### **Generic methods**

So we are finally in the generics.
At first they look complicated.
But in reality they really are not.
Generics of course meaning that they can apply to more than one type.
So a method or a class which is generic - can work both for integer type and for string type and for any other type.

| ব           |                         | - Micros      |                       | Studio              |                     |             |                          |                                 |                  |              |                 |          |     |       |  |
|-------------|-------------------------|---------------|-----------------------|---------------------|---------------------|-------------|--------------------------|---------------------------------|------------------|--------------|-----------------|----------|-----|-------|--|
| li <u>k</u> | <u>E</u> dycja          | <u>W</u> idok | P <u>r</u> ojek       | t Kompi <u>l</u> ow | anie Deb <u>u</u> g | gowanie Z   | Zes <u>p</u> ół <u>I</u> | <u>V</u> arzędzia Te <u>s</u> t | Anali <u>z</u> a | <u>O</u> kno | Po <u>m</u> oc  |          |     |       |  |
| G           | -01                     | 行 - 省         | <b>1</b> 2 <b>1</b> 2 | "ଅ - ୧୯ -           | Debug -             | Any CPU     |                          | 02. GenericClass                |                  | -            | 🕨 Rozpocznij 👻  | 🏓 📮 🖗    | b f | 13 23 |  |
| л<br>У I    | MyList.cs               |               | ntryPoint.            | .cs +⊨ X            |                     |             |                          |                                 |                  |              |                 |          |     |       |  |
| 3 -         | 대) 2152(65<br>대 02. Gen |               |                       |                     |                     | 🗸 🔩 Gener   | ricClass.Ent             | tryPoint                        |                  |              | - 💁 Main()      |          |     |       |  |
|             |                         | L             | ,                     |                     | ,                   |             |                          |                                 |                  |              |                 |          |     |       |  |
|             |                         | ⊡name         | space Ge              | nericClass          |                     |             |                          |                                 |                  |              |                 |          |     |       |  |
|             |                         | {             |                       |                     |                     |             |                          |                                 |                  |              |                 |          |     |       |  |
| Ú           | 10                      | Ē.            | class En              | tryPoint            |                     |             |                          |                                 |                  |              |                 |          |     |       |  |
|             | 11<br>12                |               | i<br>stat             | ic void Main        | 0                   |             |                          |                                 |                  |              |                 |          |     |       |  |
| ž.          | 13                      | T.            | {                     |                     | ()                  |             |                          |                                 |                  |              |                 |          |     |       |  |
|             | 14                      |               |                       | Console.Writ        |                     |             |                          |                                 |                  |              |                 |          |     |       |  |
|             | 15                      |               |                       | Console.Writ        | eLine(AreEqu        | ual(2, 2)); |                          |                                 |                  |              |                 |          |     |       |  |
|             | 16                      |               | }                     |                     |                     |             |                          |                                 |                  |              |                 |          |     |       |  |
|             | 17<br>18                |               | pub1                  | ic static bo        | ol AreEqual(        | (int num1.  | int num2                 | )                               |                  |              |                 |          |     |       |  |
|             | 19                      | T             | {                     |                     |                     | (           |                          |                                 |                  |              |                 |          |     |       |  |
|             | 20                      |               |                       | return (num1        | == num2);           |             |                          |                                 |                  |              |                 |          |     |       |  |
|             | 21                      |               | }                     |                     |                     |             |                          |                                 |                  |              |                 |          |     |       |  |
|             | 22<br>23                |               | }                     |                     |                     |             |                          |                                 |                  |              |                 |          |     |       |  |
|             | 23                      | [}            |                       |                     |                     |             |                          |                                 |                  |              |                 |          |     |       |  |
|             | 25                      | 1             |                       | C:\\                | Vindows\syste       | em32\cmd.e  | xe                       |                                 |                  |              |                 |          |     |       |  |
|             | 26                      |               |                       | False               |                     |             |                          |                                 |                  |              |                 |          |     | ~     |  |
|             | 27                      |               |                       | True<br>HDy K       | ontynuowa           | ć, naciś    | nij dow                  | olny klawis:                    | z                |              |                 |          |     |       |  |
|             | 28<br>29                |               |                       |                     |                     |             |                          |                                 |                  |              |                 |          |     |       |  |
|             | 30                      |               |                       |                     |                     |             |                          | ole a method t                  |                  |              | o numbers are   | e equal. |     |       |  |
|             | 31                      | 1             |                       |                     |                     | -           | -                        | nd you should                   | be able to c     | do it.       |                 |          |     |       |  |
|             | 32                      | 1             |                       |                     | you can see         |             |                          | -                               |                  |              |                 |          |     |       |  |
|             | 33                      | 1             |                       |                     | 're going to        |             |                          |                                 |                  |              |                 |          |     |       |  |
|             | 34<br>35                |               |                       | Tru                 | e or false w        | hether the  | e numbe                  | rs are equal or                 | r not.           |              |                 |          |     |       |  |
|             |                         | 1             |                       | And                 | d arguments         | s int num1  | and int                  | num2                            |                  |              |                 |          |     |       |  |
|             | 37                      | 1             |                       | We                  | are simply          | going to re | eturn nu                 | m1 equal to n                   | um2.             |              |                 |          |     |       |  |
|             | 38                      | 1             |                       | Ver                 | y simple.           |             |                          |                                 |                  |              |                 |          |     |       |  |
|             |                         |               |                       | As                  | we see in fii       | rst exampl  | e we hav                 | ve false and in                 | second we h      | have tr      | ue.             |          |     |       |  |
|             | 40<br>41                |               |                       | lt w                | vorks good l        | because in  | first exa                | mple number                     | s are not equ    | ual and      | d in second the | ey are.  |     |       |  |
|             | 42                      |               |                       | But                 | now what            | if you wan  | it to mak                | e it work with                  | any type.        |              |                 |          |     |       |  |
|             | 43                      |               |                       |                     |                     | •           |                          |                                 |                  |              |                 |          |     |       |  |
|             | 44                      |               |                       |                     |                     |             |                          |                                 |                  |              |                 |          |     |       |  |

| M                   |                | - Microso     | oft Visual Studio   |   |
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| Pli <u>k</u>        | <u>E</u> dycja | <u>W</u> idok | P <u>r</u> ojekt Kompi <u>l</u> owanie Deb <u>u</u> gowanie Zes <u>p</u> ół <u>N</u> arzędzia Te <u>s</u> t Ana | ali <u>z</u> a <u>O</u> kno Po <u>m</u> oc      |
| 6                   |                | 約 - 當         | 💾 🗳 ႒ – 🔍 – Debug – Any CPU – 02. GenericClass  | 🗸 🕨 Rozpocznij 🗸 🎜 🚽 🔚 📲 🗍                      |
| Ē                   |                |               |   |   |
| Eksplorator serwera | MyList.cs      |               | ntryPoint.cs 🗢 🗙  |   |
| orat                | C# 02. Ger     | rericClass    | 🗸 🤸 GenericClass.EntryPoint   | - 🗣 Main()                                      |
| or a                |                |               |   |   |
| ienv                |                |               | space GenericClass  |   |
| /era                | 9<br>10        | {<br>⊑¦ (     | class EntryPoint  | What should we do.                              |
|                     | 10             |               | {   | Well one solution is to change the integer type |
| Przybornik          | 12             |               | static void Main()  | to object.                                      |
| Por la              | 13             |               | {   | That way we will be able to give with any type  |
| ÷                   | 14             |               | Console.WriteLine(AreEqual(2, 2));  | as an argument that we want.                    |
|                     | 15<br>16       |               | <pre>Console.WriteLine(AreEqual('a', 'a'));</pre>   | Let's try do it.                                |
|                     | 10             |               | console.writeLine(Arelquar( a , a )),   | We try it for three types. As we can see it     |
|                     | 18             |               | Console.WriteLine(AreEqual("abba", "abba"));  | returns wrong answers for integer type and for  |
|                     | 19             |               | <pre>Console.WriteLine(AreEqual("abba", "abc"));</pre>  | character type.                                 |
|                     | 20             |               | }   | For string type it works good.                  |
|                     | 21<br>22       |               | public static bool AreEqual(object num1, object num2)   | So it doesn't work for any types.               |
|                     | 23             | Ţ             | {   | We can not use the object type.                 |
|                     | 24             |               | <pre>return (num1 == num2);</pre>   | we can not use the object type.                 |
|                     | 25             |               | }   |   |
|                     | 26<br>27       | }             | C:\Windows\system32\cmd.exe   |   |
|                     | 28             |               |   |   |
|                     | 29             | I             | False   | · · · · · · · · · · · · · · · · · · ·           |
|                     |                |               | True<br>False   |   |
|                     | 31<br>32       |               | hby koncynuować, naciśnij dowolny kl  | lawisz  |
|                     | 33             |               |   |   |
|                     | 34             |               |   | · · · · · · · · · · · · · · · · · · ·           |
|                     | 35             |               |   |   |
|                     | 36             |               |   |   |
|                     | 37<br>38       |               |   |   |
|                     |                |               |   |   |
|                     |                |               |   |   |
|                     | 41             |               |   |   |
|                     | 42             |               |   |   |
|                     | 43<br>44       |               |   |   |
|                     |                |               |   |   |

| $\triangleleft$ |            | - Microso    |           | Studio  |           |              |                         |             |             |           |         |      |                         |           |          |           |          |
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| Plik            | Edycja     | Widok        | Projek    | t Kor   | npilowani | e Deb        | ugowanie                | Zespół      | Narzędzia   | a Test    | Analiza | Okno | Pomoc                   |           |          |           |          |
| G               | -01        | 約 - 省        | 12 Ja     | 9-      | ୯ - ୮     | ebug -       | Any CP                  | U           | - 02. Gene  | ericClass |         | -    | 🕨 Rozpocznij –          | 🗩 _ ें 🕅  | 5 (F     | 1 1       | <b>I</b> |
|                 |            |              |           |         |           | -            |                         |             |             |           |         |      |                         | • •       |          |           |          |
| -σ              | MyList.cs  |              | ntryPoint | .cs 🕂   | ×         |              | <b>A</b> -              |             |             |           |         |      | 0                       |           |          |           |          |
| orat            | ⊂# 02. Gen | ericClass    |           |         |           | . <b>.</b> , | - 📲 Ge                  | enericClass | EntryPoint. |           |         |      | + 𝔤 <sub>ฅ</sub> Main() |           |          |           |          |
| or s            |            |              | 6-        |         |           |              |                         |             |             |           |         |      |                         |           |          |           |          |
| erw             |            | ⊡name:<br> { | space Ge  | nericc  | Lass      |              |                         |             |             |           |         |      |                         |           |          |           |          |
| era             | 10         |              | class En  | ntryPoi | nt        |              |                         |             |             |           |         |      |                         |           |          |           |          |
| Pa              | 11         |              | {         |         |           |              |                         |             |             |           |         |      |                         |           |          |           |          |
| уbс             | 12<br>13   | Ê            | stat      | ic voi  | Main()    |              |                         |             |             |           |         |      |                         |           |          |           |          |
| Przybornik      | 13         |              | l         | Consol  | .WriteL:  | ine(AreE     | qua <mark>l(1,</mark> " | abc"));     |             |           |         |      |                         |           |          |           |          |
| ^               | 15         |              |           |         |           |              |                         |             |             |           |         |      |                         |           |          |           |          |
|                 | 16         |              | }         |         |           |              |                         |             |             |           |         |      |                         |           |          |           |          |
|                 | 17<br>18   |              | publ      | ic sta  | tic bool  | AreEqua      | 1(object                | num1. obt   | ject num2)  |           |         |      |                         |           |          |           |          |
|                 | 19         | Ţ            | {         |         |           |              |                         | , , ,       |             |           |         |      |                         |           |          |           |          |
|                 | 20         |              |           | return  | (num1 =   | = num2);     |                         |             |             |           |         |      |                         |           |          |           |          |
|                 | 21<br>22   | •            | ; }       |         |           |              |                         |             |             |           |         |      |                         |           |          |           |          |
|                 | 23         | <b>}</b>     | r         |         |           |              |                         |             |             |           |         |      | _                       |           |          | x         |          |
|                 | 24         |              |           |         |           |              | system32\               | cmd.exe     |             |           |         |      |                         |           |          |           |          |
|                 | 25         |              |           |         | False     | ontunu       | омаć в                  | aciénii     | dowolny     | , klawi   |         |      |                         |           |          | ~         |          |
|                 | 26<br>27   |              |           |         |           | oncyna       | owac, m                 | acisnij     | 40%0109     | , MIGWI   |         | An   | d as we see. Whe        | en we tr  | y comp   | are two   | )        |
|                 | 28         |              |           |         |           |              |                         |             |             |           |         |      | ferent types.           |           |          |           |          |
|                 | 29         |              |           |         |           |              |                         |             |             |           |         | For  | example numbe           | er and st | ring – r | nethod    | tries    |
|                 | 30<br>31   |              |           |         |           |              |                         |             |             |           |         | sol  | ve it.                  |           |          |           |          |
|                 | 32         |              |           |         |           |              |                         |             |             |           |         | Со   | mpiler can not re       | ecognize  | that th  | ere are   | two      |
|                 | 33         |              |           |         |           |              |                         |             |             |           |         | dif  | ferent types – no       | t compa   | tible a  | nd not    |          |
|                 | 34<br>35   |              |           |         |           |              |                         |             |             |           |         | cor  | nparable.               |           |          |           |          |
|                 | 36         |              |           |         |           |              |                         |             |             |           |         | lt's | not possible to a       | compare   | them     | because   | ć        |
|                 | 37         | 1            |           |         |           |              |                         |             |             |           |         | nu   | mbers are numb          | ers and s | strings  | or string | gs.      |
|                 | 38         | 1            |           |         |           |              |                         |             |             |           |         |      | ere is no way to o      | •         |          |           |          |
|                 | 39<br>40   |              |           |         |           |              |                         |             |             |           |         |      | we need to make         |           |          |           |          |
|                 | 40         |              |           |         |           |              |                         |             |             |           |         |      | thod to make it         | work wit  | th any t | ype and   | t        |
|                 | 42         |              |           |         |           |              |                         |             |             |           |         |      | ke it work as           |           |          |           |          |
|                 | 43         |              |           |         |           |              |                         |             |             |           |         | it s | hould be workin         | g.        |          |           |          |
|                 | 44         |              |           |         |           |              |                         |             |             |           |         |      |                         |           |          |           |          |

