

Introduction to PL/SQL

Objectives

After completing this lesson, you should be able to do the following:

- Explain the need for PL/SQL
- Explain the benefits of PL/SQL
- Identify the different types of PL/SQL blocks
- Output messages in PL/SQL



Agenda

- Understanding the benefits and structure of PL/SQL
- Understanding PL/SQL blocks
- Generating output messages in PL/SQL



Limitations of SQL

- Performs one operation at a time on the database
- Lacks the capability of logically grouping multiple database operations

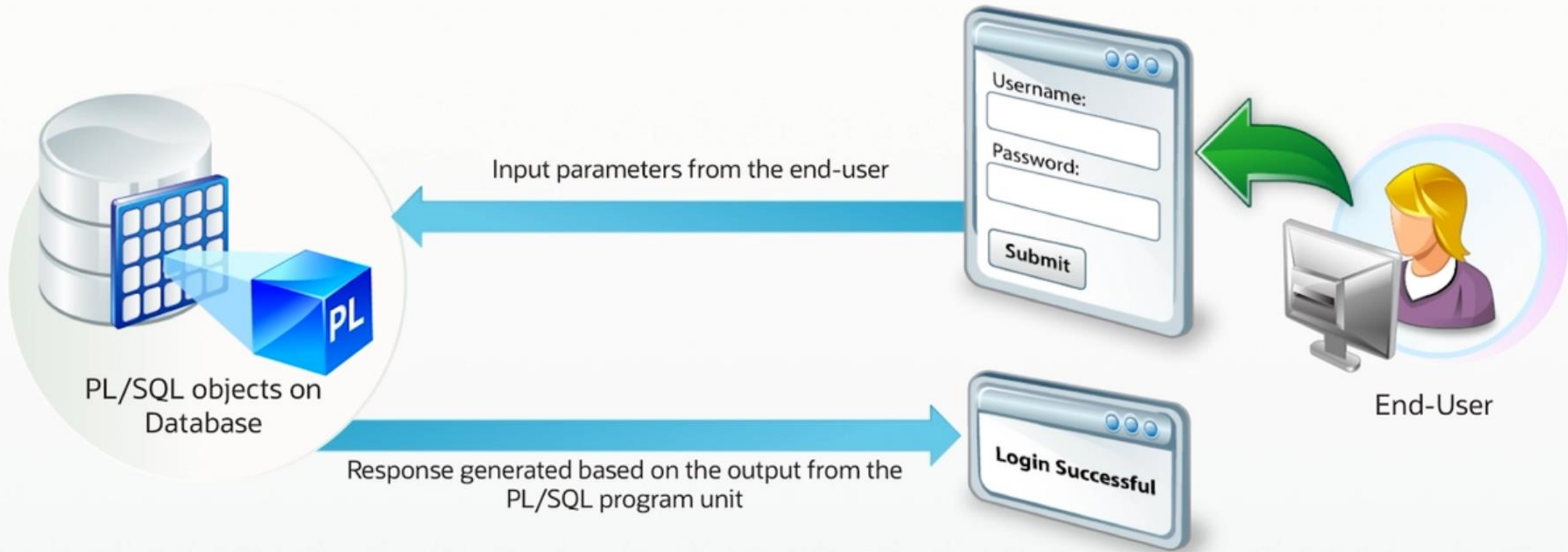


Why PL/SQL?

- Enables modularization in the application
- Provides better security
- Enables maintainability
- Provides exception handling



