C++

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فصل سوم

- Operators
- Operator Precedence



Operators

- Operators are used to perform operations on variables and values.
- Assignment operator (=)
- Arithmetic operators (+, -, *, /, %)
- Compound assignment (+=, -=, *=, /=, %=, >>=, <<=, &=, ^=, |=)
- Increment and decrement (++, -)
- Relational and comparison operators (==, !=, >, <, >=, <=)
- Logical operators (!, &&, ||)

Assignment operator

• Assignment operators are used to assign values to variables.



Arithmetic operators

$$x = 11 \% 3;$$

$$y=x+2;$$

$$z = 10 - 2$$
;

operator	description
+	addition
-	subtraction
*	multiplication
/	division
%	modulo



Compound assignment

expression	equivalent to				
y += x;	y = y + x;				
x -= 5;	x = x - 5;				
x /= y;	x = x / y;				
<pre>price *= units + 1;</pre>	<pre>price = price * (units+1);</pre>				



Increment and decrement

Example 1	Example 2			
x = 3;	x = 3;			
y = ++x;	y = x++;			
<pre>// x contains 4, y contains 4</pre>	<pre>// x contains 4, y contains 3</pre>			



Relational and comparison operators

operator	description
==	Equal to
!=	Not equal to
<	Less than
>	Greater than
<=	Less than or equal to
>=	Greater than or equal to

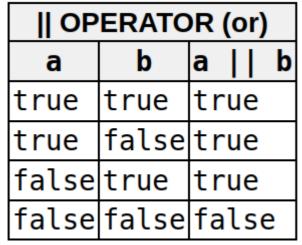
Two expressions can be compared using relational and equality operators.



```
(7 == 5)  // evaluates to false
(5 > 4)  // evaluates to true
(3 != 2)  // evaluates to true
(6 >= 6)  // evaluates to true
(5 < 5)  // evaluates to false</pre>
```

Logical operators

```
!(5 == 5) // evaluates to false because the expression at its right (5 == 5) is true !(6 <= 4) // evaluates to true because (6 <= 4) would be false !true // evaluates to false !false // evaluates to true
```



&& OPERATOR (and)					
a	b	а	&&	b	
true	true	tr	ue		
true	false	fa	ls	e	
false	true	fa	ls	e	
false	false	fa	ls	e	



Operator Precedence

Precedence	Operator	Description	Associativity
1	::	Scope resolution	Left-to-right →
	a++ a	Suffix/postfix increment and decrement	
	type() type{}	Functional cast	
2	a()	Function call	
	a[]	Subscript	
	>	Member access	
	++aa	Prefix increment and decrement	Right-to-left ←
	+a -a	Unary plus and minus	
	! ~	Logical NOT and bitwise NOT	
	(type)	C-style cast	
	*a	Indirection (dereference)	
3	&a	Address-of	
	sizeof	Size-of ^[note 1]	
	co_await	await-expression (C++20)	
	new new[]	Dynamic memory allocation	
	delete delete[]	Dynamic memory deallocation	

Operator Precedence

4	.* ->*	Pointer-to-member	Left-to-right →
5	a*b a/b a%b	Multiplication, division, and remainder	
6	a+b a-b	Addition and subtraction	
7	<< >>	Bitwise left shift and right shift	
8	<=>	Three-way comparison operator (since C++20)	
9	< <= > >=	For relational operators < and ≤ and > and ≥ respectively	
10	== !=	For equality operators = and ≠ respectively	
11	a&b	Bitwise AND	
12	^	Bitwise XOR (exclusive or)	
13	1	Bitwise OR (inclusive or)	
14	&&	Logical AND	
15	11	Logical OR	

Operator Precedence

i	a?b:c	Ternary conditional ^[note 2]	Right-to-left ←
	throw	throw operator	
	co_yield	yield-expression (C++20)	
16	=	Direct assignment (provided by default for C++ classes)	
10	+= -=	Compound assignment by sum and difference	
	*= /= %=	Compound assignment by product, quotient, and remainder	
	<<= >>=	Compound assignment by bitwise left shift and right shift	
	&= ^= =	Compound assignment by bitwise AND, XOR, and OR	
17	,	Comma	Left-to-right →



Common operators

Common operators						
assignment	increment decrement	arithmetic	logical	comparison	member access	other
a = b a += b a -= b a *= b a %= b a &= b a = b a <<= b	++a a a++ a	+a -a b b b b b b a a a a a a a a a a a a	!a a && b a b	a == b a != b a < b a > b a <= b a >= b a <= b a >= b	a[b] *a &a a->b a.b a->*b a.*b	a() a, b a?b:c

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تمرين

- 1) برنامه ای بنویسید که شعاع دایره ای را از کاربر دریافت کند و محیط و مساحت آن را محاسبه و چاپ نمایید.
 - 2) برنامه ای بنویسید که یک عدد صحیح را از ورودی بخواند و مشخص کند زوج است یا فرد.
 - 3) برنامه ای بنویسید که پنج مقدار صحیح را از ورودی خوانده سپس بزرگ ترین و کوچک ترین مقدار را پیدا کرده و چاپ کند.
 - 4) برنامه ای بنویسید که سه عدد را از ورودی خوانده و میانگین آن را محاسبه عدد کند و سپس به کاربر نمایش دهد.

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