| <b>⊠</b><br>Plik               | Generics - Microsoft Visual Stud<br><b>Edycja Widok Projekt</b>  | lio<br>Kompilowanie Debugowanie | e Zespół Narz       | ędzia Test  | Analiza Okno   | Pomoc   |  |
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|                                | 3 - 0 🕅 - 🖕 💾 🚜 🤊  | 🛛 – 🤇 – Debug – Any C           | CPU - 02.           | GenericClass  | -  | 🕨 Rozpocznij - 🛛 👼 🚽  | ) 占 📭 🗉 🖭 📕 📢  |
| Eksp                           | MyList.cs EntryPoint.cs*   | <b>⇔ X</b>                      |                     |   |  |   |  |
| lorat                          | Œ 02. GenericClass   | - 🔩                             | GenericClass.EntryP | oint  |  | <sup> </sup> → <sup> </sup>  |  |
| Eksplorator serwera Przybornik | 13 {<br>14 Cons<br>15 }<br>16 }<br>17 [<br>18 □ public s<br>19 { |                                 |                     | right here aft<br>We tell by th<br>We also need<br>method shou<br>Why we use<br>convention b<br>You can pret<br>You can write<br>This is simply<br>T is just shor<br>As you can se<br>arguments.<br>And it says th<br>T.<br>That's becau<br>that can be a<br>How are we | ter the name o<br>is that we will<br>d to change the<br>uld be able to t<br>T. We could us<br>out that doesn'<br>ty much use ar<br>e any type inste<br>y a name that y<br>ter and accept<br>ee we also have<br>nat operator ec<br>se currently ou<br>nything.<br>going to make | f the method and we<br>use type T in our met<br>e type of our argumer<br>ake any type as an arg<br>e any letter or Name<br>t mean that we can't<br>nything else you want.<br>ead of T.<br>you're going to use for<br>ed as a standard gene<br>e a problem with a co<br>quals cannot be applie | hod.<br>hts to T meaning that our<br>gument.<br>but we are using T by<br>use something else.<br>T the generic type and typ<br>ric type name. |
|                                | Lista błędów   |                                 |                     |   |  |   |  |
|                                |  | 🔇 1 Błąd 🚺 0 Ostrzeżenia        | 🚺 0 Komunikaty      | 🌴 Kompila   | acja + IntelliSense  |   | Przeszukaj listę błędów  |
|                                | Kod Opis   |                                 |                     |   |  | Projekt   | Plik   |
|                                | 🔀 CS0019 Nie można zast  | tosować operatora "==" do argu; | umentów operacji ty | /pu "T" lub "T".  |  | 02. GenericClass  | EntryPoint.cs  |

| <ul> <li>G + O</li> <li>MyList.cs</li> <li>EntryPoint.cs<sup>*</sup> + ×</li> <li>C = 02. GenericClass</li> <li>MyList.cs</li> <li>EntryPoint.cs<sup>*</sup> + ×</li> <li>C = 02. GenericClass</li> <li>Any CPU</li> <li>O2. GenericClass</li> <li>Any CPU</li> <li>Any CPU</li></ul>  | 8                              | Generics -   | Microsoft  | Visual Studio  |  |   |                         |              |           |             |             |                        |   |  |
|--|--------------------------------|--|--|--|--|---|-------------------------|--------------|-----------|-------------|-------------|------------------------|---|--|
| MyList cs EntryPoint cs * * X<br>(Ciercorvigzanie (Class Cherric Class)<br>MyList cs EntryPoint (Class Cherric Class)<br>MyList cs Cherric Class (Class Cherric Class)<br>Compare Class Cherric Class (Class Cherric Class)<br>MyList cs System Cherric Class (Class Cherric Class)<br>Cherric Class Cherric Class (Class Cherric Class)<br>Cherric Class Cherric Class (Class Cherric Class)<br>Cherric Class Cherric Class (Class Cherric Class)<br>MyList cs System (Class Cherric Class)<br>Cherric Class Cherric Class (Cherric Class)<br>Cherric Class (Class Cherric Class)<br>Cherric Class (Class Cherric Class)<br>Cherric Class (Class (Class Cherric Class)<br>Cherric Class (Class (Class Cherric Class)<br>Cherric Class (Class (Class (Class Cherric Class)<br>Cherric Class (Class (Cl | Plik                           | : Edycja   | Widok  | Projekt K  | Compilowar   | nie Debu  | gowanie                 | Zespół       | Narzęd    | zia Test    | t Analiza   | Okno                   | Pomoc   |  |
| So let's try and do this.<br>But we now have not access to the method<br>CompareTo from argument of generic type.<br>The reasoning is the same.<br>It's not clear what types exactly are we going<br>to take in, and C-Sharp can't compare them by<br>default.<br>So we need to make some constraints on our<br>generic type.<br>So we are using the where keyword.<br>So we are using the where keyword.<br>So we are using the where keyword.<br>So we are using the where tis is a generic<br>method that takes any type of T and this type<br>of T must implement the IComparable<br>interface.<br>This is a constraint that we are going to use.<br>Now we should have access to the<br>Comparable interface.<br>So we have it because it's coming from the<br>IComparable interface.<br>So any type that implements this interface is going<br>to be able to used in this method.  |                                | ᢒ-⊙ ‡  | 3 - 🖺 🖌  | 2  |  | Debug -   | Any CP                  | U -          | 02. G     | enericClass | s           | -                      | 🔸 🕨 Rozpocznij 👻 🎜 📮 陆 🛱  | i i 🤹 📕 🕯  |
| So let's try and do this.<br>But we now have not access to the method<br>CompareTo from argument of generic type.<br>The reasoning is the same.<br>It's not clear what types exactly are we going<br>to take in, and C-Sharp can't compare them by<br>default.<br>So we need to make some constraints on our<br>generic type.<br>So we are using the where keyword.<br>So we are using the where keyword.<br>So we are using the where keyword.<br>So we are using the where tis is a generic<br>method that takes any type of T and this type<br>of T must implement the IComparable<br>interface.<br>This is a constraint that we are going to use.<br>Now we should have access to the<br>Comparable interface.<br>So we have it because it's coming from the<br>IComparable interface.<br>So any type that implements this interface is going<br>to be able to used in this method.  | Eksp                           | MyList.cs  | Ent  | ryPoint.cs* -  | ⊧ ×  |   |                         |              |           |             |             |                        |   |  |
| So let's try and do this.<br>But we now have not access to the method<br>CompareTo from argument of generic type.<br>The reasoning is the same.<br>It's not clear what types exactly are we going<br>to take in, and C-Sharp can't compare them by<br>default.<br>So we need to make some constraints on our<br>generic type.<br>So we are using the where keyword.<br>So we are using the where keyword.<br>So we are using the where keyword.<br>So we are using the where tis is a generic<br>method that takes any type of T and this type<br>of T must implement the IComparable<br>interface.<br>This is a constraint that we are going to use.<br>Now we should have access to the<br>Comparable interface.<br>So we have it because it's coming from the<br>IComparable interface.<br>So any type that implements this interface is going<br>to be able to used in this method.  | lora                           | C# 02. Gene  |  |  |  |   | - 🔩 Ge                  | enericClass. | EntryPoir | nt          |             |                        | - 🛛 AreEqual <t>(T num1, T nu</t>   | m2)  |
| 02. GenericClass EntryPoint.cs   | Eksplorator serwera Przybornik | 4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20 ♀<br>21<br>22<br>23<br>24<br>25<br>26<br>90 % ↓<br>Lista błędóv<br>Całe rozwi | using<br>using<br>using<br>using<br>using<br>using<br>cl<br>cl<br>cl<br>cl<br>cl<br>cl<br>cl<br>cl<br>cl<br>cl<br>cl<br>cl<br>cl | System.Coll<br>System.Lind<br>System.Text<br>System.Text<br>System;<br>bace Generic<br>ass EntryPo<br>static vo<br>{<br>Conso<br>}<br>public st<br>{<br>retur<br>} | lections.(<br>a;<br>cading.Tas<br>cClass<br>pint<br>pid Main()<br>ple.Writel<br>tatic bool<br>rn (num1.) | sks;<br>ine(AreEqual<br>AreEqual<br>Compa<br>Compa<br>Equals<br>GetHas<br>GetHas<br>GetTyp<br>ToStrin | reTo<br>hCode<br>e<br>g | m1, T num    | parable<  | :T>.Comp    | areTo(T oth | ><br>her)<br>htelliSer | into the Dot Net framework.<br>So let's try and do this.<br>But we now have not access t<br>CompareTo from argument of<br>The reasoning is the same.<br>It's not clear what types exact<br>to take in, and C-Sharp can't c<br>default.<br>So we need to make some con<br>generic type.<br>So we are using the where key<br>So we're going to write where<br>So what we are saying here: the<br>method that takes any type of<br>of T must implement the ICon<br>interface.<br>This is a constraint that we are<br>Now we should have access to<br>ComparedTo method and the<br>We have it because it's comin<br>IComparable interface.<br>So any type that implements this<br>to be able to used in this method | o the method<br>generic type.<br>ly are we going<br>ompare them b<br>nstraints on our<br>word.<br>T is Comparable<br>T and this type<br>nparable<br>e going to use.<br>o the<br>re it is.<br>g from the<br>s interface is goin<br>d. |
|  |                                | 🚫 C  | 51001 Oc   | zekiwano ide   | ntyfikatora  |   |                         |              |           |             |             |                        | 02. GenericClass  | EntryPoint.cs  |

| Ø          |           | - Microso |                  | Studio     |                |                        |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
|------------|-----------|-----------|------------------|------------|----------------|------------------------|----------|----------|---------|----------|----------|----------|---------|------|------------------------|-------------|--------|--------|---------|------|------|
| Plik       | Edycja    | Widok     | Projek           | t Komp     | ilowanie       | Debugow                | vanie    | Zespó    | 5ł N    | Varzędzi | a Tes    | st A     | Analiza | Okno | Pomoc                  |             |        |        |         |      |      |
| G          | - 0       | 87 - 🖺    | <u>е</u> , е     | 9-9        | - Deb          | ug - A                 | ny CPU   | J        |         | 02. Gen  | ericClas | ss       |         | -    | Rozpocznij             | - 🕫 _       | ं 🛌    | c¶≣    | 1 2     |      | ية ا |
| _          |           |           |                  |            |                |                        |          |          |         |          |          |          |         |      | ,,                     |             |        | 1-     |         |      |      |
| σ -        | MyList.cs |           | ntryPoint        | .cs ≄ ×    |                |                        |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
| lora       | 🖙 02. Gen |           |                  |            |                |                        | 🔩 Ger    | nericCla | ass.Ent | tryPoint |          |          |         |      | → 🎯 🔒 Main()           |             |        |        |         |      |      |
| for        |           | usin      | g System         | n;         |                |                        |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
| serv       |           |           | space <b>G</b> e | enericClas |                |                        |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
| vera       |           | {         | space at         |            | 2              |                        |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
|            | 10        |           | class Er         | ntryPoint  |                |                        |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
| Ę          | 11        |           | {                |            |                |                        |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
| Przybornik | 12        | 曱         | stat             | ic void M  | lain()         |                        |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
| 影          | 13<br>14  |           | i                | Console.   | ritel ine      | (AreEqual              | (1, 1)   | )):      |         |          |          |          |         |      |                        |             |        |        |         |      |      |
|            | 15        |           |                  |            |                | (AreEqual              |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
|            | 16        |           |                  |            |                | (AreEqual              |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
|            | 17        |           |                  |            |                | (AreEqual              |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
|            | 18<br>19  |           |                  |            |                | (AreEqual<br>(AreEqual |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
|            | 20        |           |                  | CONSOLE    | II ICCLINE     | (AI CLYDDI             |          | , uci    | ,,,,    |          |          |          |         |      |                        |             |        |        |         |      |      |
|            | 21        |           |                  |            |                |                        |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
|            | 22        |           | }                |            |                |                        |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
|            | 23<br>24  |           | publ             | lic statio | hool An        |                        | (T       | •1 T •   |         | where    | T. T(a)  |          | hlozT   |      |                        |             |        |        |         |      |      |
|            | 24        | Ī         | - publ           |            | DOOT AP        | Ecquartiz              | (i num   | ,        | iumz)   | where    | 1. 100   | niipai a | DICUI   |      |                        |             |        |        |         |      |      |
|            | 26        |           |                  | return (r  | um1.Comp       | areTo(num              | 12) ==   | 0)       |         |          |          |          |         | Nu   | m one comp             | ared to n   | um t   | wo.    |         |      |      |
|            | 27        |           | }                | L          |                |                        |          |          |         |          |          |          |         |      | e also need to         |             |        |        | to zer  | 0    |      |
|            | 28        | -         | }                |            | C:\V           | Vindows\sy             | vstem32  | 2\cmd.e  | exe     |          |          |          |         |      | cause the Co           |             |        | •      |         |      | h    |
|            | 29<br>30  | [}        |                  |            | True           |                        |          |          |         |          |          |          |         |      | eger.                  |             |        |        |         |      | -    |
|            | 31        |           |                  |            | False          |                        |          |          |         |          |          |          |         |      | eturns less tl         | nan zero i  | fnur   | m1 is  | less tł | าลท  |      |
|            | 32        |           |                  |            | True<br>False  |                        |          |          |         |          |          |          |         |      | m2.                    |             |        |        |         |      |      |
|            | 33        | 1         |                  |            | True           |                        |          |          |         |          |          |          |         |      | eturns 1 if fir        | st is high  | or th  | an co  | cond    | and  | i+   |
|            | 34<br>35  |           |                  |            | False<br>Aby k | ontynuoi               | wać.     | naciś    | śni.i   | dowo]    | lnv kl   | lawis    | sz      |      | urns 0 if they         | -           |        | un se  | conu    | ina  |      |
|            | 36        | 1         |                  |            |                |                        | <i>p</i> |          | 0       |          |          |          |         |      | d now we cal           | •           |        | c tha  | + i+ wo | rkc  |      |
|            | 37        | 1         |                  |            |                |                        |          |          |         |          |          |          |         |      | Il for number          |             |        |        |         | 11.5 |      |
|            | 38        |           |                  |            |                |                        |          |          |         |          |          |          |         |      |                        | 3, IUI UIIC | nacit  | cis di |         |      |      |
|            | 39<br>40  |           |                  |            |                |                        |          |          |         |          |          |          |         |      | ings.<br>• can compare | them all k  |        | o mot  | hodu    | ing  |      |
|            | 40        |           |                  |            |                |                        |          |          |         |          |          |          |         |      | eric types.            |             | 5y 011 | emet   |         | шв   |      |
|            | 42        |           |                  |            |                |                        |          |          |         |          |          |          |         | 501  | iciic types.           |             |        |        |         |      |      |
|            | 43        |           |                  |            |                |                        |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |
|            | 44        |           |                  |            |                |                        |          |          |         |          |          |          |         |      |                        |             |        |        |         |      |      |

