UNIVERSITY OF WATERLOO
FACULTY OF ENGINEERING
Department of Electrical & Computer Engineering

ECE 150 *Fundamentals of Programming*

Initialization of and assignment to local variables

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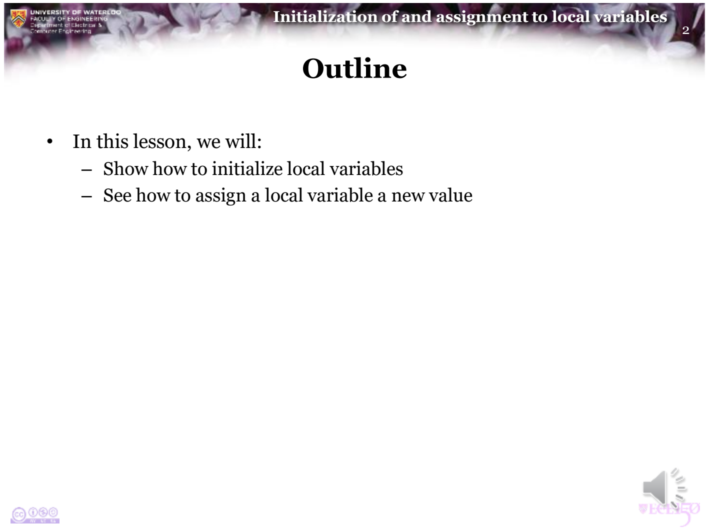
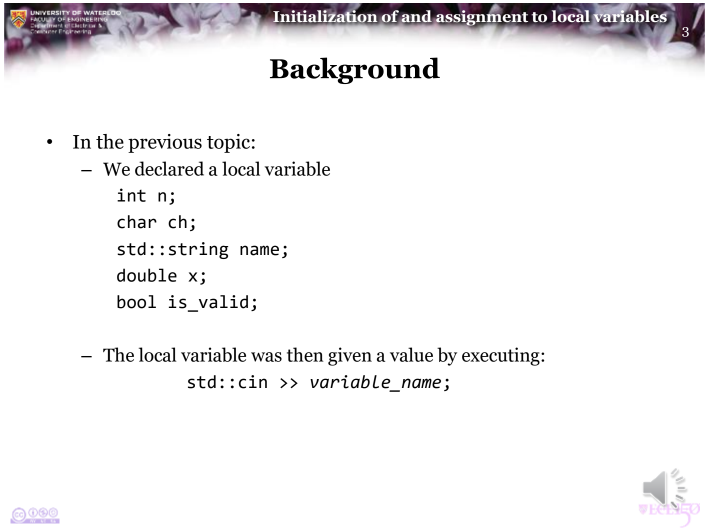


Initialization of and assignment to local variables 2

Outline

- In this lesson, we will:
  - Show how to initialize local variables
  - See how to assign a local variable a new value



Initialization of and assignment to local variables 3

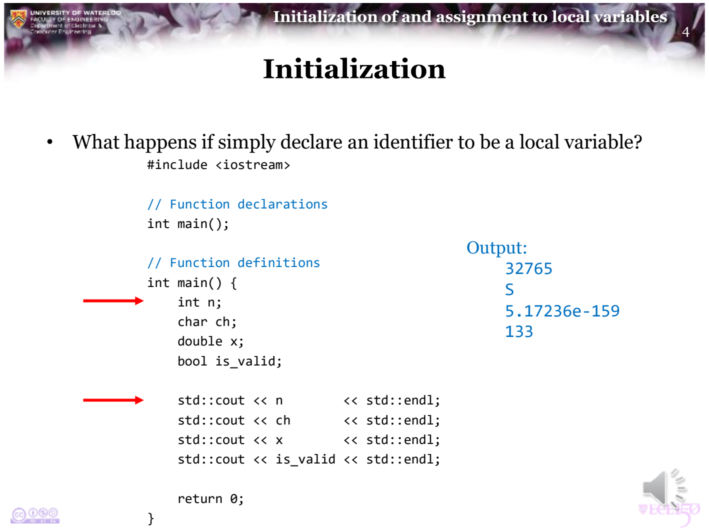
Background

- In the previous topic:
  - We declared a local variable

```
int n;
char ch;
std::string name;
double x;
bool is_valid;
```

