■ Java Optional Made Simple (for Freshers)

1. What is Optional?

Think of Optional like a box that may or may not have something inside. It is used to avoid NullPointerException.

```
Optional<String> name = Optional.of("Madhu"); // box has "Madhu"
Optional<String> empty = Optional.empty();     // box is empty
```

2. How to Create Optional

```
Optional<String> o1 = Optional.of("Java");        // must not be null
Optional<String> o2 = Optional.ofNullable(null); // safe (can be empty)
Optional<String> o3 = Optional.empty();           // empty
```

3. How to Use Optional

3.1 Check if value is present

```
Optional<String> name = Optional.of("Spring Boot");

if (name.isPresent()) {
    System.out.println(name.get());  // prints Spring Boot
}
```

3.2 Use orElse

```
Optional<String> name = Optional.empty();
String result = name.orElse("Default Name");
System.out.println(result); // prints "Default Name"
```

3.3 Use orElseThrow

```
Optional<String> name = Optional.empty();
String result = name.orElseThrow(() -> new RuntimeException("Name not found"));
```

3.4 Use ifPresent

```
Optional<String> name = Optional.of("Spring");
name.ifPresent(n -> System.out.println("Hello " + n));
```

3.5 Transform with map

```
Optional<String> name = Optional.of("spring boot");
String upper = name.map(String::toUpperCase).orElse("No Value");
System.out.println(upper); // SPRING BOOT
```

4. Where is Optional used in Spring Boot?

4.1 Repository layer (Spring Data JPA)

```
interface UserRepo extends JpaRepository<User, Long> {
    Optional<User> findByEmail(String email);
}
```

4.2 Service layer

```
public User getUserById(Long id) {
    return repo.findById(id)
        .orElseThrow(() -> new RuntimeException("User not found"));
}
```

4.3 Controller layer

```
@GetMapping("/users/{id}")
public ResponseEntity<User> getUser(@PathVariable Long id) {
    return repo.findById(id)
        .map(ResponseEntity::ok)
        .orElseGet(() -> ResponseEntity.notFound().build());
}
```

5. ■ What NOT to do

- Don't use Optional in entity fields or DTOs → just use normal fields.
- Don't pass Optional as method parameter.
- Don't use Optional> → just use empty list.

6. Quick Cheat Sheet

Value may be missing → Optional
Get default if empty → orElse("default")
Throw error if empty → orElseThrow()
Do something if present → ifPresent(...)
Change value → map(...)