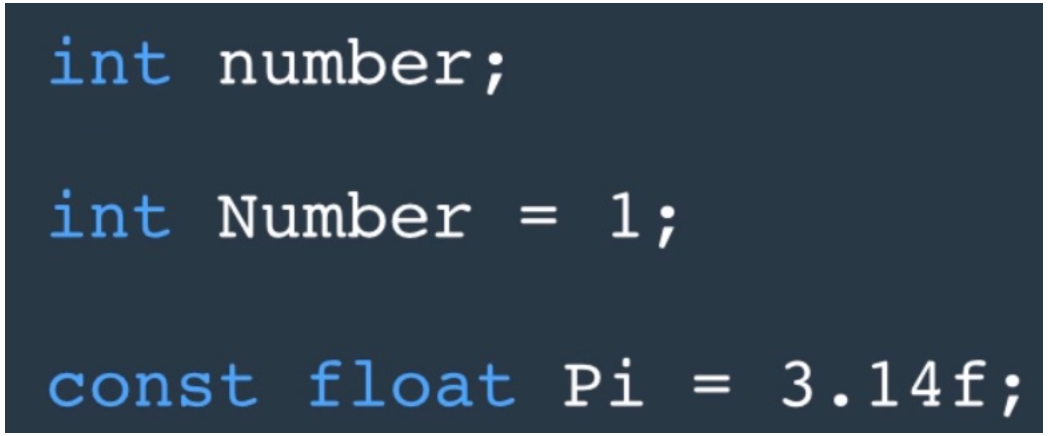
Chapter-3. Primitive Types and Expressions

Primitive Types and Expressions

1. Variables
2. Constants
3. Scope
4. Overflow
5. Operators



```
int number;

int Number = 1;

const float Pi = 3.14f;
```

Variables – A name given to storage location in the memory
Constants – An immutable value

Data Type and Identifer is required to declare a variable followed by a semicolan. For constants. Its compulsory to assign a value to it.

Identifiers

1. Cannot starts with a number
   1. 1route – illegal
   2. oneroute – legal

2. No Whitespaces
   1. First Name – illegal
   2. firstName - legal

3. Cannot be a keyword
   1. int – illegal
   2. @int - legal

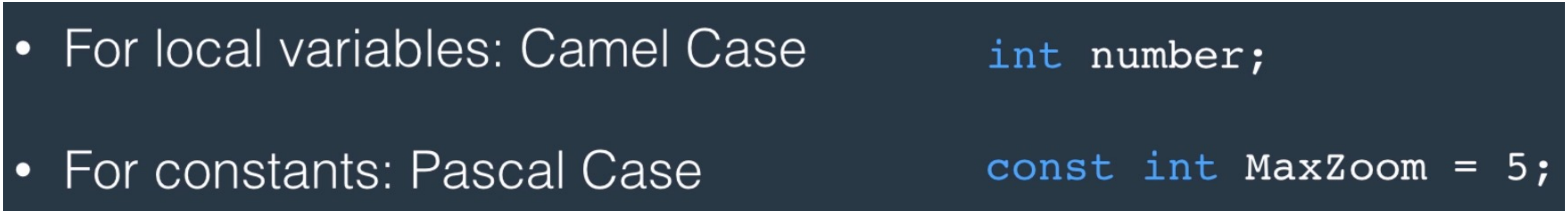
4. Always use meaningful names

Code need to be

1. Readable
2. Maintainable
3. Cleaner

Naming Conventions – C Language Family

Camel Case – firstName
Pascal Case – FirstName
Hungarian Notation – strFirstName (Came from C/C++ background. However, not liked by C# developers.



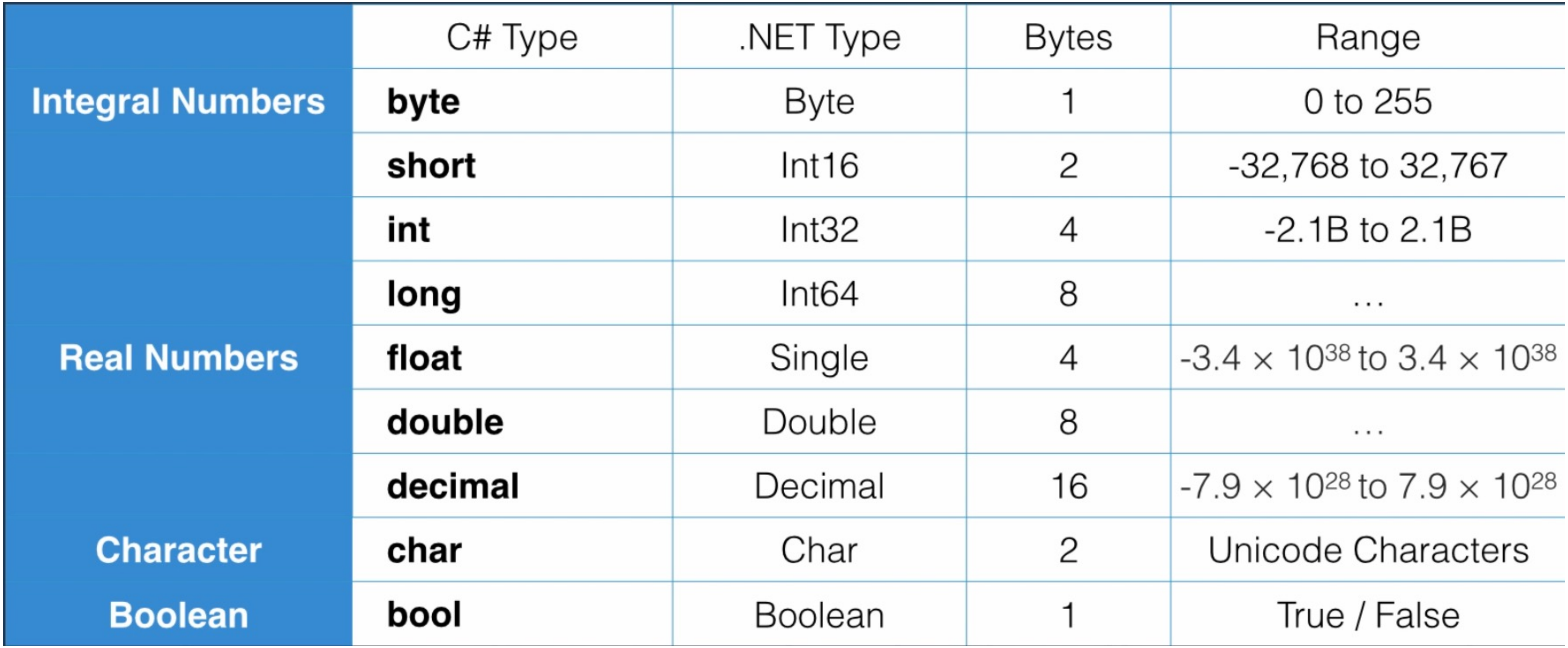
- For local variables: Camel Case

```
int number;
```

