

Primitive Types & Using Objects

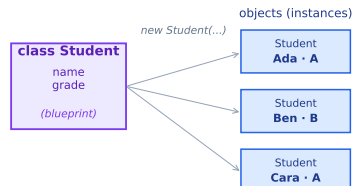
AP Computer Science A ■ Unit 1

AP Computer Science A

```
int x = 5;
```

What we will cover

- 1 Programs & compilers
- 2 Variables & data types
- 3 Expressions & casting
- 4 Methods & the Math class
- 5 Objects & strings

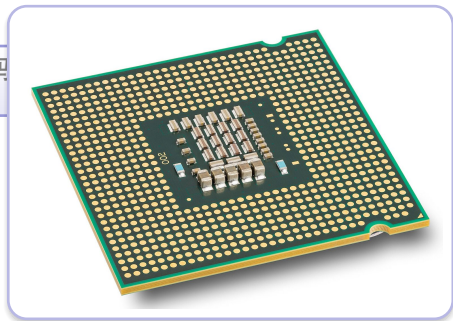


a class and its objects

From source code to running program



An **algorithm** 算法 is a step-by-step plan; a **program** 程序 is that plan in a **programming language** 编程语言 like Java. The compiler turns human-readable source into **bytecode** the JVM runs.



cpu chips

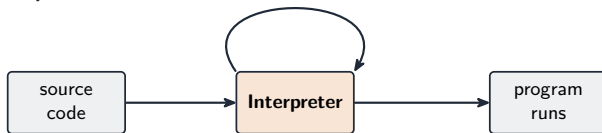
From source code to running program

Compiler — translate the whole program once



translated once; the machine code then runs many times

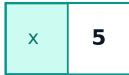
Interpreter — one line at a time



reads, translates and runs one line at a time (every run); stops at the first error

Variables & primitive types

primitive

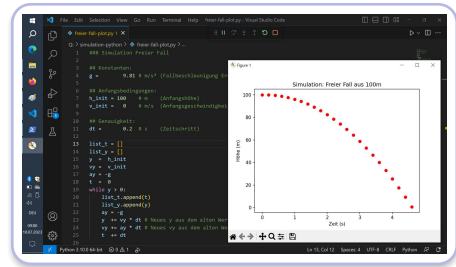


holds the value directly

reference



holds an arrow to the object



java code

Variables & primitive types

<i>type</i>	<i>stores</i>	<i>example</i>
int	whole number	7
double	decimal number	3.5
char	one character	'A'
String	text (a sequence of	"hello"
boolean	true or false	true

Expressions, casting & range

An **expression** 表达式 combines values with **operators** 运算符 (+ - * / %), following order of operations.

Integer division & casting

7 / 2 is 3 (integer division drops the remainder); 7 % 2 is 1.

Cast 类型转换 to get a decimal: (double) 7 / 2 is 3.5. A value too big for its type causes **overflow** 溢出.

Compound assignment 复合赋值: `x += 3` means `x = x + 3`.

Methods, the API & the Math class

A **method** 方法 is named, reusable code. Its **signature** 方法签名 is its name, parameters & return type.

API 应用程序接口 & libraries 库

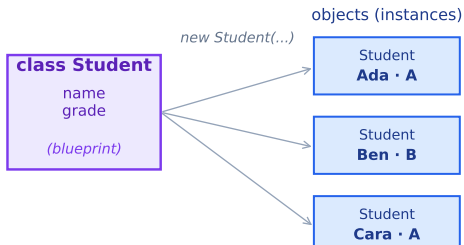
documentation of ready-made classes to reuse

Math class

`Math.sqrt(9)`, `Math.pow`,
`Math.random()`

A **comment** 注释 (`// ...`) documents code for humans; the compiler ignores it.

Objects: instances of classes



A **class** 类 is a blueprint; an **object** 对象 is a built **instance** 实例.

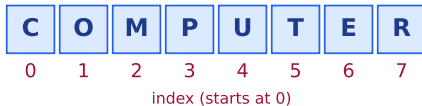
Instantiate 实例化 with `new`:

```
Scanner s = new Scanner(...);
```

Call **instance methods** 实例方法 on an object with the dot operator: `s.nextInt()`.

String manipulation

"COMPUTER".substring(0, 4) → "COMP"



A **String** 字符串 is an object – an ordered sequence of characters, indexed from **0**.

- `s.length()`
- `s.substring(0, 4)`
- `s.indexOf("x")`

Concatenate 拼接 with `+`: `"Hi, " + name`.

Key points

Java **source** → compiler
→ **bytecode** → JVM

Strongly typed: int,
double, boolean

$7/2=3$; **cast** for decimals; $x += 3$

A **class** is a blueprint;
an **object** is an instance

Worked example – the excluded endpoint

```
String s = "COMPUTER"; (indices 0–7)
```

```
s.length() → 8
```

```
s.substring(0, 4) → "COMP" (index 4  
is excluded)
```

```
s.substring(4) → "UTER" (index 4 to the  
end)
```

```
s.indexOf("PU") → 3
```

```
s.indexOf("X") → -1 (not found)
```

Miscounting substring's **excluded endpoint** is the single most common slip on this paper.

Check yourself

- 1 `"COMPUTER".substring(0,4)` gives what?
- 2 What does `indexOf` return when the string is absent?
- 3 Is `int` a primitive or a reference type?
- 4 What does the compiler turn source code into?

Answers 1. "COMP" 2. -1 3. primitive 4. bytecode, run by the JVM