

David M. Kroenke and David J. Auer

Database Processing:

Fundamentals, Design, and Implementation



Chapter Two: Introduction to Structured Query Language

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Chapter Objectives I



- Structured Query Language (SQL)
- **SELECT/FROM/WHERE** framework
- retrieve data from
 - a **single** table
- To be able to write queries in SQL to use SQL DISTINCT, AND, OR, NOT, BETWEEN, LIKE, and IN keywords

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Structured Query Language



- **Structured Query Language (SQL)** was developed by the IBM Corporation in the late 1970's.
- SQL was endorsed as a U.S. national standard by the American National Standards Institute (ANSI) in 1992 [**SQL-92**].

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SQL As a Data Sublanguage



- SQL is **not** a **full** featured programming language.
 - C, C#, Java
- SQL is a data sublanguage for creating and processing database data and metadata.
- SQL is ubiquitous in enterprise-class DBMS products.
- SQL programming is a critical skill.

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SQL DDL and DML



- SQL statements can be divided into two categories:
 - **Data definition language (DDL)** statements
 - Used for creating tables, relationships, and other structures
 - Covered in Chapter **Seven**
 - **Data manipulation language (DML)** statements
 - Used for queries and data modification
 - Covered in this chapter (Chapter **Two**)

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Cape Codd Outdoor Sports

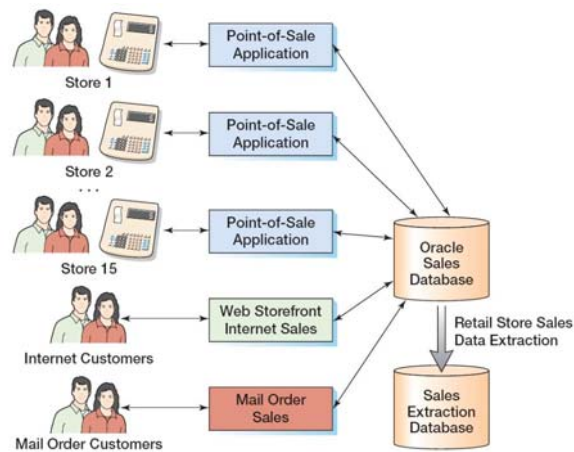


- Cape Codd Outdoor Sports is a fictitious company based on an actual outdoor retail equipment vendor.
- Cape Codd Outdoor Sports:
 - Has 15 retail stores in the United States and Canada.
 - Has an online Internet store.
 - Has a (postal) mail order department.
- All retail sales recorded in an Oracle database.

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Cape Codd Retail Sales Structure



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Extracted Retail Sales Data Format

Table	Column	Date Type
RETAIL_ORDER	OrderNumber	Integer
	StoreNumber	Integer
	StoreZip	Character (9)
	OrderMonth	Character (12)
	OrderYear	Integer
	OrderTotal	Currency
ORDER_ITEM	OrderNumber	Integer
	SKU	Integer
	Quantity	Integer
	Price	Currency
	ExtendedPrice	Currency
SKU_DATA	SKU	Integer
	SKU_Description	Character (35)
	Department	Character (30)
	Buyer	Character (30)

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Retail Sales Extract Tables

RETAIL_ORDER

ORDER_ITEM

SKU_DATA

OrderNumber	StoreNumber	StoreZIP	OrderMonth	OrderYear	OrderTotal
1000	10	98110	December	2014	\$445.00
2000	20	02335	December	2014	\$310.00
3000	10	98110	January	2015	\$480.00

OrderNumber	SKU	Quantity	Price	ExtendedPrice
1000	201000	1	\$300.00	\$300.00
1000	202000	1	\$130.00	\$130.00
2000	101100	4	\$50.00	\$200.00
2000	101200	2	\$50.00	\$100.00
3000	100200	1	\$300.00	\$300.00
3000	101100	2	\$50.00	\$100.00
3000	101200	1	\$50.00	\$50.00

SKU	SKU_Description	Department	Buyer
100100	Std. Scuba Tank, Yellow	Water Sports	Pete Hansen
100200	Std. Scuba Tank, Magenta	Water Sports	Pete Hansen
101100	Dive Mask, Small Clear	Water Sports	Nancy Meyers
101200	Dive Mask, Med Clear	Water Sports	Nancy Meyers
201000	Half-dome Tent	Camping	Cindy Lo
202000	Half-dome Tent Vestibule	Camping	Cindy Lo
301000	Light Fly Climbing Harness	Climbing	Jerry Martin
302000	Locking Carabiner, Oval	Climbing	Jerry Martin