| ۹ G        | Generics - Microsoft Visual Studio |           |             |                               |         |            |            |                     |          |          |              |           |       |           |          |          |          |            |       |   |
|------------|------------------------------------|-----------|-------------|-------------------------------|---------|------------|------------|---------------------|----------|----------|--------------|-----------|-------|-----------|----------|----------|----------|------------|-------|---|
| lik E      | idycja                             | Widok     | Projekt     | Kompilow                      | anie De | bugowanie  | e Zespo    | ół Narz             | zędzia   | Test     | Analiza      | Okno      | Por   | moc       |          |          |          |            |       |   |
| G -        | 0 1                                | ð - 齨     | 🗳 🗳 🗎       | ୭ - ୯ -                       | Debug   | - Any C    | PU         | - 02.               | . Generi | icClass  |              | -         | ► R   | Rozpoczni | ij - 🛛 🞜 | <b>-</b> | 旨 ో      | 1 2        |       | ¶ |
| - NA.      | 1 int an                           |           | ntryPoint.c |                               |         |            |            |                     |          |          |              |           |       |           |          |          |          |            |       |   |
| _          | List.cs                            | ericClass | itryPoint.c | s 74 ×                        |         | <b>*</b> * |            | <b>F</b> + <b>D</b> |          |          |              |           | 0     | 1.4-:-0   |          |          |          |            |       |   |
| <b>C</b> # | 02. Gen<br>6                       |           | system;     |                               |         |            | GenericCla | ass.EntryP          | oint     |          |              |           | Ψ     | a Main()  |          |          |          |            |       |   |
|            |                                    | ⊡names    | space Gen   | ericClass                     |         |            |            |                     |          |          |              | An        | d nov | w we ca   | in try c | compa    | aring tv | vo diff    | erent | t |
|            | <pre>10</pre>                      |           |             |                               |         |            |            |                     |          |          |              |           |       |           |          |          |          |            |       |   |
|            | 28<br>29<br>30<br>31               |           |             |                               |         |            |            |                     |          |          |              |           |       |           |          |          |          |            |       |   |
| 90 9       | % -                                | •         |             |                               |         |            |            |                     |          |          |              |           |       |           |          |          |          |            |       |   |
| List       | a błędó                            | w         |             |                               |         |            |            |                     |          |          |              |           |       |           |          |          |          |            |       |   |
| C          | ałe rozw                           | iązanie   |             | 🔀 1 Błąd                      | 🔔 0 Ost | rzeżenia   | 🚺 0 Kon    | nunikaty            | ×        | Komp     | ilacja + Int | elliSense |       |           |          | Р        | rzeszuka | j listę bł | ędów  |   |
|            | - "I K                             | (od (     | Onis        |                               |         |            |            |                     |          |          |              |           |       | Projekt   |          |          | P        | lik        |       |   |
|            | <b>⊗</b> c                         |           |             | wywnioskowa<br>a. Spróbuj jaw |         |            |            | y "EntryPo          | oint.Are | Equal <1 | T>(T, T)" n  | a podstav | wie   | 02. Gene  |          | s        | Er       | ıtryPoin   | t.cs  |   |

# Generic methods for sorting collections

All right let's try another example here.

| ک)   | Generics   | - Micros                              | oft Visual Stu   | dio  |               |   |            |        |         |      |                                      |        |     |   |
|------|--|---------------------------------------|--|--|---------------|---|------------|--------|---------|------|--------------------------------------|--------|-----|---|
| Plik | Edycja   | Widok                                 | Projekt  | Kompilowanie   | Debugowanie   | Zespół  | Narzędzia  | Test   | Analiza | Okno | Pomoc                                |        |     |   |
| G    | - 0  | 智 - 當                                 | - <b>19</b> 17   5   | > - ୯' - De  | bug 👻 Any CPU | J –   | 01. Generi | cMetho | ds      | -    | 🕨 Rozpocznij 👻 🕽                     | • 🗐 🚽  | 1 1 | 뒊 |
| Eksp | EntryPoin  | t.cs → >                              | < MyList.cs  | EntryPoi   | int.cs        |   |            |        |         |      |                                      |        |     |   |
| -    | C ■ 01. Ger 1 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21      | nericMeth<br><mark>⊡name</mark><br> { | espace Gener<br>using Syste<br>class Entry<br>{<br>static<br>{<br>int<br>/// | ricMethods<br>em;<br>yPoint<br>void Main()<br>t[] array = {<br>Just a simple<br>r (int i = 0;<br>for (int j =<br>{<br>if (arra<br>{<br>int<br>arra |               | 5, 7, 8, 9<br>algorithm<br>n; i++)<br>ay.Length;<br>array[j]) | j++)       |        | , 3 };  |      | • 🗣 Main()                           |        |     |   |
|      | 22<br>23<br>24   |                                       | }  |  |               |   |            |        |         |      | rt algorithm.<br>s simply sorting an | array. |     |   |
|      | 25<br>26<br>27<br>28<br>29<br>30<br>31<br>32<br>33<br>34<br>35<br>36 | [}                                    | }  |  |               |   |            |        |         |      |                                      |        |     |   |
|      | 37<br>38<br>39   |                                       |  |  |               |   |            |        |         |      |                                      |        |     |   |

| শ             | Generics - Microsoft Visual Studio |  |  |   |             |
|---------------|------------------------------------|--|--|---|-------------|
| Plik          | Edycja Widok Projekt Ko            | mpilowanie Debugowanie Zes                               | pół Narzędzia Test Analiza             | a Okno Pomoc  |             |
| 6             | ) - 💿 者 - 🖕 💾 🗳 ႒ -                | 😋 – Debug – Any CPU                                      | <ul> <li>01. GenericMethods</li> </ul> | 🔹 🕨 Rozpocznij 👻 👼 🛫                                  | 占 🕼 🗉 🔮 📕 🕯 |
| . <del></del> | EntryPoint.cs + × MyList.cs        | EntryPoint.cs  |  |   |             |
| σ             | C# 01. GenericMethods              |  | /lethods.EntryPoint                    | → ♥ <sub>e</sub> Main()                               |             |
| rato          | 1 pnamespace Generic               |  |  |   |             |
| r sen         | 2 {                                |  |  |   |             |
| wera          | 3 using System;<br>4               |  |  |   |             |
|               | 5 🖻 class EntryPoi                 | nt   |  |   |             |
| Przybornik    | 6   {<br>7 ⊡ static voi            | d Main()   |  |   |             |
| ornik         | 8 {                                |  |  |   |             |
|               | 9 int[]<br>10                      | array = { 3, 4, 2, 1, 5, 6, 7,                           | 8, 9, 2, 2, 2, 1, 23, 3 };             |   |             |
|               | 11 // Jus                          | t a simple Selection Sort algo                           |  |   |             |
|               | 12 🖻 for (i<br>13 {                | <pre>nt i = 0; i &lt; array.Length; i+</pre>             | +)                                     |   |             |
|               | 14 🛱 🕇 fo                          | r (int j = i + 1; j < array.Le                           | ngth; j++)                             |   |             |
|               | 15 {<br>16 🖂                       | <pre>if (array[i].CompareTo(array</pre>                  | [1]) > 0)                              |   |             |
|               | 17                                 | {  |  |   |             |
|               | 18<br>19                           | <pre>int temp = array[i];<br/>array[i] = array[j];</pre> |  |   |             |
|               | 20                                 | array[j] = temp;   |  |   |             |
|               | 21 22 }                            | }  |  | To confirm that it's working                          |             |
|               | 23                                 |  |  | print the results of our arr                          |             |
|               | 24<br>25 Consol                    | e.WriteLine(string.Join(', ",                            | arrav)):                               | and we show it by using st<br>As we can see method wo | -           |
|               | 26                                 | , , ,  |  | numbers in array are sorte                            | -           |
|               | 27 }<br>28 }                       | C:\Windows\system32\cmd.e                                | exe                                    | So our algorithm is workin                            |             |
|               | 29 }                               | 1. 1. 2. 2. 2. 2. 3. 3                                   | 4. 5. 6. 7. 8. 9. 23                   | algorithm into a method.                              |             |
|               | 30                                 | Aby kontynuować, naciś                                   | nij dowolny klawisz                    | · -   |             |
|               | 32                                 |  |  |   |             |
|               | 33<br>34                           |  |  |   |             |
|               | 35                                 |  |  |   |             |
|               | 36<br>37                           |  |  |   |             |
|               | 38                                 |  |  |   |             |
|               | 30                                 |  |  |   |             |

| ⊲          | Generics - Microsoft Visual Studio     |  |   |
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| Plik       | Edycja Widok Projekt Kompilowanie      | Debugowanie Zespół Narzędzia Test Analiza  | Okno Pomoc  |
| ିତ         | ) - 💿 📸 - 😩 💾 🚰 🎾 - 🤆 - 🛛 Deb          | bug – Any CPU – 01. GenericMethods   | 🔹 🕨 Rozpocznij - 🎜 🚽 🔚 👘 🗐                          |
|            |  |  |   |
| <u> </u>   | EntryPoint.cs  P X MyList.cs EntryPoin |  |   |
| ei -       | C# 01. GenericMethods                  | - 🤏 GenericMethods.EntryPoint  |   |
| tors       | 1 ⊟namespace GenericMethods<br>2  {    | C:\Windows\system32\cmd.exe  |   |
| erwera     | 3 using System;                        | 1, 1, 2, 2, 2, 2, 3, 3, 4, 5, 6, 7, 8,<br>Aby kontynuować, naciśnij dowolny klaw | , 9, 23   |
| a          |  | Aby kontynuować, naciśnij dowolny klau   | wisz  |
| Pz         | 5 📥 class EntryPoint<br>6   {          |  |   |
| SP         | 7 🗉 static void Main()                 |  |   |
| Przybornik | 8 {                                    |  |   |
|            | 9 int[] array = { 3                    | 3, 4, 2, 1, 5, 6, 7, 8, 9, 2, 2, 2, 1, 23, 3 };                                  |   |
|            | 11 int[] sortedArray                   | / = Sort(array);   |   |
|            | 12                                     |  |   |
|            | 13 Console.WriteLine                   | e(string.Join(", ", sortedArray));   |   |
|            | 15 }                                   |  |   |
|            | 16                                     |  |   |
|            | 17 白 public static int[] S<br>18 【     | sort(int[] array)  |   |
|            |  | Selection Sort algorithm   |   |
|            |  | i < array.Length; i++)   |   |
|            | 21 {<br>22 □ for (int j =              | i + 1; j < array.Length; j++)  | So, public, static and it returns array of integers |
|            | 22                                     |  | and as argument it has also array of ints.          |
|            |  | y[i].CompareTo(array[j]) > 0)  | All right – as we can see it's working.             |
|            | 25 {<br>26 int t                       | torn - appav[i].   | So int sortedArray equals sort our array.           |
|            |  | temp = array[i];<br>y[i] = array[j];   |   |
|            |  | y[j] = temp;   |   |
|            | 29 }                                   |  |   |
|            | 30 }<br>31 }                           |  |   |
|            | 32                                     |  |   |
|            | 33 return array;                       |  |   |
|            | 34 }<br>35                             |  |   |
|            | 36 }                                   |  |   |
|            | 37 [}                                  |  |   |
|            | 38                                     |  |   |

