



## Beginning SQL

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and  
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# WHAT IS SQL



SQL, 'Structured Query Language', is a programming language designed to manage data stored in relational databases.

SQL operates through simple, declarative statements. This keeps data accurate and secure, and helps maintain the integrity of databases, regardless of size.




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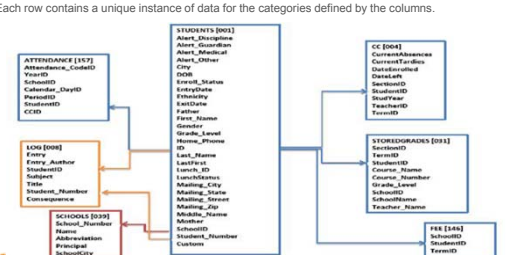

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## ORACLE® A relational database

A relational database is a set of tables containing data fitted into predefined categories. Each table (which is sometimes called a relation) contains one or more data categories in columns. Each row contains a unique instance of data for the categories defined by the columns.


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### Table Design

Fields/Columns which describe one characteristic of a record

ID	SCHOOLID	LAST_NAME	FIRST_NAME	MIDDLE_NAME	GRADE_LEVEL	GENDER	ETHNICITY
12345	490305	Smith	Stephen		10	M	W
12346	490300	Johnson	James	Lee	9	M	B
12347	490304	Benfield	Scott	Douglas	11	M	A
12348	490300	Wilson	Barbara	Anne	12	F	H

Records/Rows describe the occurrence of a record




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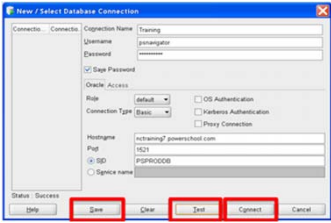

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### Client Application Oracle SQL Developer

SQL Developer is used to connect to an Oracle database.  
This product is provided free by the Oracle Corporation.


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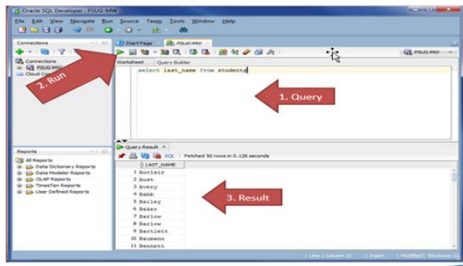

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### SQL Developer

- SQL Developer icon


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### View Table Names

Click the + beside connection name

Scroll down, click the + beside "Other Users"

Scroll down, click the + beside "PS"

Click "Tables"

Table Columns

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### View Column Names

Follow the steps under View Table Names.

Click the + beside the table for the column names you want to view.

To see the data in the table click the data tab.

Data Columns

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### How Does SQL Developer Connect to Oracle Database?

ODBC – Short for **O**pen **D**ata**B**ase **C**onnectivity, is an open standard application programming interface (API) for accessing a database. By using ODBC statements in a program, you can access files in a number of different databases.

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### KEYWORDS

**SELECT** –The SELECT statement is used to select columns for viewing and does not make changes to the database.

**FROM** –The FROM clause identifies the table where the columns are located.

**WHERE** –The WHERE statement filters the number of records returned by a query.

**ORDER BY** –The ORDER BY clause sorts records based on the values in one or more columns.




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### Let's Build a Simple Query

The SELECT statement is used to select data from a database.

**Problem:** The guidance counselor needs all available demographic information for students.

ID	FIRST_NAME	MIDDLE_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
46257	Percy	Donald	Slade	99	M	999999	W
46264	Geppetto	Donald	Flaversham	99	M	999999	W
46277	Megara	Daisy	Book	99	F	999999	M
46283	Orville	Daisy	Flaversham	99	F	999999	W

**Step 1-** What SQL keyword is required to select the data?

**Step 2-** What wildcard operator will select all columns in a table?

**Step 3-** What SQL keyword is required to select a table.

**Step 4-** What table holds the data?

**Note:** SQL statements are terminated with a semicolon.

**SELECT \* FROM students;**

ID	FIRST_NAME	MIDDLE_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
46257	Percy	Donald	Slade	99	M	999999	W
46264	Geppetto	Donald	Flaversham	99	M	999999	W
46277	Megara	Daisy	Book	99	F	999999	M
46283	Orville	Daisy	Flaversham	99	F	999999	W




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### Select Specific Columns

**Problem:** The secretary is requesting information including the student id, grade level, gender and ethnicity for all students.

ID	FIRST_NAME	MIDDLE_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
46257	Percy	Donald	Slade	99	M	999999	W
46264	Geppetto	Donald	Flaversham	99	M	999999	W
46277	Megara	Daisy	Book	99	F	999999	M
46283	Orville	Daisy	Flaversham	99	F	999999	W

**Step 1-** What SQL keyword is required to select the data?

**Step 2-** How do you select specific columns from a table?

**Note:** Commas are need to separate each column name.

**Step 3-** What SQL keyword is required to select a table?

**Step 4-** What table holds the data?

**Remember:** SQL statements are terminated with a semicolon.

**SELECT id, grade\_level, gender, ethnicity FROM students ;**

ID	GRADE_LEVEL	GENDER	ETHNICITY
46257	99	M	W
46264	99	M	W
46277	99	F	M
46283	99	F	W




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### Exercise #1

Write a query that returns the last name and the first name of all students from the students table below.

ID	FIRST_NAME	MIDDLE_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
46257	Percy	Donald	Slade	99	M	999999	W
46264	Geppetto	Donald	Flaversham	99	M	999999	W
46277	Megara	Daisy	Book	99	F	999999	M
46283	Orville	Daisy	Flaversham	99	F	999999	W

ANSWER:

```
SELECT last_name,
       first_name
FROM students;
```

LAST_NAME	FIRST_NAME
Slade	Percy
Flaversham	Geppetto
Book	Megara
Flaversham	Orville




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### Column Aliases

Aliases are created to temporarily rename columns in order to make the data easier to understand.

**Problem:** The cafeteria manager requests a list of all students. The list should show the student id, grade level, last name, first name, gender, and race for all students.

