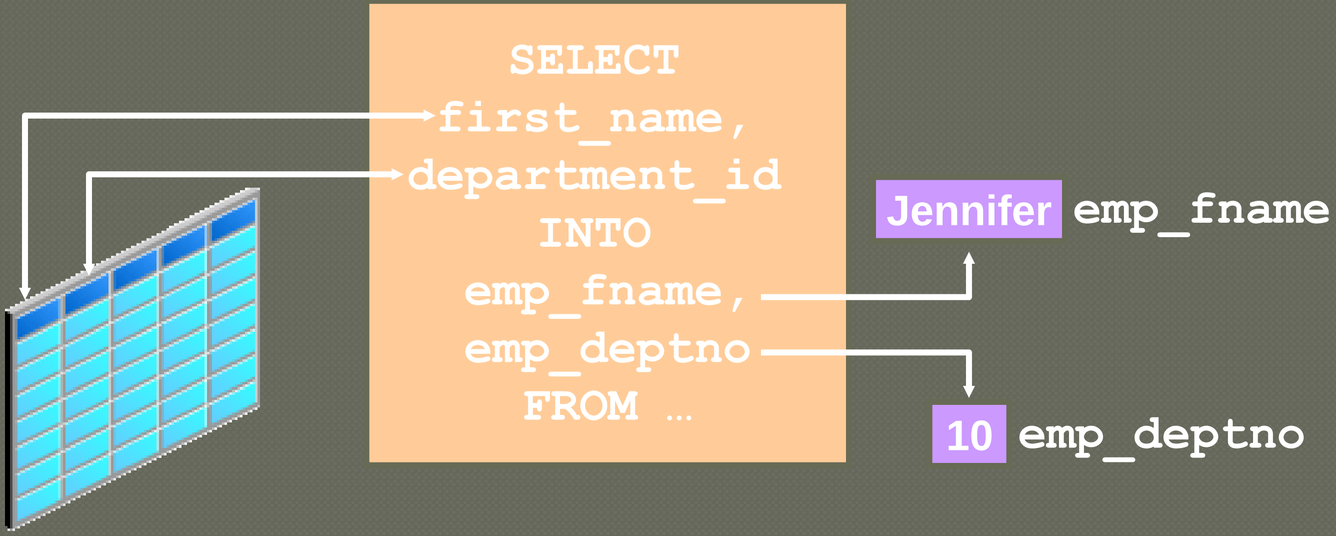
# Declaring PL/SQL Variables

## Objectives

- After completing this, you should be able to do the following:
  - Identify valid and invalid identifiers
  - List the uses of variables
  - Declare and initialize variables
  - List and describe various data types
  - Identify the benefits of using `%TYPE` attribute
  - Declare, use, and print bind variables

# Use of Variables

- Variables can be used for:
  - Temporary storage of data
  - Manipulation of stored values
  - Reusability



# Identifiers

- Identifiers are used for:
  - Naming a variable
  - Providing a convention for variable names:
    - Must start with a letter
    - Can include letters or numbers
    - Can include special characters such as dollar sign, underscore, and pound sign
    - Must limit the length to 30 characters
    - Must not be reserved words

## Handling Variables in PL/SQL

- Variables are:
  - Declared and initialized in the declarative section
  - Used and assigned new values in the executable section
  - Passed as parameters to PL/SQL subprograms
  - Used to hold the output of a PL/SQL subprogram

## Declaring and Initializing PL/SQL Variables

**Syntax:**

```
identifier [CONSTANT] datatype [NOT NULL]
      [:= | DEFAULT expr];
```

**Examples:**

```
DECLARE
  emp_hiredate     DATE;
  emp_deptno       NUMBER(2) NOT NULL := 10;
  location         VARCHAR2(13) := 'Atlanta';
  c_comm           CONSTANT NUMBER := 1400;
```

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# Declaring and Initializing PL/SQL Variables

1

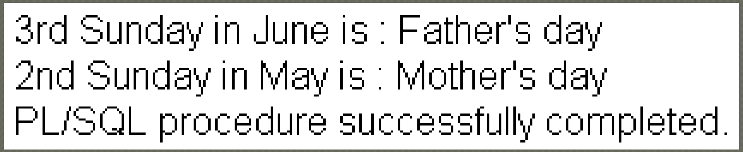
```
SET SERVEROUTPUT ON
DECLARE
   Myname VARCHAR2(20);
BEGIN
   DBMS_OUTPUT.PUT_LINE('My name is: '||Myname);
   Myname := 'John';
   DBMS_OUTPUT.PUT_LINE('My name is: '||Myname);
END;
/
```