PI

| ⊲           |              | Microsoft Visual Studio   |   |
|-------------|--------------|---|---|
| Plik        | Edycja       | Widok Projekt Kompilowanie Debugowanie Zespół Narzędzia Test Analiza (  | Okno Pomoc  |
| G           | 0 *          | 🖞 - 🖕 💾 💾 🎾 - 🔍 - 🛛 Debug - Any CPU - 01. GenericMethods  | 🔹 🕨 Rozpocznij 🗸 🎜 📮 🔚 🏣 😭                        |
| <u> </u>    |              |   |   |
| Eksplorator | EntryPoint.o | s 🕫 🗙 MyList.cs EntryPoint.cs   |   |
| lora        | 💷 01. Gene   | ricMethods & GenericMethods EntryDoint  | - 🕅 Sort(string[] arrav)                          |
|             |              | C:\Windows\system32\cmd.exe   |   |
| sen         | 2            | {     Alphabet, Cherry, Coffee, Strawberry, St  | tring, Tod  |
| serwera     | 4            | using System;   | se  |
|             |              | class EntryPoint  |   |
| Przybornik  |              | E C   |   |
| ğ           |              | static void Main()  |   |
| nj,         |              | [ [ [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]   |   |
|             | 9<br>10      | <pre>// int[] array = { 3, 4, 2, 1, 5, 6, 7, 8, 9, 2, 2, 2, 1, 23, 3 }; // int[] sortedArray = Sort(array);</pre> |   |
|             | 11           | <pre>string[] stringArray = { "Tod", "Strawberry", "Cherry", "Coffee", "St</pre>                                  | tring", "Alphabet" };                             |
|             | 12           |   |   |
|             | 13           | <pre>string[] sortedStringArray = Sort(stringArray);</pre>  |   |
|             | 14           | <pre>Console.WriteLine(string.Join(", ", sortedStringArray));</pre>   |   |
|             | 15<br>16     | console.writeLine(string.join(,, , sortedstringArray));   |   |
|             | 17           | }   |   |
|             | 18           |   |   |
|             | 19           | public static string[] Sort(string[] array)   |   |
|             | 20           |   |   |
|             | 21<br>22     | <pre>// Just a simple Selection Sort algorithm for (int i = 0; i &lt; array.Length; i++)</pre>                    | All right. Now let's try and make this sorting    |
|             | 23           |   | method as a generic sorting method so that        |
|             | 24           | for (int j = i + 1; j < array.Length; j++)  | will be able to sort anything in the array.       |
|             | 25           | {   | Now let's say that we want to make this           |
|             | 26           | <pre>if (array[i].CompareTo(array[j]) &gt; 0)</pre>   | algorithm work for strings.                       |
|             | 27<br>28     | <pre>1 string temp = array[i];</pre>  | All we have to do is change the return type to    |
|             | 29           | array[i]-jrray[j];  | string array, input type to string array and temp |
|             |              | array[j] = temp;  | variable to the string type.                      |
|             | 31           | }   | And as we see on the console it is working for    |
|             | 32<br>33     |   | string type.                                      |
|             | 34           |   | All right. So we confirm that the algorithm is    |
|             | 35           | return array;   | working for both integers and strings.            |
|             |              | }   | Let's make it work for both of them and for any   |
|             | 37           |   | other type.                                       |
|             | 38           |   |   |

Eksplorator serwera Przybornik

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| C# 01. GenericMethods                                   |   |
|---|---|
|   |   |
| 1 pnamespace GenericMethods C:\Windows\system32\cmd.exe |   |
| 2       {         3       using System;         4       | ring, Tod   |
| <pre>19 20 20 20 20 20 20 20 20 20 20 20 20 20</pre>    | must start with the angle brackets.<br>going to make it generic - T means any type<br>e going to take.<br>e taking array of any type and we are going to<br>e array of that same type.<br>e working with only one specific type which<br>my type.<br>ourse we have to implement the IComparable<br>because we should compare arguments of |

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# Implementing the IComparable interface in a class

All right we have created two generic methods: AreEqual and Sort that work on any type.

But so far we have tried it with integers and with strings and some simple types.

How about if we have our own custom type or a class.

| ٩   |   | Microso                       |   | itudio   |   |             |   |                        |          |          |         |                       |  |                      |            |              |                 |
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| lik | Edycja  | Widok                         | Projek  | t Kompil   | owanie  | Debugowanie | e Zespół  | ł Narzę                | dzia T   | est Anal | liza Ok | no                    | Pomoc                                    |                      |            |              |                 |
| G   | - O   \$  | 3 - 🖆                         | <b>1</b>  | <b>?</b> - C   | - Debug   | j – Any C   | PU  | - 01.0                 | GenericM | ethods   |         | • )                   | Rozpocznij                               | - 🏓 :                | - 🛛 🖿      | <u>`</u> ≣ ' | 열 📕 🎙           |
| 7   | EntryPoint.   | ts +⊨ ×                       | MyList.   | cs E   | ntryPoint.c   | :s          |   |                        |          |          |         |                       |  |                      |            |              | Person.cs       |
|     | ⊂# 01. Gene   |                               |   |  |   |             | GenericMet  | thods.Entr             | ryPoint  |          |         |                       | ଡି <mark>ଜ</mark> Main()                 |                      |            |              |                 |
|     | 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30<br>31<br>32<br>33 | ericMetho<br>⊡names<br> {<br> | ods<br>space Ge<br>using Sy<br>class En<br>{<br>stat<br>{<br>}<br>publ<br>{ | nericMetho<br>stem;<br>tryPoint<br>ic void Ma<br>Console.Wr<br>Console.Wr<br>Console.Wr<br>Console.Wr<br>ic static<br>return inp | in()<br>iteLine(A<br>iteLine(A<br>iteLine(A<br>iteLine(A<br>bool AreE<br>ut1.Compa<br>C:Window<br>lse<br>ue<br>lse<br>lse |             | <pre>5));<br/>5));<br/>bc", "abc'<br/>ue, false<br/>', 'b'));<br/>input1, T<br/>2) == 0;<br/>(cmd.exe</pre> | "));<br>));<br>input2) | where    |          |         | Let's<br>can s<br>and | use a gene<br>see it work<br>characters. | eric met<br>s for nu | mbers, sti | rings, l     | As you<br>bools |
|     | 34<br>35<br>36<br>37<br>38  |                               |   |  |   |             |   |                        |          |          |         | And                   | now let's c                              | reate a              | new class  | - clas       | s person.       |
|     |   |                               |   |  |   |             |   |                        |          |          |         |                       |  |                      |            |              |                 |

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| <u>ک</u>                       | Generics - Micro   |  |   |   | 7 (1  | N 13       | <b>-</b> . | . r          | 0          | 5   |  |  |                       |
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| 0                              | ) - O   13 - 9   |  | 🤈 - 🤉 - Deb   | ug 👻 Any CP   | U -   | 01. Generi | Method     | ls           | •          | 🕨 Rozpocznij 👻 🎜  | = - 🗧 👘  |  |                       |
| Eksp                           | Person.cs*   | EntryPoint.c   | is 👳 🗙 MyList.c   | s EntryPo   | oint.cs   |            |            |              |            |   |  |  |                       |
| olora                          | Œ 01. GenericMe  | thods  |   | 👻 🔩 Ge  | nericMetho  | ds.Person  |            |              |            | 🗕 🗲 Age   |  |  |                       |
| Eksplorator serwera Przybornik | 6<br>7 □<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21 □<br>22<br>23<br>24<br>25<br>26<br>27<br>28 □<br>29<br>30 | <pre>{     Co     Co     Co     Co     Co     Co     Co     Pe     Pe     Pe     Po     Co     }     public     {         re     }     public cla     { </pre> | <pre>void Main() onsole.WriteLine onsole.WriteLine onsole.WriteLine onsole.WriteLine erson p1 = new P erson p2 = new P onsole.WriteLine c static bool Ar eturn input1.Com uss Person c int Age { get;</pre>   | <pre>(AreEqual(5, 5<br/>(AreEqual("abc<br/>(AreEqual("abc<br/>(AreEqual(true<br/>(AreEqual('a',<br/>erson() { Age<br/>(AreEqual(p1,<br/>eEqual<t>(T in<br/>pareTo(input2)</t></pre> | <pre>));<br/>", "abc"));<br/>false));<br/>'b'));<br/>= 15 };<br/>= 15 };<br/>p2));<br/>put1, T in</pre> |            | e T : I    | Comparab]    | Le <t></t> | This class is going<br>property that is A<br>Of course in reali-<br>properties but it I<br>moment.<br>So right now we t<br>Person one and p<br>And if I try to con<br>to work.<br>It's not going to w<br>implicit method t<br>Basically you can<br>is currently not in<br>IComparable inte<br>Hence why it's no<br>So to fix it we hav<br>IComparable met | Age.<br>ty it can ha<br>has only or<br>try to creat<br>person two<br>npare then<br>work becau<br>so compare<br>say that th<br>nplementing<br>erface.<br>ot working.<br>we to imple | ive many one at the set two peodonates of the set there is there is the set there is the set t | ople.<br>oing<br>s no |
|                                | 31 ¦<br>90 % → ∢   | }  |   |   |   |            |            |              |            |   |  |  |                       |
|                                |  |  |   |   |   |            |            |              |            |   |  |  |                       |
|                                | Lista błędów   |  | 🔀 1 Błąd 🔒 🔒  | Ostrzeżenia   | 0 K   |            |            |              | une        |   | Deserved   |  |                       |
|                                | Całe rozwiązanie   |  | 🔽 I Błád 🔽 O  | Ostrzezenia   | 0 Komuni  | katy 🌱     |            | lacja + Inte | elliSense  |   |  | kaj listę błęd   |                       |
|                                | " Kod  |  | ÷   | Asthenda Deserved   | -1  |            | Projekt    | t            |            | Plik  | W  | Stan pom   | inięcia               |
|                                | 🙁 <u>CS0311</u>  | w typie ogóli<br>niejawnej ko  | żyć typu "GenericM<br>nym lub metodzie<br>nwersji odwołania<br>mparable <generici< td=""><th>"EntryPoint.AreEc<br/>z typu "GenericM</th><td>ual<t>(T, T<br/>ethods.Perso</t></td><td>)". Brak</td><td>)1. Gen</td><th>ericMetho</th><td>ds</td><td>EntryPoint.cs</td><th>18</th><th>Aktywne</th><td></td></generici<> | "EntryPoint.AreEc<br>z typu "GenericM   | ual <t>(T, T<br/>ethods.Perso</t>   | )". Brak   | )1. Gen    | ericMetho    | ds         | EntryPoint.cs   | 18   | Aktywne  |                       |

| 2          | Generics - Microsoft Visual Studio |   |                                |  |                         |                       |  |  |  |  |  |
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| Plik       | Edycja Wi                          | dok Projekt Kompilowanie De               | ougowanie Zespół Narzę         | dzia Test Analiza Okno                               | Pomoc                   |                       |  |  |  |  |  |
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|            | D                                  |   | Fata Daiat an                  |  |                         |                       |  |  |  |  |  |
| τö -       | Person.cs                          | EntryPoint.cs + × MyList.cs               | EntryPoint.cs                  | - D-1-+  | Ø M-:- 0                |                       |  |  |  |  |  |
| orat       | C# 01. GenericN                    | Aethods                                   | - 🔩 GenericMethods.Ent         | yPoint   | ≁ <sup>©</sup> a Main() |                       |  |  |  |  |  |
|            | 5 🗗                                | class EntryPoint                          |                                | Construction System 32\cmd.exe                       |                         |                       |  |  |  |  |  |
| serwera    | 6  <br>7 🗖                         | { static void Main()                      | Tru                            |  |                         |                       |  |  |  |  |  |
| 3          | 7 🗉<br>8                           |   | Fal                            | se   |                         |                       |  |  |  |  |  |
| Przy       | 9                                  | Person p1 = new Perso                     | () { Age = 13 };               | konować, naciśnij                                    | j dowolny klawis        | z <u>-</u>            |  |  |  |  |  |
| Przybornik | 10<br>11                           | Person p2 = new Perso                     | n() { Age = 15 }:              |  |                         |                       |  |  |  |  |  |
| nik        | 12                                 | Console.WriteLine(Are                     | Equal(p1, p2));                |  |                         |                       |  |  |  |  |  |
|            | 13                                 | Console.WriteLine(Are                     | Equal(new Person() { Age       | = 17 }, new Person() { Age                           | = 21 }));               |                       |  |  |  |  |  |
|            | 14                                 | }   |                                |  |                         |                       |  |  |  |  |  |
|            | 15  <br>16 🗆                       | public static bool AreEqu                 | al <t>(T input1. T input2)</t> | where T : IComparable <t></t>                        |                         |                       |  |  |  |  |  |
|            | 17                                 | {   |                                |  |                         |                       |  |  |  |  |  |
|            | 18                                 | return input1.Compare                     | To(input2) == 0;               | We do this by using a ICom                           | •                       |                       |  |  |  |  |  |
|            | 19<br>20                           | 3   |                                | The only thing that it requi                         |                         | plement how two       |  |  |  |  |  |
|            | 21                                 | }   |                                | people are going to be con                           | •                       |                       |  |  |  |  |  |
|            | 22                                 |   |                                | So how are we going to co                            | -                       | it people.            |  |  |  |  |  |
|            | 23 🖻<br>24                         | public class Person : ICompar             | able <person></person>         | Well the only property is A                          | -                       |                       |  |  |  |  |  |
|            | 25                                 | public int Age { get; set                 | ;                              | So this is what we're going                          |                         | two people.           |  |  |  |  |  |
|            | 26 🖻                               | <pre>public int CompareTo(Pers</pre>      | on other)                      | We're going to compare th                            |                         | n ia laas than soonad |  |  |  |  |  |
|            | 27<br>28 🖃                         | <pre>{     if (this.Age &lt; other.</pre> | Mga)                           | If first Age is less then second                     |                         |                       |  |  |  |  |  |
|            | 28 ⊑<br>29                         | {   | -Bc)                           | person. When ages are equal And as you can see we no |                         | -                     |  |  |  |  |  |
|            | 30                                 | return -1;                                |                                | implemented the requiren                             |                         |                       |  |  |  |  |  |
|            | 31                                 | }   |                                | In first example persons ar                          |                         |                       |  |  |  |  |  |
|            | 32 🖻<br>33                         | <pre>else if (this.Age == {</pre>         | other.Age)                     | Result is true.                                      | e equali because ti     | ien ages ale equal.   |  |  |  |  |  |
|            | 34                                 | return 0;                                 |                                | In second example ages ar                            | e not equall and th     | en nersons are not    |  |  |  |  |  |
|            | 35                                 | ,   |                                | equall. So the result is false                       |                         | ch persons are not    |  |  |  |  |  |
|            | 36 Ē<br>37 ┃                       | else                                      | L                              | equal so the result is fais                          | с.                      |                       |  |  |  |  |  |
|            | 38                                 | ۲<br>return 1;                            |                                |  |                         |                       |  |  |  |  |  |
|            | 39                                 | }   |                                |  |                         |                       |  |  |  |  |  |
|            | 40                                 | }   |                                |  |                         |                       |  |  |  |  |  |
|            | 41<br>42                           | 3   |                                |  |                         |                       |  |  |  |  |  |
|            |                                    |   |                                |  |                         |                       |  |  |  |  |  |

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#### **Generic classes**

So we not only have generic methods but we also have generic classes and there is one particular generic class that we use over and over again.