Use an alias to rename the Ethnicity column to Race.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
46257	Percy	Slade	99	M	999999	W
46264	Geppetto	Flaversham	99	M	999999	W
46277	Megara	Book	99	F	999999	M
46283	Orville	Flaversham	99	F	999999	W

- Step 1- What SQL keyword is required to select the data?
- Step 2- How do you select specific columns from a table?
- Step 3- What SQL keyword is used to alias a column?
- Step 4- How do you rename the column?
- Step 5- What SQL keyword is required to select a table?
- Step 6- What table holds the data?

**Remember:** Commas are needed to separate each column name. SQL statements are terminated with a semicolon.

```
SELECT id, grade_level, last_name, first_name, gender, ethnicity as "Race"
FROM students;
```

ID	GRADE_LEVEL	LAST_NAME	FIRST_NAME	GENDER	RACE
46257	99	Slade	Percy	M	W
46264	99	Flaversham	Geppetto	M	W
46277	99	Book	Megara	F	M
46283	99	Flaversham	Orville	F	W




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### Formatting

SQL Keywords are not case sensitive.  
SELECT is the same as select.

Case matters when using "QUOTES" or 'quotes'.

Spaces between keywords are required.

Tabbing and new lines are recommended to increase readability and clarity.

```
SELECT
    id,
    grade_level
FROM
    students;
```




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### Comparison Operators

Comparison operators are used to filter records.

When using the WHERE clause only those records are extracted that meet a required specification.

Comparison Operators	Description
=	equal to
<>, !=	is not equal to
<	less than
>	greater than
>=	greater than or equal to
<=	less than or equal to

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### Matching a Condition

The WHERE clause is used to select data by matching a condition.

**Problem:** The principal requests all demographic information for female students.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character

**Step 1-** What SQL keyword is used to required to select the data?  
**Step 2-** What wildcard operator will select all columns in a table?  
**Step 3-** What SQL keyword is required to select a table?  
**Step 4-** What table holds the data?  
**Step 5-** What SQL keyword is used to filter records?  
**Step 6-** What column is being filtered?  
**Step 7-** What comparison operator is used to compare a value?  
**Step 8-** What value needs to be compared?

**Remember:** SQL statements are terminated with a semicolon.

Enclose literal strings in single quotes

```
SELECT *
FROM students
WHERE gender = 'F';
```

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
46277	Megara	Book	99	F	999999	M
46283	Flaversham	Orville	99	F	999999	W
46208	Marie	Porter	99	F	999999	H
46324	Disney	Tige	11	F	490354	W

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### Exercise #2

Select the first name, last name and ethnicity of students whose ethnicity is 'W'.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
46257	Percy	Slade	99	M	999999	W
46264	Ceppetto	Flaversham	99	M	999999	W
46277	Megara	Book	99	F	999999	M
46283	Orville	Flaversham	99	F	999999	W

**ANSWER:**

```
SELECT first_name, last_name, ethnicity
FROM students
WHERE ethnicity = 'W';
```

FIRST_NAME	LAST_NAME	ETHNICITY
Percy	Slade	W
Ceppetto	Flaversham	W
Orville	Flaversham	W
John	Book	W
Copper	King	W

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### <= Comparison Operator

The LESS THAN or EQUAL TO operator is used to compare whether the left operand is less than or equal to the right operand.

**Problem:** The guidance counselor requests last name, first name and grade level for students in grades lower than grade 11?

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character


**Step 1-** What SQL keyword is used to select the data?  
**Step 2-** How do you select specific columns?  
**Step 3-** What SQL keyword is required to select a table?  
**Step 4-** What table holds the data?  
**Step 5-** What SQL keyword is used to filter records?  
**Step 6-** What column is being filtered?  
**Step 7-** What comparison operator is used to compare a value?  
**Step 8-** What value needs to be compared?

**Remember:** SQL statements are terminated with a semicolon.

```

SELECT last_name, first_name, grade_level
FROM students
WHERE grade_level <= 10;
    
```

LAST_NAME	FIRST_NAME	GRADE_LEVEL
Lily	Berkoz	-1
Aladdin	Naveen	10
Tangled	Anita	9
Darling	Frank	0
Darling	David	10




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### <> Comparison Operator

The not equal to operator is used to compare whether the left operand is not equal to the right operand.

**Problem:** The guidance counselor requests last name, first name and grade level for students who are not in grade 99?

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character


**Step 1-** What SQL keyword is used to select the data?  
**Step 2-** How do you select specific columns?  
**Step 3-** What SQL keyword is required to select a table?  
**Step 4-** What table holds the data?  
**Step 5-** What SQL keyword is used to filter records?  
**Step 6-** What column is being filtered?  
**Step 7-** What comparison operator is used to compare values?  
**Step 8-** What value needs to be compared?

**Remember:** SQL statements are terminated with a semicolon.

```

SELECT last_name, first_name, grade_level
FROM students
WHERE grade_level <> 99;
    
```

LAST_NAME	FIRST_NAME	GRADE_LEVEL
Book	John	11
King	Copper	12
Aladdin	Jennifer	11




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### ORDER BY clause

The ORDER BY clause sorts results either in ascending or descending order. Oracle sorts query results in ascending order by default.

**Problem:** The secretary requests the first name, last name, and grade level for students. Sort the list by last name in descending order.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character


**Step 1-** What SQL keyword is used to select the data?  
**Step 2-** How do you select specific columns?  
**Step 3-** What SQL keyword is required to select a table?  
**Step 4-** What table holds the data?  
**Step 5-** What SQL keywords are used to sort data?  
**Step 6-** What column(s) is the data sorted by?  
**Step 7-** How is the data sorted?

**Remember:** SQL statements are terminated with a semicolon.

```

SELECT first_name, last_name, grade_level
FROM students
ORDER BY last_name desc;
    
```

FIRST_NAME	LAST_NAME	GRADE_LEVEL
Jacob	Zwilling	99
Isabella	Zwilsnske	5
Amelia	Zwiener	99
Joshua	Zwiener	99
Dakota	Zweigle	8




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### Exercise #3

Select the first name, last name and grade level for all students. Sort by last name descending order and grade level in ascending order.

