

JAVA 快速参考

OOP、集合、Stream、异常处理摘要

基础

Hello World

```
public class Main {
    public static void main(String[] args) {
        System.out.println("Hello, World!");
    }
}
```

编译与运行

```
javac Main.java # compile
java Main # run
java Main.java # single-file (Java 11+)
```

命名约定

ClassName 类和接口用 PascalCase
methodName 方法和变量用 camelCase
CONSTANT_NAME 常量用 UPPER_SNAKE
com.example.pkg 包名用小写反向域名

数据类型

基本类型

byte 8 位有符号 (-128 到 127)
short 16 位有符号
int 32 位有符号 (默认整数)
long 64 位有符号 (后缀 L)
float 32 位 IEEE-754 (后缀 f)
double 64 位 IEEE-754 (默认小数)
boolean true / false
char 16 位 Unicode 字符

字符串

```
String s = "hello";
String joined = s + " world"; // concatenation
int len = s.length();
String sub = s.substring(0, 3); // "hel"
boolean eq = s.equals("hello"); // content equality
```

类型转换

```
int i = (int) 3.14; // narrowing cast
double d = i; // widening (auto)
int n = Integer.parseInt("42"); // string to int
String s = String.valueOf(42); // int to string
```

数组

```
int[] nums = {1, 2, 3};
String[] names = new String[5];
int[][] matrix = new int[3][4];
Arrays.sort(nums);
```

控制流

If / Else

```
if (x > 0) {
    System.out.println("positive");
} else if (x == 0) {
    System.out.println("zero");
} else {
    System.out.println("negative");
}
```

Switch

```
// Traditional
switch (day) {
    case "Mon": doWork(); break;
    case "Sat": case "Sun": rest(); break;
    default: routine();
}

// Switch expression (Java 14+)
String type = switch (day) {
    case "Sat", "Sun" -> "weekend";
    default -> "weekday";
};
```

循环

```
for (int i = 0; i < 10; i++) { }
for (String s : list) { }
while (condition) { }
do { } while (condition);
```

方法

定义

```
public static int add(int a, int b) {
    return a + b;
}
```

可变参数与重载

```
static int sum(int... nums) {
    int total = 0;
    for (int n : nums) total += n;
    return total;
}
// sum(1, 2) sum(1, 2, 3) both work
```

访问修饰符

public 任何地方可访问
protected 同包 + 子类
(default) 仅同包 (无关键字)
private 仅同类

类与对象

类定义

```
public class User {
    private String name;
    private int age;
    public User(String name, int age) {
        this.name = name;
        this.age = age;
    }
    public String getName() { return name; }
}
```

Record (Java 16+)

```
public record Point(double x, double y) {
    // auto: constructor, getters, equals, hashCode, toString
    public double distance() {
        return Math.sqrt(x * x + y * y);
    }
}
```

static 与 final

static 属于类而非实例
final field 初始化后不可再赋值
final method 不可被重写
final class 不可被继承

继承

extends

```
public class Animal {
    public void speak() { System.out.println("..."); }
}
public class Dog extends Animal {
    @Override
    public void speak() { System.out.println("Woof!"); }
}
```

抽象类

```
public abstract class Shape {
    abstract double area();
    abstract void describe() {
        System.out.println("Area: " + area());
    }
}
```

关键概念

super 调用父类构造器或方法
@Override 编译时重写检查
instanceof 运行时类型检查
sealed (17+) 限制可继承的类

接口

定义

```
public interface Printable {
    void print(); // abstract
    default String format() { // default method
        return toString();
    }
    static Printable of(String s) { // static method
        return () -> System.out.println(s);
    }
}
```

实现

```
public class Report implements Printable, Serializable {
    @Override
    public void print() {
        System.out.println("Report");
    }
}
```

函数式接口

Runnable `() -> void``
Supplier<T> `() -> T``
Consumer<T> `T -> void``
Function<T,R> `T -> R``
Predicate<T> `T -> boolean``
Comparator<T> `(T,T) -> int``

集合

List

```
List<String> list = new ArrayList<>();
list.add("a");
list.get(0); // "a"
list.size(); // 1
List<String> immutable = List.of("a", "b", "c");
```

Map

```
Map<String, Integer> map = new HashMap<>();
map.put("key", 42);
map.getOrDefault("key", 0); // 42
map.containsKey("key"); // true
map.forEach((k, v) -> { });
```

Set

```
Set<String> set = new HashSet<>();
set.add("a");
set.contains("a"); // true
Set<String> immutable = Set.of("a", "b", "c");
```

常用实现

ArrayList 可变数组, 随机访问快
LinkedList 双向链表, 插入/删除快
HashMap 哈希表, O(1) get/put
TreeMap 按键排序, O(log n)
HashSet 唯一元素, O(1) 查找
LinkedHashMap 保持插入顺序的 HashMap

异常处理

Try / Catch / Finally

```
try {
    int result = 10 / 0;
} catch (ArithmeticException e) {
    System.err.println(e.getMessage());
} finally {
    // always executes
}
```

Try-with-Resources

```
try (var reader = new BufferedReader(new FileReader(path))) {
    String line = reader.readLine();
} // auto-closes reader
```

异常层级

Throwable 所有错误和异常的根
Error 严重问题 (OutOfMemoryError)
Exception 受检异常 (必须处理)

RuntimeException 非受检异常 (NullPointerException, IndexOutOfBoundsException)

自定义异常

```
public class AppException extends Exception {
    public AppException(String msg) { super(msg); }
    public AppException(String msg, Throwable cause) {
        super(msg, cause);
    }
}
```

Stream 与 Lambda

Lambda 语法

```
Comparator<String> byLen = (a, b) -> a.length() - b.length();
Runnable task = () -> System.out.println("run");
Function<String, Integer> len = String::length; // method ref
```

Stream 管道

```
List<String> result = names.stream()
    .filter(n -> n.length() > 3)
    .map(String::toUpperCase)
    .sorted()
    .collect(Collectors.toList());
```

常用 Stream 操作

.filter(pred) 保留满足断言的元素
.map(func) 转换每个元素
.flatMap(func) 映射并展平嵌套 Stream
.sorted() 排序 (自然序或 Comparator)
.distinct() 去重
.limit(n) 取前 n 个元素
.collect() 终止: 收集到集合
.forEach() 终止: 对每个元素执行操作
.reduce() 终止: 合并为单个值
.count() 终止: 统计元素数量

泛型

泛型类与方法

```
public class Box<T> {
    private T value;
    public Box(T value) { this.value = value; }
    public T get() { return value; }
}
public static <T> List<T> listOf(T... items) {
    return List.of(items);
}
```

有界类型与通配符

<T extends Number> T 必须是 Number 或其子类
<T extends A & B> 多界 (类 + 接口)
<?> 未知类型 (只读)
<? extends T> 上界通配符 (生产者)
<? super T> 下界通配符 (消费者)

Optional 与现代 Java

Optional

```
Optional<String> opt = Optional.ofNullable(getValue());
String result = opt.orElse("default");
opt.ifPresent(v -> System.out.println(v));
String upper = opt.map(String::toUpperCase).orElse("");
```

文本块 (Java 15+)

```
String json = """
    {"name": "Alice", "age": 30 }
    """;
```

实用新特性

var (10+) 局部变量类型推断
record (16+) 不可变数据载体类
sealed (17+) 受限类层级
pattern matching (21+) instanceof 带自动转型
virtual threads (21+) 轻量线程 (Thread.ofVirtual())