

`while` **Loop**

# Example – while Loop

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

input:

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

input:

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

Input:

6

input: 6

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

input:	6
nbits:	0

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

```
input:  6
nbits:  0
```

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

```
input: 6
nbits: 0
```

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

6 != 0

true



# Example – while Loop

input: 3  
nbits: 0

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

```
input: 3
nbits: 1
```

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

```
input:  3
nbits:  1
```

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

```
input:  3
nbits:  1
```

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

3 != 0

true

# Example – while Loop

input: 1  
nbits: 1

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

```
input: 1
nbits: 2
```

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

```
input:  1
nbits:  2
```

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

input:	1
nbits:	2

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

1 != 0

true



# Example – while Loop

input: 0  
nbits: 2

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

```
input: 0  
nbits: 3
```

```
// Input  
unsigned int input;  
std::cin >> input;  
unsigned int nbits = 0;  
  
// Determine number of bits  
while (input != 0) {  
    input /= 2;  
    ++nbits;  
}  
  
// Output  
std::cout << "Number of bits: "  
          << nbits << "\n";
```

# Example – while Loop

```
input:  0
nbits:  3
```

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

```
input:  0
nbits:  3
```

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

0 != 0

false

# Example – while Loop

```
input:  0
nbits:  3
```

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

# Example – while Loop

```
input:  0
nbits:  3
```

```
// Input
unsigned int input;
std::cin >> input;
unsigned int nbits = 0;

// Determine number of bits
while (input != 0) {
    input /= 2;
    ++nbits;
}

// Output
std::cout << "Number of bits: "
          << nbits << "\n";
```

**Output:**

**Number of bits: 3**

do **Loop**

# Example – do Loop

```
int input;  
int sum = 0;  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```



# Example – do Loop

input:

```
int input;  
int sum = 0;  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

# Example – do Loop

input:  
sum: 0

```
int input;  
int sum = 0;  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

# Example – do Loop

input:  
sum: 0

```
int input;  
int sum = 0;  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

# Example – do Loop

input:	3
sum:	0

```
int input;  
int sum = 0  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

Input:

3

# Example – do Loop

input:	3
sum:	3

```
int input;
int sum = 0;

do {
    std::cin >> input;
    sum += input;
} while (-30 <= input && input <= 30);

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

# Example – do Loop

input:	3
sum:	3

```
int input;  
int sum = 0;  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

# Example – do Loop

input:	3
sum:	3

```
int input;  
int sum = 0;  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

-30 <= 3 && 3 <= 30  
true

# Example – do Loop

input:	3
sum:	3

```
int input;  
int sum = 0;  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```



# Example – do Loop

input: -20  
sum: 3

```
int input;  
int sum = 0  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

Input:  
-20

# Example – do Loop

input: -20  
sum: -17

```
int input;  
int sum = 0;  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

# Example – do Loop

```
input: -20  
sum: -17
```

```
int input;  
int sum = 0;  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

# Example – do Loop

input: -20  
sum: -17

```
int input;  
int sum = 0;  
  
do {  
    std::cin >>  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

-30 <= -20 && -20 <= 30  
true

# Example – do Loop

input: -20  
sum: -17

```
int input;  
int sum = 0;  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

# Example – do Loop

input: 32  
sum: -17

```
int input;  
int sum = 0  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

Input:  
32

# Example – do Loop

input:	32
sum:	15

```
int input;  
int sum = 0;  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

# Example – do Loop

input:	32
sum:	15

```
int input;
int sum = 0;

do {
    std::cin >> input;
    sum += input;
} while (-30 <= input && input <= 30);

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



# Example – do Loop

input:	32
sum:	15

```
int input;  
int sum = 0;  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

-30 <= 32 && 32 <= 30  
false

# Example – do Loop

input:	32
sum:	15

```
int input;  
int sum = 0;  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

# Example – do Loop

input:	32
sum:	15

```
int input;  
int sum = 0;  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input <= 30);  
  
std::cout << "Sum: " << sum << "\n";
```

Output:

Sum: 15

# Why do and not while?

- Need `input` in `condition`.

```
...  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
...
```

# Why do and not while?

- Need `input` in `condition`.
- But: `input` receives value **in body** at least one iteration

```
...  
  
do {  
    std::cin >> input;  
    sum += input;  
} while (-30 <= input && input <= 30);  
  
...
```