ID	FIRST_NAME	MIDDLE_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character		Character	Number	Character	Number	Character

ANSWER:

```
SELECT first_name, last_name, grade_level
FROM students
ORDER BY last_name desc, grade_level;
```

FIRST_NAME	LAST_NAME	GRADE_LEVEL
Jacob	Zwilling	99
Isabella	Zwirnska	5
Amelia	Zwiener	99
Joshua	Zwiener	99
Emily	Zweigle	3
Dakota	Zweigle	8



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### Logical Operators

Using the WHERE clause logical operators allow you to combine multiple conditions.

#### AND

The AND operator displays a record if both the first and the second condition are true.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
46257	Percy	Slade	99	M	999999	W
46254	Geppetto	Flaversham	99	M	999999	W
46277	Megara	Book	99	F	999999	M
46283	Orville	Flaversham	99	F	999999	W

```
SELECT first_name, last_name
FROM students
WHERE first_name = 'Geppetto' AND last_name = 'Flaversham';
```

FIRST_NAME	LAST_NAME
Geppetto	Flaversham

#### OR

The OR operator displays a record if either the first condition or the second condition is true.

```
SELECT first_name, last_name
FROM students
WHERE first_name = 'Percy' OR first_name = 'Megara';
```

FIRST_NAME	LAST_NAME
Percy	Slade
Megara	Book



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### AND Logical Operator

The AND operator displays a record if both the first condition AND the second condition are true.

Problem: The secretary requests the student id, first name, last name, grade level and gender for 12<sup>th</sup> grade female students.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character

- Step 1- What SQL keyword is used to select the data?
- Step 2- How do you select specific columns from a table?
- Step 3- What SQL keyword is required to select a table?
- Step 4- What table holds the data?
- Step 5- What SQL keyword is used to filter records?
- Step 6- What columns are being filtered?
- Step 7- What comparison operator is used to compare a value?
- Step 8- What values need to be compared?
- Step 9- What logical operator is used to compare the values?

Remember: SQL statements are terminated with a semicolon.

```
SELECT id, first_name, last_name, grade_level, gender
FROM students
WHERE grade_level = 12 AND gender = 'F';
```

Enclose literal strings in single quotes.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER
45453	Jake	Dalmations	12	F
45537	Jock	King	12	F
46215	Daisy	Elephant	12	F
46169	Drizella	Aristocats	12	F



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### Exercise #4

Select the first name, last name and ethnicity of students who are in grade 9 and ethnicity is B.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character

**ANSWER:**

```
SELECT first_name, last_name, ethnicity
FROM students
WHERE grade_level = 9 AND ethnicity = 'B';
```

FIRST_NAME	LAST_NAME	ETHNICITY
Maximus	Stone	B
Apolo	Aladdin	B
Donald	Packard	B
David	Rescuers	B

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### OR Operator

The OR operator displays a record if either the first condition OR the second condition is true.

**Problem:** The secretary requests the student id, first name, last name, grade level, and gender for students in the 10<sup>th</sup> grade OR all Male students in any grade.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character

**Step 1-** What SQL keyword is used to select the data?  
**Step 2-** How do you select specific columns from a table?  
**Step 3-** What SQL keyword is required to select a table?  
**Step 4-** What table holds the data?  
**Step 5-** What SQL keyword is used to filter records?  
**Step 6-** What columns are being filtered?  
**Step 7-** What comparison operator is used to compare a value?  
**Step 8-** What values need to be compared?  
**Step 9-** What logical operator is used to compare the values?

**Remember:** SQL statements are terminated with a semicolon.

```
SELECT id, first_name, last_name, grade_level, gender
FROM students
WHERE grade_level = 10 OR gender = 'M';
```

Enclose literal strings in single quotes

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER
46579	Fenton	Porter	10	M
48231	Oliver	Lily	10	M
48289	Tantor	Slade	10	M
46028	Chip	Dalmations	10	M

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### Wildcards

**SQL WILDCARD Operators** are used in conjunction with the LIKE operator to enhance the search in a table.

Wildcard characters can be either used as a prefix or a suffix. In fact, wildcard operators can be used anywhere in a word.

There can be more than one wildcard in a word.

Wild Card Operator	Description
% (Percentage)	A substitute for zero or more characters
_ Underscore	A substitute for a single character

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### Comparison Keywords

There are other comparison keywords available in sql which are used to enhance the search capabilities of a sql query. They are "LIKE", "IN", "BETWEEN...AND", "IS NULL".

Comparison Operators	Description
LIKE	Column value is similar to specified character(s).
IN	Column value is equal to any one of a specified set of values.
BETWEEN ...AND	Column value is between two values, including the end values specified in the range.
IS NULL	Column value does not exist.




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### LIKE Operator Using (%)

The LIKE operator is used to list all rows in a table whose column values match a specified pattern using the wildcard operators \_ (underscore) and % (percent).

**Problem:** The guidance counselor requests the first name, last name and grade level for students whose first name starts with an S.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character

- Step 1- What SQL keyword is used to select the data?
- Step 2- How do you select specific columns from a table?
- Step 3- What SQL keyword is required to select a table?
- Step 4- What table holds the data?
- Step 5- What SQL keyword is used to filter records?
- Step 6- What column is being filtered?
- Step 7- What SQL comparison keyword is used to compare the value?
- Step 8- What value needs to be compared?
- Step 9- What wildcard is used?