Why PL/SQL




About PL/SQL



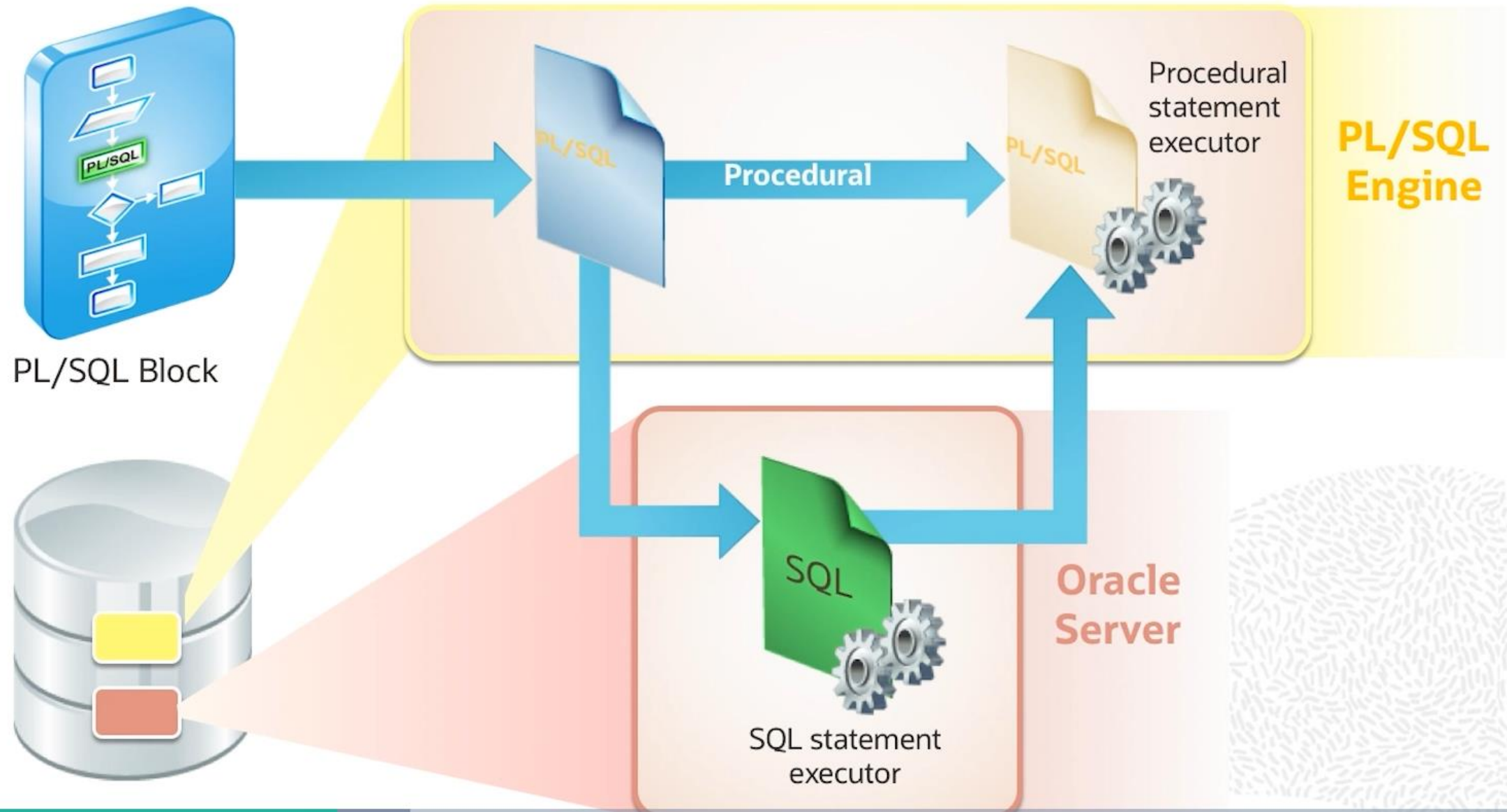
- Stands for “Procedural Language Extension to SQL”
- Integrates procedural constructs with SQL
- Provides a block structure for executable units of code
- Provides procedural constructs such as:
 - Variables, constants, and data types
 - Control structures: Loops, conditional statements
- Enables writing reusable program units

Benefits of PL/SQL



- Integration of procedural constructs with SQL
 - Improved performance
 - Modularized program development
 - Integration with Oracle tools
 - Portability
 - Exception handling
 - Support for Object Oriented Programming
- 

