**1. Counter-Controlled Loops**

**Ex.1 Print 1 to 10 numbers.**

#include <iostream>

int main() {

int i = 1;

while (i <= 10) {

std::cout << i << " ";

i++;

}

return 0;

}

// Output: 1 2 3 4 5 6 7 8 9 10

**Ex.2 Sum of first 5 even numbers.**

#include <iostream>

int main() {

int sum = 0, i = 1;

while (i <= 5) {

sum += 2 \* i;

i++;

}

std::cout << "Sum: " << sum << std::endl; // Output: Sum: 30

return 0;

}

**Ex. 3 Multiply numbers from 1 to 4 (factorial-like)**

#include <iostream>

int main() {

int product = 1, i = 1;

while (i <= 4) {

product \*= i;

i++;

}

std::cout << "Product: " << product << std::endl; // Output: Product: 24

return 0;

}

**Ex. 4 Count down from 10 to 1.**

#include <iostream>

int main() {

int i = 10;

while (i >= 1) {

std::cout << i << " ";

i--;

}

return 0;

}

// Output: 10 9 8 7 6 5 4 3 2 1

Ex. 5 Print squares of first 3 numbers.

#include <iostream>

int main() {

int i = 1;

while (i <= 3) {

std::cout << i \* i << " ";

i++;

}

return 0;

}

// Output: 1 4 9

**2. Sentinel-Controlled Loops**

Ex. 1 Sum numbers until 0 is entered.

#include <iostream>

int main() {

int num, sum = 0;

std::cout << "Enter numbers (0 to stop): ";

std::cin >> num;

while (num != 0) {

sum += num;

std::cin >> num;

}

std::cout << "Sum: " << sum << std::endl;

return 0;

}

**Ex.2 Count positive numbers until -1.**

#include <iostream>

int main() {

int num, count = 0;

std::cout << "Enter numbers (-1 to stop): ";

std::cin >> num;

while (num != -1) {

if (num > 0) count++;

std::cin >> num;

}

std::cout << "Positive count: " << count << std::endl;

return 0;

}

**Ex. 3 Find max number until "end" (simplified with string sentinel).**

#include <iostream>

#include <string>

int main() {

std::string input;

int max = INT\_MIN;

while (true) {

std::cout << "Enter number or 'end': ";

std::cin >> input;

if (input == "end") break;

int num = std::stoi(input);

if (num > max) max = num;

}

std::cout << "Max: " << max << std::endl;

return 0;

}

**Ex, 4 Average of numbers until -999.**

#include <iostream>

int main() {

int num, count = 0;

double sum = 0;

std::cout << "Enter numbers (-999 to stop): ";

std::cin >> num;

while (num != -999) {

sum += num;

count++;

std::cin >> num;

}

std::cout << "Average: " << (count ? sum / count : 0) << std::endl;

return 0;

}

**Ex. 5 Accumulate even numbers until 99**.

#include <iostream>

int main() {

int num, sum = 0;

std::cout << "Enter numbers (99 to stop): ";

std::cin >> num;

while (num != 99) {

if (num % 2 == 0) sum += num;

std::cin >> num;

}

std::cout << "Even sum: " << sum << std::endl;

return 0;

}

**3. For Loops**

**Ex. 1 Print 1 to 5.**

#include <iostream>

int main() {

for (int i = 1; i <= 5; i++) {

std::cout << i << " ";

}

return 0;

}

// Output: 1 2 3 4 5

**Ex. 2 Sum of 1 to 10.**

#include <iostream>

int main() {

int sum = 0;

for (int i = 1; i <= 10; i++) {

sum += i;

}

std::cout << "Sum: " << sum << std::endl; // Output: Sum: 55

return 0;

}

**Ex. 3 Print multiples of 3 up to 15.**

#include <iostream>

int main() {

for (int i = 3; i <= 15; i += 3) {

std::cout << i << " ";

}

return 0;

}

// Output: 3 6 9 12 15

**Ex. 4 Factorial of 5**

#include <iostream>

int main() {

int fact = 1;

for (int i = 1; i <= 5; i++) {

fact \*= i;

}

std::cout << "Factorial: " << fact << std::endl; // Output: Factorial: 120

return 0;

}

**Ex.5 Reverse print 10 to 1.**

#include <iostream>

int main() {

for (int i = 10; i >= 1; i--) {

std::cout << i << " ";

}

return 0;

}

// Output: 10 9 8 7 6 5 4 3 2 1

**4. While Loops**

**Ex.1 Print 1 to 7 (counter-controlled).**

#include <iostream>

int main() {

int i = 1;

while (i <= 7) {

std::cout << i << " ";

i++;

}

return 0;

}

// Output: 1 2 3 4 5 6 7

**Ex. 2 Read until empty string (sentinel).**

#include <iostream>

#include <string>

int main() {

std::string input;

while (std::getline(std::cin, input) && !input.empty()) {

std::cout << "You entered: " << input << std::endl;

}

return 0;

}

**Ex. 3 Countdown from 8.**

#include <iostream>

int main() {

int i = 8;

while (i > 0) {

std::cout << i << " ";

i--;

}

return 0;

}

// Output: 8 7 6 5 4 3 2 1

**Ex. 4 Sum odds until 9.**

#include <iostream>

int main() {

int sum = 0, i = 1;

while (i <= 9) {

sum += i;

i += 2;

}

std::cout << "Odd sum: " << sum << std::endl; // Output: Odd sum: 25

return 0;

}

**Ex. 5 Validate input until positive**

#include <iostream>

int main() {

int num;

std::cout << "Enter positive number: ";

std::cin >> num;

while (num <= 0) {

std::cout << "Invalid, try again: ";

std::cin >> num;

}

std::cout << "Good: " << num << std::endl;

return 0;

}

**5. Do-While Loops**

**Example 1: Menu loop until 'q'.**

#include <iostream>

#include <string>

int main() {

std::string choice;

do {

std::cout << "Enter choice (q to quit): ";

std::cin >> choice;

} while (choice != "q");

return 0;

}

**Ex. 2 Sum until 0 (at least one input).**

#include <iostream>

int main() {

int num, sum = 0;

do {

std::cout << "Enter number (0 to stop): ";

std::cin >> num;

if (num != 0) sum += num;

} while (num != 0);

std::cout << "Sum: " << sum << std::endl;

return 0;

}

**Ex. 3 Guess a number (1-10) until correct.**

#include <iostream>

int main() {

int guess, secret = 7;

do {

std::cout << "Guess (1-10): ";

std::cin >> guess;

} while (guess != secret);

std::cout << "Correct!" << std::endl;

return 0;

}

**Ex. 4 Print 1 to 4 (counter-controlled).**

#include <iostream>

int main() {

int i = 1;

do {

std::cout << i << " ";

i++;

} while (i <= 4);

return 0;

}

// Output: 1 2 3 4

**Ex. 5 Validate age (at least 18).**

#include <iostream>

int main() {

int age;

do {

std::cout << "Enter age (>=18): ";

std::cin >> age;

} while (age < 18);

std::cout << "Valid age: " << age << std::endl;

return 0;

}