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The SQL SELECT Statement

- The fundamental framework for SQL query states is the **SQL SELECT** statement
 - **SELECT** {ColumnName(s)}
 - **FROM** {TableName(s)}
 - **WHERE** {Conditions} ;
- All SQL statements end with a **semi-colon (;)**

Specific Columns on One Table



```
SELECT Department, Buyer  
FROM SKU_DATA;
```

SKU	SKU_Description	Department	Buyer
100100	Std. Scuba Tank, Yellow	Water Sports	Pete Hansen
100200	Std. Scuba Tank, Magenta	Water Sports	Pete Hansen
101100	Dive Mask, Small Clear	Water Sports	Nancy Meyers
101200	Dive Mask, Med Clear	Water Sports	Nancy Meyers
201000	Half-dome Tent	Camping	Cindy Lo
202000	Half-dome Tent Footprint	Camping	Cindy Lo
301000	Light Fly Climbing Harness	Climbing	Jerry Martin
302000	Locking carabiner, Oval	Climbing	Jerry Martin

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Specifying Column Order



```
SELECT Buyer, Department  
FROM SKU_DATA;
```

SKU	SKU_Description	Department	Buyer
100100	Std. Scuba Tank, Yellow	Water Sports	Pete Hansen
100200	Std. Scuba Tank, Magenta	Water Sports	Pete Hansen
101100	Dive Mask, Small Clear	Water Sports	Nancy Meyers
101200	Dive Mask, Med Clear	Water Sports	Nancy Meyers
201000	Half-dome Tent	Camping	Cindy Lo
202000	Half-dome Tent Footprint	Camping	Cindy Lo
301000	Light Fly Climbing Harness	Climbing	Jerry Martin
302000	Locking carabiner, Oval	Climbing	Jerry Martin

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The DISTINCT Keyword



```
SELECT    DISTINCT Buyer, Department  
FROM      SKU_DATA;
```

SKU	SKU_Description	Department	Buyer
100100	Std. Scuba Tank, Yellow	Water Sports	Pete Hansen
100200	Std. Scuba Tank, Magenta	Water Sports	Pete Hansen
101100	Dive Mask, Small Clear	Water Sports	Nancy Meyers
101200	Dive Mask, Med Clear	Water Sports	Nancy Meyers
201000	Half-dome Tent	Camping	Cindy Lo
202000	Half-dome Tent Footprint	Camping	Cindy Lo
301000	Light Fly Climbing Harness	Climbing	Jerry Martin
302000	Locking carabiner, Oval	Climbing	Jerry Martin

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Selecting All Columns: The Asterisk (*) Keyword



```
SELECT    *  
FROM SKU_DATA;
```

SKU	SKU_Description	Department	Buyer
100100	Std. Scuba Tank, Yellow	Water Sports	Pete Hansen
100200	Std. Scuba Tank, Magenta	Water Sports	Pete Hansen
101100	Dive Mask, Small Clear	Water Sports	Nancy Meyers
101200	Dive Mask, Med Clear	Water Sports	Nancy Meyers
201000	Half-dome Tent	Camping	Cindy Lo
202000	Half-dome Tent Footprint	Camping	Cindy Lo
301000	Light Fly Climbing Harness	Climbing	Jerry Martin
302000	Locking carabiner, Oval	Climbing	Jerry Martin

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Specific Rows from One Table



```
SELECT      *
FROM        SKU_DATA
WHERE       Department = 'Water Sports';
```

SKU	SKU_Description	Department	Buyer
100100	Std. Scuba Tank, Yellow	Water Sports	Pete Hansen
100200	Std. Scuba Tank, Magenta	Water Sports	Pete Hansen
101100	Dive Mask, Small Clear	Water Sports	Nancy Meyers
101200	Dive Mask, Med Clear	Water Sports	Nancy Meyers
201000	Half-dome Tent	Camping	Cindy Lo
202000	Half-dome Tent Footprint	Camping	Cindy Lo
301000	Light Fly Climbing Harness	Climbing	Jerry Martin
302000	Locking carabiner, Oval	Climbing	Jerry Martin