This class is a List class.

Remember that after you write a list you have always angle brackets to deal with what type the list is going to have.

We can write list with integer or string or anything else that we may want the list contain.

This is the perfect example of a generic class.

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|---|---|--|---|
| Person.cs   | EntryPoint.cs MyList.   |  |   |
| C     ■ 02. Gene     1     2     3     4     5     6     7     8     9     10     11     12     13     14 | <pre>using _02.GenericClass;<br/>using System.Collections.Gen<br/>using System.Linq;<br/>using System.Text;<br/>using System.Threading.Tasks<br/>using System;<br/>enamespace GenericClass<br/>{<br/>class EntryPoint<br/>{<br/>class EntryPoint<br/>{<br/>class EntryPoint<br/>{<br/>list<string><br/>10 {<br/>list<string><br/>10 {<br/>list</string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></string></pre> | ;<br>lay("Count = {Count}")]<br>Proxy(typeof(Generic.Mscorlib_CollectionDebug  | <pre>- @<sub>a</sub> Main() List [z metadanych] @ gView&lt;&gt;&gt;))] ple<t>, IEnumerable, IList, ICollection, IReadOnlyList<t>,</t></t></pre>                                   |
|   | 18 public Li<br>19<br>20 public T<br>21   | <pre>st();<br/>st(int capacity);<br/>st(IEnumerable<t> collection);<br/>this[int index] { get; set; }<br/>t Count { get: }</t></pre> | If we inspect a List type you can see that it's a<br>list of T.<br>And here's a bunch of methods that are going<br>to work on that list.<br>And let's go back to our entry point. |
| 15<br>16<br>17<br>18<br>19<br>20<br>21<br>22  | [ }<br>[}   |  |   |

| n.cs EntryPoint.cs MyList.cs EntryPoint.cs → ×<br>GenericClass - Constructions.Generic;<br>Cusing System:<br>Cusing System;<br>Constructions Generic;<br>Cusing System;<br>Constructions Generic;<br>Cusing System;<br>Constructions Generic;<br>Cusing System;<br>Constructions Generic;<br>Cusing System;<br>Cusing | 👻 🗣 items   |
|---|---|
| <pre>1 ⊟using System.Collections.Generic;<br/>2 [using System;<br/>3 4 ⊟namespace GenericClass</pre>  | 🚽 🤷 items   |
| 2 using System;<br>3 4 ⊡namespace GenericClass  |   |
| <pre>6 E class EntryPoint 7 { 8 E static void Main() 9 { 10</pre>   |   |
| 20 }<br>21 }<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29  | So let's create a new class and call it MyList.<br>We're going to create our own generic list<br>class.<br>So let's start thinking what those list have.<br>It has an array of items of type T. |

| <u>(</u> 8  | Generics         | - Microsof | t Visual Stu | dio                                |                |             |              |                |         |      |   |
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| Plik        | Edycja           | Widok      | Projekt      | Kompilowanie                       | Debugowanie    | Zespół      | Narzędzia    | Test           | Analiza | Okno | Pomoc   |
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| Eksp        | Person.cs        | En         | tryPoint.cs  | MyList.c                           | s EntryPo      | int.cs* 中   | ×            |                |         |      |   |
| Eksplorator | 대 02. Gen        | ericClass  |              |                                    | 👻 🔩 Ge         | nericClass. | EntryPoint.M | lyList <t></t> |         |      | →  Ø MyList()   |
| tor serwera |                  | using      | System;      | ollections.Gene                    | ric;           |             |              |                |         |      |   |
| FI          | 4                | ⊡names     | pace Gener   | ricClass                           |                |             |              |                |         |      |   |
| Przybornik  |                  | `<br>□ c   | lass Entry   | /Point                             |                |             |              |                |         |      |   |
| ornik       |                  | Ē          | {            | <pre>void Main()</pre>             |                |             |              |                |         |      |   |
|             | 10<br>11         |            |              | List≺string> st<br>List≺int> intLi |                |             |              |                |         |      |   |
|             | 12<br>13         |            |              | List <bool> bool</bool>            |                |             |              |                |         |      |   |
|             | 14               |            |              |                                    |                |             |              |                |         |      |   |
|             | 15<br>16         |            | Class r<br>{ | ¶yList <t></t>                     |                |             |              |                |         |      |   |
|             | 17               |            |              | ivate T[] items                    |                |             |              |                |         |      |   |
|             | 18<br>19<br>20   |            |              | ivate int count<br>ivate int capac |                |             |              |                |         |      |   |
|             | 21               |            |              |                                    | { get; private |             |              |                |         | lt h | has a property count that contains the  |
|             | 22<br>23         | -          | pul          | olic int Capaci                    | ty { get; priv | ate set;    | }            |                |         | nu   | mber of elements in the list.   |
|             | 24               | e i        | pul          | olic MyList()                      |                |             |              |                |         |      | we're going to make it private because no   |
|             | 25<br>26         |            | {            | this.items =                       | new T[2];      |             |              |                |         |      | e needs to get access to that array.<br>e also have capacity for our list.            |
|             | 27               |            |              | this.capacity                      | / = 2;         |             |              |                |         |      | d we also need the constructor.   |
|             | 28<br>29         |            | }            | <pre>this.count =</pre>            | 0;             |             |              |                |         |      | what we're going to have in these   |
|             |                  |            |              |                                    |                |             |              |                |         |      | nstructor.  |
|             | 31<br>32<br>33   | }          | 3            |                                    |                |             |              |                |         |      | e need to initialize our array, property Count<br>d Capacity with the initial values. |
|             | 34<br>35         | [}         |              |                                    |                |             |              |                |         |      |   |
|             | 35               |            |              |                                    |                |             |              |                |         |      |   |
|             | 37               |            |              |                                    |                |             |              |                |         |      |   |
|             | 38               |            |              |                                    |                |             |              |                |         |      |   |

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|--|--|---|-----------------------------------|---|
| Person.cs  | EntryPoint.cs  | MyList.cs EntryPoint.cs 🕈 🗙   |                                   |   |
| o<br>o<br>a<br>(≢ 02. Gen  |  | 👻 🐾 GenericClass.Entr   | yPoint.MyList <t></t>             | ✓ Ø MyList()  |
| Person.cs           Image: Construction of the server of the ser | <pre>Dusing System.Collection using System;  namespace GenericClass {     class EntryPoint     {         static void Ma         {             MyList<str mylist<br=""></str>Console.Wr             Console.Wr             Console</pre> | <pre>ons.Generic;<br/>s<br/>ain()<br/>ring&gt; stringList = new MyList<strint<br>t&gt; intList = new MyList<int>();<br/>ol&gt; boolList = new MyList<bool>();<br/>riteLine(intList.Capacity);<br/>riteLine(intList.Count);</bool></int></strint<br></pre> | m32\cmd.exe<br>naciśnij dowolny k |   |
| 19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30<br>31<br>32<br>33<br>34<br>35<br>36<br>37<br>38<br>39   | <pre>public int {     get {         privat     }      public int {         get {             privat     }      public Myl {         this.d         this.d     } </pre>   | <pre>ht count;<br/>ht capacity;<br/>t Count<br/>return this.count; }<br/>te set { this.count = value; }<br/>t Capacity<br/>return this.capacity; }<br/>te set { this.capacity = value; }</pre>  |                                   | Our Count property is simply number of<br>elements in our items array.<br>And Capacity is the size in memory of our<br>items array. |

|  | EntryPoint.cs MyList.cs EntryPo   | oint.cs 🕫 🗙  |   |
|--|---|--|---|
| # 02. GenericClas  | s 🗸 🗸 🗸   | enericClass.EntryPoint   | - 🗣 Main()  |
| ■       02. GenericClass         5       {         6       □         7       □         8       □         9       0         10       1         12       1         13       14         15       16         16       17         18       19         20       □         21       □         22       □         23       □         24       □         25       26         27       □         32       □         37       □         38       □         39       40         41       □         42       43         45       46 | <pre>s class EntryPoint {     static void Main()     {         MyList<string> stringList = new         MyList<int> intList = new MyList         MyList<bool> boolList = new MyList         MyList<bool> boolList = new MyList         boolList.Add(true);         boolList.Add(false);         boolList.Add(false);         boolList.Add(true);         Console.WriteLine(intList.Capace         public int Capacity[         public MyList()         {             this.items = new T[2];             this.count = 0;         }         public void Add(T item)         {             this.items[this.Count] = int             this.Count++;         }         }     } }</bool></bool></int></string></pre> | <pre>w MyList<string>();<br/>st<int>();<br/>List<bool>();<br/>city);<br/>t);</bool></int></string></pre> | we can write Add method to add elements of the type T.<br>this method needs to take generic argument T.<br>cally it takes the same type as the type of the item array.<br>perty Count shows the first empty place in items array (after<br>element).<br>dows\system32\cmd.exe<br>nieobslużony: System.IndexOutOf RangeException |

| R<br>Plik                | Edycja Widok   |   | Debugowanie Zesp<br>1 - Any CPU  | ół Narzędzia Test<br>~ 02. GenericClass |              | Pomoc<br>▶ Rozpocznij ~ 🏼 🎜 🚽  | 6 f 🗄 🗉 📜          |
|--------------------------|--|---|--|---|--------------|--|--------------------|
| Eksp                     | Person.cs E  | ntryPoint.cs MyList.cs  | EntryPoint.cs  | ⇒ ×                                     |              |  |                    |
| ō                        | C# 02. GenericClass  |   | 🚽 🔩 GenericCl  | ass.EntryPoint                          |              | - 🖓 Main()   |                    |
| rator serwera Przybornik | 10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21<br>22 | MyList <string> stri<br/>MyList<int> intList<br/>MyList<bool> boolList<br/>boolList.Add(true);<br/>boolList.Add(false);<br/>boolList.Add(false);<br/>boolList.Add(true);<br/>Console.WriteLine(<br/>Console.WriteLine(<br/>Console.WriteLine(</bool></int></string> | <pre>st = new MyList<int> st = new MyList<bo ;="" poollist.capacity);<="" pre=""></bo></int></pre> | ();<br>ol>();                           |              |  |                    |
|                          | 23<br>24<br>25<br>26   | <pre>{     private T[] items;     private int count;     private int capacit</pre>  |  |   | perform a ch | fore we add anything t<br>eck if the array has a s<br>e array with 2 places fo | pace because we're |

÷ ÷

ace because we're items only. We can public int Count do it in the following way: public int Capacity So if the items are equal to the capacity we are going to multiply it by 2. public MyList() We are going to create a new array which is going to this.items = new T[2]; clone our current array. this.capacity = 2; Then we're going to double the capacity. this.count = 0; So this top capacity multiply by two and we are going to create new greater array and copy previous array to the public void Add(T item) new biger array. if (this.capacity == this.count) Now we add some elements. And we check what is the capacity and what is that T[] clone = (T[])items.Clone(); count. this.capacity \*= 2; this.items = new T[this.capacity]; As you see it is working. Array.Copy(clone, 0, this.items, 0, clone.Length); We have a capacity of four and count of four. And it is correct. this.items[this.Count] = item; this.Count++;