  - The local variable was then given a value by executing:

```
std::cin >> variable_name;
```



Initialization of and assignment to local variables 4

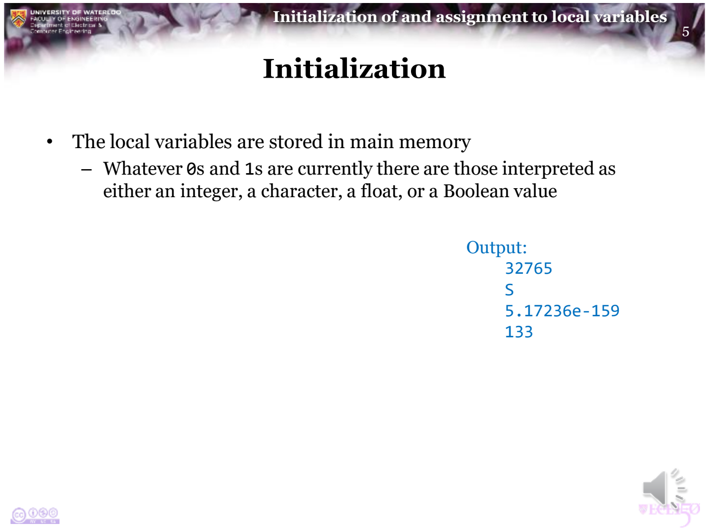
Initialization

- What happens if simply declare an identifier to be a local variable?

```
#include <iostream>

// Function declarations
int main();

// Function definitions
int main() {
    int n;
    char ch;
    double x;
    bool is_valid;

    std::cout << n        << std::endl;
    std::cout << ch       << std::endl;
    std::cout << x        << std::endl;
    std::cout << is_valid << std::endl;

    return 0;
}
```

Output:

```
32765
S
5.17236e-159
133
```

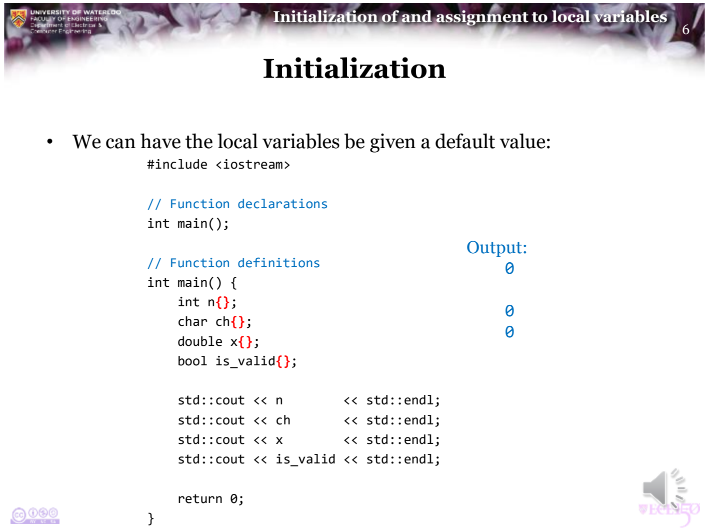


Initialization

- The local variables are stored in main memory
  - Whatever `0`s and `1`s are currently there are those interpreted as either an integer, a character, a float, or a Boolean value

