

# Woche 03: expressions, for-loops

ICSE HS23

# Homework/Recap

$$\begin{array}{ccc} 1 & 0 & 1 \\ 2^2 & 2^1 & 2^0 \end{array}$$

$$0x\underline{f}e\underline{1}$$

$$16^2 \quad 16^1 \quad 16^0$$



$$0b\underline{1111}1\underline{111}0001$$

$$\underline{0b101} \quad \dots$$

binary

$$0x101$$

hex  $\rightarrow 16$



$$1 \quad 0 \quad 1$$

exp:  $2 \quad 1 \quad 0$

$$16^2 \quad 16^1 \quad 16^0$$

$$(a = ( \quad ));$$

$$a \leftarrow u$$

# Expressions: Precedence

$(a + b) > \dots$

Generelle Regel:

binary arithmetic, relational operators, binary logical operators

$+ -$   
← binden stärker

&&

Ganz sicher seid ihr mit:

[https://en.cppreference.com/w/cpp/language/operator\\_precedence](https://en.cppreference.com/w/cpp/language/operator_precedence)

# Expressions: Precedence

$(3 < (4 + 1)) \&\& (2 < 3)$

# Expressions: Associativity

`((false && false) && true)`

# Expressions: Short Circuit Evaluation

`2 > 3 && 17u - 55 <= ++x % y`

False && ...

true || ... → true

false && ... → false

# Expressions: Example 1

if (a % 2 == 0) ...  
(a = 5)

== vs. =  
5 == ... ? int a = 5;

int x = 1;

(x == 1) || ((1 / (x - 1)) < 1)

# Expressions: Example 2

\* `bool` -> `char` -> `short int` -> `int` ->  
`unsigned int` -> `long` -> `unsigned` ->  
`long long` -> `float` -> `double` -> `long double`

$\neg(\sim)$

$(!(1 < 2) \&\& (x == 1)) + 1$

$((\text{true}) \&\& (\text{true}))$   
true

$! \text{true} + 1$

\*  $\text{false} + 1$   
 $0 + 1 = 1$

$\text{bool} \rightarrow \text{int}$



# Control-Flow: for-loops

int i = 0  
for ( ; ... )

++i

```
for( init; condition; expression) {
```

```
    statement1;
```

```
    statement2;
```

```
}
```

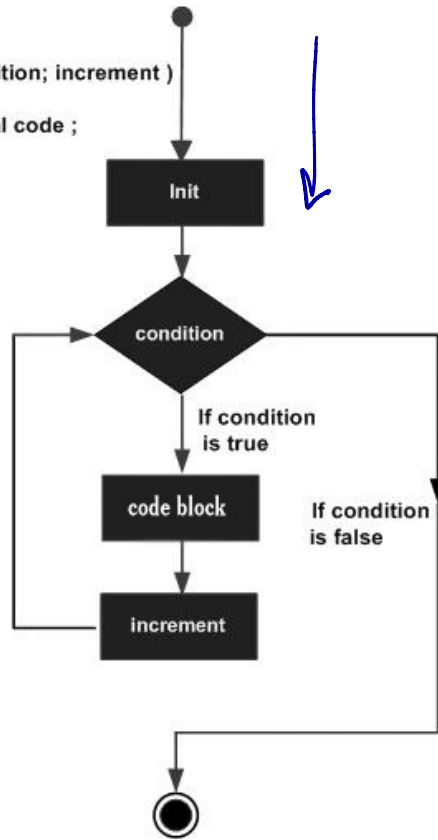
```
·  
·
```

$i += 2 \iff i = i + 2$

$i *= 2$

if ( ) break;

```
for( init; condition; increment )  
{  
  conditional code ;  
}
```



for Loop

# Example – for Loop

*int sum;*

```
→ int sum = 0; ✓  
→ for (int i = 1; i <= 3; ++i)  
    sum += i;  
  
std::cout << sum << "\n";
```

# Example – for Loop

sum: 0

```
int sum = 0;  
  
for (int i = 1; i <= 3; ++i)  
    sum += i;  
  
std::cout << sum << "\n";
```

# Example – for Loop

```
int sum = 0;

for (int i = 1; i <= 3; ++i)
    sum += i;

std::cout << sum << "\n";
```



sum:	0
i:	1

# Example – for Loop

```
int sum = 0;

for (int i = 1; i <= 3; ++i)
    sum += i;

std::cout << sum << "\n";
```

sum:	0
i:	1

# Example – for Loop

```
int sum = 0;
```

```
for (int i = 1; i <= 3; ++i)  
    sum += i;
```

```
std::cout << sum << "\n";
```

1 <= 3  
true

sum:	0
i:	1



# Example – for Loop

sum:	1
i:	1

```
int sum = 0;
```

```
for (int i = 1; i <= 3; ++i)
```

```
    // sum += i;           sum = sum + i;
```

```
std::cout << sum << "\n";
```

# Example – for Loop

```
int sum = 0;

for (int i = 1; i <= 3; ++i)
    sum += i;

std::cout << sum << "\n";
```

sum:	1
i:	2

# Example – for Loop

```
int sum = 0;

for (int i = 1; i <= 3; ++i)
    sum += i;

std::cout << sum << "\n";
```

sum:	1
i:	2

# Example – for Loop

```
int sum = 0;
```

```
for (int i = 1; i <= 3; ++i)  
    sum += i;
```

```
std::cout << sum << "\n";
```

2 <= 3  
true

sum:	1
i:	2

# Example – for Loop

```
int sum = 0;

for (int i = 1; i <= 3; ++i)
    sum += i;

std::cout << sum << "\n";
```

sum:	3
i:	2

# Example – for Loop

```
int sum = 0;

for (int i = 1; i <= 3; ++i)
    sum += i;

std::cout << sum << "\n";
```

sum:	3
i:	3

# Example – for Loop

```
int sum = 0;

for (int i = 1; i <= 3; ++i)
    sum += i;

std::cout << sum << "\n";
```

sum:	3
i:	3

# Example – for Loop

```
int sum = 0;
```

```
for (int i = 1; i <= 3; ++i)  
    sum += i;
```

```
std::cout << sum << "\n";
```

3 <= 3  
true

sum:	3
i:	3



# Example – for Loop

```
int sum = 0;

for (int i = 1; i <= 3; ++i)
    sum += i;

std::cout << sum << "\n";
```

sum:	6
i:	3

# Example – for Loop

```
int sum = 0;

for (int i = 1; i <= 3; ++i)
    sum += i;

std::cout << sum << "\n";
```

sum:	6
i:	4

# Example – for Loop

```
int sum = 0;

for (int i = 1; i <= 3; ++i)
    sum += i;

std::cout << sum << "\n";
```

sum:	6
i:	4

# Example – for Loop

```
int sum = 0;
```

```
for (int i = 1; i <= 3; ++i)  
    sum += i;
```

```
std::cout << sum << "\n";
```

4 <= 3

false

sum:	6
i:	4

# Example – for Loop

```
int sum = 0;

for (int i = 1; i <= 3; ++i)
    sum += i;

std::cout << sum << "\n";
```

sum: 6

# Exercise: Strange Sum

Auf CodeExpert:

Code examples → Lecture 3: Exercise Session → Strange Sum

# Exercise: Strange Sum

Auf CodeExpert:

Code examples → Lecture 3: Exercise Session → Largest Power