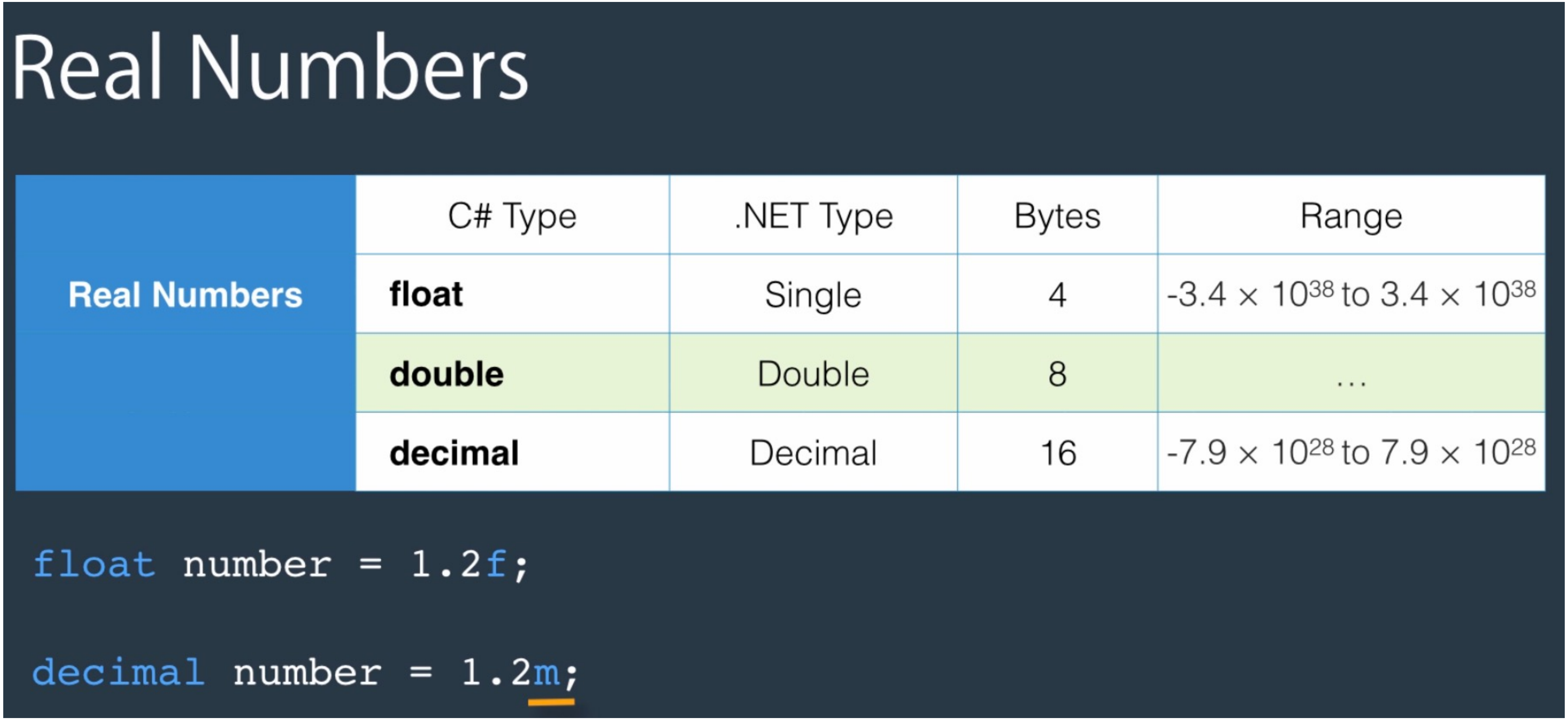
- For constants: Pascal Case

```
const int MaxZoom = 5;
```

Primitive Data Types



	C# Type	.NET Type	Bytes	Range
Integral Numbers	**byte**	Byte	1	0 to 255
	short	Int16	2	-32,768 to 32,767
	int	Int32	4	-2.1B to 2.1B
	long	Int64	8	...
Real Numbers	**float**	Single	4	-3.4 × 10^{38} to 3.4 × 10^{38}
	double	Double	8	...
	decimal	Decimal	16	-7.9 × 10^{28} to 7.9 × 10^{28}
Character	**char**	Char	2	Unicode Characters
Boolean	**bool**	Boolean	1	True / False



Real Numbers

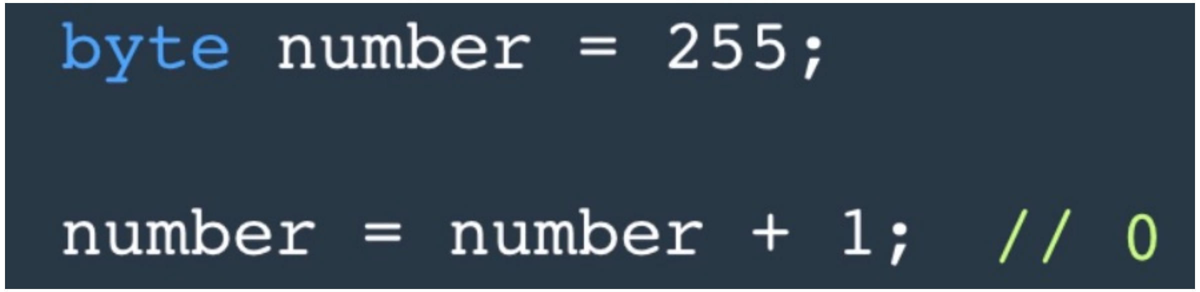
	C# Type	.NET Type	Bytes	Range
Real Numbers	**float**	Single	4	-3.4 × 10^{38} to 3.4 × 10^{38}
	double	Double	8	...
	decimal	Decimal	16	-7.9 × 10^{28} to 7.9 × 10^{28}

```
float number = 1.2f;

decimal number = 1.2m;
```

