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Database Programming with SQL

2-3

Comparison Operators

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Objectives

- This lesson covers the following objectives:
  - Apply the proper comparison operator to return a desired result
  - Demonstrate proper use of BETWEEN, IN, and LIKE conditions to return a desired result
  - Distinguish between zero and NULL, the latter of which is unavailable, unassigned, unknown, or inapplicable
  - Explain the use of comparison conditions and NULL

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Purpose

- We use comparisons in everyday conversation without really thinking about it
  - "I can meet you BETWEEN 10:00 a.m. and 11:00 a.m."
  - "I'm looking for a pair of jeans LIKE the ones you are wearing."
  - "If I remember correctly, the best concert seats are IN rows 100, 200, and 300."

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Purpose

- The need to express these types of comparisons also exists in SQL
- Comparison conditions are used to find data in a table meeting certain conditions
- Being able to formulate a SELECT clause to return specific data is a powerful feature of SQL

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Comparison Operators

- You are already familiar with the comparison operators such as equal to (=), less than (<), and greater than (>)
- SQL has other operators that add functionality for retrieving specific sets of data
- These include:
  - BETWEEN…AND
  - IN
  - LIKE

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BETWEEN...AND

- The BETWEEN...AND operator is used to select and display rows based on a range of values
- When used with the WHERE clause, the BETWEEN...AND condition will return a range of values between and inclusive of the specified lower and upper limits

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BETWEEN…AND

- Note in the example from the Employees database, the values returned include the lower-limit value and the upper-limit value
- Values specified with the BETWEEN condition are said to be inclusive
- Note also that the lower-limit value must be listed first

```
SELECT last_name, salary
FROM employees
WHERE salary BETWEEN 9000 AND 11000;
```

LAST_NAME	SALARY
Zlotkey	10500
Abel	11000
Hunold	9000

- Note that the output included the lower-limit and upper-limit values

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BETWEEN…AND

- Using BETWEEN...AND is the same as using the following expression:

```
WHERE salary >= 9000 AND salary <=11000;
```

- In fact, there is no performance benefit in using one expression over the other
- We use BETWEEN...AND for simplicity in reading the code

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IN

- The IN condition is also known as the "membership condition."
- It is used to test whether a value is IN a specified set of values
- For example, IN could be used to identify students whose identification numbers are 2349, 7354, or 4333 or people whose international phone calling code is 1735, 82, or 10

```
SELECT city, state_province,
country_id
FROM locations
WHERE country_id IN('UK', 'CA');
```

CITY	STATE_PROVINCE	COUNTRY_ID
Toronto	Ontario	CA
Oxford	Oxford	UK

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IN

- In this example, the WHERE clause could also be written as a set of OR conditions:

```
SELECT city, state_province, country_id
FROM locations
WHERE country_id IN('UK', 'CA');
…
WHERE country_id = 'UK' OR country_id = 'CA';
```

- As with BETWEEN...AND, the IN condition can be written using either syntax just as efficiently

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LIKE

- Have you ever gone shopping to look for something that you saw in a magazine or on television but you weren't sure of the exact item?
- It's much the same with database searches
- A manager may know that an employee's last name starts with "S" but doesn't know the employee's entire name
- Fortunately, in SQL, the LIKE condition allows you to select rows that match either characters, dates, or number patterns
- Two symbols -- the (%) and the underscore (_) -- called wildcard characters, can be used to construct a search string

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LIKE

- The percent (%) symbol is used to represent any sequence of zero or more characters
- The underscore (_) symbol is used to represent a single character
- In the example shown below, all employees with last names beginning with any letter followed by an "o" and then followed by any other number of letters will be returned

```
SELECT last_name
FROM employees
WHERE last_name LIKE '_o%';
```

LAST_NAME
Kochhar
Lorentz
Mourgos

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LIKE

```
SELECT last_name
FROM employees
WHERE last_name LIKE '_o%';
```

- Which of the following last names could have been returned from the above query?
  - 1. Sommersmith
  - 2. Oog
  - 3. Fong
  - 4. Mo

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LIKE

- One additional option that is important:
  - When you need to have an exact match for a string that has a % or _ character in it, you will need to indicate that the % or the _ is not a wildcard but is part of the item you're searching for

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LIKE

- The ESCAPE option can be used to indicate that the _ or % is part of the name, not a wildcard value
- For example, if we wanted to retrieve an employee JOB_ID from the employees table containing the pattern _R, we would need to use an escape character to say we are searching for an underscore, and not just any one character

```
SELECT last_name, job_id
FROM EMPLOYEES
WHERE job_id LIKE '%\_R%' ESCAPE '\';
```

- This example uses the backslash '\' as the escape character, but any character can be used

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LIKE

- Without the ESCAPE option, all employees that have an R in their JOB_ID would be returned

```
SELECT last_name, job_id
FROM EMPLOYEES
WHERE job_id LIKE '%_R%'
```

LAST_NAME	JOB_ID
Abel	SA_REP
Davies	ST_CLERK
Ernst	IT_PROG
Fay	MK_REP
Fay	MK_REP
Grant	SA_REP
Higgins	AC_MGR
Hunold	IT_PROG
King	AD_PRES
Lorentz	IT_PROG
Matos	ST_CLERK
Rajs	ST_CLERK
Taylor	SA_REP
Vargas	ST_CLERK

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IS NULL, IS NOT NULL

- Remember NULL?
- It is the value that is unavailable, unassigned, unknown, or inapplicable
- Being able to test for NULL is often desirable
- You may want to know all the dates in June that, right now, do not have a concert scheduled
- You may want to know all of the clients who do not have phone numbers recorded in your database

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IS NULL, IS NOT NULL

- The IS NULL condition tests for unavailable, unassigned, or unknown data
- IS NOT NULL tests for data that is available in the database
- In the example on the next slide, the WHERE clause is written to retrieve all the last names of those employees who do not have a manager

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IS NULL, IS NOT NULL

```
SELECT last_name, manager_id
FROM employees
WHERE manager_id IS NULL;
```

LAST_NAME	MANAGER_ID
King	

- Employee King is the President of the company, so has no manager

```
SELECT last_name, commission_pct
FROM employees
WHERE commission_pct IS NOT NULL;
```

LAST_NAME	COMMISSION_PCT
Zlotkey	.2
Abel	.3
Taylor	.2
Grant	.15

- IS NOT NULL returns the rows that have a value in the commission_pct column

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Terminology

- Key terms used in this lesson included:
  - BETWEEN…AND
  - IN
  - LIKE
  - IS NULL
  - IS NOT NULL

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Summary

- In this lesson, you should have learned how to:
  - Apply the proper comparison operator to return a desired result
  - Demonstrate proper use of BETWEEN, IN, and LIKE conditions to return a desired result
  - Distinguish between zero and NULL, the latter of which is unavailable, unassigned, unknown, or inapplicable
  - Explain the use of comparison conditions and NULL

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