**Remember:** SQL statements are terminated with a semicolon.

```
SELECT first_name, last_name, grade_level
FROM students
WHERE first_name like 'S%';
```

Enclose literal strings in single quotes

Strings are case sensitive

FIRST_NAME	LAST_NAME	GRADE_LEVEL
Serabi	Aladdin	12
Serabi	Aladdin	99
Simba	Aladdin	9




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### Exercise #5

Select the first name, last name and grade level of all students whose last name starts with B.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character

**ANSWER:**

```
SELECT first_name, last_name, grade_level
FROM students
WHERE last_name like 'B%'
```

FIRST_NAME	LAST_NAME	GRADE_LEVEL
Hans	Badun	1
Hans	Badun	2
Jake	Badun	8
Donald	Balthazar	9




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### LIKE Operator Using ( \_ )

**Problem:** The guidance counselor requests the first name, last name and grade level for students whose last name starts with an S, the 2<sup>nd</sup> character is unknown, the other known characters are ith.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character

**Step 1-** What SQL keyword is used to select the data?  
**Step 2-** How do you select specific columns from a table?  
**Step 3-** What SQL keyword is required to select a table?  
**Step 4-** What table holds the data?  
**Step 5-** What keyword is used to filter records?  
**Step 6-** What column is being filtered?  
**Step 7-** What SQL comparison keyword is used to compare the value?  
**Step 8-** What value needs to be compared?  
**Step 9-** What wildcard is used?

**Remember:** SQL statements are terminated with a semicolon.


```

SELECT first_name, last_name, grade_level
FROM students
WHERE last_name like 'S_ith';
    
```

Strings are case sensitive

Enclose literal strings in single quotes

FIRST_NAME	LAST_NAME	GRADE_LEVEL
Smith	Jake	9
Smith	Jake	99
Smith	Jasper	4




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### Exercise #6

Select the first name, last name and grade level of students whose first name has the following characteristics:

- The 1<sup>st</sup> character is an S
- The 2<sup>nd</sup> character is unknown
- The 3<sup>rd</sup> and 4<sup>th</sup> characters are ba
- The 5<sup>th</sup> character is unknown
- The 6<sup>th</sup> character is t
- The rest of the characters are unknown


ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character

**ANSWER:**

```

SELECT first_name, last_name, grade_level
FROM students
WHERE first_name like 'S_ba_t%';
    
```

FIRST_NAME	LAST_NAME	GRADE_LEVEL
Sebastian	Aladdin	10
Sebastian	Aladdin	99
Sebastian	Aladdin	7
Sebastian	Aladdin	4




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### BETWEEN

The operator BETWEEN and AND is used to compare data for a range of values. The values can be dates, numbers or text.

**Problem:** The principal requests a report showing the first name, last name and grade level for students in grades 10 through grade 12.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character


**Step 1-** What SQL keyword is used to select the data?  
**Step 2-** How do you select specific columns from a table?  
**Step 3-** What SQL keyword is required to select a table?  
**Step 4-** What table holds the data?  
**Step 5-** What SQL keyword is used to filter records?  
**Step 6-** What column is being filtered?  
**Step 7-** What SQL comparison keywords are used to compare the values?  
**Step 8-** What values need to be compared?

**Remember:** SQL statements are terminated with a semicolon.

```

SELECT first_name, last_name, grade_level
FROM students
WHERE grade_level BETWEEN 10 AND 12 ;
    
```

FIRST_NAME	LAST_NAME	GRADE_LEVEL
John	Book	11
Copper	King	12
Jennifer	Aladdin	11
Tige	Disney	11
Oliver	Flowerham	11
Naveen	Aladdin	10




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### Exercise 7


Select all students whose grade is between 9 and 11.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character

**ANSWER:**

```
SELECT *
FROM students
WHERE grade_level between 9 and 11;
```

FIRST_NAME	LAST_NAME	GRADE_LEVEL
John	Book	11
Jennifer	Aladdin	11
Tige	Diane	11
Oliver	Flowerham	11
Naveen	Aladdin	10
Anita	Tangled	9




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### IN

The **IN** operator checks to see if a value is "IN" a list of values provided after the keyword **IN**.

**Problem:** The principal requests the student id, first name, last name, grade level and ethnicity for students whose ethnicity is Black, Hispanic or Asian. (B, H, A)

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character


**Step 1-** What SQL keyword is used to select the data?  
**Step 2-** How do you select specific columns from a table?  
**Step 3-** What SQL keyword is required to select a table?  
**Step 4-** What table holds this the data?  
**Step 5-** What SQL keyword is used to filter records?  
**Step 6-** What column is being filtered?  
**Step 7-** What SQL comparison keyword is used to compare the values?  
**Step 8-** What conditions needs to be compared?

**Remember:** SQL statements are terminated with a semicolon.

```
SELECT id, first_name, last_name, grade_level, ethnicity
FROM students
WHERE ethnicity IN ('B', 'H', 'A');
```

Enclose literal strings in single quotes

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	ETHNICITY
46208	Marie	Porter	99	H
46417	Tod	Anisocats	11	B
46428	David	Darling	10	A
46524	Percy	Horse	11	H




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### NOT Operator

Sometimes, it is more efficient to list the values that you do **NOT** want, as opposed to the values that you do want.

The NOT operator is used to negate a condition in the WHERE clause.

**Example- NOT IN, NOT BETWEEN, NOT LIKE, IS NOT NULL.**

**Problem:** The secretary requests student id, first name, last name and grade level for students not in grade 99.


ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character

**Step 1-** What SQL keyword is used to select the data?  
**Step 2-** How do you select specific columns from a table?  
**Step 3-** What is the keyword required to select a table?  
**Step 4-** What table holds the information?  
**Step 5-** What keyword is used to filter records?  
**Step 6-** What columns hold the data?  
**Step 7-** What comparison operator is used to match a value?  
**Step 8-** What values needs to be matched?

**Remember:** SQL statements are terminated with a semicolon.

```
SELECT id, first_name, last_name, grade_level
FROM students
WHERE grade_level not in 99;
```

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL
46318	John	Book	11
46217	Copper	King	12
46319	Jennifer	Aladdin	11




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### NULLS

NULL values represent missing unknown data.

NULL in SQL basically means that the value is 'undefined' whereas 0 is a defined value

**Problem:** The secretary requests last name, first name for students who do not have a web id.

ID	FIRST_NAME	MIDDLE_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	WEB_ID
Number	Character	Character	Character	Number	Character	Number	Character


**Step 1-** What SQL keyword is used to select the data?  
**Step 2-** How do you select specific columns?  
**Step 3-** What SQL keyword is required to select a table?  
**Step 4-** What table holds the data?  
**Step 5-** What SQL keyword is used to filter records?  
**Step 6-** What column is being filtered?  
**Step 7-** What SQL comparison keyword is used to compare a value?