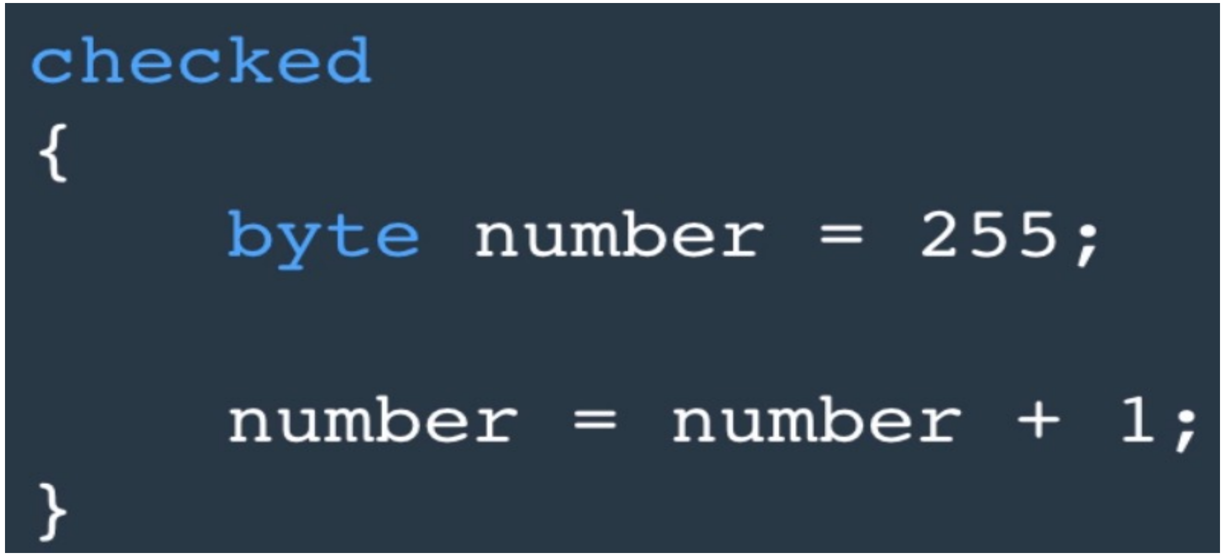
Non-Primitive Data Types

1. Strings
2. Arrays
3. Enum
4. Class

Overflowing



```
byte number = 255;

number = number + 1;  // 0
```



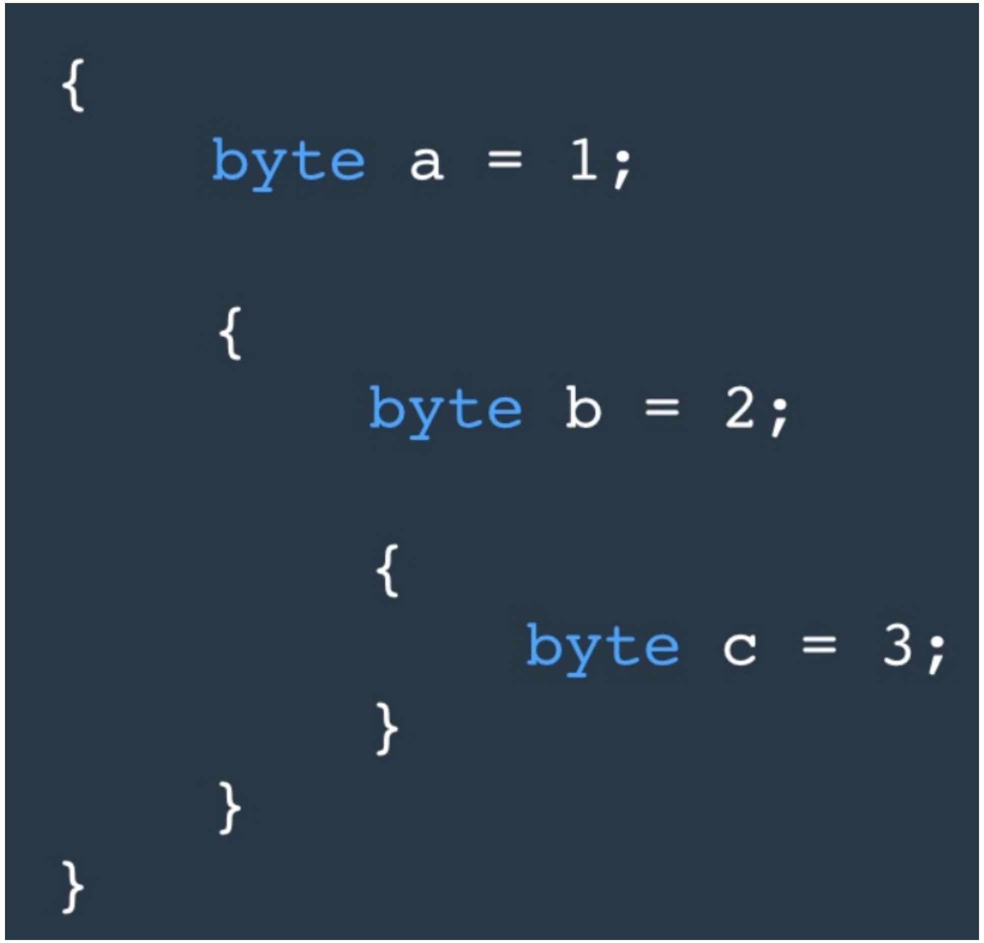
```
checked
{
    byte number = 255;

    number = number + 1;
}
```

Ariane 5 Explosion | A Very Costly Coding Error

https://www.youtube.com/watch?v=5tJPXYA0Nec

Scope

Scope – where a variable or constant have a meaning



```
{
    byte a = 1;

    {
        byte b = 2;

        {
            byte c = 3;
        }
    }
}
```

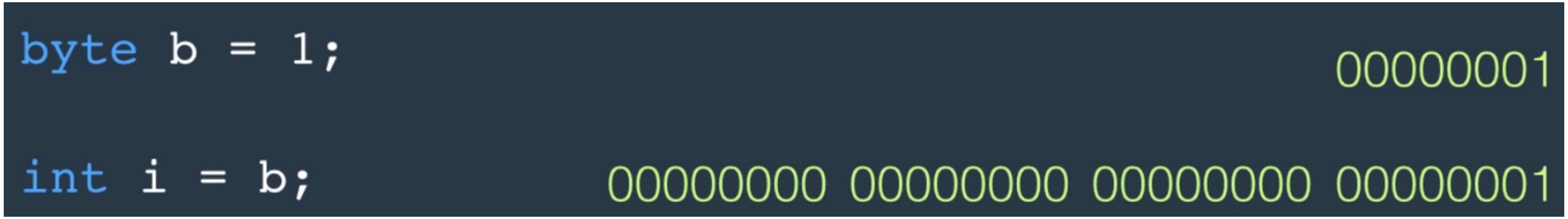
Type Conversions

Implicit Type Conversion

Explicit Type Conversion (Casting)

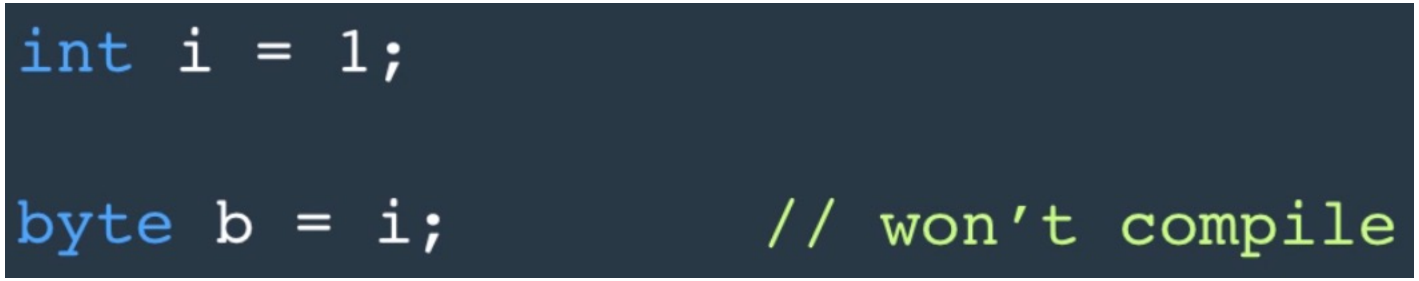
Conversion between non compatible types

Implicit Type Conversion

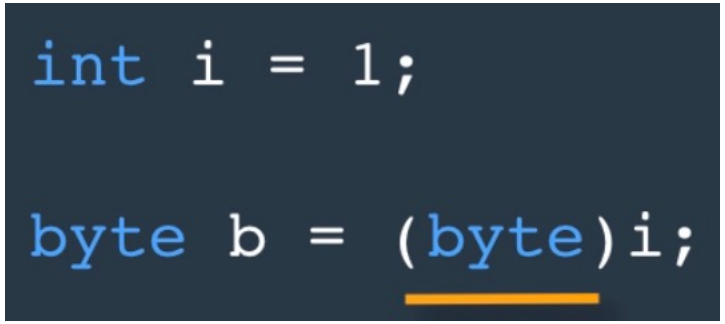


```
byte b = 1;                                  00000001

int i = b;        00000000 00000000 00000000 00000001
```

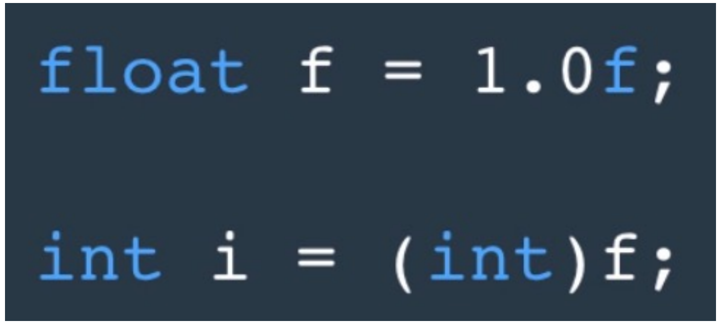
Explicit Types Conversion



```
int i = 1;

byte b = i;           // won't compile
```

