Computer Science: Create Your Own RPG Day #5

OPPTAG Explorations 2014

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- Another way to say this is that A is B's child, and B is A's parent.
- We can also say that A is derived from B, inheriting B's methods.
- A subclass can use any of the methods of its parent class.
- A class can only extend one other class. However, a class can extend a class that extends another class that... etc.
- To access the methods of a parent class, use the keyword `super`.

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- Both the student and the teacher are persons. Thus they can do anything other persons can do.
- When a teacher works, she or he creates homework. When a student does work, she or he finishes homework.
- All classes *descend* from the Object class. This means all objects have inherited the methods from the Object class. Furthermore, in a way null descends from all classes, though it does not contain any methods.

Different Persons

```
public class Person{
    public void work(){}
}

public class Teacher extends Person{
    public void work(){
    //Create Homework Here
    }
}

public class Student  extends Person{
    public void work(){
    //Finish Homework Here
    }
}
```

Why Bother?

Using classes, subclasses, and hierarchies of objects simplifies our code by making it 1. shorter and 2. organizing it by type.

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- Abstract classes can have both normal methods (the ones we are used to), as well as abstract methods. Abstract methods *have to* be overriden by the subclass.
- Since the methods must be seen by subclasses in order to be overriden, they cannot be private.
- To declare an abstract method, you use the abstract keyword followed by the method declaration followed by a semicolon:

```
abstract public void collision(SimpleObject
                               s);
```

Sneak Peak #4

```
public abstract class SimpleObject {
    protected final int[] off =  0, 0 ;
    abstract public void collision(SimpleObject s);
    abstract public void update();
    abstract public char id();
    public String getInfo(){
        return "";
    }
    public SimpleObject getCopy(String s){
        return null;
    }
```

...

Interfaces

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- Like an abstract class, an *interface* must be *implemented* by a subclass.
- Unlike an abstract class, interfaces *only* contains empty methods that must be overriden, and they only contain static final variables.
- The keyword *final* makes a variable constant. Final variables cannot change
- However, interfaces are useful since you can *implement* more than one.
- When we access objects through shared methods of a parent class or an interface, we call that (inclusion) *polymorphism*.

The KeyListener Class

```
public interface KeyListener extends EventListener {

    public void keyTyped(KeyEvent e);

    public void keyPressed(KeyEvent e);

    public void keyReleased(KeyEvent e);
}
```

Interfaces can extend (not implement) other interfaces.
Interfaces cannot extend classes.

Find the Abstract Class Errors!

```
public abstract class animal {
    abstract int population = 0;

    private abstract void eat(food f);
    public abstract static void sleep();
    protected int getPopulation();
    public abstract void makeNoise(int noise);

    private void sayHello(){
       System.out.println("I am an animal!");
    }
    public abstract void move(){
       //Move code here...
    }
}
```

Find the Interface Errors!

```
public interface updateListener implements updater {

    public final FASTUPDATE = 5;
    String s;

    public abstract void updateEvent1(int updateID);
    private void autoUpdate();
    public voidupdateEvent2(int updateID);
}
```

Find the Interface Errors!

```
public interface updateListener implements updater {

    public final FASTUPDATE = 5;
    String s;

    public abstract void updateEvent1(int updateID);
    private void autoUpdate();
    public voidupdateEvent2(int updateID);
}
```

If we fixed all the errors in the above code, what methods would a class that implements updateListener have to override?

Introduction

- So far we know the following operators for integers: `+`, `-`, `*`, `/`, `%`, and `=`.
- In addition to these there are bitwise operators: `^`, `&`, `|`, `~`, `>>`, `>>>`, and `<<`.
- Finally there is one *ternary* operator `?:`. It is shorthand for an if else statement.

