Control structures

C++ Lecture 3

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Motivation

- We need our program to perform differently under certain circumstances
- We need to repeat parts of our program under certain circumstances
Today is devoted to programming control structures
- Conditionals
- Loops
- When to use them…
Conditionals (control flow)

if statements
(if the condition is true, execute the block of code)

If-else statements
(if the condition is true, execute the block of code. Otherwise execute the other block)

If-else if-else statements
(check multiple conditions. If all are false, execute the else block)
What’s a Condition?

- A condition is any evaluation which results in a Boolean data-type
  - A Boolean variable
  - OR
  - A Boolean expression (using &&, ||, >, <, <=, >=, ==, …)

```java
if( ) {
    // Statements to execute if condition is true
}
```
Conditional Examples

- Checking single variables in a conditional
- Using Boolean expressions in a conditional
- if, if-else, if-if else-else
- Nested conditionals
Mini Task


2. Under `challenges/` read `rollerCoasterCheck.md`

3. Make a new project and code 🧑💻
Loops (iterative flow)

- Loops allow us to repeat sections of code as long as a condition is met
- 2 main types of loops
  - For loop
  - While loop
For Loop Anatomy

```
for(int i = 0; i < 5; i++) {
    std::cout << "i: " << i << std::endl;
}
```

- **Initialization** of loop variable run once only before entering the loop.
- **Condition** check run every time before entering the loop.
- **Action** Run after each iteration of the loop.
For Loop

- Normally used when we know exactly how many iterations we want

This will print “0 1 2 3 4”

```cpp
// for loop ---------------------------------------
/*
 int i = 0; // initialize
 i < 5; // condition
 i++ // increment
*/
for(int i = 0; i < 5; i++) {
    std::cout << "i: " << i << std::endl;
}
```
While Loop Anatomy

```
int j = 0;
while(j < 5) {
    std::cout << "j: " << j << std::endl;
    j++;
}
```

**Condition** check run every time before running loop
While loop

- Normally used when we don’t know how many iterations we need

This will print “0 1 2 3 4”

```cpp
// while loop ------------------------------
/*
   int i = 0; // initialize
   i < 5; // condition
   i++; // increment
*/
int j = 0;
while (j < 5) {
    std::cout << "j: " << j << std::endl;
    j++;
}
Loop Examples

- Printing out numbers 1 to 10 (for loop)
- Printing out numbers 10 to 1 (for loop)
- Making a looping program → when do we quit? (while loop)
- Looping through an array (for loop)
1. Go to https://github.com/iastate/VRAC_REU_Programming

2. Under challenges/ read sevensOnly.md

3. Make a new project and code
Questions?
Assignment

1. Go to https://github.com/iastate/VRAC_REU_Programming

2. Under challenges/ read guessingGame.md

3. Make a new project and code 😊