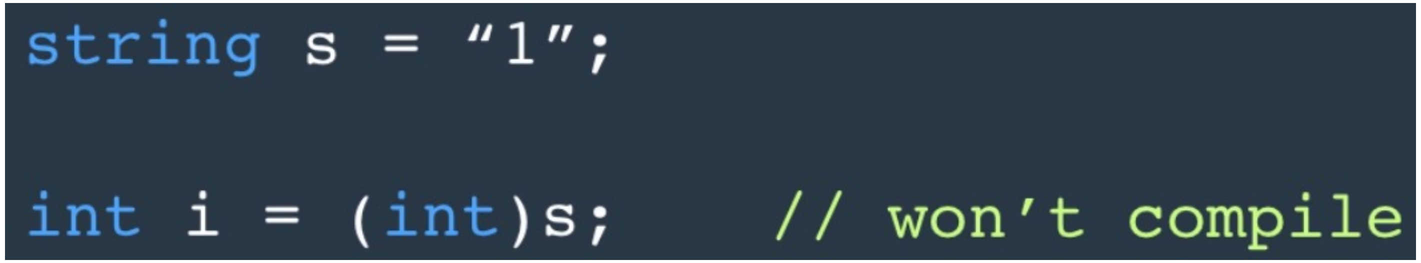


```
int i = 1;

byte b = (byte)i;
```



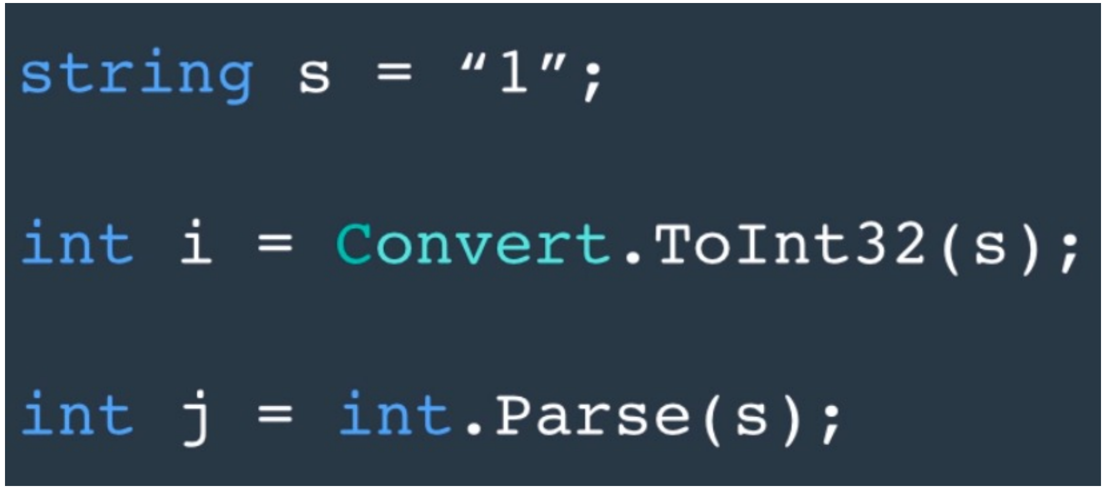
```
float f = 1.0f;

int i = (int)f;
```

Non-Compatible Types



```
string s = “1”;

int i = (int)s;     // won’t compile
```

Use Convert class defined in System Namespace or Parse method

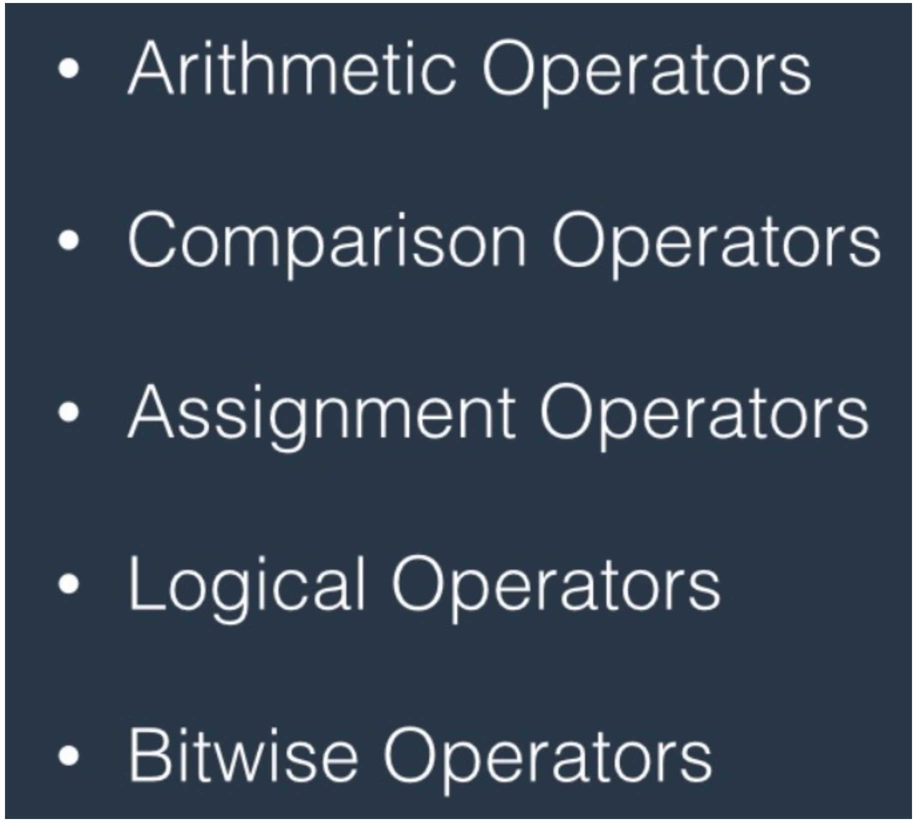


```
string s = “1”;

int i = Convert.ToInt32(s);

int j = int.Parse(s);
```