| <u>لگ</u>                      | Generics   | - Micros   | oft Visual Stu                         | Idio   |  |                             |            |         |   |  |   |  |          |  |  |
|--------------------------------|--|--|--|--|--|-----------------------------|------------|---------|---|--|---|--|----------|--|--|
| Plik                           | Edycja   | Widok  | : Projekt                              | Kompilowanie   | Debugowanie  | Zespół                      | Narzędzia  | Test    | Analiza   | Okno   | Pomoc   |  |          |  |  |
|                                | - 0  | 13 - 省   | <b>19 2</b> 9 1                        | <b>? -</b> 🤉 - Det   | oug 👻 Any CP   | - U                         | 02. Generi | icClass |   | •  | 🕨 Rozpocznij 👻 🎜  |  | 2 🗐      |  |  |
| Eksp                           | Person.cs  |  | EntryPoint.cs                          | MyList.c   | s EntryPo  | oint.cs 🕘 >                 |            |         |   |  |   |  |          |  |  |
| olora                          | C# 02. Gen   | ericClas   |  |  |  | enericClass.E               | -          |         |   | - 🖓 Main()   |   |  |          |  |  |
| Eksplorator serwera Przybornik | 10<br>11<br>12<br>13<br>14<br>15<br>16<br>17                         |  | My<br>My<br>ba<br>ba<br>ba             | List <string> st<br/>List<int> intLi<br/>List<bool> bool<br/>olList.Add(true<br/>olList.Add(fals<br/>olList.Add(fals</bool></int></string> | <pre>ist = new MyLis List = new MyL ;; ;; ;; ;; ;; ;; ;;;;;;;;;;;;;;;;;;</pre> | <pre>st<int>();</int></pre> |            |         |   |  |   |  |          |  |  |
| nik                            | 18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29 | Console.WriteLine(boolList.Capac<br>Console.WriteLine(boolList.Count<br>Console.WriteLine(boolList[1]);<br>Console.WriteLine(boolList[1]);<br>Class MyList <t><br/>Class MyList<t><br/>f<br/>private T[] items;<br/>private int count;<br/>private int capacity;</t></t> |  |  | nt);   |                             |            |         | can<br>If w<br>get<br>squ<br>Myl<br>som<br>to d | e problem that we h<br>'t access the items of<br>a want to take first<br>an error: it says can<br>are brackets to the<br>List of integer basica<br>ne way to allow us to<br>this we need to imp<br>re going to do in the n | of the array.<br>element of the<br>not apply inde<br>expression.<br>ally means tha<br>o index its iter<br>plement an inde | e list – we<br>exing with<br>t we need<br>ns and |          |  |  |
|                                | 30<br>35<br>40<br>41<br>42<br>43<br>90 % ▼                           |  | pu<br>pu                               | blic int Count<br>blic int Capaci<br>blic MyList()<br>this.items =   | <br>ity  |                             |            |         |   |  |   |  |          |  |  |
|                                | Linta bla de   |  |  |  |  |                             |            |         |   |  |   |  |          |  |  |
|                                | Lista błędó<br>Całe rozw   |  | •••••••••••••••••••••••••••••••••••••• | 🔀 1 Błąd 🛛 🛕   | ) Ostrzeżenia  | ] 0 Komuni                  | katy 🌾     | Komp    | ilacja + Inte                                   | IliSense -   | -   | Przeszukaj list                                  | ę błędów |  |  |
|                                |  | Kod  | Opis                                   |  |  |                             |            |         | Projekt   |  | Plik  | W  |          |  |  |
|                                |  |  | Do wyrażenia                           | i typu "EntryPoint.<br>a przy użyciu kons  |  | ie można zas                | strsować   |         | )2. Generic(                                    | Class  | EntryPoint.cs   | 22   | Aktywne  |  |  |

## **Generic classes - indexers**

| $\triangleleft$ |         | - Microsof |         |            |          |          |        |             |       |         |      |       |
|-----------------|---------|------------|---------|------------|----------|----------|--------|-------------|-------|---------|------|-------|
| Plik            | Edycja  | Widok      | Projekt | Kompilowar | nie Debu | igowanie | Zespół | Narzędzia   | Test  | Analiza | Okno | Pomoc |
| G               | - 0   * | 8 - 🖄      | ہ اس کا | 2 - @ - [] | Debua -  | Any CPU  | J -    | 02. Generic | Class |         | -    | Rozpo |

| 0                   | 3 - 🛛 🕅 - 🖁       | 🖹 💾 📽 🛛 🤊 - 🤇 | 🦿 - Debug - | Any CPU 🚽           | 02. GenericClass                  | 🔹 🕨 Rozpocznij 👻 🎜 📮 🔚 📬 📜 😭   |
|---------------------|-------------------|---------------|-------------|---------------------|-----------------------------------|--|
| Eksp                | Person.cs         | EntryPoint.cs | MyList.cs   | EntryPoint.cs 👳 🗙   |                                   |  |
| olora               | C# 02. GenericCla | ISS           |             | - 🔩 GenericClass.Er | tryPoint.MyList <t></t>           | - 🔑 this[int index]  |
| Eksplorator serwera | 13                |               |             |                     |                                   |  |
| serw                | 14                |               | boolList    | .Add(true);         |                                   |  |
| era                 | 15                |               | boolList    | .Add(false);        |                                   |  |
| Prz                 | 16                |               | boolList    | .Add(false);        |                                   |  |
| Przybornik          | 17                |               | boolList    | .Add(true);         |                                   |  |
| nik                 | 18                |               |             |                     |                                   |  |
|                     | 19                |               | Console.    | WriteLine(boo       | olList[1]);                       |  |
|                     | 20                |               |             |                     |                                   |  |
|                     | 21                | }             |             |                     | C:\Windows\system32\cmd.exe       |  |
|                     | 22                | Ģ c           | lass MyList | <t></t>             | raise<br>Aby kontynuować, naciśni | ij dowolny klawisz   |
|                     | 23                | {             |             |                     |                                   |  |
|                     | 24                |               | private     | [] items;           |                                   |  |
|                     | 25                |               | private :   | int count;          |                                   |  |
|                     | 26                |               | private :   | int capacity;       |                                   |  |
|                     | 27                |               |             | <b>\</b>            |                                   | Ve can do the index as a property and it looks ike this.                     |
|                     | 28                | ¢ i           | public T    | this[int ind        | ov                                | t starts just like a normal property.  |
|                     | 29                |               | {           |                     |                                   | The property is public.  |
|                     | 30                | e i           | get         |                     |                                   | hen we write type T and keyword this.  |
|                     | 31                |               | {           |                     |                                   | hen we need to give it square brackets.                                      |
|                     | 32                |               |             | return this.i       | cells finder is                   | And here we need to give it the indexer.                                     |
|                     | 33 💡              |               | }           |                     |                                   | And we write that by indexing the object, we ndex items array of the object. |
|                     | 34                |               | }           |                     |                                   | As you can see there is no error now – we can                                |
|                     | 35                |               |             |                     |                                   | ead the item from our list.  |
|                     | 36                | Đ             |             | nt Count            |                                   |  |
|                     | 41                | Ð             | public i    | nt Capacity.        |                                   |  |
|                     | 46                |               |             |                     |                                   |  |
|                     | 47                |               | nublic M    | ulic+()             |                                   |  |

| Plik                           | : Edycja W   | /idok Projekt | Kompilowanie Deb   | ugowanie Zespół   | Narzędzia Test Analiza    | Okno Pomoc  |
|--------------------------------|--|---------------|--|---|---------------------------|---|
|                                | <b>3 -</b> ⊖   †3 ·  | - 🚔 💾 🗳 🦻     | 🕶 🤍 - Debug -  | - Any CPU -   | 02. GenericClass          | 🔹 🕨 Rozpocznij 👻 🎜 🖉 📮 📜 📬  |
| Eksp                           | Person.cs  | EntryPoint.cs | MyList.cs  | EntryPoint.cs 👳 🗙   |                           |   |
| plora                          | 🖙 02. Generic  | Class         |  | 👻 🔩 GenericClass.Er   | ntryPoint                 | + 🗘 Main()  |
| Eksplorator serwera Przybornik | 13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29 |               | <pre>boolList.Add(t boolList.Add(f boolList.Add(f boolList.Add(f boolList.Add(t boolList[1] = Console.WriteL ass MyList<t> private T[] it private int co private int ca public T this[ {</t></pre> | <pre>inue);<br/>false);<br/>false);<br/>true);<br/>true;<br/>int(boolList[1])<br/>eems;<br/>put;<br/>put;<br/>pucity;</pre> | ;<br>C:\Windows\s<br>True | ystem32\cmd.exe<br>wać, naciśnij dowolny klawisz<br>We are going to implement a setter which  |
|                                | 30<br>31<br>32<br>33<br>34<br>35<br>36<br>37<br>38<br>39<br>40<br>41<br>40<br>41<br>46<br>51<br>52 |               | }<br>set<br>{  | pacity  | V                         | enables us to write elements to the list.<br>Just the simple property with the only<br>difference it's basically giving an indexer to our<br>list.<br>And now we can set elements of the list.<br>And there are no erros executing this method.<br>Ok. We have created our own list generic class.<br>We have an index so we can access our items<br>we can add items. Currently we can't remove<br>items. But I think you can practice it Youself. |

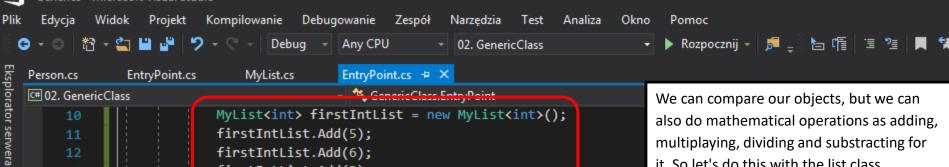
# **Overloading mathematical operators**

Now we are going to overload mathematical operator.

| Å   | Generics -                | - Microso     | ft Visual Stu  | ıdio  |                              |                          |                   |                      |                  |              |                |             |          |             |         |          |
|---|---------------------------|---------------|--|---|------------------------------|--------------------------|-------------------|----------------------|------------------|--------------|----------------|-------------|----------|-------------|---------|----------|
| Pli <u>k</u>  | <u>E</u> dycja            | <u>W</u> idok | P <u>r</u> ojekt   | Kompi <u>l</u> owanie   | Deb <u>u</u> gowanie         | Zes <u>p</u> ół <u>N</u> | <u>l</u> arzędzia | Te <u>s</u> t        | Anali <u>z</u> a | <u>O</u> kno | Po <u>m</u> oc |             |          |             |         |          |
| ÷ (   | 3 - 0   1                 | පී - 쐽        | <b>la</b> 🖓 📑  | ? - 약 - Deb   | oug 👻 Any CPI                | U -                      | 02. Generi        | cClass               |                  | -            | Rozpoczi       | nij - 🛛 🞜 ; | = 🕺 🔄    |             | 2 📃     | 뒊        |
| Eks   | Person.cs                 | E             | ntryPoint.cs   | MyList.c  | s EntryPo                    | EntryPoint.cs -= ×       |                   |                      |                  |              |                |             |          |             |         |          |
| Eksplorator serwera   | C# 02. Gene               | ericClass     |  |   | - 🔩 Ge                       | nericClass.Ent           | tryPoint          |                      |                  |              | 🚽 🎯 🖬 Main(    |             |          |             |         |          |
| ator  | 4 Enamespace GenericClass |               |  |   |                              |                          |                   |                      |                  |              |                |             |          |             |         |          |
| serv  |                           |               |  |   |                              |                          |                   |                      |                  |              |                |             |          |             |         |          |
| vera  | 6                         | Ē.            | class  | EntryPoint  |                              |                          |                   |                      |                  |              |                |             |          |             |         |          |
| Pr  | 7                         |               | {<br>  | tatic void Ma   | ain()                        |                          |                   |                      |                  |              |                |             |          |             |         |          |
| Przybornik  | 9                         | T             | {  |   | ,                            |                          |                   |                      |                  | We           | e want to ac   | ld two list | ts of th | ie same     | type.   |          |
| prnik   | 10                        |               |  | MyList <in< td=""><th><pre>&gt; firstIntLi</pre></th><td>ist = new</td><td>MyList&lt;</td><th><pre>int&gt;()</pre></th><th>;</th><td>We</td><td>e have two i</td><th>nteger ty</th><th>pe lists</th><th>and use</th><th>5</th><td></td></in<> | <pre>&gt; firstIntLi</pre>   | ist = new                | MyList<           | <pre>int&gt;()</pre> | ;                | We           | e have two i   | nteger ty   | pe lists | and use     | 5       |          |
|   | 11                        |               |  | firstIntL   | ist.Add(5);                  |                          |                   |                      |                  |              | erator + to a  |             |          |             |         |          |
|   | 12                        |               |  |   |                              |                          |                   |                      |                  |              |                |             |          |             |         |          |
|   | 13                        |               | firstIntList.Add(3); be done for this operator. You can do this with any of your custom classes you can. |   |                              |                          |                   |                      |                  |              | 1              |             |          |             |         |          |
|   | 14                        |               |  | Mulictin  | > secondInt                  | list - nou               | . Mylict          | /int \/              | <b>.</b>         | any          | y of your cu   | stom clas   | ses you  | u can.      |         |          |
|   | 15<br>16                  |               |  |   | List.Add(5);                 | LISC = new               | myLISC            | <tuc>(</tuc>         | )3               |              |                |             |          |             |         |          |
|   | 17                        |               |  |   | list.Add(2);                 |                          |                   |                      |                  |              |                |             |          |             |         |          |
|   | 18                        |               |  |   | List.Add(4);                 |                          |                   |                      |                  |              |                |             |          |             |         |          |
|   | 19                        |               |  |   |                              |                          |                   |                      |                  |              |                |             |          |             |         |          |
|   | 20                        |               |  | MyList <in†< td=""><th>&gt; sumIntList</th><td>t = first]</td><td>ntList</td><th>+</th><th>ondIntLi</th><td>ist;</td><td></td><th></th><th></th><th></th><th></th><td></td></in†<>  | > sumIntList                 | t = first]               | ntList            | +                    | ondIntLi         | ist;         |                |             |          |             |         |          |
|   | 21                        |               | }  |   |                              |                          |                   |                      |                  |              |                |             |          |             |         |          |
|   | 22<br>23                  |               |  | lass MyList<  |                              |                          |                   |                      |                  |              |                |             |          |             |         |          |
|   | 23                        |               |  |   |                              |                          |                   |                      |                  |              |                |             |          |             |         |          |
|   | 25                        |               |  | private T   | <pre>[] items:</pre>         |                          |                   |                      |                  |              |                |             |          |             |         |          |
|   | 109 % 🝷                   | -             |  |   |                              |                          |                   |                      |                  |              |                |             |          |             |         |          |
|   | Lista błędó               | w protocol    |  |   |                              |                          |                   |                      |                  |              |                |             |          |             |         | <b>-</b> |
|   | Całe rozw                 | iązanie       | -  | 😢 1 Błąd 🛛 🛕 (  | ) C <mark>str</mark> zeżenia | 🕽 0 Komunika             | ity 🎽             | Kompi                | lacja + Inte     | elliSense    |                |             | Przesz   | zukaj listę | błędów  |          |
|   | " K                       | (od C         | Dpis   |   |                              |                          |                   |                      | Projekt          |              | Plik           |             |          | W           | Stan po | min      |
| S CS0019 Nie można zastosować operatora "+" do argumentów operacji typu "EntryPoint.MyList <int>" lub "EntryPoint.MyList<int>". 02.</int></int> |                           |               |  |   |                              | 2. Generic               | Class             | Entry                | Point.cs         |              | 20             | Aktywne     |          |             |         |          |

**4** I

Przybornik



firstIntList.Add(6); firstIntList.Add(3); MyList<int> secondIntList = new MyList<int>(); secondIntList.Add(5); secondIntList.Add(2); secondIntList.Add(4); MyList<int> sumIntList = firstIntList + secondIntList; class MyList<T>

objects. We are going to overload the mathematical operator addition. We have to do it public, static and return a type of this operation. We simply return the sum of all integers in

it. So let's do this with the list class.

lists. We have firstIntegerList and

lists.