2

```
SET SERVEROUTPUT ON
DECLARE
   Myname VARCHAR2(20):= 'John';
BEGIN
   Myname := 'Steven';
   DBMS_OUTPUT.PUT_LINE('My name is: '||Myname);
END;
/
```

## Delimiters in String Literals

```
SET SERVEROUTPUT ON
DECLARE
   event VARCHAR2(15);
BEGIN
  event := q'!Father's day!';
  DBMS_OUTPUT.PUT_LINE('3rd Sunday in June is :
   '||event);
  event := q'[Mother's day]';
  DBMS_OUTPUT.PUT_LINE('2nd Sunday in May is :
   '||event);
END;
/
```



```
3rd Sunday in June is : Father's day
2nd Sunday in May is : Mother's day
PL/SQL procedure successfully completed.
```

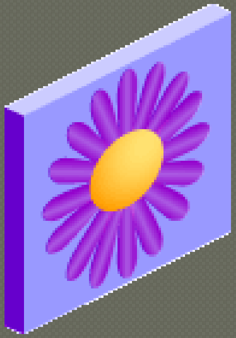
## Types of Variables

- PL/SQL variables:
  - Scalar
  - Composite
  - Reference
  - Large objects (LOB)
- Non-PL/SQL variables: Bind variables

# Types of Variables

TRUE

25-JAN-01



The soul of the lazy man desires, and has nothing; but the soul of the diligent shall be made rich.

256120.08

Atlanta

# Guidelines for Declaring and Initializing PL/SQL Variables

- Follow naming conventions.
- Use meaningful names for variables.
- Initialize variables designated as `NOT NULL` and `CONSTANT`.
- Initialize variables with the assignment operator (:=) or the `DEFAULT` keyword:

```
Myname VARCHAR2(20):='John';
```

```
Myname VARCHAR2(20) DEFAULT 'John';
```

- Declare one identifier per line for better readability and code maintenance.

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## Guidelines for Declaring PL/SQL Variables

- Avoid using column names as identifiers.

```
DECLARE
   employee_id  NUMBER(6);
BEGIN
   SELECT     employee_id
   INTO       employee_id
   FROM       employees
   WHERE      last_name = 'Kochhar';
END;
/
```

- **Use the `NOT NULL` constraint when the variable must hold a value.**

# Scalar Data Types

- Hold a single value
- Have no internal components

TRUE

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The soul of the lazy man desires, and has nothing; but the soul of the diligent shall be made rich.

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## Base Scalar Data Types

- CHAR [(maximum_length)]
- VARCHAR2 (maximum_length)
- LONG
- LONG RAW
- NUMBER [(precision, scale)]
- BINARY_INTEGER
- PLS_INTEGER
- BOOLEAN
- BINARY_FLOAT
- BINARY_DOUBLE

## Base Scalar Data Types

- DATE
- TIMESTAMP
- TIMESTAMP WITH TIME ZONE
- TIMESTAMP WITH LOCAL TIME ZONE
- INTERVAL YEAR TO MONTH
- INTERVAL DAY TO SECOND

## Declaring Scalar Variables

- Examples:

```
DECLARE
   emp_job          VARCHAR2(9);
   count_loop       BINARY_INTEGER := 0;
   dept_total_sal   NUMBER(9,2) := 0;
   orderdate        DATE := SYSDATE + 7;
   c_tax_rate       CONSTANT NUMBER(3,2) := 8.25;
   valid            BOOLEAN NOT NULL := TRUE;
   ...
```

## The %TYPE Attribute

- The %TYPE attribute
  - Is used to declare a variable according to:
    - A database column definition
    - Another declared variable
  - Is prefixed with:
    - The database table and column
    - The name of the declared variable

# Declaring Variables with the %TYPE Attribute

Syntax:

```
identifier      table.column_name%TYPE;
```

- Examples:

```
...
  emp_lname       employees.last_name%TYPE;
  balance         NUMBER(7,2);
  min_balance     balance%TYPE := 1000;
...
```

# Declaring Boolean Variables

- Only the values `TRUE`, `FALSE`, and `NULL` can be assigned to a Boolean variable.
- Conditional expressions use logical operators `AND`, `OR`, and unary operator `NOT` to check the variable values.
- The variables always yield `TRUE`, `FALSE`, or `NULL`.
- Arithmetic, character, and date expressions can be used to return a Boolean value.