**Remember:** SQL statements are terminated with a semicolon.

```

SELECT last_name, first_name, web_id
FROM students
WHERE web_id IS NULL ;
    
```

LAST_NAME	FIRST_NAME	WEB_ID
Porter	Marie	
Lily	Berkoz	
Aladdin	Jake	




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### Count(\*)

This function returns the number of records in the table that satisfy the condition specified in the WHERE clause.

**Problem:** The secretary requests a count of all students in the school that are currently enrolled.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ENROLL_STATUS
Number	Character	Character	Number	Character	Number	Character


**Step 1-** What SQL keyword is used to select the data?  
**Step 2-** What function is used to count rows of data?  
**Step 3-** What SQL keyword is required to select a table?  
**Step 4-** What table holds the data?  
**Step 5-** What SQL keyword is used to filter records?  
**Step 6-** What column is being filtered?  
**Step 7-** What comparison operator is used to compare criteria?  
**Step 8-** What value needs to be compared?

**Remember:** SQL statements are terminated with a semicolon.

```

SELECT count(*)
FROM students
WHERE enroll_status = 0;
    
```

Count(*)
20871




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### Group BY

The GROUP BY clause specifies one or more columns used to group rows returned by the query.

**Problem:** The secretary requests a count of all students in each grade level that are currently enrolled. The column that contains the count should be named Total Students.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ENROLL_STATUS
Number	Character	Character	Number	Character	Number	Character


**Step 1-** What SQL keyword is used to select the data?  
**Step 2-** How is the data being counted grouped?  
**Step 3-** What function is used to count records?  
**Step 4-** What SQL keyword is used to alias a column?  
**Step 5-** What SQL keyword is required to select a table?  
**Step 6-** What table holds the data?  
**Step 7-** What SQL keyword is used to filter records?  
**Step 8-** What column is being filtered?  
**Step 9-** What comparison operator is used to compare values?  
**Step 10-** What value needs to be compared?  
**Step 11-** What SQL keyword groups records returned by the query?  
**Step 12-** What column should the data be grouped by?

**Remember:** SQL statements are terminated with a semicolon.

```

SELECT grade_level, count(*) AS "Total Students"
FROM students
WHERE enroll_status = 0
GROUP BY grade_level ;
    
```

GRADE_LEVEL	TOTAL STUDENTS
1	1395
11	1855
13	49




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### Exercise 8

Provide a count of students grouped by gender that are currently enrolled. The column count should be named Total.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ENROLL_STATUS
Number	Character	Character	Number	Character	Number	Character

ANSWER:

```
SELECT gender, count(*) as "TOTAL"
FROM students
WHERE enroll_status = 0
GROUP BY gender;
```

GENDER	TOTAL
M	10830
F	10041




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### DISTINCT

The DISTINCT clause ensures that any records that are returned are unique for the column or columns in the SELECT statement.

Problem: The guidance counselor requests a list of unique ethnicities in the school.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	SCHOOLID	ETHNICITY
Number	Character	Character	Number	Character	Number	Character

- Step 1- What SQL keyword is used select the data?
- Step 2- What SQL keyword selects unique columns?
- Step 3- What column holds the data?
- Step 4- What SQL keyword is required to select a table?
- Step 5- What table holds the data?

Remember: SQL statements are terminated with a semicolon.

```
SELECT DISTINCT ethnicity
FROM students ;
```

ETHNICITY
W
H
P
I
M




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### Introducing Joins

A SQL query walks into a restaurant and sees two tables.



He walks up to them and says "Can I join you?"




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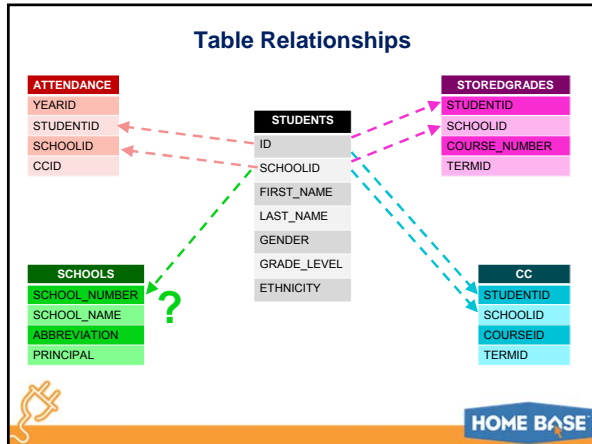
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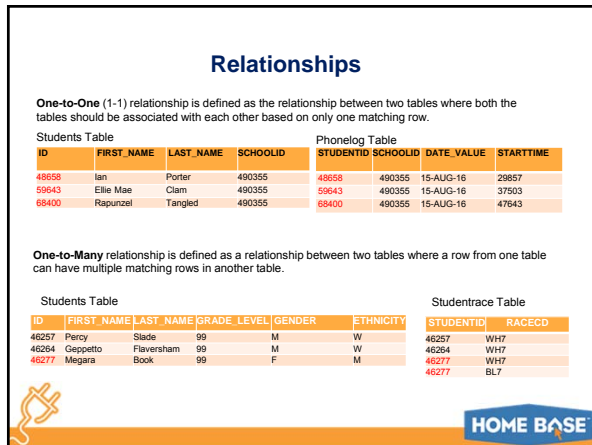
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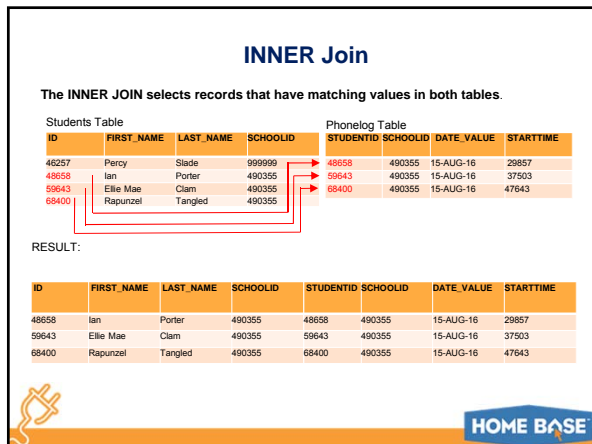
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### Inner Join Example

