1.1 Hello, World

› why programming?
› your first program
› program development
1.1 Hello, World

- why programming?
- your first program
- program development
A human being should be able to
change a diaper,
plan an invasion,
butcher a hog,
conn a ship,
design a building,
write a sonnet,
balance accounts,
build a wall,
set a bone,
comfort the dying,
take orders,
give orders,
cooperate,
act alone,
solve equations,
analyze a new problem,
pitch manure,
program a computer,
cook a tasty meal,
fight efficiently,
die gallantly.
You need to know how to program

Prepackaged solutions (apps). Great when what they do is what you want.

Programming. Empowers you to tell a computer what you want it to do.

Analytical Engine (first computer)  Ada Lovelace (first programmer)
Telling a computer what to do

**Machine languages.** Easy for computers; error-prone for people.

```
0011111100100001100101101100110110110011011001101100110011100011101111100111011101111001
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11101110111101111000111001000110011100001010010001010111011001011001000101011100100
1000101100001100110010011000011010100110000111000110110100011111111110000110011000011
```

**Natural languages.** Easy for people; error-prone for computers.

**High-level programming languages.** Enables people and computers to communicate effectively.

*rapid progress in past year (but not as robust as desired)*
This course: Java

Java features.
- Embraces full set of modern abstractions.
- Freely available for OS X, Windows, and Linux.
- Variety of automatic checks for mistakes in programs.
- Widely used: millions of developers; billions of devices.

Ex. Android phones/TVs, web servers, Mars rover, medical devices, internet of things, ...

Reality. Use different programming languages, depending on domain.

among top 3 languages for past two decades
A rich subset of the Java language

Your programs will primarily consist of these plus identifiers (names) that you make up.

### data types
- int
- double
- boolean
- char
- String

### arithmetic
- +
- -
- *
- /
- %

### boolean
- true
- false

### type conversion
- Integer.parseInt()
- Double.parseDouble()

### punctuation
- {
- }
- ()
- ,
- ;

### comparisons
- <
- >
- <=
- >=
- ==
- !=

### arrays
- [
- ]

### flow control
- if
- else
- while
- for
- do
- return
- break
- continue

### Math library
- Math.min()
- Math.max()
- Math.sqrt()
- Math.abs()
- Math.log()
- Math.exp()
- Math.sin()
- Math.cos()
- Math.PI
- Math.E

### objects / methods
- public
- private
- class
- new
- static
- final
- void
- main()
- compareTo()
- toString()

### strings
- +
- length()
- charAt()

### comments
- /* */
- //

### our I/O libraries
- StdIn/In
- StdOut/Out
- StdPicture/Picture
- StdDraw/Draw
- StdAudio

seems like a lot, but typical English vocabulary is 20K words!
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Anatomy of your first Java program

A text file named `HelloWorld.java` contains the following Java code:

```java
public class HelloWorld {
    // prints "Hello, World"
    public static void main(String[] args) {
        System.out.println("Hello, World");
    }
}
```

To compile the program:

```
~/cos126/hello> javac HelloWorld.java
```

To execute (run) the program:

```
~/cos126/hello> java HelloWorld
```

The program output is:

```
Hello, World
```
Anatomy of your first few Java programs

- **Program name** (must match filename)

```java
public class MyProgram {
    // prints, plays, or draws something
    public static void main(String[] args) {
        ...
        ...
    }
}
```

- **Main method**

```bash
~/cos126/hello> javac MyProgram.java
~/cos126/hello> java MyProgram
[program output]
```

- **Don't worry, we'll learn about these in due time**
Hello World with audio

Standard audio. Our course library for playing sound.

```java
public class HelloWorldWithAudio {
    // prints and speaks "Hello, World"
    public static void main(String[] args) {
        System.out.println("Hello, World");
        StdAudio.play("HelloWorld.wav");
    }
}
```

```
~/cos126/hello> javac-introcs HelloWorldWithAudio.java
~/cos126/hello> java-introcs HelloWorldWithAudio
Hello, World
[speaks "Hello, World"]
```

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1.1 Hello, World

- why programming?
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Program development in Java

Developing a Java program involves three steps:

- **Edit:** write your program.
- **Compile:** create a “machine-language” version of your program.
- **Execute:** run your program, taking input and producing output.

Almost always requires cyclic refinement:

- **Not a legal Java program (compile-time error)** ⇒ need to re-edit.
- **A legal Java program that does the wrong thing** ⇒ need to re-edit.

analogous to other creative processes (compose-rehearse-play)
Coding style

Coding style. Indentation, whitespace, naming conventions, comments, ...

Goal. Make it easier for programmers (including you!) to read and understand the code.

textbook

Program 1.1.1  Hello, World

public class HelloWorld
{
    public static void main(String[] args)
    {
        // Prints "Hello, World" in the terminal window.
        System.out.println("Hello, World");
    }
}

compiler

public class HelloWorld { public static void main ( String [] args { System . out . println ( "Hello, World" ); } }
YOU’RE NOW READY TO PROGRAM!
More questions

attend office hours (or stay after lecture)
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