And let's teach C-Sharp how to add two

secondIntegerList the are three elements

long and third List is a sum two previous

We currently can't do this because C-Sharp

```
doesn't know how to add these two
             private T[] items;
             private int count;
             private int capacity;
             public T this[int index]...
the list.
             public int Count ...
             public int Capacit/...
             public MyList()
             public void Add(T item)
              public static MyList<T> operator + MyList<T> list1, MyList<T> list2)
Ξ
                 MyList<T> result = new MyList<T>();
                 return result;
```

| G - ⊖   ੴ       | - 🖆 💾 🦻                          | - 🤆 - Debug -                              | gowanie Zesp<br>Any CPU | - 02. Gene       | n Test<br>ericClass | Analiza O         |           | Pomoc<br>• Rozpocznij <del>-</del> 🎜 | - 🔁 🖷         | '≣ '≝      | <b>a</b> 1 |
|-----------------|----------------------------------|--|-------------------------|------------------|---------------------|-------------------|-----------|--------------------------------------|---------------|------------|------------|
| Person.cs       | EntryPoint.cs                    | MyList.cs                                  | EntryPoint.cs*          |                  |                     |                   |           | <b>A</b>                             |               |            |            |
| 💷 02. Generi    |                                  |  |                         | lass.EntryPoint  |                     |                   |           | ଙ <mark></mark> ₄ Main()             |               |            |            |
| 44              | <b>⊕</b><br><b>⊕</b><br><b>⊕</b> | <pre>public int Capa public MyList()</pre> |                         |                  |                     |                   |           |                                      |               |            |            |
| 49<br>55        |                                  | public void Ad                             |                         | 1                |                     |                   |           |                                      |               |            |            |
| 67              |                                  | public static /                            |                         |                  | WylictzT            | [\ ]ic+1          | Mylict    | $(T_{1})$                            |               |            |            |
| 07<br>1 68      |                                  | s  | iyersex i > op          |                  | -iyersex i          | // 115(1, I       | -iy LIS ( | (1) 115(2)                           |               |            |            |
| 69              |                                  | ۱<br>MyList(T)                             | result = new            | MyListers        | 0:                  |                   |           |                                      |               |            |            |
| 70              |                                  |  | count != lis            |                  | (73                 |                   |           |                                      |               |            |            |
| 71              | Ti i i                           | {  |                         |                  |                     |                   |           |                                      |               |            |            |
| 72              |                                  | throw                                      | new InvalidO            | perationEx       | ception(            | ("Lists ar        | e of d    | different sizes                      | s!");         |            |            |
| 73              |                                  | }  |                         |                  | · · ·               | ·                 |           |                                      |               |            | ·,         |
| 74              | É I                              | else                                       |                         |                  |                     | So we             | can on    | ly add lists that a                  | are of the sa | me leng    | gth.       |
| 75              |                                  | {  |                         |                  |                     | So if lis         | t one o   | count is different                   | from the lis  | st two co  | ount,      |
| 76              |                                  | for (i                                     | nt i = 0; i             | < list1.co       | unt; i++            | ⊦) we're g        | going to  | o throw an excep                     | otion         |            |            |
| 77              |                                  | {  |                         |                  |                     | Invalid           | Operat    | tionException -                      |               |            |            |
| 78              |                                  | re   | sult.Add( <u>li</u> s   | t1[i] + li       | st2[i]);            |                   |           | fferent sizes.                       |               |            |            |
| 79              |                                  | }  |                         |                  |                     |                   |           |                                      | ro going to a | dd thai    | m          |
| 80              |                                  | }  |                         |                  |                     |                   |           | n't the case we ar                   | 0 0           |            |            |
| 81              |                                  | return res                                 | ult;                    |                  |                     |                   | -         | ing to do this by s                  |               | •          | •          |
| 82              |                                  | }  |                         |                  |                     |                   |           | sult list with the a                 | addition of e | each of    | the        |
| 83              |                                  |  |                         |                  |                     | items f           | rom th    | ne two lists.                        |               |            |            |
| 84              |                                  |  |                         |                  |                     | We stil           | l have    | an error because                     | e compiler d  | oesnt k    | now        |
| 85<br>109 % - ◀ |                                  |  |                         |                  |                     | if two a          | argume    | ents of addition a                   | are the same  | e type.    |            |
| Line bladder    |                                  |  |                         |                  |                     |                   | -         | of this problem is                   |               |            |            |
| Lista błędów    |                                  |  |                         |                  |                     |                   |           |                                      |               | <i>.</i>   |            |
| Całe rozwiąz    |                                  | 1 Błąd 🥂 0 Ostrze                          | żenia 🚺 🚺 0 Ko          | munikaty 🎽       | Kompi               | lacja + IntelliSe | ense 🕆    |                                      | Przeszukaj    | listę błęd | lów        |
| Koc             | d Opis                           |  |                         |                  |                     | Projekt           |           | Plik                                 | ١             | W Sta      | an pomin   |
| 🔀 CS00          | 019 Nie można zasto              | sować operatora "+" o                      | lo argumentów o         | operacji typu "T | " lub "T".(         | 2. GenericClas    | s         | EntryPoint.cs                        | 7             | 8 Akt      | ywne       |

| Plik                | Edycja     | Widok                         | Projekt      | Kompilowanie  | Debugowanie              | Zespół      | Narzędzia         | Test                                 | Analiza  | Okno    | Pomoc              |                     |            |          |
|---------------------|------------|-------------------------------|--------------|---|--------------------------|-------------|-------------------|--------------------------------------|--|---------|--------------------|---------------------|------------|----------|
| 6                   | - 0   1    | පී - 省                        | B 🗗 🤊        | ) - 🤍 - Deb   | ug 👻 Any CPl             | U -         | 02. Gener         | icClass                              |  | -       | 🕨 Rozpocznij 🚽     | 🎜 🖕 🖔 🔄             |            | 2= 📃 📬   |
| Eks                 | Person.cs  | Er                            | ntryPoint.cs | MyList.cs   | s EntryPo                | int.cs → ⊃  |                   |                                      |  |         |                    |                     |            |          |
| Eksplorator serwera | C# 02. Gen | ericClass                     |              |   | - 🔩 Ge                   | nericClass. | EntryPoint        |                                      |  |         | 🚽 🎯 🔒 Main()       |                     |            |          |
| ator                | 11         |                               |              | firstIntLi  | ist.Add(5); f            | firstInt    | List.Add          | (6); f:                              | irstIntL   | .ist.Ad | ld(3);             |                     |            |          |
| ser                 | 12         |                               |              |   |                          |             |                   |                                      |  |         |                    |                     |            |          |
| Wer                 | 13         |                               |              | MyList <int< td=""><td>&gt; secondIntl</td><td>List = n</td><td>ew MyList</td><td>t<int></int></td><td>();</td><td></td><td></td><td></td><td></td><td></td></int<>   | > secondIntl             | List = n    | ew MyList         | t <int></int>                        | ();  |         |                    |                     |            |          |
|                     | 14         |                               |              | secondIntL  | <pre>ist.Add(5);</pre>   | secondI     | ntList.Ad         | dd(2);                               | secondI  | ntList  | .Add(4);           |                     |            |          |
| Prz                 | 15         |                               |              |   |                          |             |                   |                                      |  |         |                    |                     |            |          |
| Przybornik          | 16         |                               |              | MyList <int< td=""><td>&gt; sumIntList</td><td>t = firs</td><td>tIntList</td><td>+ seco</td><td>ondIntLi</td><td>.st;</td><td></td><td></td><td></td><td></td></int<> | > sumIntList             | t = firs    | tIntList          | + seco                               | ondIntLi   | .st;    |                    |                     |            |          |
| nik                 | 17         |                               |              | Console.Wr  | <pre>iteLine(\$"su</pre> | umIntLis    | t: {sumIn         | ntList                               | [0]}, {s   | umIntL  | .ist[1]}, {su      | mIntList[           | 2]}");     |          |
|                     | 18         |                               | }            |   |                          |             |                   |                                      |  |         |                    |                     |            |          |
|                     | 19         | - TÈ                          |              |   |                          |             | C:W               | Windows <sup>1</sup>                 | \system32\                                       | cmd.exe |                    |                     |            |          |
|                     | 20         | ė.                            | cl           | ass MyList∢T  | ٢>                       |             |                   |                                      | 10, 8,   | _       |                    |                     |            |          |
|                     | 21         |                               | {            |   |                          |             | Aby k             | ontynu                               | ować, n  | aciśni  | ij dowolny kl      | .awisz .            |            |          |
|                     | 22         |                               |              | private T[  | ] items;                 |             |                   |                                      |  |         |                    |                     |            |          |
|                     | 23         |                               |              | private in  | nt count;                |             |                   |                                      |  | Δεν     | you can see no     | wit is no e         | rror hecai |          |
|                     | 24         |                               |              | private in  | nt capacity;             |             |                   |                                      |  |         | npiler doesn't d   |                     |            |          |
|                     | 25         | Ē                             |              | public T t  | his[int inde             | ≥x]         |                   |                                      |  |         | •                  | -                   |            | cialius. |
|                     | 36         | Ē                             |              | <pre>public int</pre>   | Count                    |             |                   | It will be checked during executing. |  |         |                    |                     |            |          |
|                     | 41         | - <del>1</del> - <del>1</del> |              | <pre>public int</pre>   | Capacity                 |             |                   |                                      | We can now print some elements of the<br>sumList |         |                    |                     |            |          |
|                     | 46         | Ē                             |              | public MyL  | .ist()                   |             |                   |                                      |  | sun     | nlist              |                     |            |          |
|                     | 52         | Ē.                            |              | public voi  | d Add(T iten             | n)          |                   |                                      |  |         |                    |                     |            |          |
|                     | 64         | Ē                             |              | <pre>public sta</pre>   | atic MyList<             | 🕞 opera     | tor + <b>(</b> My | yList≮]                              | T> list1   | , MyLi  | ist <t> list2)</t> |                     |            |          |
|                     | 65         |                               |              | {   |                          |             |                   |                                      |  |         |                    |                     |            |          |
|                     | 66         |                               |              |   | <t> result =</t>         |             |                   | );                                   |  |         |                    |                     |            |          |
|                     | 67         | ė.                            |              | if (li  | ist1.count !=            | = list2.    | count)            |                                      |  |         |                    |                     |            |          |
|                     | 68         |                               |              | {   |                          |             |                   |                                      |  |         |                    |                     |            |          |
|                     | 69         |                               |              | th  | nrow new Inva            | alidOper    | ationExce         | eption                               | ("Lists  | are of  | f different s      | <pre>izes!");</pre> |            |          |
|                     | 70         |                               |              | }   |                          |             |                   |                                      |  |         |                    |                     |            |          |
|                     | 71         | Ē.                            |              | else  |                          |             |                   |                                      |  |         |                    |                     |            |          |
|                     | 72         |                               |              | {   |                          |             |                   |                                      |  |         |                    |                     |            |          |
|                     | 73         | ė.                            |              | fo  | or (int i = 0            | ∂;i<1       | ist1.cour         | nt; i+-                              | +)   |         |                    |                     |            |          |
|                     | 74         |                               |              | {   |                          |             |                   |                                      |  |         |                    |                     |            |          |
|                     | 75         |                               |              |   | result.Add               | d((dynam    | ic)list1          | [i] + (                              | (dynamic   | )list2  | 2[i]);             |                     |            |          |
|                     | 76         |                               |              | }   |                          |             |                   |                                      |  |         |                    |                     |            |          |