**Problem:** The guidance counselor requests a list of student id, last name, first name, gender, grade, ethnicity and race. Students should only be included in the list if they have a matching record in the studentrace table.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	ETHNICITY	STUDENTID	RACECD
45867	Marie	Frog	99	F	X	46257	WH7
46257	Percy	Slade	99	M	W	46264	WH7
46264	Geppetto	Flaversham	99	M	W	46277	WH7
46277	Megara	Book	99	F	M	46277	BL7

- Step 1- What SQL keyword is used select the data?
- Step 2- How do you select the specific columns?
- Step 3- What SQL keyword is required to select a table?
- Step 4- What tables hold the data?
- Step 5- What kind of SQL join is used to join the tables?
- Step 6- What is the column/columns both tables have in common that can be used to join the tables?
- Step 7- What SQL keyword joins the columns that have matching values?
- Step 8- What logical operator is used to compare conditions?

Remember: SQL statements are terminated with a semicolon.

```
SELECT students.id, students.last_name, students.first_name, students.gender,
students.grade_level, studentrace.studentid, studentrace.racecd
FROM students INNER JOIN studentrace ON students.id = studentrace.studentid;
```




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### Inner Join Results

Students Table						Studentrace Table	
ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	ETHNICITY	STUDENTID	RACECD
45867	Marie	Frog	99	F	X	46257	WH7
46257	Percy	Slade	99	M	W	46264	WH7
46264	Geppetto	Flaversham	99	M	W	46277	WH7
46277	Megara	Book	99	F	M	46277	BL7

```
SELECT students.id, students.last_name, students.first_name, students.gender,
students.grade_level, studentrace.studentid, studentrace.racecd
FROM students INNER JOIN studentrace ON students.id = studentrace.studentid;
```

RESULT:

ID	LAST_NAME	FIRST_NAME	GENDER	GRADE_LEVEL	ETHNICITY	RACECD
46257	Slade	Percy	M	99	W	WH7
46264	Flaversham	Geppetto	M	99	W	WH7
46277	Book	Megara	F	99	M	WH7
46277	Book	Megara	F	99	M	BL7




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### Table Aliasing

A table alias temporarily assigns another name to a table or column for the duration of a SELECT query.

Step 1- Rewrite the previous query using table aliasing.

Students Table						Studentrace Table	
ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	ETHNICITY	STUDENTID	RACECD
45867	Marie	Frog	99	F	X	46257	WH7
46257	Percy	Slade	99	M	W	46264	WH7
46264	Geppetto	Flaversham	99	M	W	46277	WH7
46277	Megara	Book	99	F	M	46277	BL7

```
SELECT students.id, students.last_name, students.first_name, students.gender, students.grade_level,
studentrace.studentid, studentrace.racecd
FROM students INNER JOIN studentrace ON students.id = studentrace.studentid;
```

```
SELECT s.id, s.last_name, s.first_name, s.gender, s.grade_level, sr.studentid, sr.racecd
FROM students s INNER JOIN studentrace sr ON s.id = sr.studentid;
```




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### LEFT Join

The LEFT JOIN returns all rows from the left table (Students), with the matching rows in the right table (Phonelog). The result is NULL in the right side when there is no match.

Students Table				Phonelog Table			
ID	FIRST_NAME	LAST_NAME	SCHOOLID	STUDENTID	SCHOOLID	DATE_VALUE	STARTTIME
46257	Percy	Slade	999999	48658	490355	15-AUG-16	29857
48658	Ian	Porter	490355	59643	490355	15-AUG-16	37503
59643	Elle Mae	Clam	490355	68400	490355	15-AUG-16	47643
68400	Rapunzel	Tangled	490355				

RESULT:

ID	FIRST_NAME	LAST_NAME	SCHOOLID	STUDENTID	SCHOOLID	DATE_VALUE	STARTTIME
46257	Percy	Slade	999999				
48658	Ian	Porter	490355	48658	490355	15-AUG-16	29857
59643	Elle Mae	Clam	490355	59643	490355	15-AUG-16	37503
68400	Rapunzel	Tangled	490355	68400	490355	15-AUG-16	47643



HOME BASE

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### Left Join Example

**Problem:** The guidance counselor requests student id, last name, first name, gender, grade, ethnicity and race. All students in the student table should be included even if no match exists in the studentrace table.

ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	ETHNICITY	STUDENTID	RACECD
45867	Marie	Frog	99	F	X	46257	WH7
46257	Percy	Slade	99	M	W	46264	WH7
46264	Geppetto	Flaversham	99	M	W	46277	WH7
46277	Megara	Book	99	F	M	46277	BL7

- Step 1- What SQL keyword is used to select the data?
- Step 2- How do you select the specific columns?
- Step 3- What SQL keyword is required to select a table?
- Step 4- What tables holds the data?
- Step 5- What kind of SQL join is used to join the tables?
- Step 6- What is the column/columns both tables have in common that can be used to join the tables?
- Step 7- What SQL keyword joins the columns ?
- Step 8- What logical operator is used to compare conditions?

