

Java Basics Course Study Materials

3. Variables and Data Types

Lecture Content:

3.1 Variables: Variables are containers for storing data values. Each variable in Java must be declared with a specific data type.

Declaration and Initialization:

```
int number; // Declaration
number = 10; // Initialization
int age = 25; // Declaration and Initialization
```

Primitive Data Types: Java supports eight primitive data types, which are predefined by the language and named by keywords.

- **byte:** 8-bit integer, range -128 to 127.

```
byte b = 100;
```

- **short:** 16-bit integer, range -32,768 to 32,767.

```
short s = 1000;
```

- **int:** 32-bit integer, range -2^{31} to $2^{31}-1$.

```
int i = 100000;
```

- **long:** 64-bit integer, range -2^{63} to $2^{63}-1$.

```
long l = 1000000000L;
```

- **float:** 32-bit floating-point, single-precision.

```
float f = 234.5f;
```

- **double:** 64-bit floating-point, double-precision.

```
double d = 123.4;
```

- **char:** 16-bit character.

```
char c = 'A';
```

- **boolean:** Represents true or false.

```
boolean b = true;
```

3.2 Type Conversion and Casting: Java supports both implicit and explicit type conversion.

- **Implicit Casting (Widening):** Automatic type conversion from a smaller to a larger data type.

```
int i = 100;
long l = i; // No explicit cast required
double d = l; // No explicit cast required
```

- **Explicit Casting (Narrowing):** Manual type conversion from a larger to a smaller data type.

```
double d = 9.78;
int i = (int) d; // Explicit cast required
```

3.3 Type Promotion in Expressions: When performing operations on variables of different types, Java automatically promotes the smaller type to the larger type.

```
byte b = 42;
char c = 'a';
short s = 1024;
int i = 50000;
float f = 5.67f;
double d = .1234;
double result = (f * b) + (i / c) - (d * s);
```

In the above expression:

- `b` is promoted to `float`.
- `c` is promoted to `int`.
- `i / c` results in `int`.
- `d * s` results in `double`.