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Specific Columns and Rows from One Table



```
SELECT      SKU_Description, Buyer
FROM        SKU_DATA
WHERE       Department = 'Climbing';
```

SKU	SKU_Description	Department	Buyer
100100	Std. Scuba Tank, Yellow	Water Sports	Pete Hansen
100200	Std. Scuba Tank, Magenta	Water Sports	Pete Hansen
101100	Dive Mask, Small Clear	Water Sports	Nancy Meyers
101200	Dive Mask, Med Clear	Water Sports	Nancy Meyers
201000	Half-dome Tent	Camping	Cindy Lo
202000	Half-dome Tent Footprint	Camping	Cindy Lo
301000	Light Fly Climbing Harness	Climbing	Jerry Martin
302000	Locking carabiner, Oval	Climbing	Jerry Martin

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Sorting the Results—ORDER BY



```
SELECT *
FROM ORDER_ITEM
ORDER BY OrderNumber, Price;
```

OrderNumber	SKU	Quantity	Price	ExtendedPrice
3000	100200	1	300.00	300.00
2000	101100	4	50.00	200.00
3000	101100	2	50.00	100.00
2000	101200	2	50.00	100.00
3000	101200	1	50.00	50.00
1000	201000	1	300.00	300.00
1000	202000	1	130.00	130.00

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Sort Order:

Ascending and Descending



```
SELECT *
FROM ORDER_ITEM
ORDER BY Price DESC, OrderNumber ASC;
```

OrderNumber	SKU	Quantity	Price	ExtendedPrice
3000	100200	1	300.00	300.00
2000	101100	4	50.00	200.00
3000	101100	2	50.00	100.00
2000	101200	2	50.00	100.00
3000	101200	1	50.00	50.00
1000	201000	1	300.00	300.00
1000	202000	1	130.00	130.00

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WHERE Clause Options—AND



```
SELECT *
FROM SKU_DATA
WHERE Department = 'Water Sports'
AND Buyer = 'Nancy Meyers';
```

SKU	SKU_Description	Department	Buyer
100100	Std. Scuba Tank, Yellow	Water Sports	Pete Hansen
100200	Std. Scuba Tank, Magenta	Water Sports	Pete Hansen
101100	Dive Mask, Small Clear	Water Sports	Nancy Meyers
101200	Dive Mask, Med Clear	Water Sports	Nancy Meyers
201000	Half-dome Tent	Camping	Cindy Lo
202000	Half-dome Tent Footprint	Camping	Cindy Lo
301000	Light Fly Climbing Harness	Climbing	Jerry Martin
302000	Locking carabiner, Oval	Climbing	Jerry Martin

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WHERE Clause Options—OR



```
SELECT *
FROM SKU_DATA
WHERE Department = 'Camping'
OR Department = 'Climbing';
```

SKU	SKU_Description	Department	Buyer
100100	Std. Scuba Tank, Yellow	Water Sports	Pete Hansen
100200	Std. Scuba Tank, Magenta	Water Sports	Pete Hansen
101100	Dive Mask, Small Clear	Water Sports	Nancy Meyers
101200	Dive Mask, Med Clear	Water Sports	Nancy Meyers
201000	Half-dome Tent	Camping	Cindy Lo
202000	Half-dome Tent Footprint	Camping	Cindy Lo
301000	Light Fly Climbing Harness	Climbing	Jerry Martin
302000	Locking carabiner, Oval	Climbing	Jerry Martin

WHERE Clause Options— **IN**



```
SELECT      *
FROM        SKU_DATA
WHERE       Buyer IN ('Nancy Meyers',
                    'Cindy Lo', 'Jerry Martin');
```

SKU	SKU_Description	Department	Buyer
100100	Std. Scuba Tank, Yellow	Water Sports	Pete Hansen
100200	Std. Scuba Tank, Magenta	Water Sports	Pete Hansen
101100	Dive Mask, Small Clear	Water Sports	Nancy Meyers
101200	Dive Mask, Med Clear	Water Sports	Nancy Meyers
201000	Half-dome Tent	Camping	Cindy Lo
202000	Half-dome Tent Footprint	Camping	Cindy Lo
301000	Light Fly Climbing Harness	Climbing	Jerry Martin
302000	Locking carabiner, Oval	Climbing	Jerry Martin

WHERE Clause Options— **NOT IN**



```
SELECT      *
FROM        SKU_DATA
WHERE       Buyer NOT IN ('Nancy Meyers',
                        'Cindy Lo', 'Jerry Martin');
```