## Bind Variables

- Bind variables are:
  - Created in the environment
  - Also called host variables
  - Created with the `VARIABLE` keyword
  - Used in SQL statements and PL/SQL blocks
  - Accessed even after the PL/SQL block is executed
  - Referenced with a preceding colon

## Printing Bind Variables

- Example:

```
VARIABLE emp_salary NUMBER
BEGIN
   SELECT salary  INTO :emp_salary
   FROM  employees WHERE employee_id = 178;
END;
/
PRINT emp_salary
SELECT first_name, last_name FROM employees
WHERE salary=:emp_salary;
```

# Printing Bind Variables

- Example:

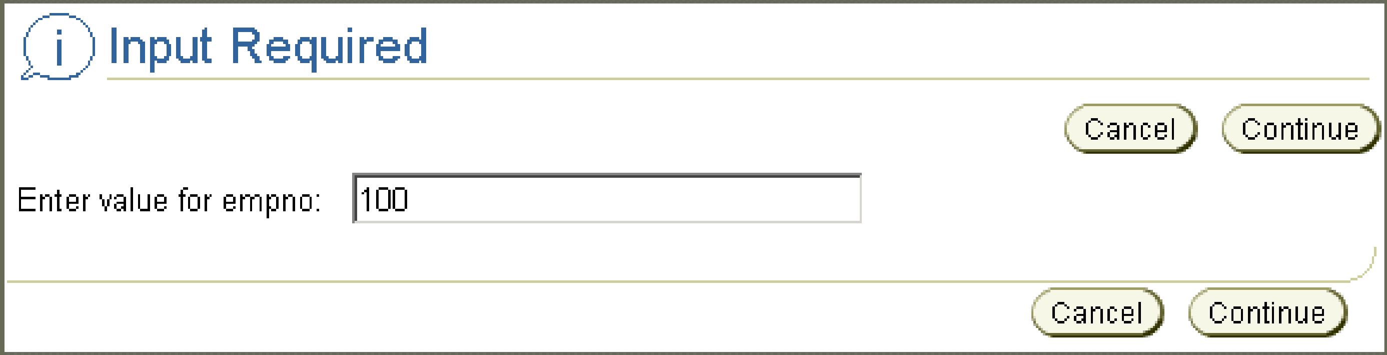
```
VARIABLE emp_salary NUMBER
SET AUTOPRINT ON
BEGIN
   SELECT salary  INTO :emp_salary
   FROM  employees WHERE employee_id = 178;
END;
/
```

## Substitution Variables

- Are used to get user input at run time
- Are referenced within a PL/SQL block with a preceding ampersand
- Are used to avoid hard coding values that can be obtained at run time

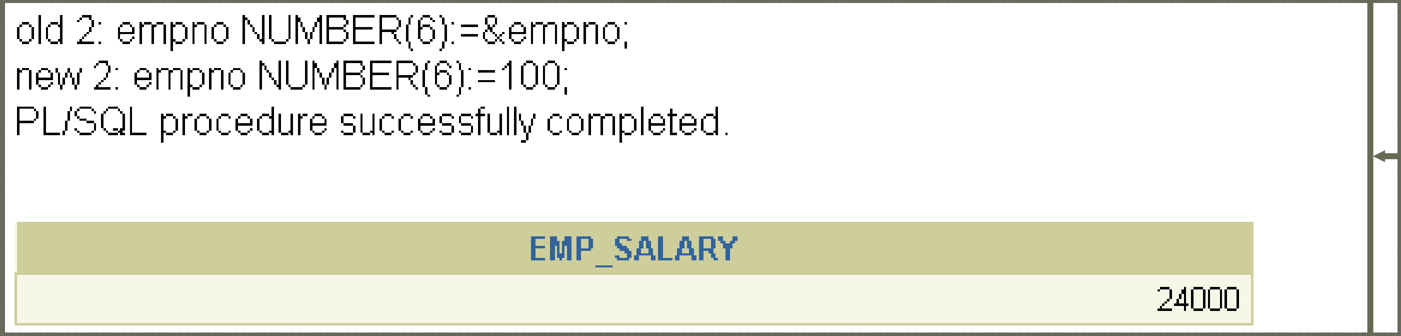
```
VARIABLE emp_salary NUMBER
SET AUTOPRINT ON
DECLARE
  empno NUMBER(6):=&empno;
BEGIN
  SELECT salary  INTO :emp_salary
  FROM  employees WHERE employee_id = empno;
END;
/
```