| ⊠                   | Generics     | - Microsof               | ft Visual Stu | dio  |                                       |             |                       |  |                        |          |                         |              |           |                |   |
|---------------------|--------------|--------------------------|---------------|--|---------------------------------------|-------------|-----------------------|--|------------------------|----------|-------------------------|--------------|-----------|----------------|---|
| Plik                | Edycja       | Widok                    | Projekt       | Kompilowanie   | Debugowanie                           | e Zespół    | Narzęc                | dzia Test  | Analiza                | Okno     | Pomoc                   |              |           |                |   |
|                     | <b>-</b> - 1 | 8 - 🖄                    | و في ط        | ) - (° - Deb   | oug - Any C                           | CPU         | - 02. G               | enericClass  |                        | -        | Rozpocznij              | -   📻 _ 3    | te te     | · <b>E ?</b> E |   |
|                     |              |                          |               |  |                                       |             |                       |  |                        |          | ·                       | ► = ≈        |           |                |   |
| Eksplorator serwera | Person.cs    |                          | ntryPoint.cs  | MyList.c   |                                       | Point.cs 🕂  |                       |  |                        |          |                         |              |           |                |   |
| ora                 | 🖙 02. Gen    |                          |               |  |                                       | GenericClas | s.EntryPoi            | int  |                        |          | - 𝔅 <sub>θ</sub> Main() |              |           |                |   |
| tor s               | 1            |                          |               | cem.Collectio  | ons.Generic                           | ;           |                       |  |                        |          |                         |              |           |                |   |
| Serv                | 2            | Lus                      | ing Syst      | tem;   |                                       | 1           | -                     | (°   |                        |          |                         |              |           |                |   |
| /era                |              | <u>ا_</u>                |               | o  |                                       |             |                       | Vindows\sys  |                        |          |                         |              |           |                |   |
| ₽                   |              | ⊟na                      | mespace       | GenericClass   | 5                                     |             | Gener                 | icClass.   | EntryPoi               | nt+MyL   | ist`1[Syste             | m.Int32      |           |                |   |
| Przybornik          |              | {'}                      | close         | EntryDeint   |                                       |             |                       | ,  |                        |          |                         |              |           |                |   |
| orn                 | 6<br>7       |                          | Class         | EntryPoint   |                                       |             |                       |  |                        |          |                         |              |           |                |   |
| ι <del>κ</del>      | 8            |                          | 1<br>! ct     | atic void Ma   | ain()                                 |             | [L                    |  |                        |          |                         |              |           |                |   |
|                     | 9            |                          | 5             | acie voiu na   | ain()                                 |             |                       |  |                        |          |                         |              |           |                |   |
|                     | 10           |                          | l             | MyListcint   | t> firstInt                           | list = n    | new Mvl               | isteints   | 0:                     |          |                         |              |           |                |   |
|                     | 11           |                          |               |  | ist.Add(5);                           |             |                       |  |                        | List.Ad  | d(3):                   |              |           |                |   |
|                     | 12           |                          |               |  |                                       |             |                       |  |                        |          |                         |              |           |                |   |
|                     | 13           |                          |               | MyList <int< td=""><td>t&gt; secondIn</td><td>tList =</td><td>new My</td><td>List<int:< td=""><td>&gt;();</td><td></td><td></td><td></td><td></td><td></td><td></td></int:<></td></int<> | t> secondIn                           | tList =     | new My                | List <int:< td=""><td>&gt;();</td><td></td><td></td><td></td><td></td><td></td><td></td></int:<> | >();                   |          |                         |              |           |                |   |
|                     | 14           |                          |               |  | List.Add(5)                           |             |                       |  |                        | IntList  | t.Add(4);               |              |           |                |   |
|                     | 15           |                          |               |  |                                       |             |                       |  |                        |          |                         |              |           |                |   |
|                     | 16           |                          |               |  | t> sumIntLi                           |             |                       |  |                        | ist;     |                         |              |           |                |   |
|                     | 17           |                          |               | Console.Wr   | riteLin <mark>e(st</mark>             | ring.Joi    | in <mark>(", "</mark> | , sumInt   | List <mark>)</mark> ); | Du +     | if we went t            |              | string la | in mot         | had to  |
|                     | 18           |                          | }             |  |                                       |             |                       |  |                        |          | t if we want to         |              | -         |                |   |
|                     | 19           |                          |               |  |                                       |             |                       |  |                        |          | nt all element<br>ues.  | .s of the fi | st, we ha | ave stra       | inge  |
|                     | 20           | Ē.                       | c]            | lass MyList<   | ۲>                                    |             |                       |  |                        |          | ues.<br>Iy. Because st  | ring loin (  | aporatos  | on list        | c   |
|                     | 21           |                          | {             |  |                                       |             |                       |  |                        |          | scendants of            | -            | •         | OTTISL         | <u>,                                     </u> |
|                     | 22           |                          |               | private T  |                                       |             |                       |  |                        |          | e want to co            |              |           | цЧ             |   |
|                     | 23           |                          |               | private in   |                                       |             |                       |  |                        |          | plement a me            |              |           | iu             |   |
|                     | 24           |                          |               |  | nt capacity                           |             |                       |  |                        |          | s do it.                |              | 51.       |                |   |
|                     | 25           |                          |               |  | this[int in                           |             |                       |  |                        | LCU      | 3 00 11.                |              |           |                |   |
|                     | 36<br>41     | Ē                        |               |  | t Count<br>t Capacity.                |             |                       |  |                        |          |                         |              |           |                |   |
|                     | 41           | Ë                        |               | public Myl   | · · · · · · · · · · · · · · · · · · · | · · ·       |                       |  |                        |          |                         |              |           |                |   |
|                     | 52           | Ë                        |               |  | id Add(T it                           | em)         |                       |  |                        |          |                         |              |           |                |   |
|                     | 64           | ]- <b>∃</b> - <b>€</b> - |               |  |                                       |             | rator +               | (MyList  | (T) list               | 1. MyLi  | ist <t> list</t>        | 2)           |           |                |   |
|                     | 65           | Ĩ                        |               | {  |                                       | oper        |                       | (.) 2150   |                        | _, ., ., |                         |              |           |                |   |
|                     | 66           |                          |               | MyList   | t <t> result</t>                      | = new M     | NVList«               | T>():  |                        |          |                         |              |           |                |   |

|                     | - O   13      | - 🖆 💾 🥙 🎾     | - Debug                                  | Any CPU       | <ul> <li>02. GenericC</li> </ul> | lass 🝷   | 🕨 Rozpocznij – 🛛 🗖 🚽 🔚 📬 🗍           |           |
|---------------------|---------------|---------------|--|---------------|----------------------------------|--|--------------------------------------|-----------|
| Eksp                | Person.cs     | EntryPoint.cs | MyList.cs                                | EntryPoint.cs | + ×                              |  |                                      |           |
| olora               | 🖙 02. Generic | :Class        |  | 🚽 🐾 Generic(  | Class.EntryPoint.MyLi            | st <t></t>   | →  Ø ToList()                        |           |
| Eksplorator serwera | 9             | {             |  |               |                                  |  |                                      |           |
| ierw                | 10            |               | MyList <int> fi</int>                    |               |                                  |  |                                      |           |
| era                 | 11            |               | firstIntList.A                           | dd(5); first  | tIntList.Add(6)                  | ); firstIntList.Ad   | ld(3);                               |           |
|                     | 12<br>13      |               | MyList≺int≻ se                           | condIntlict   | - now Mylistzi                   | ints().  |                                      |           |
| zyb                 | 13            |               |  |               |                                  | (2); secondIntList   | Add(A).                              |           |
| Przybornik          | 14            |               | Secondinceise.                           | Auu(5), Seco  | JIIIIIICLISC.AUU(                | ,2), Secondinceise   | Auu(4),                              |           |
| ~                   | 16            |               | MvList <int> su</int>                    | mIntList = f  | firstIntList +                   | <pre>secondIntList;</pre>  |                                      |           |
|                     | 17            |               |  |               |                                  | <pre>IntList.ToList()))</pre>  | );                                   |           |
|                     | 18            |               |  |               |                                  |  |                                      |           |
|                     | 19            |               |  |               |                                  |  |                                      |           |
|                     | 20            | 🗄 cla         | ass MyList <b><t></t></b>                |               |                                  |  |                                      |           |
|                     | 21            | {             |  |               |                                  | \Windows\system32\cmd  | l.exe                                |           |
|                     | 22            |               | private T[] it                           |               | 10,                              | 8,7  |                                      |           |
|                     | 23            |               | private int co                           |               | nuy .                            | KoncynuoWac, Naci  | śnij dowolny klawisz                 |           |
|                     | 24            |               | private int ca                           | · · · _       |                                  |  |                                      |           |
|                     | 25            | Ē             | <pre>public T this[</pre>                | <b>-</b> L_   |                                  |  |                                      |           |
|                     | 36<br>41      | Ш.            | public int Cou                           |               |                                  |  |                                      |           |
|                     | 41            | E             | <pre>public int Cap public MyList(</pre> |               |                                  |  |                                      |           |
|                     | 52            | E<br>H        | public void Ad                           | ·             | 7                                |  |                                      |           |
|                     | 64            | Ē             |  |               |                                  | ist <t≻ list1,="" myli<="" td=""><td>st<t> list2)</t></td><td></td></t≻> | st <t> list2)</t>                    |           |
|                     | 80            |               | <pre>public List<t></t></pre>            |               |                                  | , ,,,  |                                      |           |
|                     | 81            |               | {  |               |                                  |  | generic method ToList – we crete n   |           |
|                     | 82            |               | List <t> li</t>                          | st = new Lis  | st <t>();</t>                    |  | d all elements from our List and th  | en return |
|                     | 83            | e i           | for(int i                                | = 0; i < cou  | unt; i++)                        | the result.  |                                      |           |
|                     | 84            |               | {  |               |                                  |  | e string.Join method to retrieve all | I         |
|                     | 85            |               | list.A                                   | dd(items[i]   | );                               | elements from our  |                                      |           |
|                     | 86            |               | }  |               |                                  |  | e a result list, where all elements  | are sum   |
|                     | 87            |               | return lis                               | t;            |                                  | of elements from p   |                                      |           |
|                     | 88            |               | }  |               |                                  | 5+5=10: six and tw   | o is eigth and 3 plus 4 is 7;        |           |

| <u>त्र</u>   |  | 1icrosoft Visual Studio            |   |  |  |  |  |  |  |  |  |  |
|--|--|------------------------------------|---|--|--|--|--|--|--|--|--|--|
| Plik   | Edycja \   | Vidok Projekt Kompilowanie Debu    | gowanie Zespół Narzędzia Test Analiza   | Okno Pomoc   |  |  |  |  |  |  |  |  |
|  | - O ( 🐴  | - 🖆 💾 🥐 🏓 🖓 - 🖓 - Debug 🛛 -        | Any CPU + 02. GenericClass  | 🔹 🕨 Rozpocznij 🗸 🎜 📮 陆 🎼 🗉 🖉 📕 😭   |  |  |  |  |  |  |  |  |
| Eks  | Person.cs  | EntryPoint.cs MyList.cs            | EntryPoint.cs* + ×  |  |  |  |  |  |  |  |  |  |
| Eksplorator serwera  | ⊂# 02. Generi  |                                    | - 🐾 GenericClass.EntryPoint   | → <sup> Φ</sup> <sub>a</sub> Main()  |  |  |  |  |  |  |  |  |
| ator   | 1  | <b>□using</b> System.Collections.G | eneric;   |  |  |  |  |  |  |  |  |  |
| serv   | 2  | using System;                      | C:\Windows\system32\cmd.exe   |  |  |  |  |  |  |  |  |  |
| vera   |  |                                    | 10, 8, 7  |  |  |  |  |  |  |  |  |  |
|  |  | ⊟namespace GenericClass            | abcdef, ABCDEF, 123456  | But sofar we tried to add only int elements.                                     |  |  |  |  |  |  |  |  |
| Przybornik   | 5  | {<br>⊟¦ class EntryPoint           | HUY KUNTYHUUWAC, HACISHI,   | Now we indoit with string cicinents we do  |  |  |  |  |  |  |  |  |
| orni   | 7  |                                    |   | all the same operations – method   |  |  |  |  |  |  |  |  |
| k  |  | static void Main()                 |   | concatenates the strings.  |  |  |  |  |  |  |  |  |
|  | 9  | ٠<br>۲                             |   | As you can see the generic method work correct for both number and string lists. |  |  |  |  |  |  |  |  |
|  | 10   |                                    | MyList <int> firstIntList = new MyList<int>();</int></int>  |  |  |  |  |  |  |  |  |  |
|  | 11   | firstIntList.A                     | dd(5); firstIntList.Add(6); firstIntl   | _ist.Add(3);   |  |  |  |  |  |  |  |  |
|  | 12   |                                    |   |  |  |  |  |  |  |  |  |  |
| 13 MyList <int> secondIntList = new MyList<int>();</int></int> |  |                                    |   |  |  |  |  |  |  |  |  |  |
|  | <pre>14 secondIntList.Add(5); secondIntList.Add(2); secondIntList.Add(4); 15 16 MyList<int> sumIntList = firstIntList + secondIntList;</int></pre> |                                    |   |  |  |  |  |  |  |  |  |  |
|  |  |                                    |   |  |  |  |  |  |  |  |  |  |
|  | 17   | Console.WriteL                     | <pre>ine(string.Join(", ", sumIntList.ToLi</pre>  |  |  |  |  |  |  |  |  |  |
|  | 18   |                                    |   |  |  |  |  |  |  |  |  |  |
|  | 19   |                                    |   |  |  |  |  |  |  |  |  |  |
|  | 20   |                                    |   |  |  |  |  |  |  |  |  |  |
|  | 21   |                                    | <pre>firstStringList = new MyList<string> http://www.stringlist.action.com/particulation/com/com/particulation/com/com/p</string></pre> |  |  |  |  |  |  |  |  |  |
|  | 22<br>23   | firstStringLis                     | t.Add("abc");   | 3C"); firstStringList.Add("123");  |  |  |  |  |  |  |  |  |
|  | 23   | Mylistzstning                      | <pre>secondStringList = new MyList<string< pre=""></string<></pre>  | x().   |  |  |  |  |  |  |  |  |
|  | 25   |                                    | st.Add("def"); secondStringList.Add("   |  |  |  |  |  |  |  |  |  |
|  | 26   | Ű                                  |   |  |  |  |  |  |  |  |  |  |
|  | 27   |                                    | <pre>sumStringList = firstStringList + se</pre>   |  |  |  |  |  |  |  |  |  |
|  | 28   | Console.WriteL                     | <pre>ine(string.Join(", ", sumStringList.1</pre>  | <pre>ToList()));</pre>   |  |  |  |  |  |  |  |  |
|  | 29   |                                    |   |  |  |  |  |  |  |  |  |  |
|  | 30   | }                                  |   |  |  |  |  |  |  |  |  |  |
|  | 31   |                                    |   |  |  |  |  |  |  |  |  |  |