Contents

Numerical (Solutions)

Warm-up Exercises

1. Write an explicit conversion from a `double` variable `myDoubleVar` to an `int` variable called `myIntVar`. You don't need to re-declare those variables. Assuming `myDoubleVar`'s value is `5.89`, what value would be stored in `myIntVar`?

Solution

```
myIntVar = (int)myDoubleVar;
```

The value stored in `myDoubleVar` would be `5`.

1. Declare and initialize two integer variables, x and y. Choose any values you want. Then write necessary commands to display the result of the following 3 mathematical operations: addition, multiplication, and remainder (modulo) of x and y.

   An example of output, with x set to 5 and y set to 3:

   ```
   5 + 3 = 8
   5 * 3 = 15
   5 % 3 = 2
   ```

   An example of output, with x set to 4 and y set to 2:

   ```
   4 + 2 = 6
   4 * 2 = 8
   4 % 2 = 0
   ```

   Solution

   ```
   int x = 6;
   int y = 8;

   Console.WriteLine($"{x} + {y} = {x + y}");
   Console.WriteLine($"{x} * {y} = {x * y}");
   Console.WriteLine($"{x} % {y} = {x % y}");
   ```

2. Write a command that performs *implicit* conversion between two numeric datatypes. Then, write a command that performs *explicit*

conversion between two numeric datatypes. Add a comment above both commands to clearly indicate which command is implicit and which one is explicit.

Solution

```
// Implicit Conversion: from int to double
int num = 23;
double bigNum = num;

// Explicit Conversion: from double to int
double myDouble = 54.873
int myInt = (int)myDouble;
```

Questions

1. What distinguishes the `decimal` datatype from other numeric types? What happens when a `decimal` value is used with the `C` format specifier?

   Solution

   The `decimal` type is the most precise of the numeric types, and it can be used with the `C` format specifier to display values representing amounts of currency.

2. What can you learn from this UML class diagram?

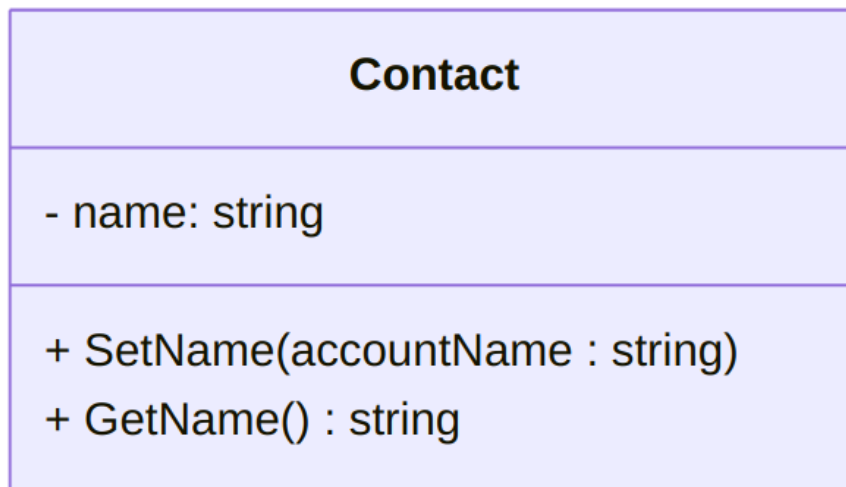| **Contact** |
|---|
| - name: string |
| + SetName(accountName : string)
 + GetName() : string |

Figure 1: A UML diagram for the Contact class (text version, image version, svg version)

Solution

> This diagram shows a **class** called "Contact", which
> ↪ contains a **private** variable of type `string`
> ↪ called "name" and two **public** methods. The method
> ↪ called "SetName" has a `void` **return** type and has
> ↪ a parameter of type `string` called
> ↪ "accountName". The method called "GetName"
> ↪ returns a `string` value and has no parameters.

3. Can conversion between two number types change value of a number? Provide an example case.

   Solution

   Yes. For example, when `float`s, `double`s, and `decimal`s are converted to `int`s, the value must be *truncated* (shortened). For example, the value `4.876f`, when converted to a `int`, will become 4.

4. Assume you have an `int` variable named **myAge** whose value is `24`. What would be displayed on the screen by the following?

   ```
   Console.WriteLine($"{myAge * 2}");
   ```

   Solution

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5. Give the values of a and b after the following four instructions have been executed.

   ```
   int a, b;
   a = 2;
   b = a * 2 + 1;
   a -= 1;
   ```

   Solution

   The value of **a** is 1 and the value of **b** is 5.

6. Give the values of c and d after the following four instructions have been executed.

   ```
   int c = 3, d;
   d = 2 + c;
   c = d * 2;
   d += 2;
   ```

   Solution

   The value of **c** is 10, and the value of **d** is '7'.

7. Is there an error in the following code? Explain the error or give the value of b after the second statement is executed.

```
float a = 3.7f;
int b = (int)a;
```

Solution

The value of b is 3.

8. Is there an error in the following code? Explain the error or give the value of b after the second statement is executed.

```
decimal a = 1.6M;
int b = (int)a + a;
```

Solution

The code produces an error because the second statement performs a math operation resulting in a decimal value and attempts to assign said value to an integer variable.

9. If one of the operator's operand is of type float and the other is of type int, what will be the type of the result of the operation?

Solution

The result of the operation will be of type float.

10. What is the return type of the operation 12.4 * 3?

Solution

The return type of the operation is float.

11. Give the values of a and b after the following four instructions have been executed.

```
int a, b;
a = 4;
b = a * 3 + 1;
a /= 2;
```

Solution

The variable a has value 2, and the variable b has value 13.

12. There is an error in the following code, at the second line. Explain the error and how you could fix this using a cast operator, without changing the datatype of the b variable.

```
decimal a = 2.5M;
int b = a / 2;
```

Solution

Since the operation a / 2 results in a `decimal` value, attempting to store it in an `int` variable results in an error. This can be fixed by casting the value of a, like so: `int b = (int)a / 2;`

13. What is the return type of the operation 12.4 * 3?

Solution

This will evaluate to a `double` value.

Problems

1. Write down, on a piece of paper, a fully compilable program that initializes an int variable named `persons` with the value 5, an `int` variable named `bottles` with the value 3, and a `double` variable named `litersPerBottle` with the value 1.5. Initialize a variable named `litersPerPerson` with the value resulting from a mathematical expression calculating the number of liters that each person would receive if split equitably, and make sure that this variable is of the type which can properly store the resulting value. Write a statement that displays its value.

Place a delimited comment with your name and the date of writing at the top of the program.

Solution

```
/*
 * Student Name
 * 2025/03/15
 */

int persons = 5;
int bottles = 3;
double litersPerBottle = 1.5;

double litersPerPerson = (bottles * litersPerBottle)
 ↪  / persons;
Console.Write($"Each person would receive
 ↪  {litersPerPerson} liters.");
```