XOR and AND

- Exclusive OR or XOR(^) outputs a '1' if one bit is a '1' and the other is a '0':

```
11001101
10010100
01011001
```

XOR and AND

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```
11001101
10010100
01011001
```

- AND(&) outputs a '1' if both bits are a '1':

```
01100110
10101010
00100010
```

OR and NOT

- OR(|) outputs a '1' if at least one bit is a '1':

```
10001101
10100100
10101101
```

OR and NOT

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```
10001101
10100100
10101101
```

- NOT(~) "flips" the bits:

```
10011010
01100101
```

Bit Shift

- Shift-left(<<) moves all bits to the left padding with a '0': (shifting by 1)

```
10011011
00110110
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- Shift-left(<<) moves all bits to the left padding with a '0': (shifting by 1)

  10011011
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- Logical Shift-right(>>) and Arithmetic Shift-right(>>>) moves all bits to the right. Logical shift right pads with a '0' while arithmetic shift copies the leading bit: (shifting by 1)

  01001101
  00101010

Playing with Bitwise Operators

```
public class Bits {

    public static int a = 5;
    public static int b = 27;
    public static int c = 17;
    public static int d = 14;

    public static void calculate(){
        int e = b & c;
        int f = b | c;
        int g = b >> 1;
        int h = d & (~ c);
        int i = a ^ b;
        int j = b << 3;
        int k = b & ((c | d) >> 2);
        int l = ((~a) & c) ^ ((~b) & d);
        int m = (a << (a - 1)) ^ b;
    }
}
```

What is a in binary?

Playing with Bitwise Operators

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public class Bits {

    public static int a = 5;
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        int l = ((~a) & c) ^ ((~b) & d);
        int m = (a << (a - 1)) ^ b;
    }
}
```

What is b in binary?

Playing with Bitwise Operators

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public class Bits {

    public static int a = 5;
    public static int b = 27;
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    public static int d = 14;

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        int k = b & ((c | d) >> 2);
        int l = ((~a) & c) ^ ((~b) & d);
        int m = (a << (a - 1)) ^ b;
    }
}
```

What is c in binary?

Playing with Bitwise Operators

```
public class Bits {

    public static int a = 5;
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    public static int d = 14;

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        int e = b & c;
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        int j = b << 3;
        int k = b & ((c | d) >> 2);
        int l = ((~a) & c) ^ ((~b) & d);
        int m = (a << (a - 1)) ^ b;
    }
}
```

What is d in binary?

Playing with Bitwise Operators

```
public class Bits {

    public static int a = 5;
    public static int b = 27;
    public static int c = 17;
    public static int d = 14;

    public static void calculate(){
        int e = b & c;
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        int k = b & ((c | d) >> 2);
        int l = ((~a) & c) ^ ((~b) & d);
        int m = (a << (a - 1)) ^ b;
    }
}
```

What is e in binary?

Playing with Bitwise Operators

```
public class Bits {

    public static int a = 5;
    public static int b = 27;
    public static int c = 17;
    public static int d = 14;

    public static void calculate(){
        int e = b & c;
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        int g = b >> 1;
        int h = d & (~ c);
        int i = a ^ b;
        int j = b << 3;
        int k = b & ((c | d) >> 2);
        int l = ((~a) & c) ^ ((~b) & d);
        int m = (a << (a - 1)) ^ b;
    }
}
```

What is f in binary?

Playing with Bitwise Operators

```
public class Bits {

    public static int a = 5;
    public static int b = 27;
    public static int c = 17;
    public static int d = 14;

    public static void calculate(){
        int e = b & c;
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        int i = a ^ b;
        int j = b << 3;
        int k = b & ((c | d) >> 2);
        int l = ((~a) & c) ^ ((~b) & d);
        int m = (a << (a - 1)) ^ b;
    }
}
```

What is g in binary?

Playing with Bitwise Operators

```
public class Bits {

    public static int a = 5;
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    public static int d = 14;

    public static void calculate(){
        int e = b & c;
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        int i = a ^ b;
        int j = b << 3;
        int k = b & ((c | d) >> 2);
        int l = ((~a) & c) ^ ((~b) & d);
        int m = (a << (a - 1)) ^ b;
    }
}
```

What is h in binary?

Playing with Bitwise Operators

```
public class Bits {

    public static int a = 5;
    public static int b = 27;
    public static int c = 17;
    public static int d = 14;

    public static void calculate(){
        int e = b & c;
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        int i = a ^ b;
        int j = b << 3;
        int k = b & ((c | d) >> 2);
        int l = ((~a) & c) ^ ((~b) & d);
        int m = (a << (a - 1)) ^ b;
    }
}
```

What is i in binary?

Playing with Bitwise Operators