Output:

```
32765
S
5.17236e-159
133
```



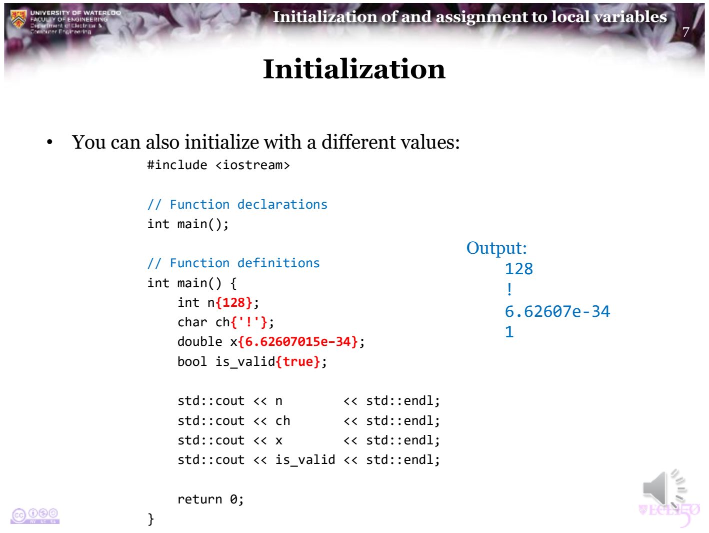
Initialization

- We can have the local variables be given a default value:

```
#include <iostream>

// Function declarations
int main();

// Function definitions
int main() {
    int n{};
    char ch{};
    double x{};
    bool is_valid{};

    std::cout << n        << std::endl;
    std::cout << ch       << std::endl;
    std::cout << x        << std::endl;
    std::cout << is_valid << std::endl;

    return 0;
}
```

Output:

```
0

0
0
```



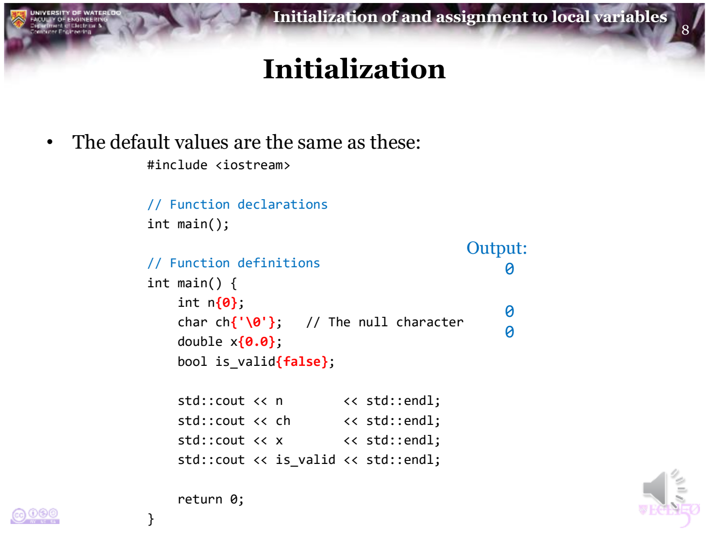
Initialization

- You can also initialize with a different values:

```
#include <iostream>

// Function declarations
int main();

// Function definitions
int main() {
    int n{128};
    char ch{'!'};
    double x{6.62607015e-34};
    bool is_valid{true};

    std::cout << n        << std::endl;
    std::cout << ch       << std::endl;
    std::cout << x        << std::endl;
    std::cout << is_valid << std::endl;

    return 0;
}
```

