C++ VARIABLES, I/O, CONTROL FLOW TOOLS: GIT

Problem Solving with Computers-I
Chapter 1 and Chapter 2

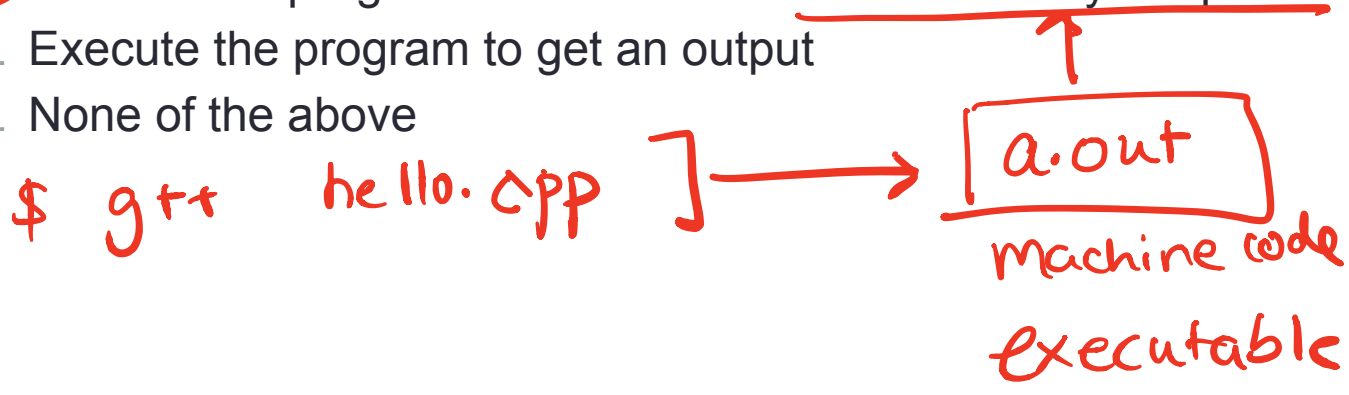
CLICKERS OUT

Review: Program compilation

freq AC

What does it mean to "compile" a C++ program?

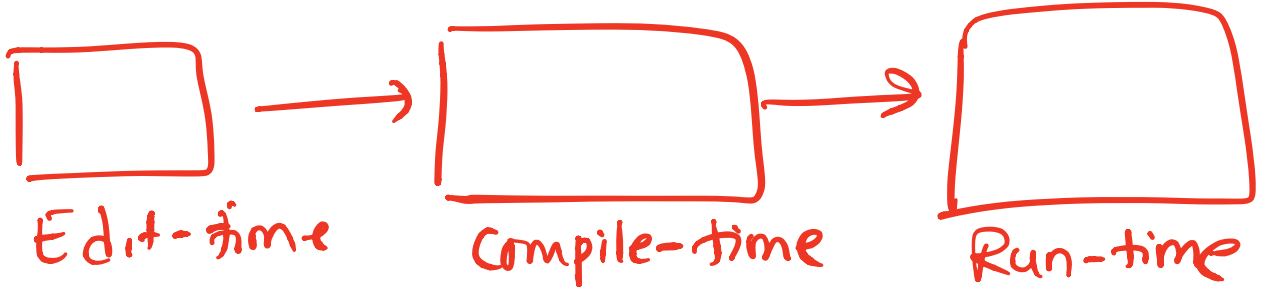
A. Write the implementation of the program in a .cpp file
B. Convert the program into a form understandable by the processor
C. Execute the program to get an output
D. None of the above



Review: Kinds of errors

Which of the following types of errors is produced if our program divides a number by 0?

A. Compile-time error
B. Run-time error
C. Both A and B
D. Neither A or B



Review: C++ Variables and Datatypes

- **Variables** are containers to store data
- **C++** variables must be “declared” before they are used by specifying a datatype
  - `int`: Integers
  - `double`: floating point numbers
  - `char`: characters
  - `string`: sequence of characters e.g. “apple”

Naming variables

- **Variable names must:**
  - Start with an alphabet (a-z, A-Z) or underscore(_)
  - Other characters can be alphanumeric and underscore characters
  - No spaces or other special characters.
- **C++ is case-sensitive**
  - ‘x’ and ‘X’ are considered different variables.