```
public class Bits {

    public static int a = 5;
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    public static void calculate(){
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        int j = b << 3;
        int k = b & ((c | d) >> 2);
        int l = ((~a) & c) ^ ((~b) & d);
        int m = (a << (a - 1)) ^ b;
    }
}
```

What is j in binary?

Playing with Bitwise Operators

```
public class Bits {

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    public static int c = 17;
    public static int d = 14;

    public static void calculate(){
        int e = b & c;
        int f = b | c;
        int g = b >> 1;
        int h = d & (~ c);
        int i = a ^ b;
        int j = b << 3;
        int k = b & ((c | d) >> 2);
        int l = ((~a) & c) ^ ((~b) & d);
        int m = (a << (a - 1)) ^ b;
    }
}
```

What is k in binary?

Playing with Bitwise Operators

```
public class Bits {

    public static int a = 5;
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    public static int c = 17;
    public static int d = 14;

    public static void calculate(){
        int e = b & c;
        int f = b | c;
        int g = b >> 1;
        int h = d & (~ c);
        int i = a ^ b;
        int j = b << 3;
        int k = b & ((c | d) >> 2);
        int l = ((~a) & c) ^ ((~b) & d);
        int m = (a << (a - 1)) ^ b;
    }
}
```

What is l in binary?

Playing with Bitwise Operators

```
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    public static int c = 17;
    public static int d = 14;

