🧪 Section 1: Dart Basics

# 🎯 Objectives

By the end of this lab, students will be able to:

* Declare and use variables of different types.
* Understand null safety and nullable variables.
* Apply control structures (if, loops, switch).
* Define and call functions, including optional parameters and arrow syntax.

# 🔹 1. Variables, Types, and Null Safety

## 🧠 Concepts

* Dart is statically typed, but supports **type inference** with var.
* Variables can be **nullable** (String?) or **non-nullable** (String).
* Once declared, non-nullable variables cannot hold null values.

### 💡 Example

void main() {

int age = 25; // Non-nullable

double height = 1.75;

String name = 'Alice';

bool isStudent = true;

// Nullable variable

String? nickname;

nickname = null;

print('$name is $age years old, height: $height m');

print('Nickname: $nickname');

}

**Explanation:**  
Here nickname is declared as String?, which allows it to be null.  
If you remove the ?, the compiler will warn you.

### 🧩 Exercise 1.1

Create variables for:

* A product’s name (String)
* Its price (double)
* Its quantity (int)
* A nullable description (String?)

Then print a message like:

Product: Laptop (Qty: 2, Price: 1500.0) – Description: High-end gaming laptop

# 🔹 2. Control Structures

## 🧠 Concepts

Dart supports:

* **if / else** for conditional execution
* **for** and **while** loops for repetition
* **switch / case** for multi-way branching

### 💡 Example

void main() {

int score = 82;

if (score >= 90) {

print('Excellent');

} else if (score >= 75) {

print('Good');

} else {

print('Needs improvement');

}

for (int i = 1; i <= 3; i++) {

print('Attempt $i');

}

switch (score ~/ 10) {

case 10:

case 9:

print('Grade: A');

break;

case 8:

print('Grade: B');

break;

default:

print('Grade: C or below');

}

}

Explanation:

* ~/ does integer division (e.g., 82 ~/ 10 = 8).
* switch can group cases (9 and 10 → Grade A).
* Loops use standard C-style syntax.

### 🧩 Exercise 2.1

Write a Dart program that:

1. Declares a variable number = 7.
2. Prints:
   * "Even number" if it’s even,
   * "Odd number" otherwise.
3. Prints all numbers from 1 to number using a loop.

💡 *Hint:* Use for (int i = 1; i <= number; i++) { ... }

### 🧩 Exercise 2.2 (Challenge)

Ask the user (simulate using a variable) for a grade between 0–100.  
Use a switch statement to print:

* “A” for 90–100
* “B” for 80–89
* “C” for 70–79
* “F” for anything else

💡 Use score ~/ 10 as in the example.

# 🔹 3. Functions, Optional Parameters, and Arrow Syntax

## 🧠 Concepts

* Functions can have **positional** or **named** optional parameters.
* You can assign **default values**.
* Arrow syntax (=>) is shorthand for single-expression functions.

### 💡 Example

int add(int a, [int b = 0]) => a + b; // optional positional

void greet(String name, {String title = 'Mr./Ms.'}) {

print('Hello $title $name');

}

void main() {

print(add(5, 3)); // 8

print(add(5)); // 5

greet('Alice'); // Hello Mr./Ms. Alice

greet('Bob', title: 'Dr.'); // Hello Dr. Bob

}

Explanation:

* [int b = 0] → optional positional parameter.
* {String title = 'Mr./Ms.'} → optional named parameter.
* => replaces { return expression; }.

### 🧩 Exercise 3.1

Write a function calculateArea with **two optional parameters**:  
width and height, both default to 1.  
Return width \* height using **arrow syntax**.

In main(), call:

print(calculateArea()); // 1

print(calculateArea(5)); // 5

print(calculateArea(5, 3)); // 15

### 🧩 Exercise 3.2 (Challenge)

Create a function greetUser(String name, {int age = 0}) that:

* Prints "Hello <name>".
* If age > 0, prints "You are <age> years old."

Try calling it with and without the age argument.

# 🏁 Summary

In this lab, you learned how to:  
✅ Use variables and null safety  
✅ Apply control flow and loops  
✅ Create functions with flexible parameters