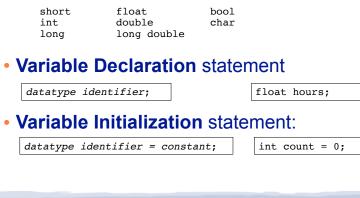
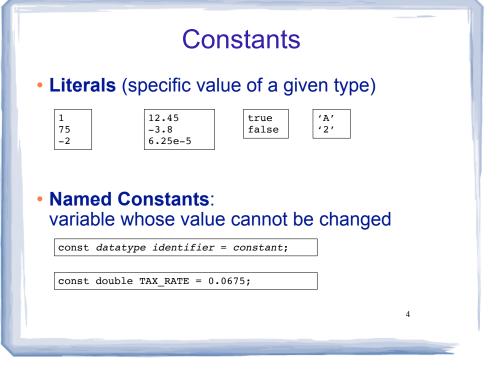


3

Variables, Data Types

- Variable: portion of memory that stores a value
- Identifier: name of a program element
- Fundamental data types





2

Assignment statement, expressions

• To change the value of a variable:

variable = expression;

count = 10;

- * The lefthand side must be a variable
- * The righthand side is an *expression* of the right type
- What is an expression?
 - * an expression has a type and evaluates to a value
 - literal
 - named constant
 - variable
 - arithmetic expression
 - etc.

Arithmetic and Relational Operations

arithmetic operators:

- + addition
- subtraction
- * multiplication/ division
- % modulo

Watchout: Integer division!!

x + 10 7 % 2

8 + 5 * 10

25

relational operators (result is bool):

| == Equal to | |
|---|---------------------------|
| Equal to Not equal to Greater than Less than | 7 < 89 = x % 8 + |
| >= Greater than or equal to | |
| <= Less than or equal to | |
| | |

== x 2 != 0 5 * 10 <=100 * n

THQ1

6

Logical Operations, precedence

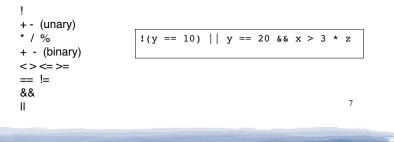
logical operators (values and results are bool):

! not && and II or

| ſ | x < 10 && x > 0 |
|---|---|
| | x < 10 && x > 0 y == 10 y == 20 ! (a == b) |
| L | :(u = b) |

5

• operator precedence (which happens first?):



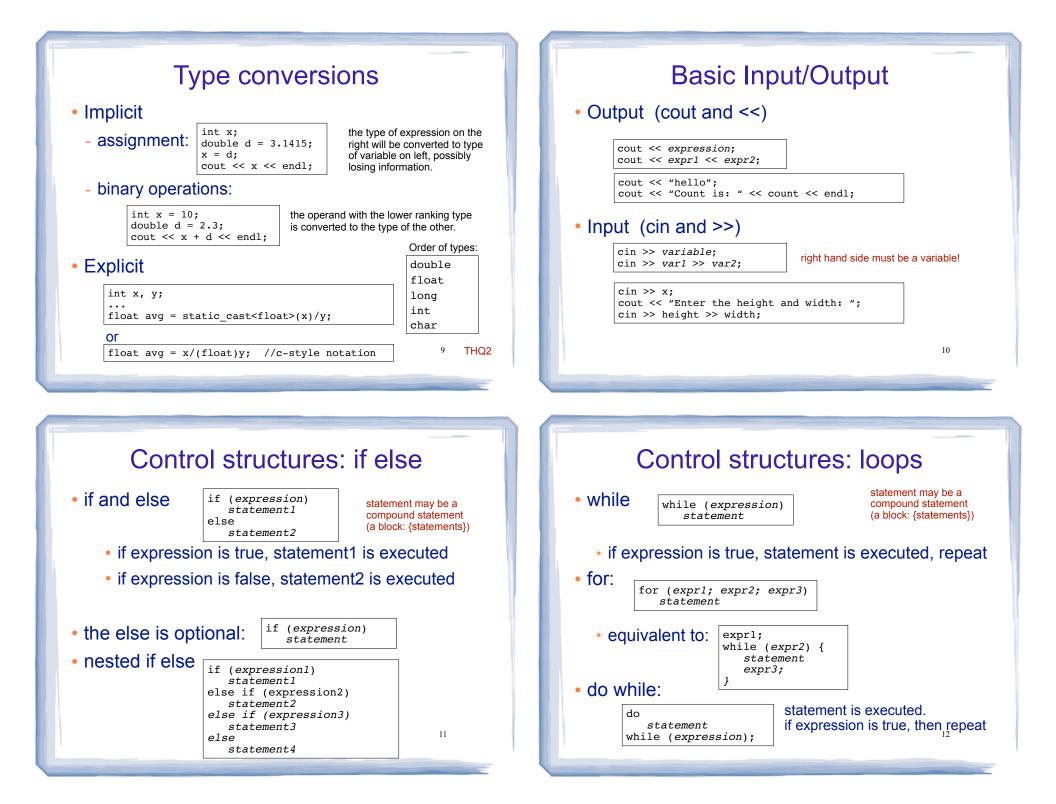
More assignment statements

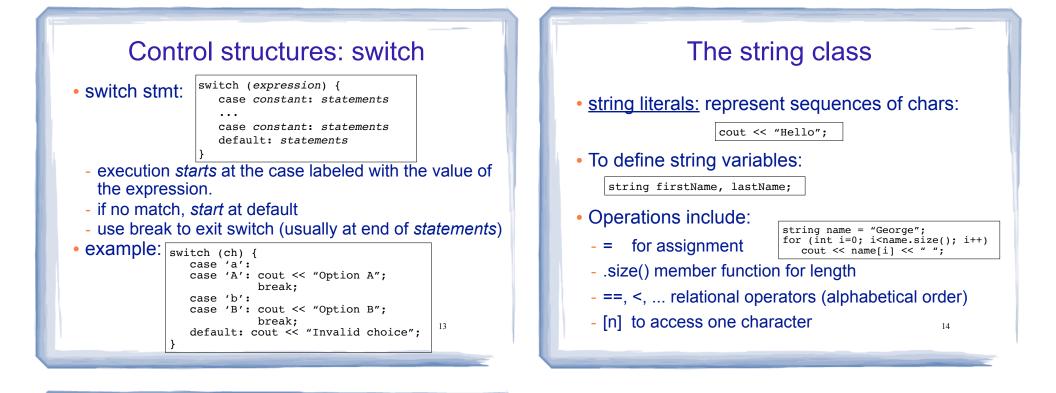
Compound assignment

| operator | usage | equivalent syntax: |
|----------|---------|--------------------|
| += | x += e; | x = x + e; |
| -= | x -= e; | x = x - e; |
| *= | x *= e; | x = x * e; |
| /= | x /= e; | x = x / e; |

increment, decrement

| operator | usage | equivalent syntax: |
|----------|-----------|--------------------|
| ++ | x++; ++x; | x = x + 1; |
| | x;x; | x = x - 1; |





File Input/Output

- #include <fstream>
- Output (ofstream)

```
ofstream fout;
fout.open("filename.txt");
fout << "hello";
fout << "Count is: " << count << endl;
fout.close();
```

```
    Input (ifstream)
```

```
ifstream fin;
fin.open("data.txt");
if (!fin) { Check for file open errors
    cout << "error opening file" << endl;
    return (0);
}
int x;
fin >> x; right hand side must be a variable!
cout << "x is " << x << endl;
fin.close();
```