**Remember:** SQL statements are terminated with a semicolon.

```
SELECT s.id,s.last_name, s.first_name, s.gender, s.grade_level,
sr.studentid, sr.racecd
FROM students s LEFT JOIN studentrace sr ON s.id = sr.studentid;
```



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### Left Join Results

Students Table							Studentrace Table	
ID	FIRST_NAME	LAST_NAME	GRADE_LEVEL	GENDER	ETHNICITY	STUDENTID	RACECD	
45867	Marie	Frog	99	F	X	46257	WH7	
46257	Percy	Slade	99	M	W	46264	WH7	
46264	Geppetto	Flaversham	99	M	W	46277	WH7	
46277	Megara	Book	99	F	M	46277	BL7	

```
SELECT s.id,s.last_name, s.first_name, s.gender, s.grade_level,
sr.studentid, sr.racecd
FROM students s LEFT JOIN studentrace sr ON s.id = sr.studentid;
```

RESULT:

ID	FIRST_NAME	LAST_NAME	GENDER	GRADE_LEVEL	ETHNICITY	RACECD
45867	Marie	Frog				
46257	Percy	Slade	M	99	W	WH7
46264	Geppetto	Flaversham	M	99	W	WH7
46277	Megara	Book	F	99	M	WH7
46277	Megara	Book	F	99	M	BL7



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### Lab Exercise 1

Write a SQL statement that will return student number, last name, first name, date of birth, and grade level from school 490362.

#### Answer:

```
SELECT student_number, last_name, first_name, dob, grade_level
FROM students
WHERE schoolid = 490362;
```

STUDENT_NUMBER	LAST_NAME	FIRST_NAME	DOB	GRADE_LEVEL
1	757192 Book	John	03-17-00	11
2	751649 Flaverham	Oliver	08-05-00	11
3	430576 Aladdin	Haveen	11-03-97	10
4	773830 Elephant	Willow	10-12-99	11
5	429176 Aristocats	Tod	05-28-99	11
6	757052 Zamp	Sibba	03-26-00	11
7	430193 Frog	Francia	03-04-99	12
Total Records Returned - 2123				
2122	12109162 Delamations	Fenson	11-29-99	11
2123	630685 Disney	Jasmine	02-25-99	11



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### Lab Exercise 2

Write a SQL statement that will return student number, last name, first name, date of birth, and grade level for all 12<sup>th</sup> graders from all schools in the district.

#### Answer:

```
SELECT student_number, last_name, first_name, dob, grade_level
FROM students
WHERE grade_level=12;
```

STUDENT_NUMBER	LAST_NAME	FIRST_NAME	DOB	GRADE_LEVEL
1	415929 King	Copper	07-10-99	12
2	777889 King	Evinrude	12-28-98	12
3	430839 Frog	Francie	03-04-99	12
4	430664 King	Jock	08-14-98	12
5	425604 Lilly	Odie	02-26-99	12
6	423826 Frog	Tiana	04-12-99	12
7	428779 Aladdin	Geppetto	05-17-98	12
8	430836 Pocahontas	Hera	12-14-98	12
Total Records Returned - 1980				
1979	8303170 Pocahontas	Hugo	02-01-98	12
1980	735972621 Aristocats	Hera	09-20-98	12



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### Lab Exercise 3

Write a SQL statement that will return student number, last name, first name, date of birth, and grade level from school 490380 and order by last name.

#### Answer:

```
SELECT student_number, last_name, first_name, dob, grade_level
FROM students
WHERE schoolid = 490380
ORDER by last_name;
```

STUDENT_NUMBER	LAST_NAME	FIRST_NAME	DOB	GRADE_LEVEL
1	880782 Aladdin	Rafiki	02-27-01	10
2	425978 Aladdin	Ellie Mae	07-18-98	12
3	424034 Aladdin	Orville	08-13-97	12
4	416046 Aladdin	Winston	05-08-99	12
5	428729 Aladdin	Sarabi	04-17-99	12
Total Records Returned - 1192				
1191	759487 Zazmani	Jayda	04-28-00	11
1192	750735 Zweigle	Bailey	11-29-99	9



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### Lab Exercise 4

Write a SQL statement to count the total number of students are in school 490346.

#### Answer:

```
SELECT count(*)
FROM students
WHERE schoolid = 490346;
```

	COUNT(*)
1	1475



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### Lab Exercise 5

Write a SQL statement that will return all students with last name like Fro.

#### Answer:

```
SELECT *
FROM students
WHERE last_name like 'Fro%';
```

SCID	ID	LASTFIRST	FIRST_NAME	MIDDLE_NAME	LAST_NAME	STUDENT_NUMBER	EN
1	47143	47143 Frog, Abigail Donald	Abigail	Donald	Frog	12260441	
2	79552	81452 Frog, Abigail Donald	Abigail	Donald	Frog	5123315179	
3	82570	85233 Frog, Abigail Donald	Abigail	Donald	Frog	8584554572	
4	45487	45487 Frog, Abigail Donald	Abigail	Daisy	Frog	252840	
5	49443	49443 Frog, Abigail Donald	Abigail	Donald	Frog	439600	
6	63891	63891 Frog, Abu Daisy	Abu	Daisy	Frog	1010588	
7	47775	47775 Frog, Abu Donald	Abu	Donald	Frog	415828	
8	48803	68923 Frog, Abu Donald	Abu	Donald	Frog	12458127	
9	57149	57149 Frog, Adelaide Donald	Adelaide	Donald	Frog	1530514	
10	42510	42510 Frog, Adelaide Daisy	Adelaide	Donald	Frog	429122	
11	41745	41745 Frog, Adelaide Daisy	Adelaide	Daisy	Frog	1199540	
12	47573	47573 Frog, Adelaide Donald	Adelaide	Donald	Frog	424811	
13	94301	94301 Frog, Adella Donald	Adella	Donald	Frog	12214169	
<b>Total Records Returned - 1372</b>							
1371	51137	51137 Froese, Sebastian ...	Sebastian	Donald	Froese	809412	
1372	47081	47081 Froese, Sebastian ...	Sebastian	Donald	Froese	762805	



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## APPENDIX



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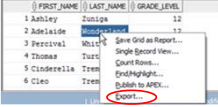
### Exporting Data

Right click in the results area.



	FIRST_NAME	LAST_NAME	GRADE_LEVEL
1	Ashley	Zuniga	12
2	Adelaide	Whittemore	12
3	Perceval	Whittemore	12

Select Export from the list.