    public static void calculate(){
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        int g = b >> 1;
        int h = d & (~ c);
        int i = a ^ b;
        int j = b << 3;
        int k = b & ((c | d) >> 2);
        int l = ((~a) & c) ^ ((~b) & d);
        int m = (a << (a - 1)) ^ b;
    }
}
```

What is m in binary?

Last Chance for Points

Define the following keywords:

public

Last Chance for Points

Define the following keywords:

public
final

Last Chance for Points

Define the following keywords:

public
final
static

Last Chance for Points

Define the following keywords:

public
final
static
private

Last Chance for Points

Define the following keywords:

public
final
static
private
protected

Last Chance for Points

Define the following keywords:

public
final
static
private
protected
void

Last Chance for Points

Define the following keywords:

public
final
static
private
protected
void
abstract

Last Chance for Points

Define the following keywords:

public
final
static
private
protected
void
abstract
class

Last Chance for Points

Define the following keywords:

public
final
static
private
protected
void
abstract
class
interface

Last Chance for Points

Define the following keywords:

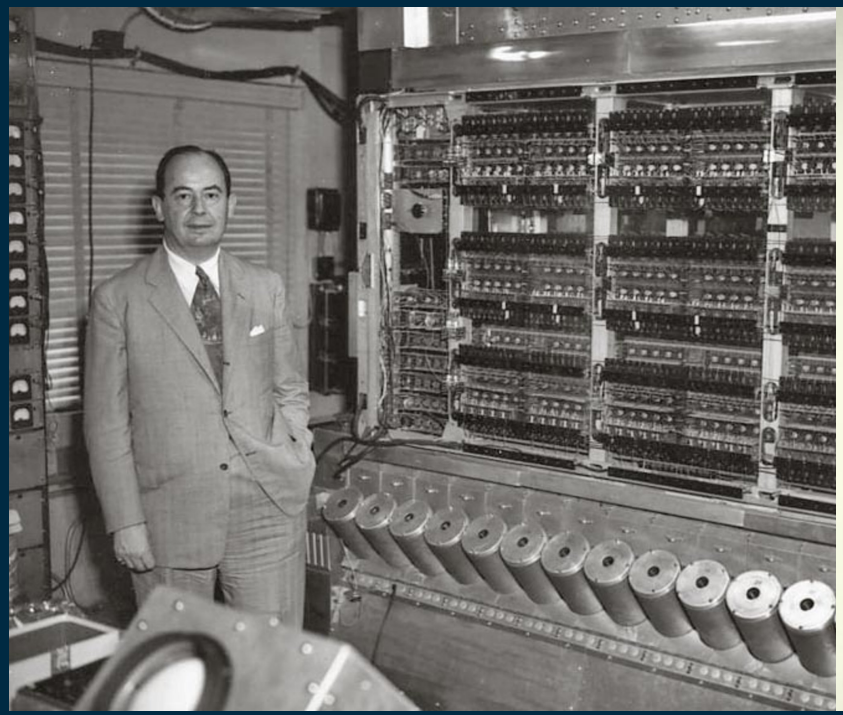
public
final
static
private
protected
void
abstract
class
interface
implements

Last Chance for Points

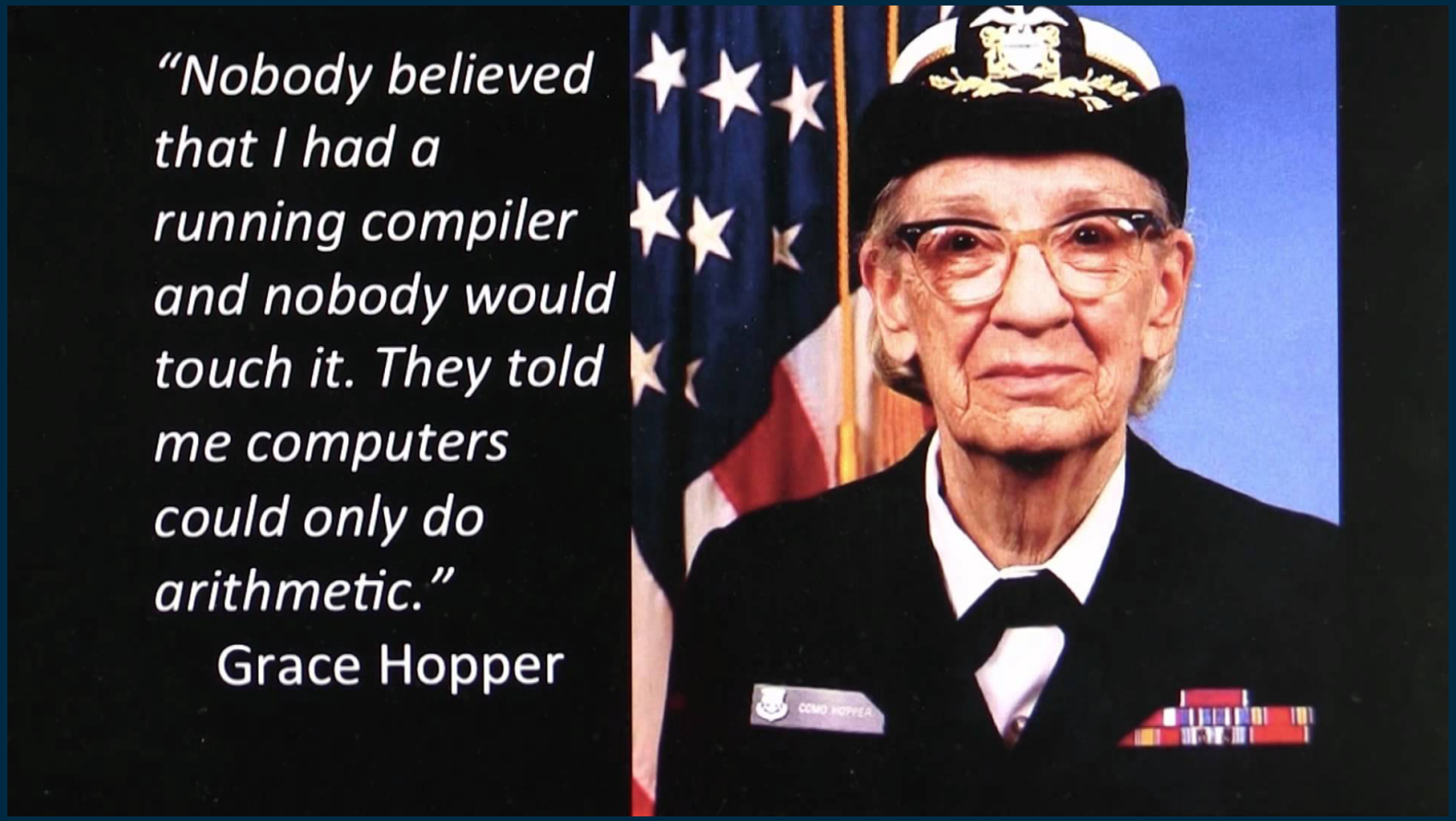
Define the following keywords:

public
