

# 23

## Handling Exceptions

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### Objectives

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

- **Define PL/SQL exceptions**
- **Recognize unhandled exceptions**
- **List and use different types of PL/SQL exception handlers**
- **Trap unanticipated errors**
- **Describe the effect of exception propagation in nested blocks**
- **Customize PL/SQL exception messages**

23-2

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## Handling Exceptions with PL/SQL

- What is an exception?
  - Identifier in PL/SQL that is raised during execution.
- How is it raised?
  - An Oracle error occurs.
  - You raise it explicitly.
- How do you handle it?
  - Trap it with a handler.
  - Propagate it to the calling environment.

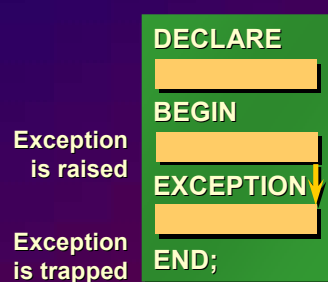
23-3

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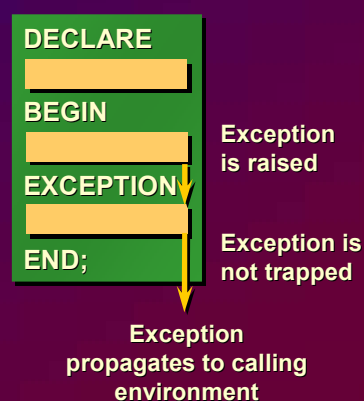
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## Handling Exceptions

### Trap the Exception



### Propagate the Exception



23-4

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## Exception Types

- Predefined Oracle Server
  - Non-predefined Oracle Server
  - User-defined
- } Implicitly raised
- Explicitly raised

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## Trapping Exceptions

### Syntax

```
EXCEPTION
  WHEN exception1 [OR exception2 . . .] THEN
    statement1;
    statement2;
    . . .
  [WHEN exception3 [OR exception4 . . .] THEN
    statement1;
    statement2;
    . . .]
  [WHEN OTHERS THEN
    statement1;
    statement2;
    . . .]
```

23-6

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## Trapping Exceptions Guidelines

- **WHEN OTHERS** is the last clause.
- **EXCEPTION** keyword starts exception-handling section.
- Several exception handlers are allowed.
- Only one handler is processed before leaving the block.

23-7

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## Trapping Predefined Oracle Server Errors

- Reference the standard name in the exception-handling routine.
- Sample predefined exceptions:
  - **NO\_DATA\_FOUND**
  - **TOO\_MANY\_ROWS**
  - **INVALID\_CURSOR**
  - **ZERO\_DIVIDE**
  - **DUP\_VAL\_ON\_INDEX**

23-8

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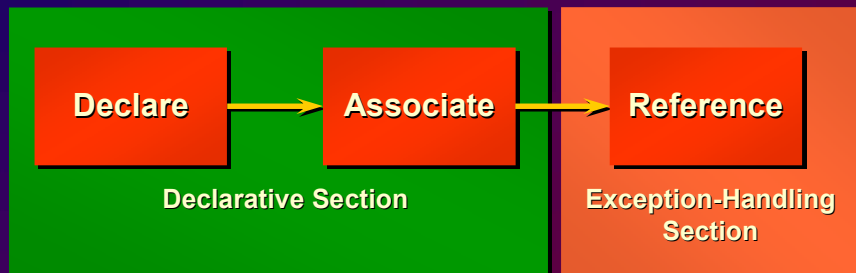
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## Predefined Exception

### Syntax

```
BEGIN SELECT ... COMMIT;
EXCEPTION
  WHEN NO_DATA_FOUND THEN
    statement1;
    statement2;
  WHEN TOO_MANY_ROWS THEN
    statement1;
  WHEN OTHERS THEN
    statement1;
    statement2;
    statement3;
END;
```

## Trapping Non-Predefined Oracle Server Errors



- Name the exception
- Code the PRAGMA EXCEPTION\_INIT
- Handle the raised exception