	FIRST_NAME	LAST_NAME	GRADE_LEVEL
1	Ashley	Zuniga	12
2	Adelaide	Whittemore	12
3	Perceval	Whittemore	12
4	Thomas	Turtie	12
5	Cinderella	Tremaine	12
6	Cleo	Tremaine	12

**HOME BASE**

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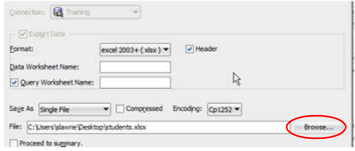
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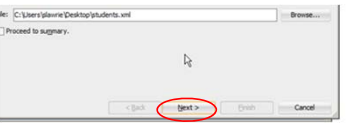
### Exporting Data

From the format drop down select excel 2003+(xlsx)

Click Browse to set where the data will be extracted to.



Click Next



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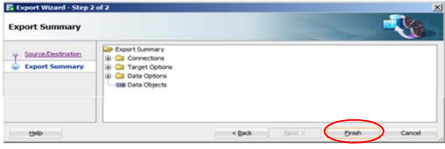
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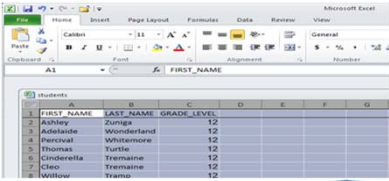
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### Exporting Data

Click Finish



Data exported to Excel



	FIRST_NAME	LAST_NAME	GRADE_LEVEL
1	Ashley	Zuniga	12
2	Adelaide	Whittemore	12
3	Perceval	Whittemore	12
4	Thomas	Turtie	12
5	Cinderella	Tremaine	12
6	Cleo	Tremaine	12
7	Willow	Tremaine	12

**HOME BASE**

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**SQL Resources**

**Web**

- [w3schools.com](http://w3schools.com)
- [SQLZoo.net](http://SQLZoo.net)
- [TechOnTheNet](http://TechOnTheNet)
- [Beginner SQL Tutorial](#)
- [SQLCourse.com](http://SQLCourse.com)

**Books**

- [Learning SQL: Master SQL Fundamentals 2nd Edition](#)
- [SQL: The Complete Reference, 3rd Edition](#)
- [Beginning SQL Queries: From Novice to Professional](#)
- [SQL: Programming Basics for Absolute Beginners](#)
- [SQL in 10 Minutes, Sams Teach Yourself \(4th Edition\)](#)
- [The Complete Guide for Beginners to Learn SQL Programming FAST](#)



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**PowerSchool Resources**

8778 – PowerSchool 9.x Data Dictionaries  
Data Dictionary Tables for PowerSchool 9.x

**PowerSchool Data Dictionaries**

NC Extended Schema Data Dictionary

**Extended Data Dictionary**



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**Oracle/SQL Developer Installation Software**

Create an Oracle account or sign in .

**Oracle Sign In**

Download Oracle PC Client software from the link below.

**Oracle PC Client**

Download SQL Developer software from the link below.

**SQL Developer**



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### Documents Needed from PowerSource

**Logon to PowerSource**

The following documents will help you with your setup:

1. Oracle ODBC Configuration and Client Installation Guide (Article #74822)
2. Request ODBC access to the database:  
6686 - ODBC Access & 6688 - Hosted ODBC FAQ
3. SSL VPN  
70605 - Pearson PowerSchool Software as a Service VPN Connectivity

An **SSL VPN** (Secure Sockets Layer virtual private network) is a form of **VPN** that can be used with a standard Web browser.

An SSL VPN allows users to remotely access restricted network resources via a secure and authenticated pathway by encrypting all network traffic.




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### KEYWORDS

**SELECT** –The SELECT statement is used to select columns for viewing and does not make changes to the database.

**FROM** –The FROM clause identifies the table where the columns are located.

**WHERE** –The WHERE statement filters the number of rows returned by a query.

**ORDER BY** –The ORDER BY clause sorts records based on the values in one or more columns.




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### Formatting

**SQL Keywords are not case sensitive.**  
SELECT is the same as select.

**Case matters when using “QUOTES” or ‘quotes’.**

**Spaces between keywords are required.**

**Tabbing and new lines are recommended to increase readability and clarity.**

```

SELECT
    id,
    grade_level
FROM
    students;

```




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### Most Used PowerSchool Tables

- Schools
- Students
- Courses
- Terms
- CC
- Sections
- Teachers
- StoredGrades




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### Comparison Operators

Comparison operators are used to filter records.

When using the WHERE clause only those records are extracted that fill a required specification.

Comparison Operators	Description
=	equal to
<>, !=	is not equal to
<	less than
>	greater than
>=	greater than or equal to
<=	less than or equal to




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### Wildcards

**SQL WILDCARD Operators** are used in conjunction with the LIKE operator to enhance the search in a table.

Wildcard characters can be either used as a prefix or a suffix. In fact, wildcard operators can be used anywhere in a word.

There can be more than one wildcard in a word.

Wild Card Operator	Description
% (Percentage)	A substitute for zero or more characters
_ Underscore	A substitute for a single character




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### Mathematical Functions

+	Addition
-	Subtraction
*	Multiplication
/	Division
%	Modulo = determines the integer remainder of the division
Round(x)	Returns the value of x rounded to the nearest whole integer
Round(x,d)	Returns the value of x rounded to the number of decimal places specified by the value of d
Floor(x)	Returns the largest integer value that is less than or equal to x
Cell(x)	Returns the smallest integer value that is less than or equal to x




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### Comparison Keywords

There are other comparison keywords available in sql which are used to enhance the search capabilities of a sql query. They are "LIKE", "IN", "BETWEEN...AND", "IS NULL".

Comparison Operators	Description
LIKE	Column value is similar to specified character(s).
IN	Column value is equal to any one of a specified set of values.
BETWEEN ...AND	Column value is between two values, including the end values specified in the range.
IS NULL	Column value does not exist.




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### Aggregate Functions

Comparison Operators	Description
Min	Returns the smallest value in a given column
Max	Returns the largest value in a given column
Sum	Returns the sum of the numeric values in a given column
Avg	Returns the average value of a given column
Count	Returns the total number of values in a given column
Count(*)	Returns the number of rows in a table




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