final
static
private
protected
void
abstract
class
interface
implements
extends

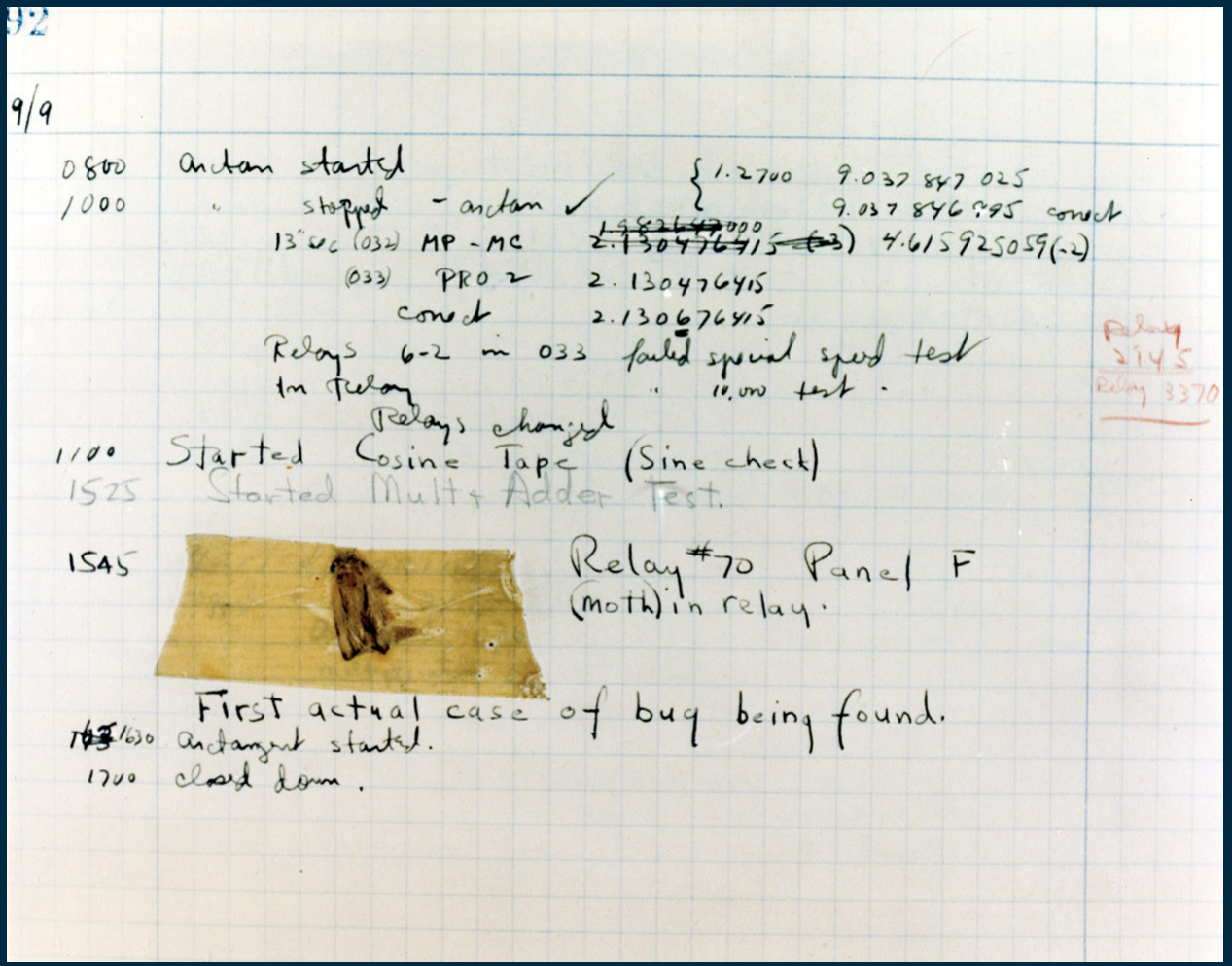
Jon von Neumann and Alonzo Church



Grace Hopper

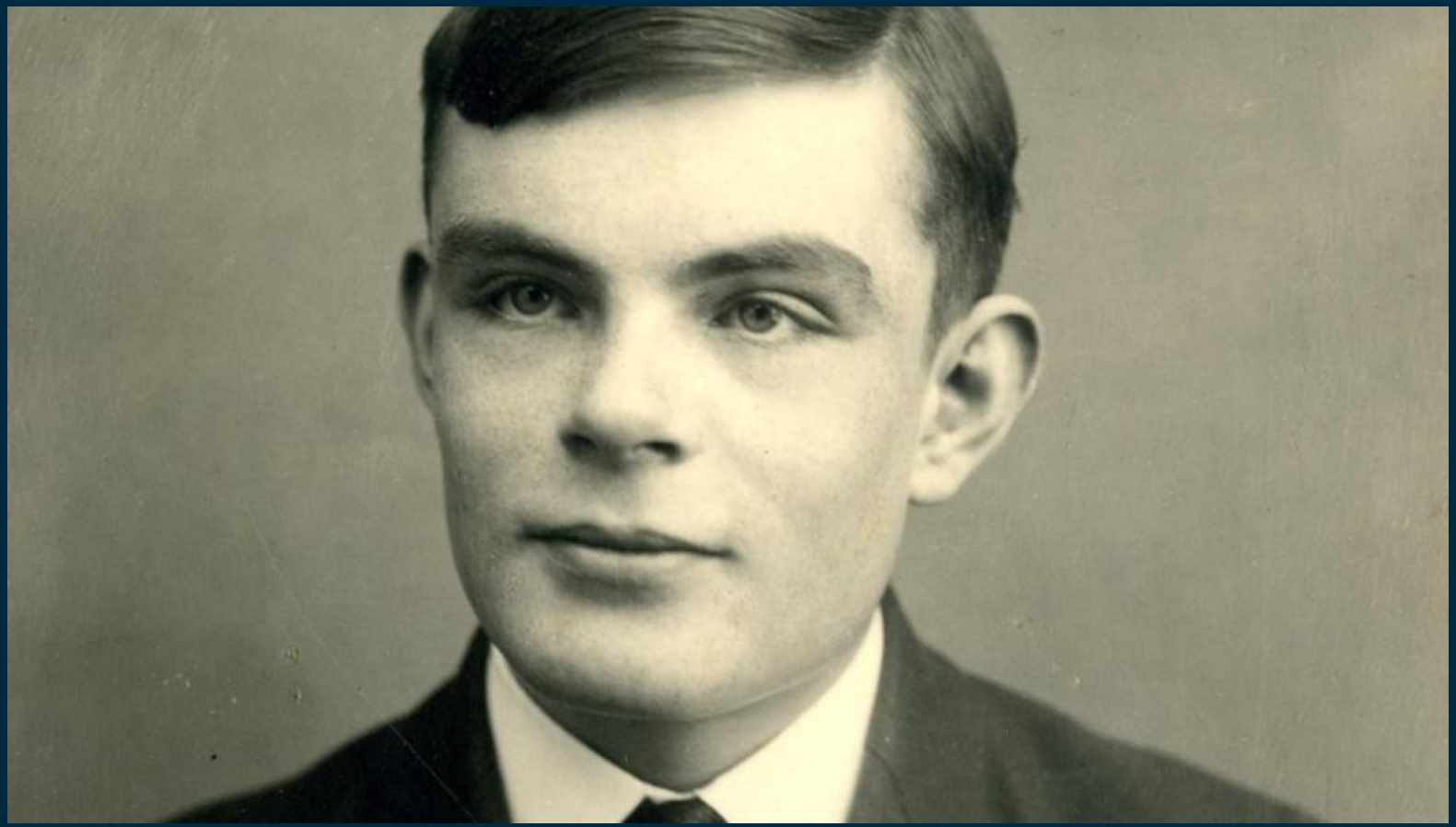


Grace Hopper



Grace Hopper

Alan Turing



Alan Turing

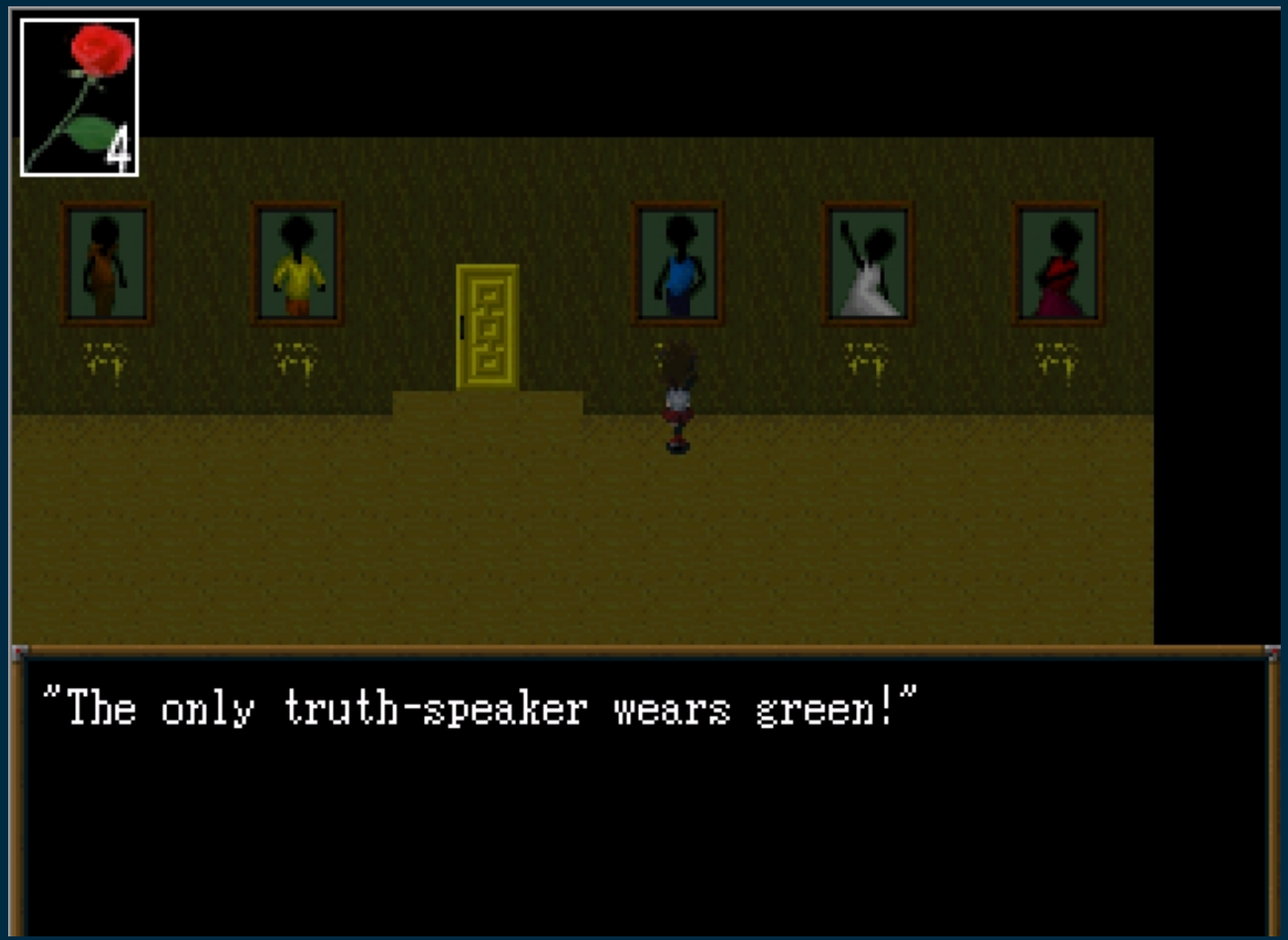
Ada Lovelace

Ada Lovelace

Ada Lovelace

Ada Lovelace

Ib



Yume Nikki

Voxatron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PLAY
EDITOR
OPTIONS
EXIT

Voxatron