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## Non-Predefined Error Trap for Oracle Server error number -2292 an integrity constraint violation

```
DECLARE
  e_products_invalid EXCEPTION;
  PRAGMA EXCEPTION_INIT (
    e_products_invalid, -2292);
  v_message VARCHAR2(50);
BEGIN
  . . .
EXCEPTION
  WHEN e_products_invalid THEN
    :g_message := 'Product code
                  specified is not valid.';
  . . .
END;
```

1

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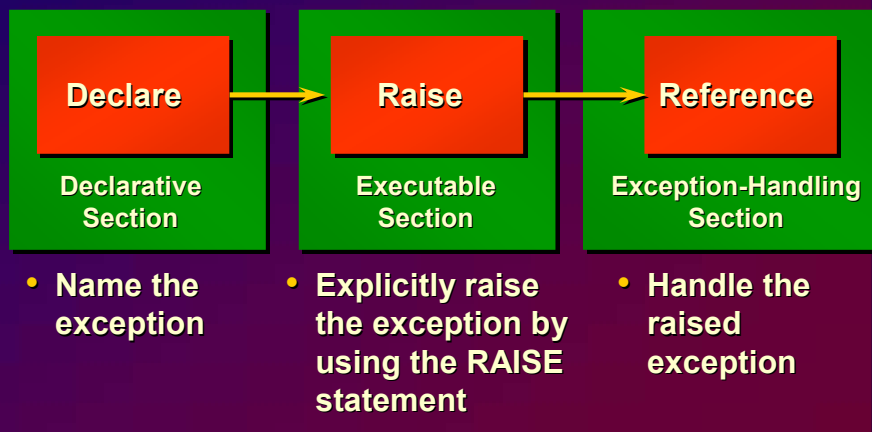
3

23-12

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## Trapping User-Defined Exceptions



## User-Defined Exception

### Example

```
[DECLARE]
  e_amount_remaining EXCEPTION;
  . . .
BEGIN
  . . .
  RAISE e_amount_remaining;
  . . .
EXCEPTION
  WHEN e_amount_remaining THEN
    :g_message := 'There is still an amount
                  in stock.';
  . . .
END;
```

1

2

3

23-15

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## Functions for Trapping Exceptions

- **SQLCODE**  
Returns the numeric value for the error code
- **SQLERRM**  
Returns the message associated with the error number

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# Functions for Trapping Exceptions

## Example

```
DECLARE
    v_error_code      NUMBER;
    v_error_message    VARCHAR2 (255) ;
BEGIN
    ...
EXCEPTION
    ...
    WHEN OTHERS THEN
        ROLLBACK;
        v_error_code := SQLCODE ;
        v_error_message := SQLERRM ;
        INSERT INTO errors VALUES (v_error_code,
                                    v_error_message) ;
END;
```

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## Calling Environments

SQL*Plus	Displays error number and message to screen
Procedure Builder	Displays error number and message to screen
Developer/2000 Forms	Accesses error number and message in a trigger by means of the ERROR_CODE and ERROR_TEXT packaged functions
Precompiler application	Accesses exception number through the SQLCA data structure
An enclosing PL/SQL block	Traps exception in exception-handling routine of enclosing block

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## Propagating Exceptions

Subblocks can handle an exception or pass the exception to the enclosing block.

```
DECLARE
    . . .
    e_no_rows      exception;
    e_integrity     exception;
    PRAGMA EXCEPTION_INIT (e_integrity, -2292);
BEGIN
    FOR c_record IN emp_cursor LOOP
        BEGIN
            SELECT ...
            UPDATE ...
            IF SQL%NOTFOUND THEN
                RAISE e_no_rows;
            END IF;
        EXCEPTION
            WHEN e_integrity THEN ...
            WHEN e_no_rows THEN ...
        END;
    END LOOP;
EXCEPTION
    WHEN NO_DATA_FOUND THEN . . .
    WHEN TOO_MANY_ROWS THEN . . .
END;
```

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## Summary

- **Exception types:**
  - Predefined Oracle Server error
  - Non-predefined Oracle Server error
  - User-defined error
- **Trap exceptions**
- **Handle exceptions:**
  - Trap the exception within the PL/SQL block
  - Propagate the exception

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## Practice Overview

- Handling named exceptions
- Creating and invoking user-defined exceptions

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## Practice Overview

- Handling named exceptions
- Creating and invoking user-defined exceptions

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