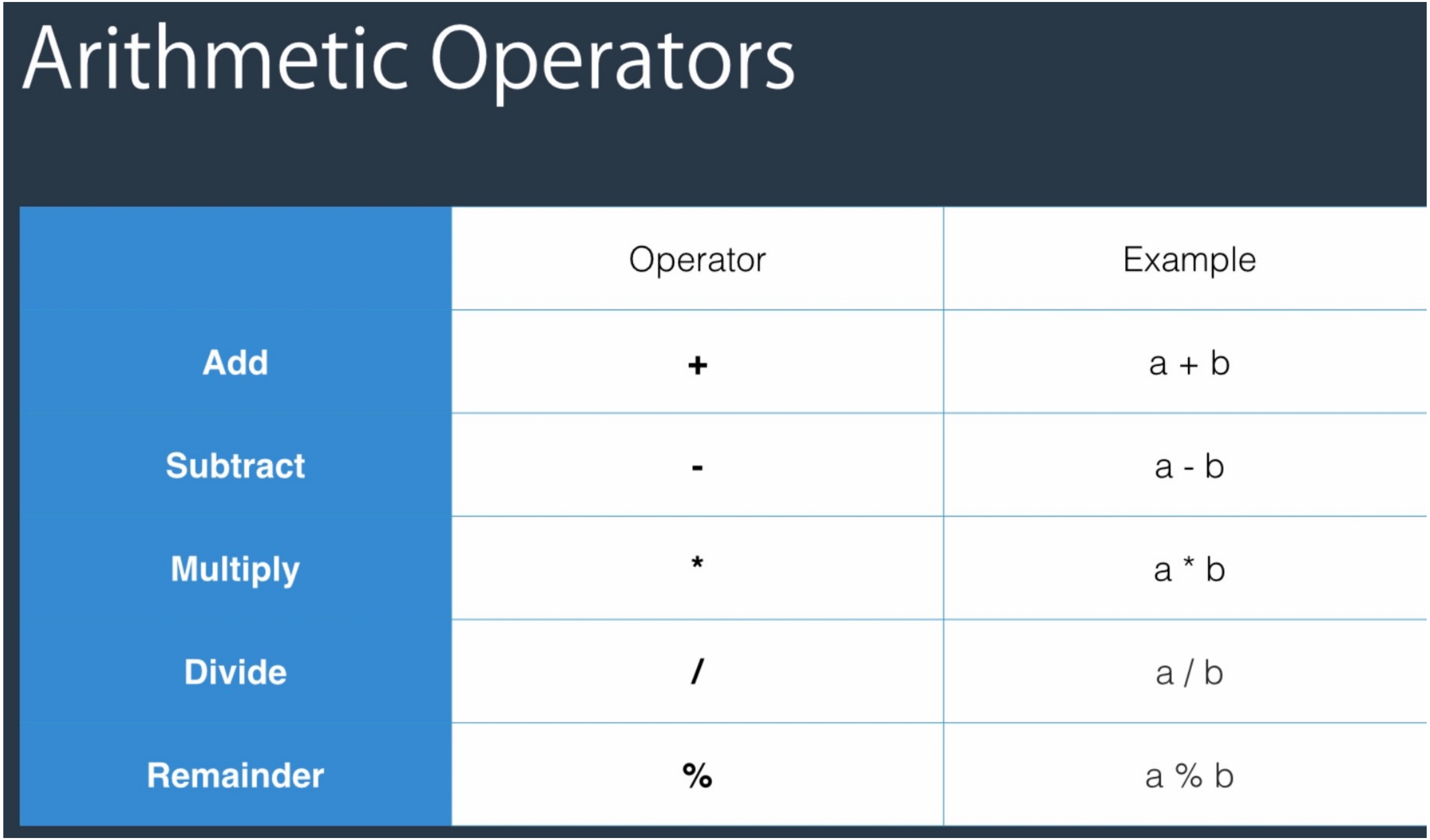
Convert Class

- ToByte()
- ToInst16()
- ToInt32()
- ToInt64()

C# Operators



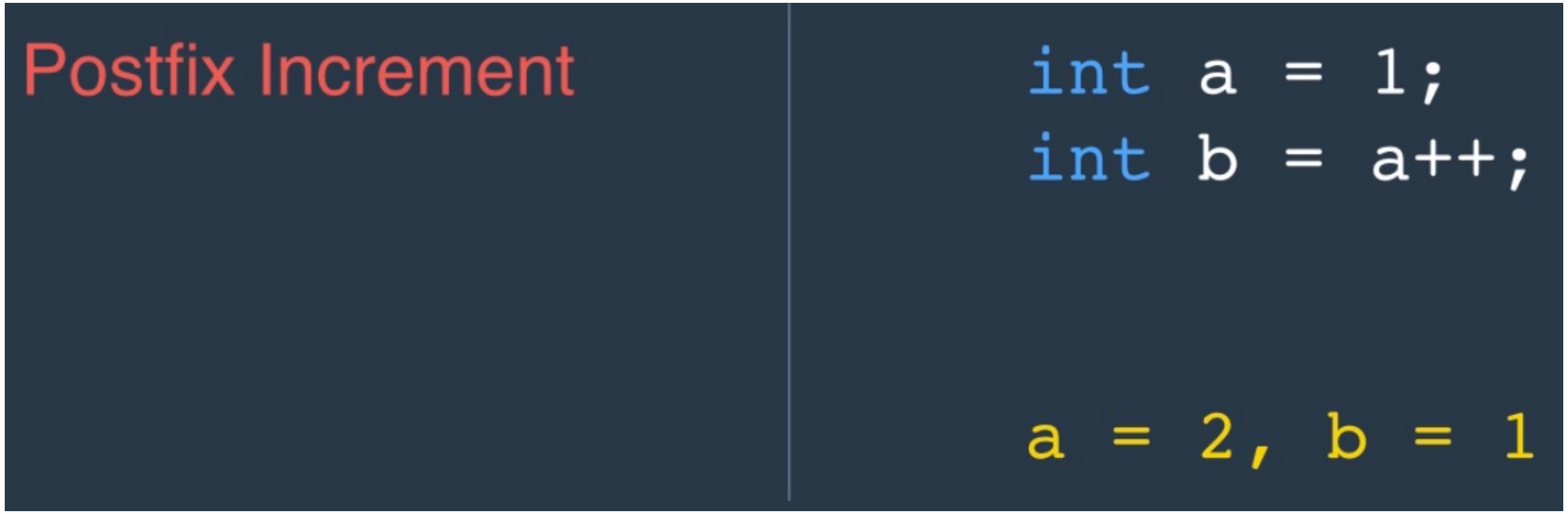
- Arithmetic Operators
- Comparison Operators
- Assignment Operators
- Logical Operators
- Bitwise Operators



Arithmetic Operators

	Operator	Example
Add	**+**	a + b
Subtract	**-**	a - b
Multiply	*****	a * b
Divide	**/**	a / b
Remainder	**%**	a % b

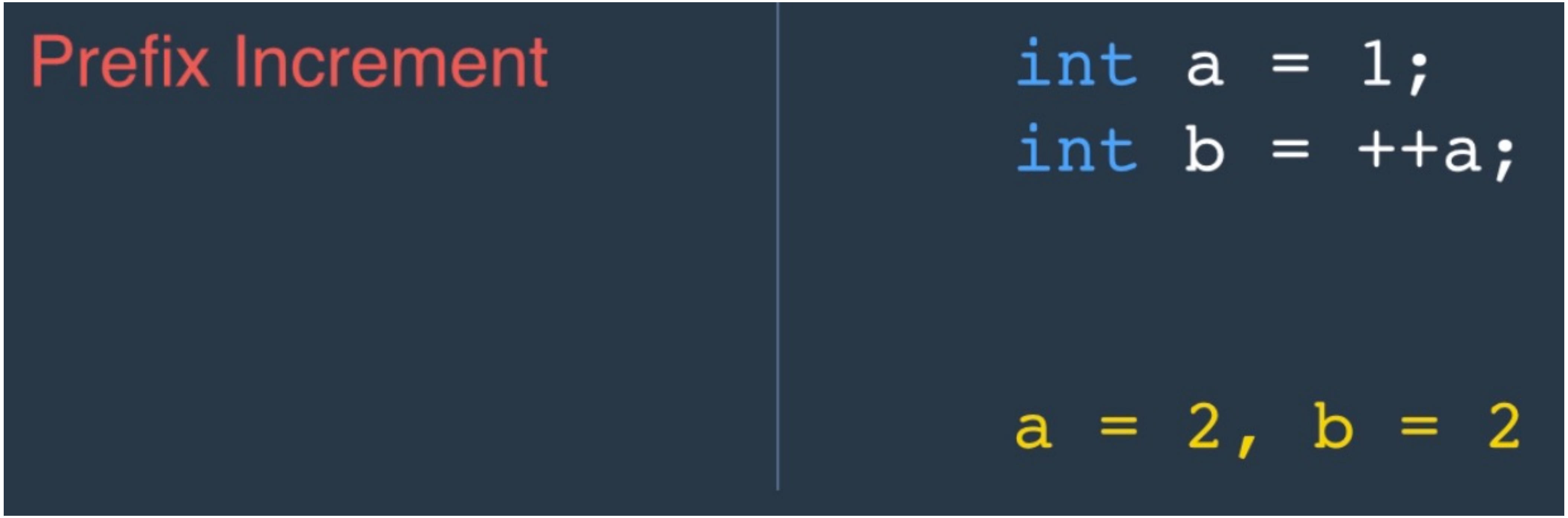
	Operator	Example	Same as
Increment	**++**	a++	a = a + 1
Decrement	**--**	a--	a = a - 1