Output:

```
128
!
6.62607e-34
1
```



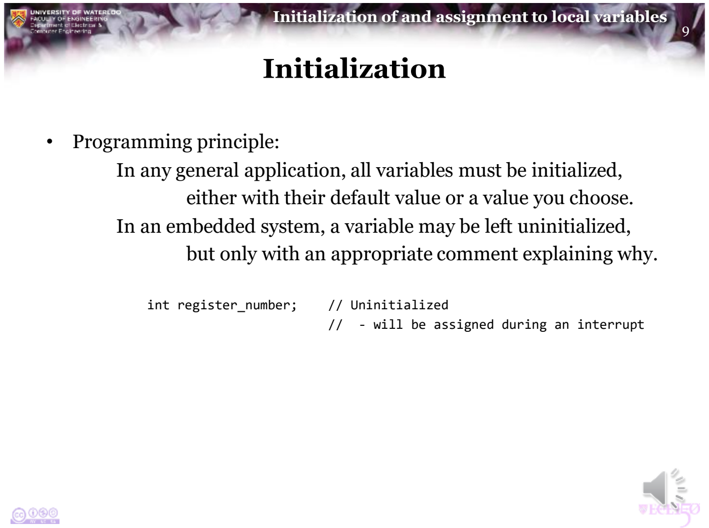
Initialization

- The default values are the same as these:

```
#include <iostream>

// Function declarations
int main();

// Function definitions
int main() {
    int n{0};
    char ch{'\0'};   // The null character
    double x{0.0};
    bool is_valid{false};

    std::cout << n        << std::endl;
    std::cout << ch       << std::endl;
    std::cout << x        << std::endl;
    std::cout << is_valid << std::endl;

    return 0;
}
```

Output:

```
0

0
0
```

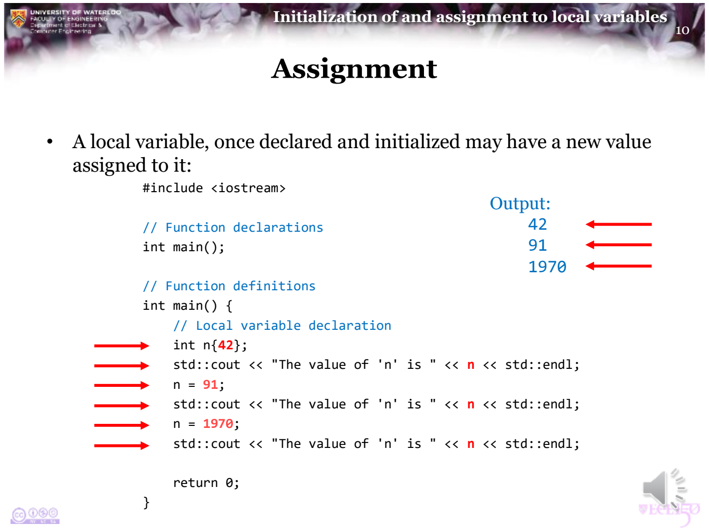


Initialization

- Programming principle:

  In any general application, all variables must be initialized,
  either with their default value or a value you choose.
  In an embedded system, a variable may be left uninitialized,
  but only with an appropriate comment explaining why.

```
int register_number;    // Uninitialized
                        //  - will be assigned during an interrupt
```



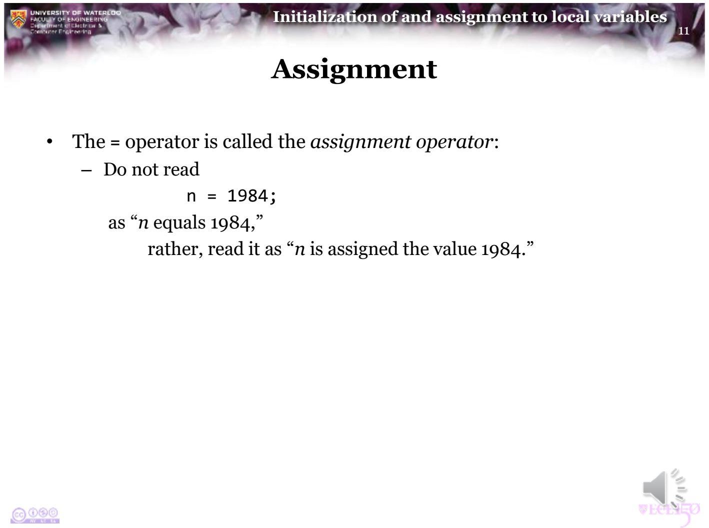
Assignment

- A local variable, once declared and initialized may have a new value assigned to it:

```
#include <iostream>

// Function declarations
int main();

// Function definitions
int main() {
    // Local variable declaration
    int n{42};
    std::cout << "The value of 'n' is " << n << std::endl;
    n = 91;
    std::cout << "The value of 'n' is " << n << std::endl;
    n = 1970;
    std::cout << "The value of 'n' is " << n << std::endl;

    return 0;
}
```