# Substitution Variables



Enter value for empno: 100

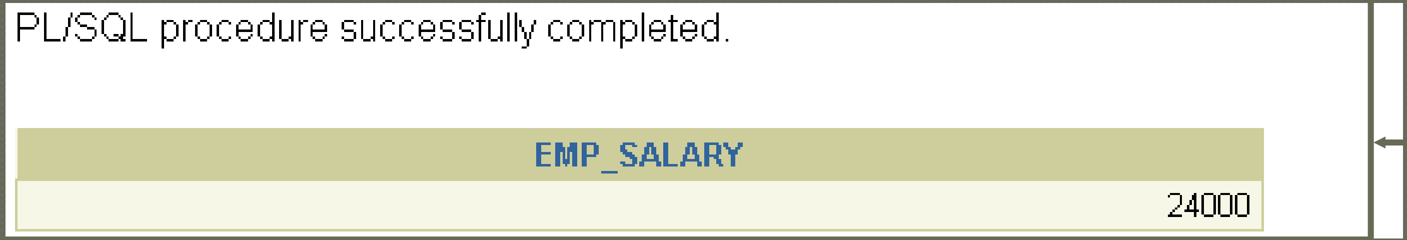
1



```
old 2: empno NUMBER(6):=&empno;
new 2: empno NUMBER(6):=100;
PL/SQL procedure successfully completed.
```

| EMP_SALARY |
|---|
| 24000 |

2



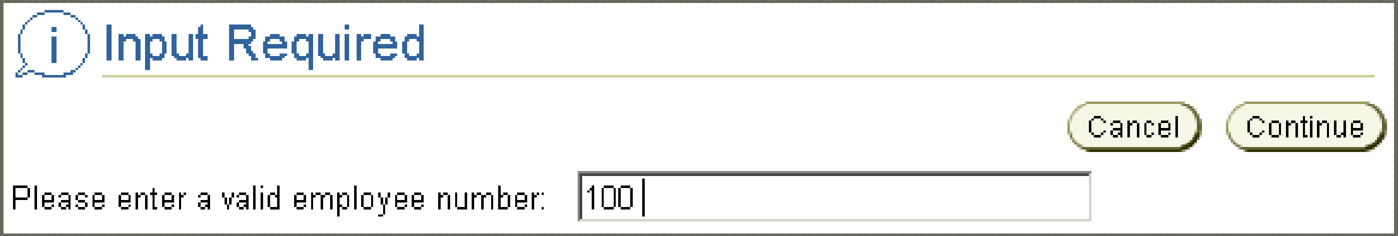
```
PL/SQL procedure successfully completed.
```

| EMP_SALARY |
|---|
| 24000 |

3

# Prompt for Substitution Variables

```
SET VERIFY OFF
VARIABLE emp_salary NUMBER
ACCEPT empno PROMPT 'Please enter a valid employee
number: '
SET AUTOPRINT ON
DECLARE
  empno NUMBER(6):= &empno;
BEGIN
  SELECT salary  INTO :emp_salary  FROM  employees
  WHERE employee_id = empno;
END;
/
```



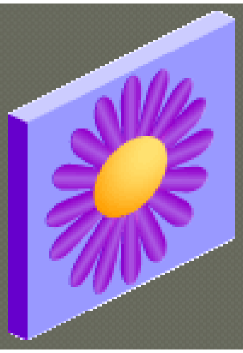
Please enter a valid employee number: 100

# Using DEFINE for User Variable

- Example:

```
SET VERIFY OFF
DEFINE lname= Urman
DECLARE
  fname VARCHAR2(25);
BEGIN
  SELECT first_name INTO fname FROM employees
  WHERE last_name='&lname';
END;
/
```

