright (c) Microsoft Corporation.  All rights reserved.

Assembly 'jp.z6c.dll' is valid

C:\studies\jpdotnet\lab\lab1-msil>_
```

7.a)

```
C:\studies\jpdotnet\lab\lab1-msil>gacutil -i jp.z6c.dll
Microsoft (R) .NET Global Assembly Cache Utility.  Version 4.0.30319.0
Copyright (c) Microsoft Corporation.  All rights reserved.

Assembly successfully added to the cache

C:\studies\jpdotnet\lab\lab1-msil>_
```

7.c)

```
C:\studies\jpdotnet\lab\lab1-msil>csc -t:library -out:jp.z6c.dll AssemblyInfo.cs ClassA.cs
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.

C:\studies\jpdotnet\lab\lab1-msil>
```

7.d)

```
C:\studies\jpdotnet\lab\lab1-msil>csc -out:np.z7d -r:jp.z6c.dll ProgA.cs
Microsoft (R) Visual C# Compiler version 4.3.0-3.22470.13 (80a8ce8d)
Copyright (C) Microsoft Corporation. All rights reserved.

C:\studies\jpdotnet\lab\lab1-msil>_
```

7.e)

```
C:\studies\jpdotnet\lab\lab1-msil>gacutil -i jp.z6c.dll
Microsoft (R) .NET Global Assembly Cache Utility.  Version 4.0.30319.0
Copyright (c) Microsoft Corporation.  All rights reserved.

Assembly successfully added to the cache

C:\studies\jpdotnet\lab\lab1-msil>
```

7.g)

```
C:\studies\jpdotnet\lab\lab1-msil>gacutil -l jp.z6c
Microsoft (R) .NET Global Assembly Cache Utility.  Version 4.0.30319.0
Copyright (c) Microsoft Corporation.  All rights reserved.

The Global Assembly Cache contains the following assemblies:
  jp.z6c, Version=1.0.0.0, Culture=neutral, PublicKeyToken=a299ccdf8401740f, processorArchitecture=MSIL
  jp.z6c, Version=1.0.0.1, Culture=neutral, PublicKeyToken=a299ccdf8401740f, processorArchitecture=MSIL

Number of items = 2
```

7.h)

```
C:\studies\jpdotnet\lab\lab1-msil>jp.z6d.exe
Wydruk z klasy A. 1.0

C:\studies\jpdotnet\lab\lab1-msil>jp.z7h.exe
Wydruk z nowej klasy A. 1.0
```

7.i)

This PC > Local Disk (C:) > Windows > Microsoft.NET > assembly > GAC_MSIL > jp.z6c

Name	Date modified	Type
v4.0_1.0.0.0__a299ccdf8401740f	2022-10-19 01:24	File folder
v4.0_1.0.0.1__a299ccdf8401740f	2022-10-19 01:29	File folder

7.j)

```
Assembly: jp.z6c, Version=1.0.0.0, Culture=neutral, PublicKeyToken=a299ccdf8401740f, processorArchitectu
re=MSIL
Uninstalled: jp.z6c, Version=1.0.0.0, Culture=neutral, PublicKeyToken=a299ccdf8401740f, processorArchite
cture=MSIL

Assembly: jp.z6c, Version=1.0.0.1, Culture=neutral, PublicKeyToken=a299ccdf8401740f, processorArchitectu
re=MSIL
Uninstalled: jp.z6c, Version=1.0.0.1, Culture=neutral, PublicKeyToken=a299ccdf8401740f, processorArchite
cture=MSIL
Number of assemblies uninstalled = 2
Number of failures = 0
```