C++ Uninitialized Variables

- Value of uninitialized variables is “undefined”
- Undefined means “anything goes”
- Can be a source of tricky bugs

- What is the output of the code below?

```
int main() {
    int a, b;
    cout<<"The sum of "<< a << " and " << b<< " is:"<< a+b<<endl;
    return 0;
}
```

Variable Assignment

- The values of variables can be initialized...

```
int myVariable = 0;
```

-or-

```
int myVariable;
myVariable = 0;
```

- ...or changed on the fly...

```
int myVariable = 0;
myVariable = 5 + 2;
```

Variable Assignment

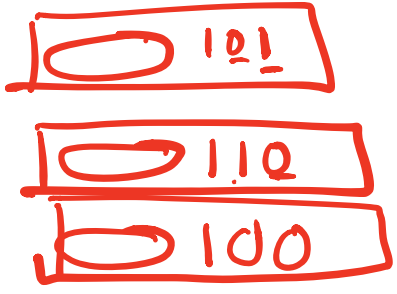
- ...or even be used to update the same variable!

```
int myVariable = 0;
myVariable = 5 + 2;
myVariable = 10 - myVariable;
myVariable = myVariable==0;
```

Logical operators
&&
||
!

Bitwise operators
&, |, !

```
int x = 5;
int y = 6
int z1 = x&y; //z1=4
int z2 = x||y; //z2=1
```



C++ types in expressions

```
int i =10;
double sum = 1/i;
```

What is printed by the above code?

A. 0

B. 0.1

C. 1

D. None of the above

Boolean Expressions

- An expression that evaluates to either true or false.
- You can build boolean expressions with relational operators comparing values:

```
==   // true if two values are equivalent
!=   // true if two values are not equivalent
<    // true if left value is less than the right value
<=   // true if left value is less than OR EQUAL to the right value
>    // true if left value is greater than the right value
>=   // true if left value is greater than OR EQUAL to the right value
```

- **In C++, 0 or empty string (“”) evaluate to a false**
- **Everything else evaluates to true**

Boolean Expressions

- Integer values can be used as boolean values
- C++ will treat the number 0 as false and any non-zero number as true.

```
bool x = 5 == 1;  // x = 0
bool x = 3 != 2;  // x = 1
```

- Combine boolean expressions using Logical Operators

```
!     // inverts true to false or false to true
&&  // boolean AND
||    // boolean OR
```

- Example

```
bool x = true;
bool y = true;
x = !x;          // x = false
x = x && y    // x = false
x = x || y      // x = true
```

Control flow: if statement

- The `condition` is a **Boolean expression**
- These can use relational operators

```
if ( Boolean expression) {
  // statement 1;
  // statement 2;
}
```

Examples of if statements

- The `condition` is a **Boolean expression**
- These can use relational operators

```
if ( 1 < 2 ) {
  cout<< “foo” ;
}

if ( 2 == 3) {
  cout<<“foo” ;
}
```

Use the curly braces even if you have a single statement in your if

Fill in the ‘if’ condition to detect numbers divisible by 3

A. `x/3 == 0`

B. `!(x%3)`

C. `x%3 == 0`

D. Either B or C

E. None of the above

```
if ( _________ )
   cout<< x << “is divisible by 3 \n” ;
}
```

Control Flow: if-else

```
if (x > 0){
    pet = dog;
    count++;
}   else {
    pet = cat;
    count++;
}
```