PL/SQL Runtime Architecture

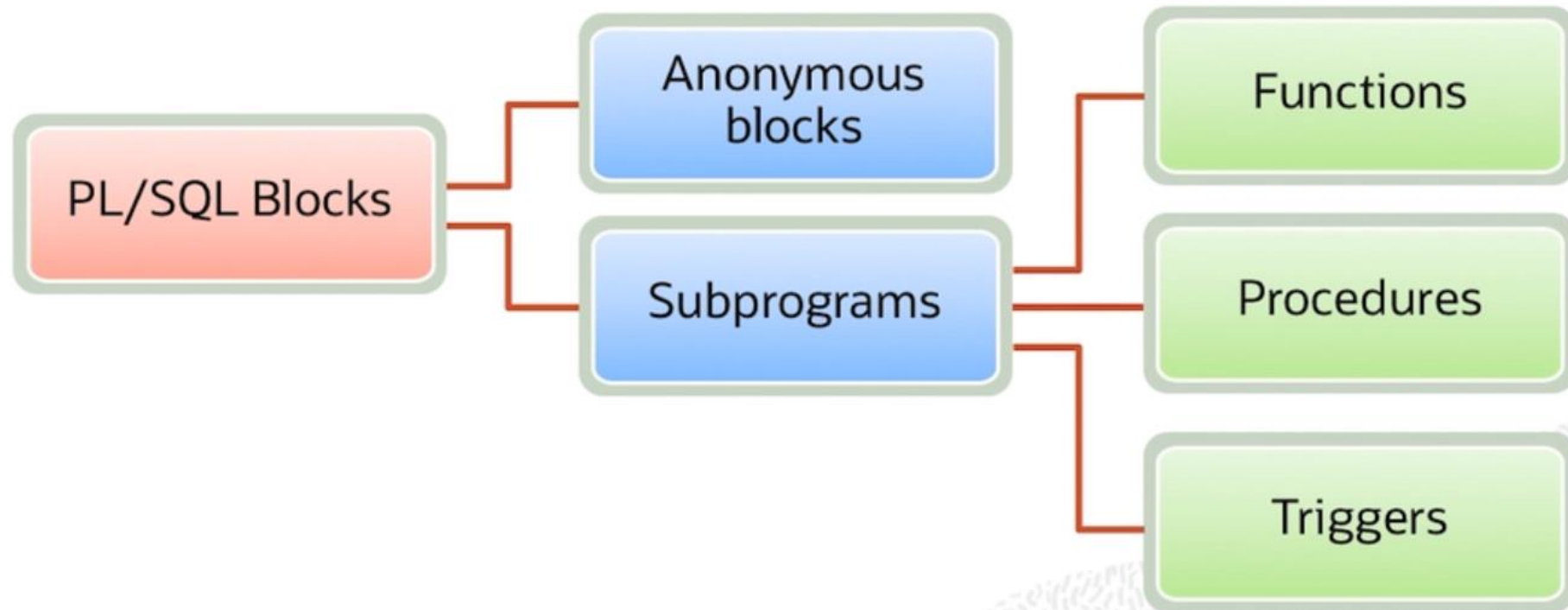


PL/SQL Block Structure

- DECLARE (optional)
 - Variables, cursors, user-defined exceptions
- BEGIN (mandatory)
 - SQL statements
 - PL/SQL statements
- EXCEPTION (optional)
 - Actions to perform when exceptions occur
- END (mandatory)

