while Loop

Example – `while` Loop

```cpp
// 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
unsigned int input;
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    input /= 2;
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}

// 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

```cpp
// 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

```cpp
// 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

```cpp
// 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
unsigned           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
```

```cpp
// 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
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

```cpp
// 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
unsigned            0;
                    3 != 0

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

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

Example – `while` Loop

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

```cpp
// 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

```cpp
// 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";
```

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

Example – `while` Loop

```cpp
// 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";
```

input: 1
nbits: 2

```cpp
// Input
unsigned int input;
std::cin

unsigned              0;
```

```
1 != 0

true
```

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

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

Example – `while` Loop

```
input:    0
nbits:    2
```

```cpp
// 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

```cpp
// 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
```

```cpp
// 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 ...
unsigned ...        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

```cpp
// 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
```

```cpp
// 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**

```cpp
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:

```cpp
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

```cpp
int input;
int sum = 0;

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

std::cout << "Sum: " << sum << "\n";
```
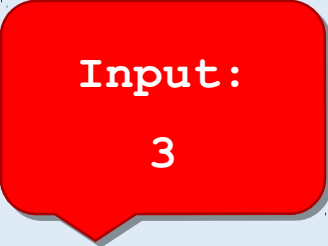
Example – do Loop

input:	
sum:	0

```cpp
int input;
int sum = 0;

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

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

input: 3
sum: 0

```cpp
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**

```cpp
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

```cpp
int input;
int sum = 0;

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

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

Example – do Loop

```
int input;
int sum = 0;

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

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

input: 3
sum: 3

-30 <= 3 && 3 <= 30

true

input: 3
sum: 3

```cpp
int input;
int sum = 0;

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

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

Example – do Loop

```
int input;
int sum = 0;

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

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

input: -20
sum: 3

Input:
-20

Example – do Loop

```
int input;
int sum = 0;

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

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

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

Example – do Loop

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

```cpp
int input;
int sum = 0;

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

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

Example – do Loop

Example – do Loop

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

```cpp
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
```

```cpp
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
```

```cpp
int input;
int sum = 0;

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

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

```
int input;
int sum = 0;

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

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

input: 32
sum: 15

-30 <= 32 && 32 <= 30

false

Example – do Loop

```
input:    32
sum:      15
```

```cpp
int input;
int sum = 0;

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

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

```
int input;
int sum = 0;

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

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

input: 32
sum: 15

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

```cpp
…

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

…
```