Postfix Increment

```
int a = 1;
int b = a++;
```

```
a = 2, b = 1
```



Prefix Increment

```
int a = 1;
int b = ++a;
```

```
a = 2, b = 2
```

Comparison Operators

	Operator	Example
Equal	**==**	a == b
Not Equal	**!=**	a != b
Greater than	**>**	a > b
Greater than or equal to	**>=**	a >= b
Less than	**<**	a < b
Less than or equal to	**<=**	a <= b

Assignment Operators

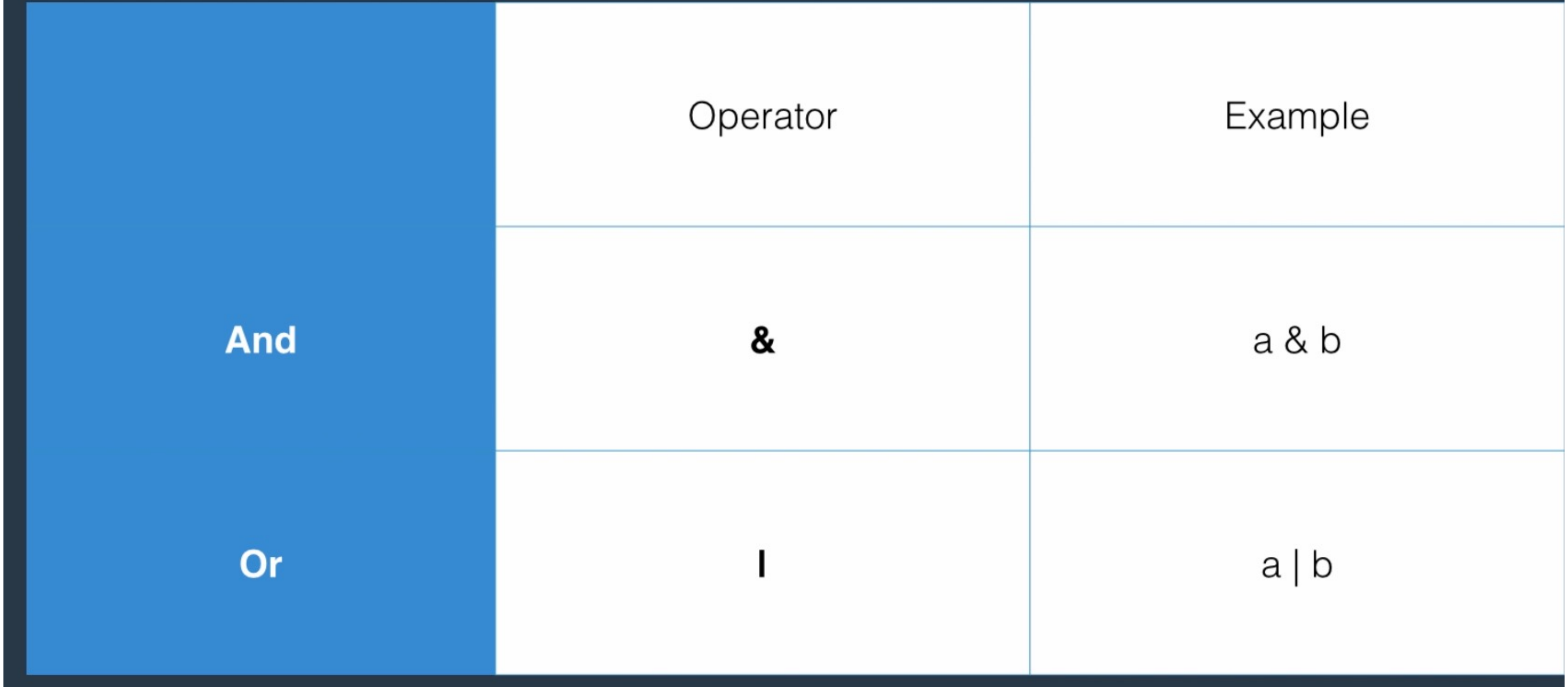
	Operator	Example	Same as
Assignment	**=**	a = 1	
Addition assignment	**+=**	a += 3	a = a + 3
Subtraction assignment	**-=**	a -= 3	
Multiplication assignment	***=**	a *= 3	
Division assignment	**/=**	a /= 3	

Logical Operators

	Operator	Example
And	**&&**	a && b
Or	**||**	a || b
Not	**!**	!a

Bitwise Operators

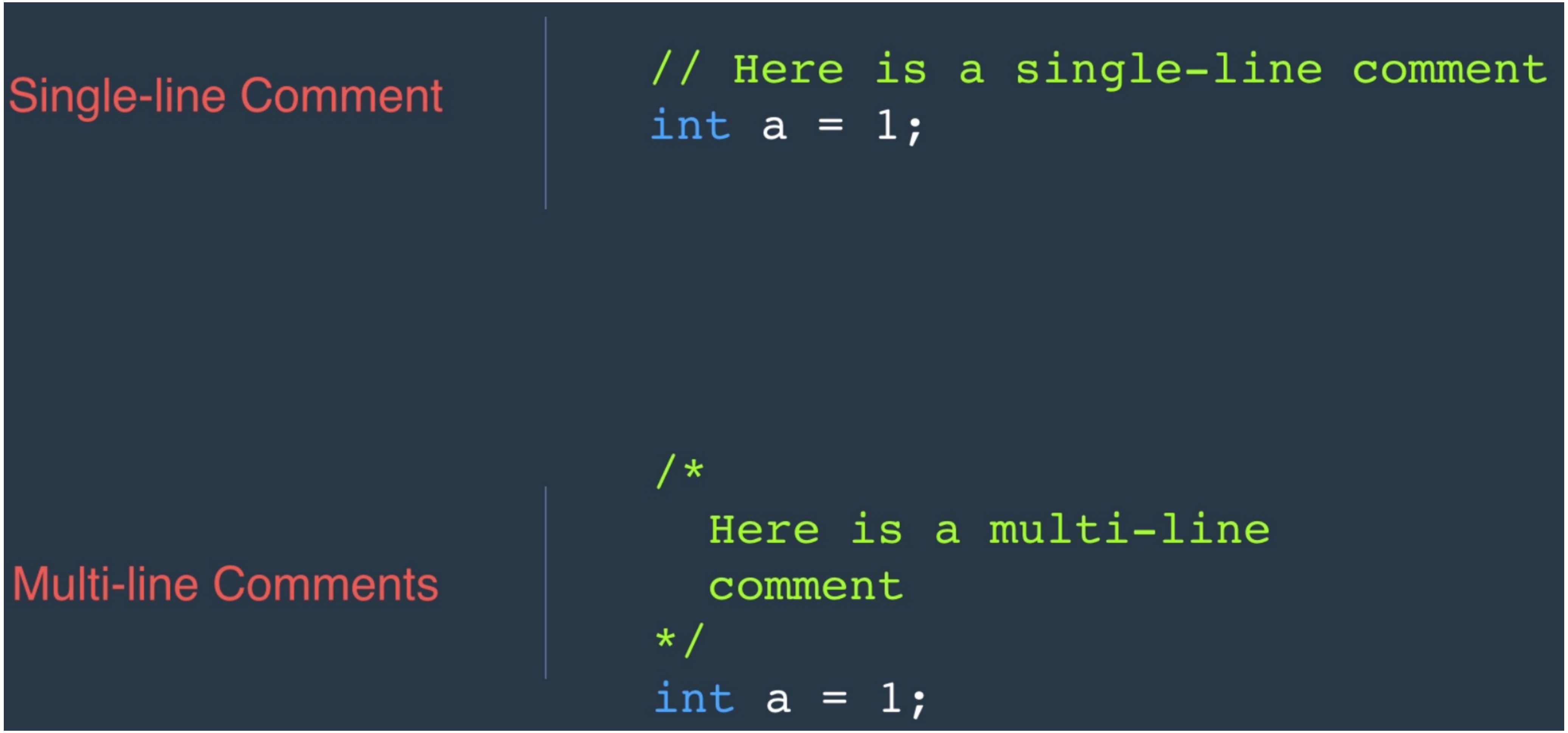
Used in low level programming, sockets, encryption,