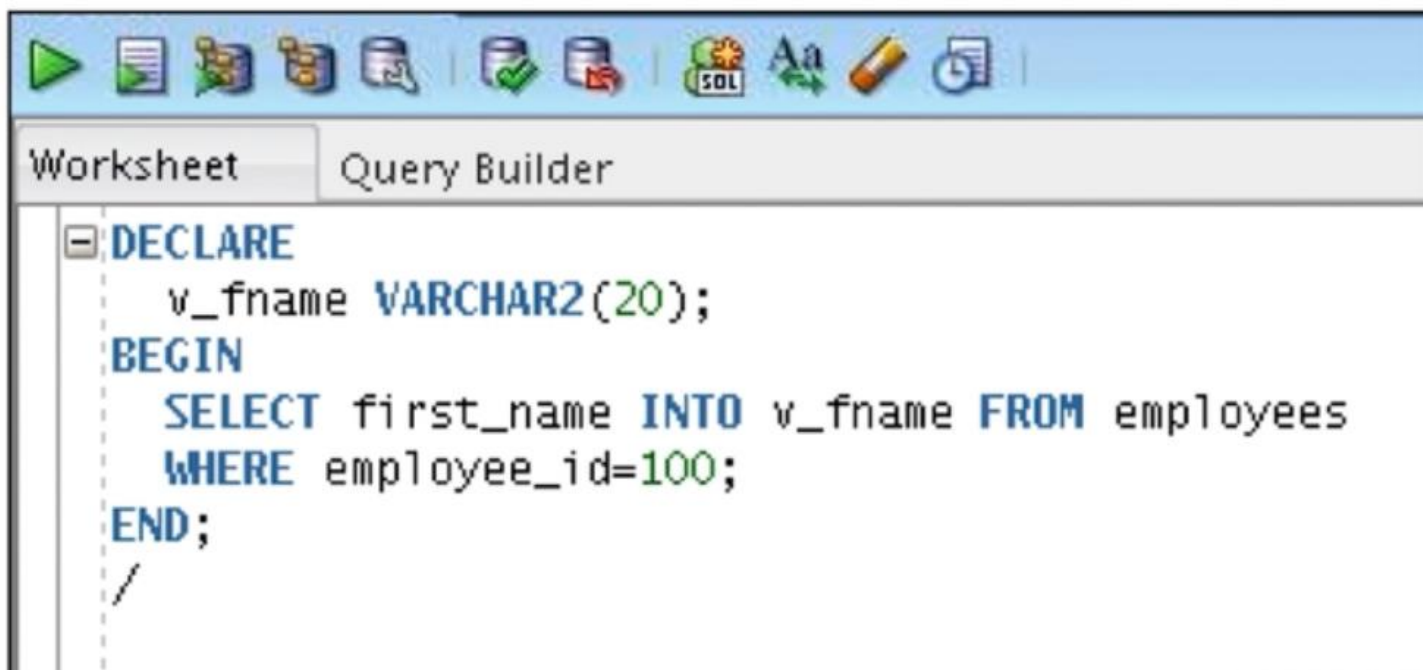


Block Types



Examining an Anonymous Block

An anonymous block in the SQL Developer workspace:

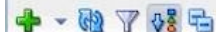
A screenshot of the SQL Developer workspace. The top toolbar contains various icons for execution, editing, and navigation. Below the toolbar are two tabs: 'Worksheet' and 'Query Builder'. The 'Worksheet' tab is active, displaying an anonymous SQL block. The code is as follows:

```
DECLARE  
  v_fname VARCHAR2(20);  
BEGIN  
  SELECT first_name INTO v_fname FROM employees  
  WHERE employee_id=100;  
END;  
/
```

Insert Show line number :



Connections



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MyConnection~10

0.066 seconds

Worksheet Query Builder

```
1 BEGIN
2
3 END;
```

Script Output x

Task complet

```
END;
Error report -
ORA-06550: line 3,
PLS-00103: Encounte
```

```
( begin case dec
raise return sel
<a double-quoted delimited-identifier> <a bind variable> <<
continue close current delete fetch lock insert open rollback
savepoint set sql execute commit forall merge pipe purge
json_exists json_value json_query json_object json_array
06550. 00000 - "line %s, column %s:\n%s"
*Cause: Usually a PL/SQL compilation error.
*Action:
```

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Help

Code Editor: Line Gutter

☐ Show Line Numbers☒ Enable Line Selection by Click-Dragging in Gutter

Line Gutter Colors:

☐ Use Look and Feel Colors☒ Use Editor Colors☐ Use Custom Colors: Background Color:

Foreground Color:



OK

Cancel



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MyConnection~10



Worksheet Query Builder

```
1 BEGIN
2
3 END;
```

Script Output x



Task complete

```
END;
Error report -
ORA-06550: line 3,
PLS-00103: Encounte
```

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Help OK Cancel

```
( begin case dec
raise return sel
<a double-quoted delimited-identifier> <a bind variable> <<
continue close current delete fetch lock insert open rollback
savepoint set sql execute commit forall merge pipe purge
json_exists json_value json_query json_object json_array
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*Cause: Usually a PL/SQL compilation error.
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MyConnection~10



Worksheet Query Builder

```
1 BEGIN
2
3 END;
```

Script Output

Task completed in 0.066 seconds

END;

Error report -

ORA-06550: line 3, column 1:

PLS-00103: Encountered the symbol "END" when expecting one of the following:

```
( begin case declare exit for goto if loop mod null pragma
raise return select update while with <an identifier>
<a double-quoted delimited-identifier> <a bind variable> <<
continue close current delete fetch lock insert open rollback
savepoint set sql execute commit forall merge pipe purge
json_exists json_value json_query json_object json_array
```

06550. 00000 - "line %s, column %s:\n%s"

*Cause: Usually a PL/SQL compilation error.

*Action:



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MyConnection~10



Worksheet Query Builder

```
1 declare
2 v_lname varchar2(20);
3 BEGIN
4 select last_name INTO v_lname
5 from employees
6 where employee_id=100;
7 end;
8
```

	Run Statement	F9
	Run Script	F5
	Create Report...	
	Save as Snippet...	
	Explain...	
	Autotrace...	F6
	SQL Tuning Advisor...	Ctrl-F12
	Commit	F11
	Rollback	F12
	Clear	Ctrl-D
	SQL History	F8
	To Upper/Lower/initCap	Alt-Quote
	Cut	Ctrl-X
	Copy	Ctrl-C
	Paste	Ctrl-V
	Select All	Ctrl-A
	Debug	Ctrl+Shift-F10
	Toggle Line Comments	Ctrl-Slash
	Completion Insight	Ctrl-Space
	Indent Block	
	Unindent Block	
	Refactoring	
	Code Outline	
	Format	Ctrl-F7
	Embed/Expose...	Ctrl+Shift-F7
	Open Declaration	
	Popup Describe	Shift-F4
	Code Template	



Connections

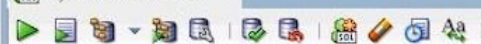


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MyConnection~10



MyConnection

Worksheet Query Builder

```
1 DECLARE
2     v_lname VARCHAR2(20);
3 BEGIN
4     SELECT
5         last_name INTO v_lname
6     FROM
7         employees
8     WHERE
9         employee_id =100;
10
11 END;
```

Script Output

Task completed in 0.084 seconds



Connections



Reports



MyConnection-10

0.07 seconds

Worksheet Query Builder

```
1 DECLARE
2   v_lname VARCHAR2(20);
3 BEGIN
4   SELECT
5     last_name INTO v_lname
6   FROM
7     employees;
8   --WHERE
9     --employee_id =100;
10
11 END;
```

Script Output

Task completed in 0.07 seconds