# Composite Data Types

| | | | |
|---|---|---|---|
| TRUE | 23-DEC-98 | ATLANTA |  |

PL/SQL table structure

| | |
|---|---|
| 1 | SMITH |
| 2 | JONES |
| 3 | NANCY |
| 4 | TIM |

VARCHAR2

PLS_INTEGER

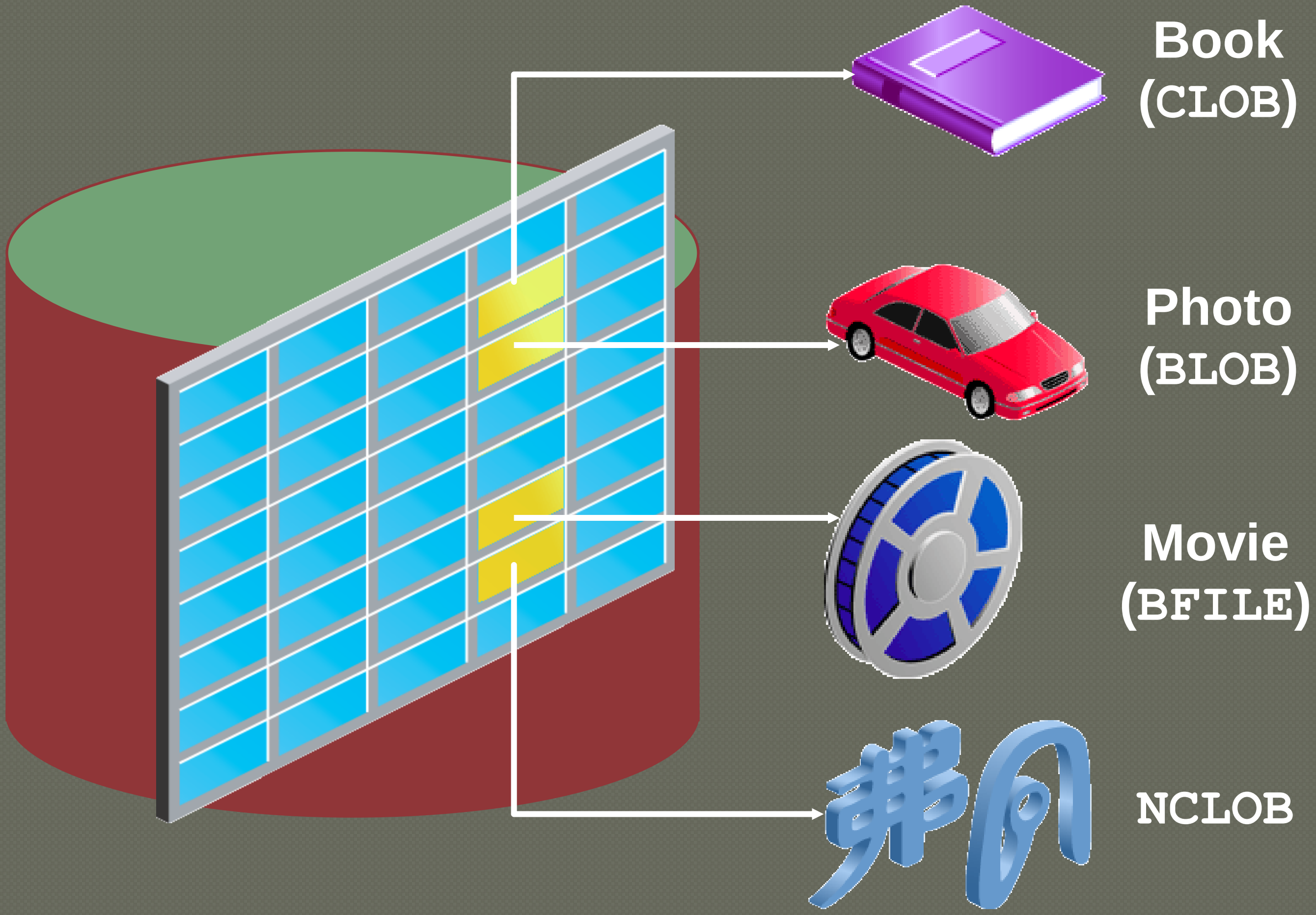
PL/SQL table structure

| | |
|---|---|
| 1 | 5000 |
| 2 | 2345 |
| 3 | 12 |
| 4 | 3456 |

NUMBER

PLS_INTEGER

# LOB Data Type Variables



## Summary

- In this, you should have learned how to:
  - Identify valid and invalid identifiers
  - Declare variables in the declarative section of a PL/SQL block
  - Initialize variables and utilize them in the executable section
  - Differentiate between scalar and composite data types
  - Use the `%TYPE` attribute
  - Make use of bind variables

## Practice: Overview

- This practice covers the following topics:
  - Determining valid identifiers
  - Determining valid variable declarations
  - Declaring variables within an anonymous block
  - Using the `%TYPE` attribute to declare variables
  - Declaring and printing a bind variable
  - Executing a PL/SQL block