SKU	SKU_Description	Department	Buyer
100100	Std. Scuba Tank, Yellow	Water Sports	Pete Hansen
100200	Std. Scuba Tank, Magenta	Water Sports	Pete Hansen
101100	Dive Mask, Small Clear	Water Sports	Nancy Meyers
101200	Dive Mask, Med Clear	Water Sports	Nancy Meyers
201000	Half-dome Tent	Camping	Cindy Lo
202000	Half-dome Tent Footprint	Camping	Cindy Lo
301000	Light Fly Climbing Harness	Climbing	Jerry Martin
302000	Locking carabiner, Oval	Climbing	Jerry Martin

WHERE Clause Options—Ranges with



```
SELECT *
FROM ORDER_ITEM
WHERE ExtendedPrice
      BETWEEN 100 AND 200;
```

OrderNumber	SKU	Quantity	Price	ExtendedPrice
3000	100200	1	300.00	300.00
2000	101100	4	50.00	200.00
3000	101100	2	50.00	100.00
2000	101200	2	50.00	100.00
3000	101200	1	50.00	50.00
1000	201000	1	300.00	300.00
1000	202000	1	130.00	130.00

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WHERE Clause Options—Ranges with



```
SELECT *
FROM ORDER_ITEM
WHERE ExtendedPrice >= 100
      AND ExtendedPrice <= 200;
```

OrderNumber	SKU	Quantity	Price	ExtendedPrice
3000	100200	1	300.00	300.00
2000	101100	4	50.00	200.00
3000	101100	2	50.00	100.00
2000	101200	2	50.00	100.00
3000	101200	1	50.00	50.00
1000	201000	1	300.00	300.00
1000	202000	1	130.00	130.00

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WHERE Clause Options— LIKE and Wildcards



- The SQL keyword **LIKE** can be combined with wildcard symbols:

_ = exactly **one** character

% = any set of **one or more** characters

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WHERE Clause Options— **LIKE** and Wildcards



SELECT *

FROM SKU_DATA

WHERE Buyer LIKE 'Pete%';

SKU	SKU_Description	Department	Buyer
100100	Std. Scuba Tank, Yellow	Water Sports	Pete Hansen
100200	Std. Scuba Tank, Magenta	Water Sports	Pete Hansen
101100	Dive Mask, Small Clear	Water Sports	Nancy Meyers
101200	Dive Mask, Med Clear	Water Sports	Nancy Meyers
201000	Half-dome Tent	Camping	Cindy Lo
202000	Half-dome Tent Footprint	Camping	Cindy Lo
301000	Light Fly Climbing Harness	Climbing	Jerry Martin
302000	Locking carabiner, Oval	Climbing	Jerry Martin

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WHERE Clause Options— LIKE and Wildcards



SELECT *

FROM SKU_DATA

WHERE SKU_Description LIKE '%Tent%';

SKU	SKU_Description	Department	Buyer
100100	Std. Scuba Tank, Yellow	Water Sports	Pete Hansen
100200	Std. Scuba Tank, Magenta	Water Sports	Pete Hansen
101100	Dive Mask, Small Clear	Water Sports	Nancy Meyers
101200	Dive Mask, Med Clear	Water Sports	Nancy Meyers
201000	Half-dome Tent	Camping	Cindy Lo
202000	Half-dome Tent Footprint	Camping	Cindy Lo
301000	Light Fly Climbing Harness	Climbing	Jerry Martin
302000	Locking carabiner, Oval	Climbing	Jerry Martin

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WHERE Clause Options— LIKE and Wildcards



SELECT *

FROM SKU_DATA

WHERE SKU LIKE '%2__';

SKU	SKU_Description	Department	Buyer
100100	Std. Scuba Tank, Yellow	Water Sports	Pete Hansen
100200	Std. Scuba Tank, Magenta	Water Sports	Pete Hansen
101100	Dive Mask, Small Clear	Water Sports	Nancy Meyers
101200	Dive Mask, Med Clear	Water Sports	Nancy Meyers
201000	Half-dome Tent	Camping	Cindy Lo
202000	Half-dome Tent Footprint	Camping	Cindy Lo
301000	Light Fly Climbing Harness	Climbing	Jerry Martin
302000	Locking carabiner, Oval	Climbing	Jerry Martin

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