	Operator	Example
And	**&**	a & b
Or	**|**	a | b

Comments

A comment is text that we put in our code to improve its readability and maintainability in C-sharp

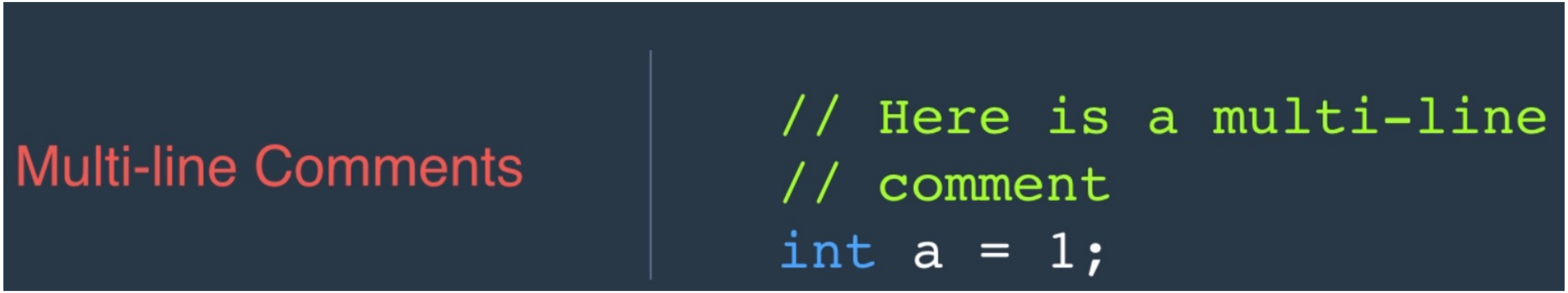


Single-line Comment

```
// Here is a single-line comment
int a = 1;
```

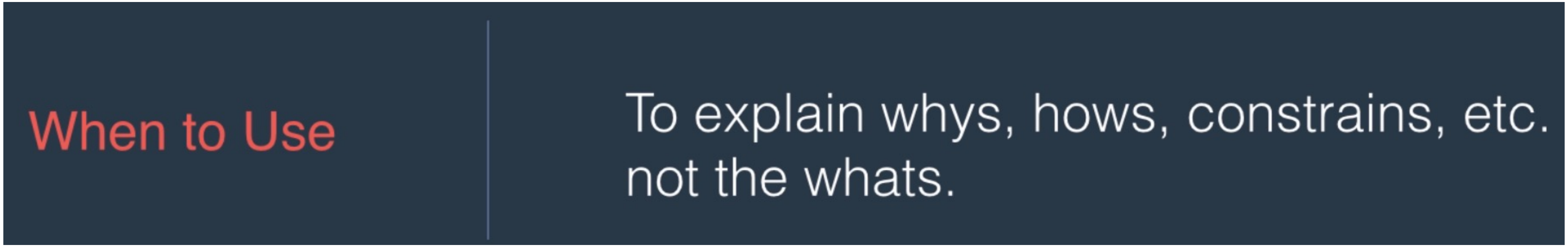
Multi-line Comments

```
/*
  Here is a multi-line
  comment
*/
int a = 1;
```



Multi-line Comments

```
// Here is a multi-line
// comment
int a = 1;
```



When to Use

To explain whys, hows, constrains, etc. not the whats.

Comments – Rule of Thumb

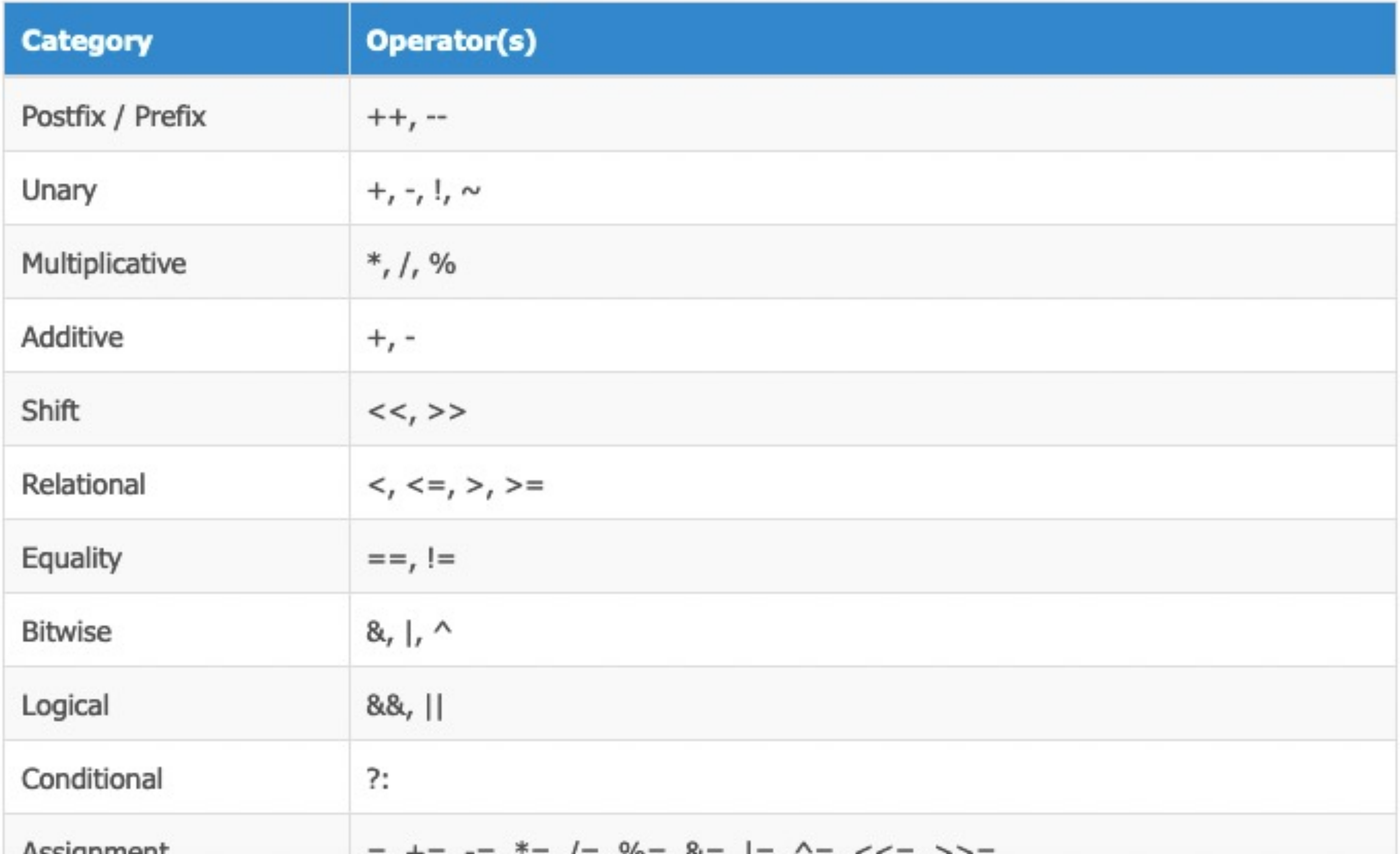
Now as a rule of thumb keep your comments to minimum use comments only when required and that's when explaining whys hows constraint and things like that do not explain what the code is doing.