Output:

```
42
91
1970
```

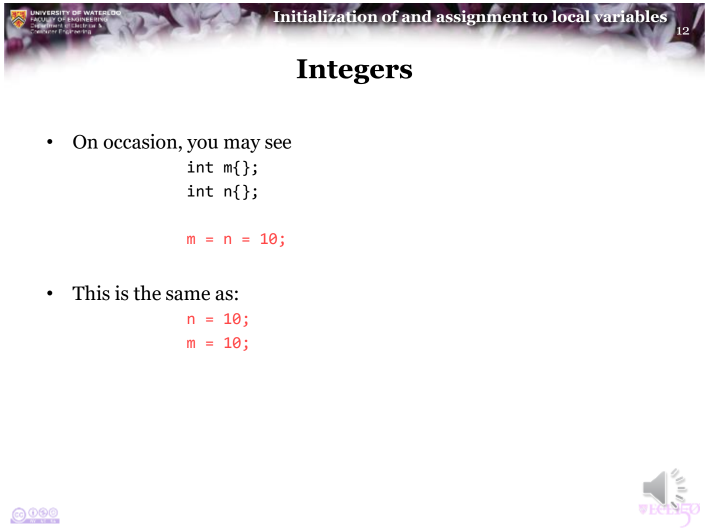


Assignment

- The = operator is called the *assignment operator*:
  - Do not read

    `n = 1984;`

    as “*n* equals 1984,”
    rather, read it as “*n* is assigned the value 1984.”



Integers

- On occasion, you may see

```
int m{};
int n{};

m = n = 10;
```

- This is the same as:

```
n = 10;
m = 10;
```

Summary

- Following this lesson, you now:
  - Understand the need for initializing local variables
    - Know the default initial values
  - Know how to assign a local variable a new value
    - The = operator is the *assignment* operator

References

[1] Wikipedia,
https://en.wikipedia.org/wiki/Local_variable

Acknowledgements

None so far.

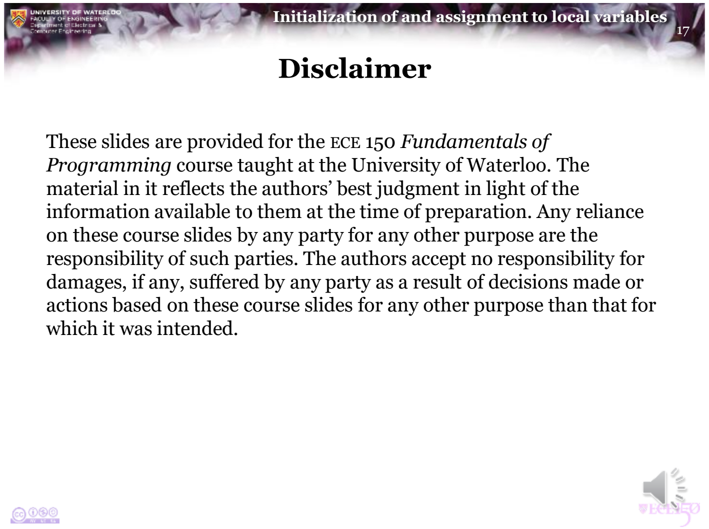
Colophon

These slides were prepared using the Georgia typeface. Mathematical equations use Times New Roman, and source code is presented using `Consolas`.

The photographs of lilacs in bloom appearing on the title slide and accenting the top of each other slide were taken at the Royal Botanical Gardens on May 27, 2018 by Douglas Wilhelm Harder. Please see

https://www.rbg.ca/

for more information.



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