```
DECLARE
SELECT
  last_name INTO v_lname
FROM
  employees;
--WHERE
  --employee_id =100;
```

END;

Error report -

ORA-01422: exact fetch returns more than requested number of rows

ORA-06512: at line 4

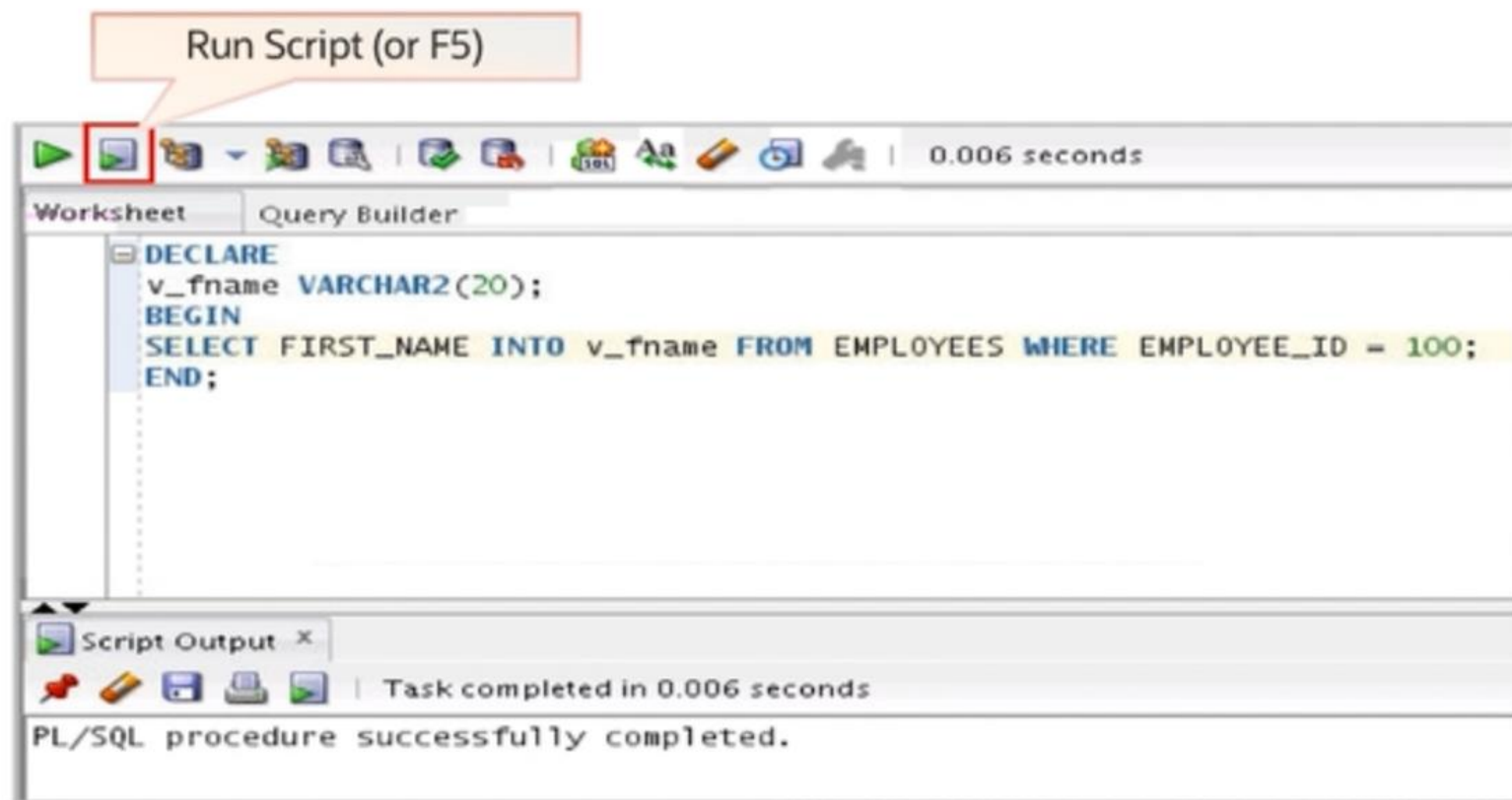
01422. 00000 - "exact fetch returns more than requested number of rows"

*Cause: The number specified in exact fetch is less than the rows returned.

*Action: Rewrite the query or change number of rows requested

Executing an Anonymous Block

Click the Run Script icon to execute the anonymous block:



Enabling Output of a PL/SQL Block

1. To enable output in SQL Developer, execute the following command before running the PL/SQL block:

```
SET SERVEROUTPUT ON
```

2. Use a predefined Oracle package and its procedure in the anonymous block:

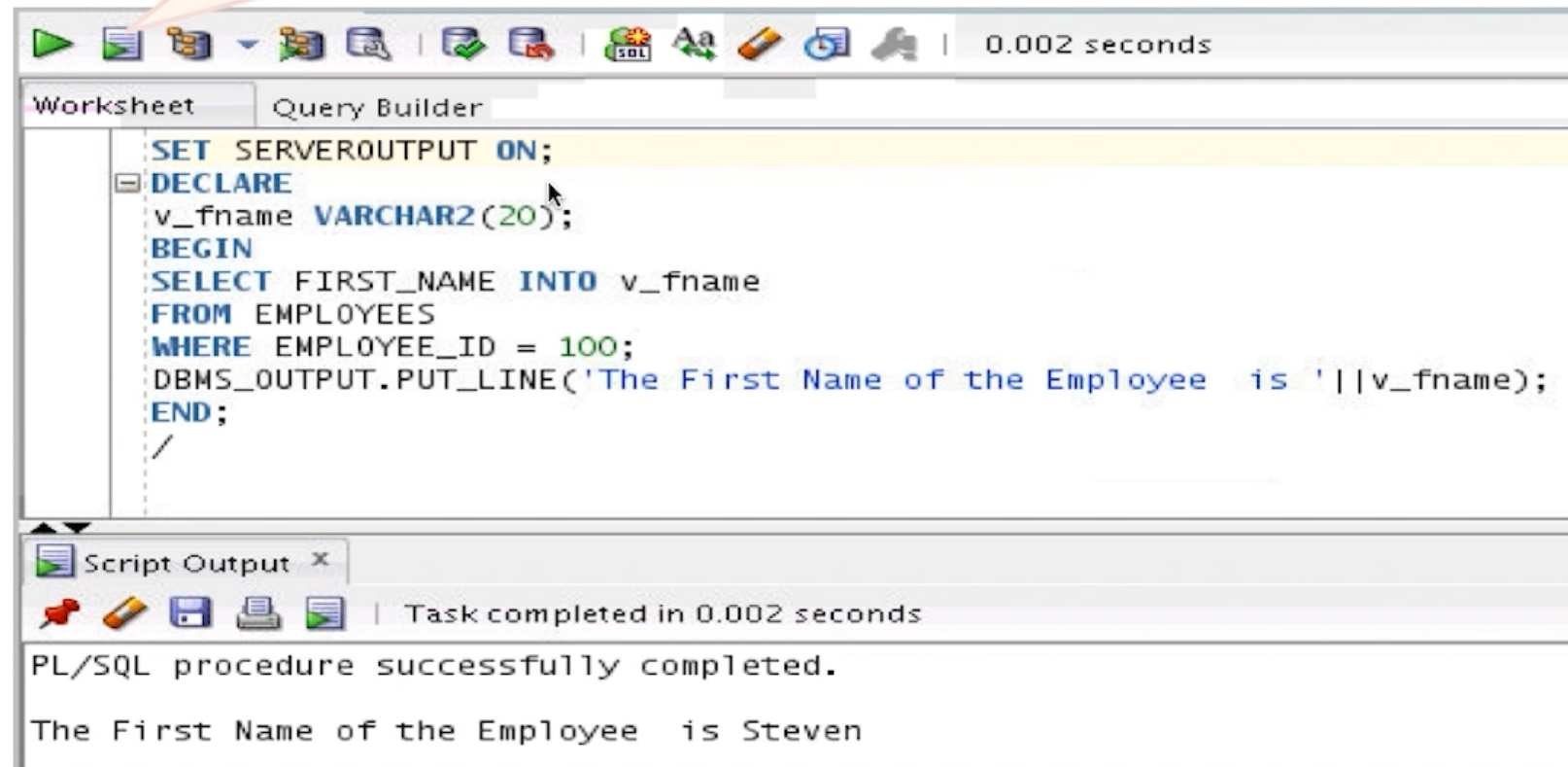
```
- DBMS_OUTPUT.PUT_LINE
```

```
DBMS_OUTPUT.PUT_LINE(' The First Name of the Employee is ' ||  
v_fname);
```

```
...
```


Viewing the Output of a PL/SQL Block

Press F5 to execute the command and PL/SQL block.



The screenshot shows a PL/SQL development environment with a toolbar at the top containing icons for running, saving, and other actions. A status bar on the right indicates a duration of 0.002 seconds. Below the toolbar are two tabs: 'Worksheet' and 'Query Builder'. The 'Worksheet' tab is active, displaying a PL/SQL script. The script is as follows:

```
SET SERVEROUTPUT ON;  
DECLARE  
  v_fname VARCHAR2(20);  
BEGIN  
  SELECT FIRST_NAME INTO v_fname  
  FROM EMPLOYEES  
  WHERE EMPLOYEE_ID = 100;  
  DBMS_OUTPUT.PUT_LINE('The First Name of the Employee is '||v_fname);  
END;  
/
```

Below the script editor is a 'Script Output' window. It shows a status bar with icons for running, saving, and other actions, and a message: 'Task completed in 0.002 seconds'. The output text is:

```
PL/SQL procedure successfully completed.  
The First Name of the Employee is Steven
```

By default it doesn't print anything.



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MyConnection~10 MyConnection (Unshared)



0.059 seconds

MyConnectio...

Worksheet Query Builder

```
1  --SET SERVEROUTPUT ON
2  DECLARE
3      v_lname VARCHAR2(20);
4  BEGIN
5      SELECT
6          last_name INTO v_lname
7      FROM
8          employees
9      WHERE
10         employee_id =100;
11  dbms_output.put_line('The last name of the employee is '||v_lname);
12  END;
```

Script Output

Task completed in 0.059 seconds

The last name of the employee is King

PL/SQL procedure successfully completed.

The last name of the employee is King

PL/SQL procedure successfully completed.

The last name of the employee is King

PL/SQL procedure successfully completed.



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MyConnection~10 MyConnection (Unshared)

0.078 seconds

Worksheet Query Builder