Your code should be so clean and straightforward that it doesn't need comment. If a comment explains just what the code is doing is redundant and a problem with redundant comments is we changed the code. But not everyone is very consistent in changing the comments.

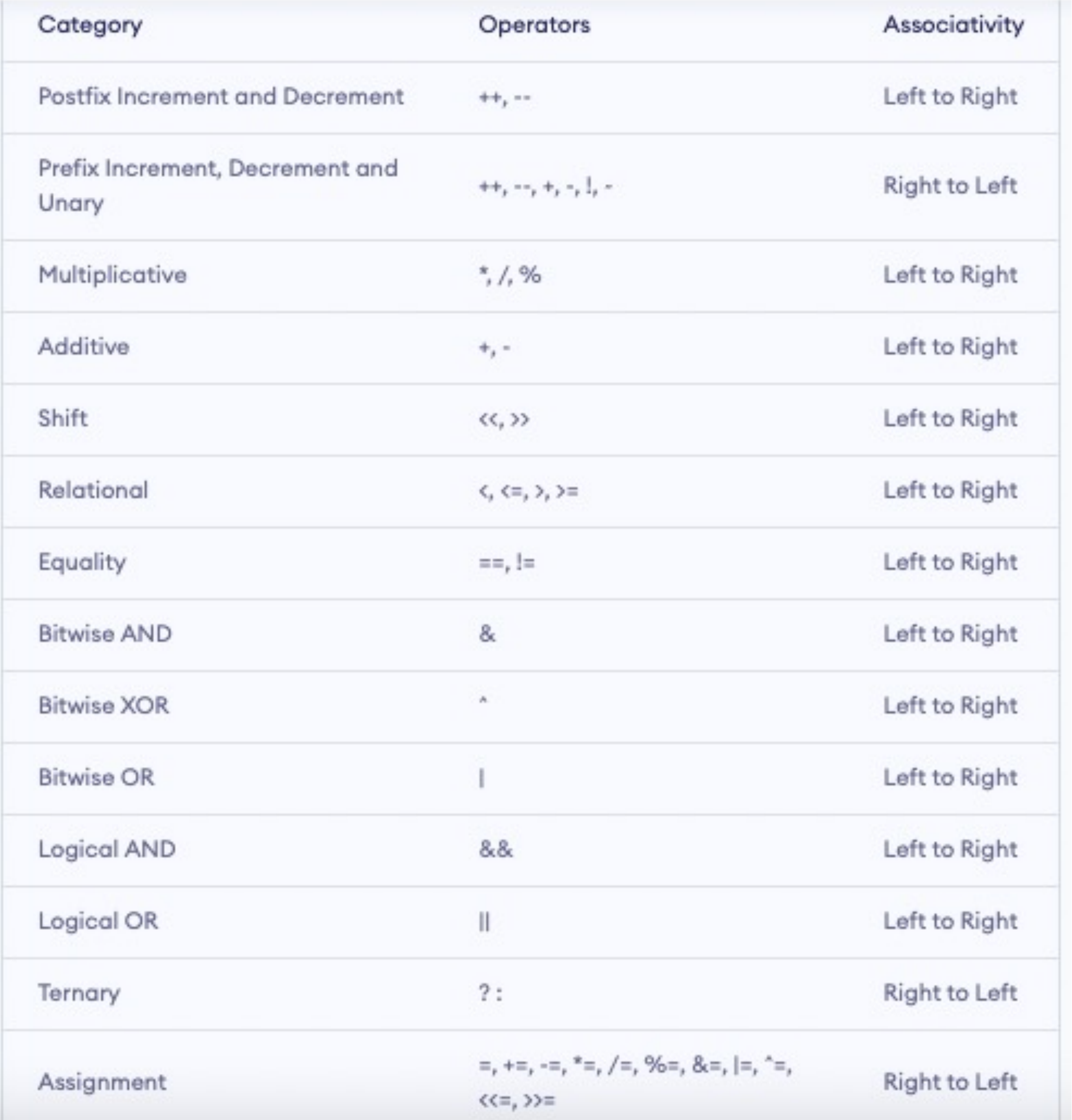
So after a while these comments become outdated and because they don't get compiled like the code there is no way to validate them. And after a while they become useless.

Hence keep them to a minimum and explain why's hows and constraints that you had at the time you wrote the code.

Operator Precedence & Associativity



Category	Operator(s)
Postfix / Prefix	++, --
Unary	+, -, !, ~
Multiplicative	*, /, %
Additive	+, -
Shift	<<, >>
Relational	<, <=, >, >=
Equality	==, !=
Bitwise	&, |, ^
Logical	&&, ||
Conditional	?:
Assignment	=, +=, -=, *=, /=, %=, &=, |=, ^=, <<=, >>=



Category	Operators	Associativity
Postfix Increment and Decrement	++, --	Left to Right
Prefix Increment, Decrement and Unary	++, --, +, -, !, ~	Right to Left
Multiplicative	*, /, %	Left to Right
Additive	+, -	Left to Right
Shift	<<, >>	Left to Right
Relational	<, <=, >, >=	Left to Right
Equality	==, !=	Left to Right
Bitwise AND	&	Left to Right
Bitwise XOR	^	Left to Right
Bitwise OR	|	Left to Right
Logical AND	&&	Left to Right
Logical OR	||	Left to Right
Ternary	? :	Right to Left
Assignment	=, +=, -=, *=, /=, %=, &=, |=, ^=, <<=, >>=	Right to Left

Practical - 1

1. Solve the following on your class notebook
2. Write down the program in C# to print the values of w, x, y, and z on the console.
3. Compile and run the program to compare it with your notebook result.
4. Upload it on your GitHub account.

w = -1 + 4 * 6

x = (35+ 5) % 7

y = 14 + -4 * 6 / 11

z = 2 + 15 / 6 * 1 - 7 % 2

Practical - 2

1. Solve the following on your class notebook
2. Write down the program in C# to print the result1 on the console.
3. Compile and run the program to compare it with your notebook result.
4. Upload it on your GitHub account.

```
int a = 5, b = 6, c = 4;
result1 = --a * b - ++c;
```