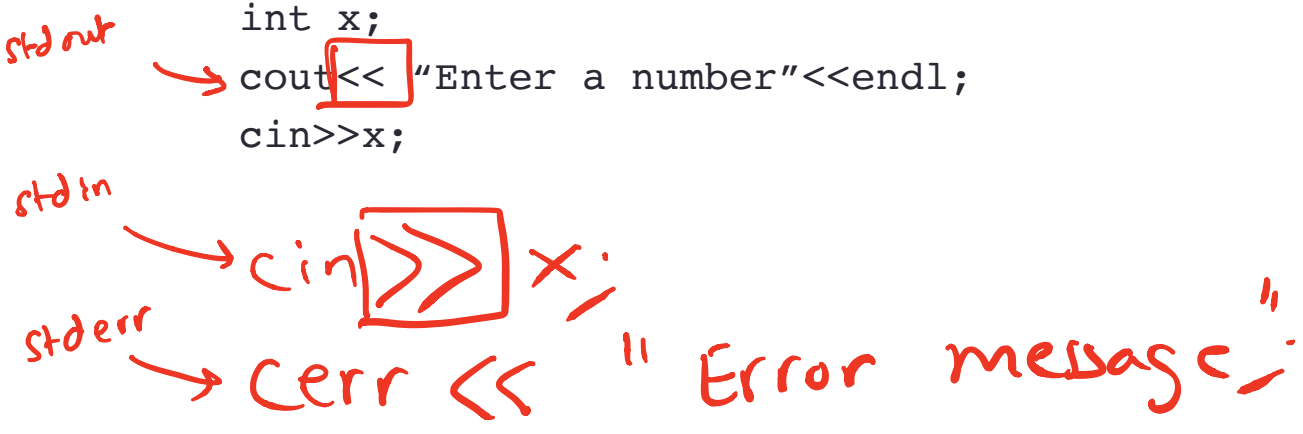
This line will be executed irrespective of the value of x. Take it out of the if-else

- Can you write this code in a more compact way?

Input from user (using cin)

- Input streams: stdin (standard input)
- Output streams: stdout (standard output) and stderr (standard error)

```
int x;
cout<< "Enter a number"<<endl;
cin>>x;
```



Let's code Fizzbuzz -1.0

$ Enter a number: 1
1
$ Enter a number: 2
2
$ Enter a number: 3
fizz
$ Enter a number: 4
4

$Enter a number: 5
5
$Enter a number: 6
fizz
$Enter a number: 7
7
$Enter a number: 15
fizz

Control Flow: Multiway if-else

```
if (x > 100){
    pet = dog;
    count++;
}   else if (x > 90){
    pet = cat;
    count++;
}   else {
    pet = owl;
    count++;
}
```

- Can you write this code in a more compact way?

Let's code Fizzbuzz -2.0

$ Enter a number: 1
1
$ Enter a number: 2
2
$ Enter a number: 3
fizz
$ Enter a number: 4
4

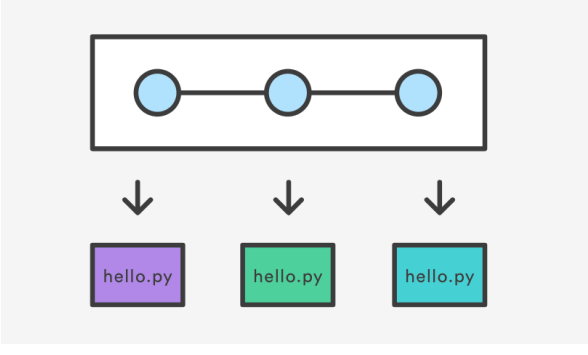
$Enter a number: 5
Buzz
$Enter a number: 6
fizz
$Enter a number: 7
7
$Enter a number: 15
fizz buzz

What is git?

Git is a version control system (VCS).

A VCS allows you to keep track of changes in a file (or groups of files) over time

Git allows you to store code on different computers and keep all these different copies in sync



Git Concepts

repo (short for repository): a place where all your code and its history is stored

Remote repo: A repo that exists on the web (in our case github.com)

In class demo

- creating a repo on github.com
- adding collaborators to the repo
- adding files to the repo
- Updating files in a remote repo using a web browser
- Viewing the version history

Vim survival skills

- Learn the basic 8: https://ucsb-cs16.github.io/topics/vim_basic_eight/
- Open a new file: vim <filename>
    1. Quit without saving
    2. Enter code
    3. Save, Save and quit
    4. Copy paste, cut and paste
    5. Search, Search and replace
    6. Show line numbers
    7. Go to a line number
    8. Save as

Next time

- Functions and loops