```
1 DECLARE
2     v_lname VARCHAR2(20);
3 BEGIN
4     SELECT
5         last_name INTO v_lname
6     FROM
7         employees
8     WHERE
9         employee_id = 100;
10 dbms_output.put_line('The last name of the employee is '||v_lname);
11 END;
```

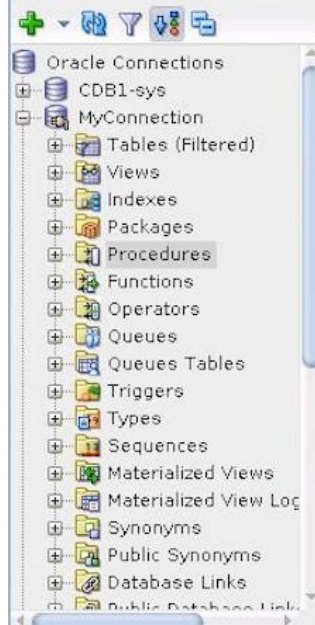
Script Output x

Task completed in 0.078 seconds

PL/SQL procedure successfully completed.



Connections



Reports



MyConnection~10 MyConnection (Unshared)

0.059 seconds

Worksheet Query Builder

```
1 --SET SERVEROUTPUT ON
2 DECLARE
3     v_lname VARCHAR2(20);
4 BEGIN
5     SELECT
6         last_name INTO v_lname
7     FROM
8         employees
9     WHERE
10        employee_id =100;
11 dbms_output.put_line('The last
12 END;
```

Save Snippet

Category PL/SQL Programming Techniques

Name dbms_output

ToolTip

Snippet

dbms_output.put_line();|

Help

Apply

Cancel

The last name of the employee is K:

PL/SQL procedure successfully completed.

The last name of the employee is King

PL/SQL procedure successfully completed.

The last name of the employee is King

PL/SQL procedure successfully completed.

Snippets

Aggregate Functions

```
COUNT(*)
COUNT([ALL | DISTINCT] expr)
MAX(expr)
MEDIAN(expr)
MIN(expr)
STDDEV(expr)
SUM(expr)
VARIANCE(expr)
```


Oracle SQL Developer - MyConnection - 10

File Edit View Navigate Run Source Team Tools Window Help

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MyConnection ~ 10 | MyConnection (Unshared) | 0.044 seconds

Worksheet | Query Builder

```
1 SET SERVEROUTPUT ON
2 DECLARE
3     v_lname VARCHAR2(20);
4 BEGIN
5     SELECT
6         last_name INTO v_lname
7     FROM
8         employees
9     WHERE
10        employee_id =100;
11 dbms_output.put_line( v_lname);
12 END;
```

Snippets

PL/SQL Programming Techniques

- CASE
- Cursor
- DBMS_OUTPUT.PUT_LINE
- IF-THEN-ELSE
- IF-THEN-ELSEIF
- Loop: FOR LOOP
- Loop: WHILE LOOP
- RAISE_APPLICATION_ERROR [example]
- RAISE_APPLICATION_ERROR(-number, 'error-text')
- Random number: NORMAL()
- Random number: VALUE()
- Random number: VALUE(low, high)
- Random string: STRING('A', 10)
- Random string: STRING('P', 10)
- Random string: STRING('X', 10)
- dbms_output
- serveroutput

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Script Output x

Task completed in 0.044 seconds

King

PL/SQL procedure successfully completed.

Quiz



A PL/SQL block *must* consist of the following three sections:

- A Declarative section, which begins with the keyword `DECLARE` and ends when the executable section starts
 - An Executable section, which begins with the keyword `BEGIN` and ends with `END`
 - An Exception handling section, which begins with the keyword `EXCEPTION` and is nested within the executable section
- a. True
b. False



Practice 2: Overview

This practice covers the following topics:

- Identifying PL/SQL blocks that execute successfully
- Creating and executing a simple PL/SQL block

