

ADVANCED RDB and SQL

Welcome!!

Advanced Relational Database
and SQL
Coursera Project Network

Overview

Grades

Notes

Discussion Forums

Messages

Resources

Supplemental
Materials

Course Manager
Staff & Mentors Only

Supplemental Materials

HIGHLY recommended prerequisite:

Introduction to Relational Database and SQL

<https://www.coursera.org/projects/introduction-to-relational-database-and-sql>

Intermediate Relational Database and SQL

<https://coursera.org/projects/intermediate-rdb-sql>

MySQL functions on W3Schools:

https://www.w3schools.com/sql/sql_ref_mysql.asp

MySQL Server Locale Support (location codes)

<https://dev.mysql.com/doc/refman/5.7/en/locale-support.html>

Differences between Stored Procedures and Stored Functions

<https://www.dotnettricks.com/learn/sqlserver/difference-between-stored-procedure-and-function-in-sql-server#:~:text=Basic%20Differences%20between%20Stored%20Procedure,have%20input%20or%20output%20param>

Naming convention:

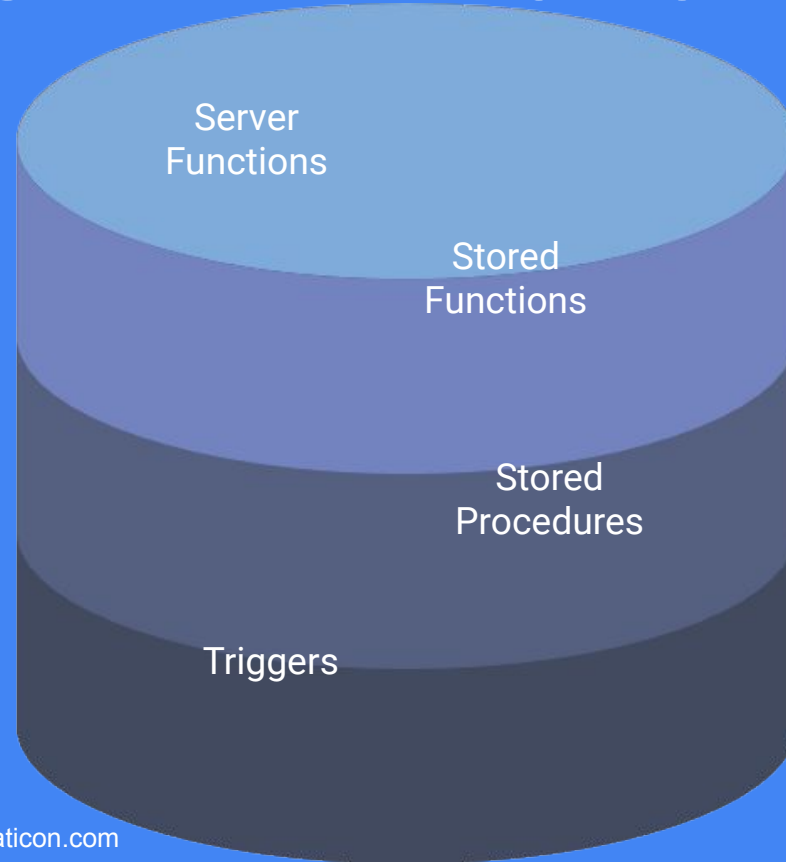
<https://launchbylunch.com/posts/2014/Feb/16/sql-naming-conventions/>

SQL Data Types

https://www.w3schools.com/sql/sql_datatypes.asp

ADVANCED RDB and SQL

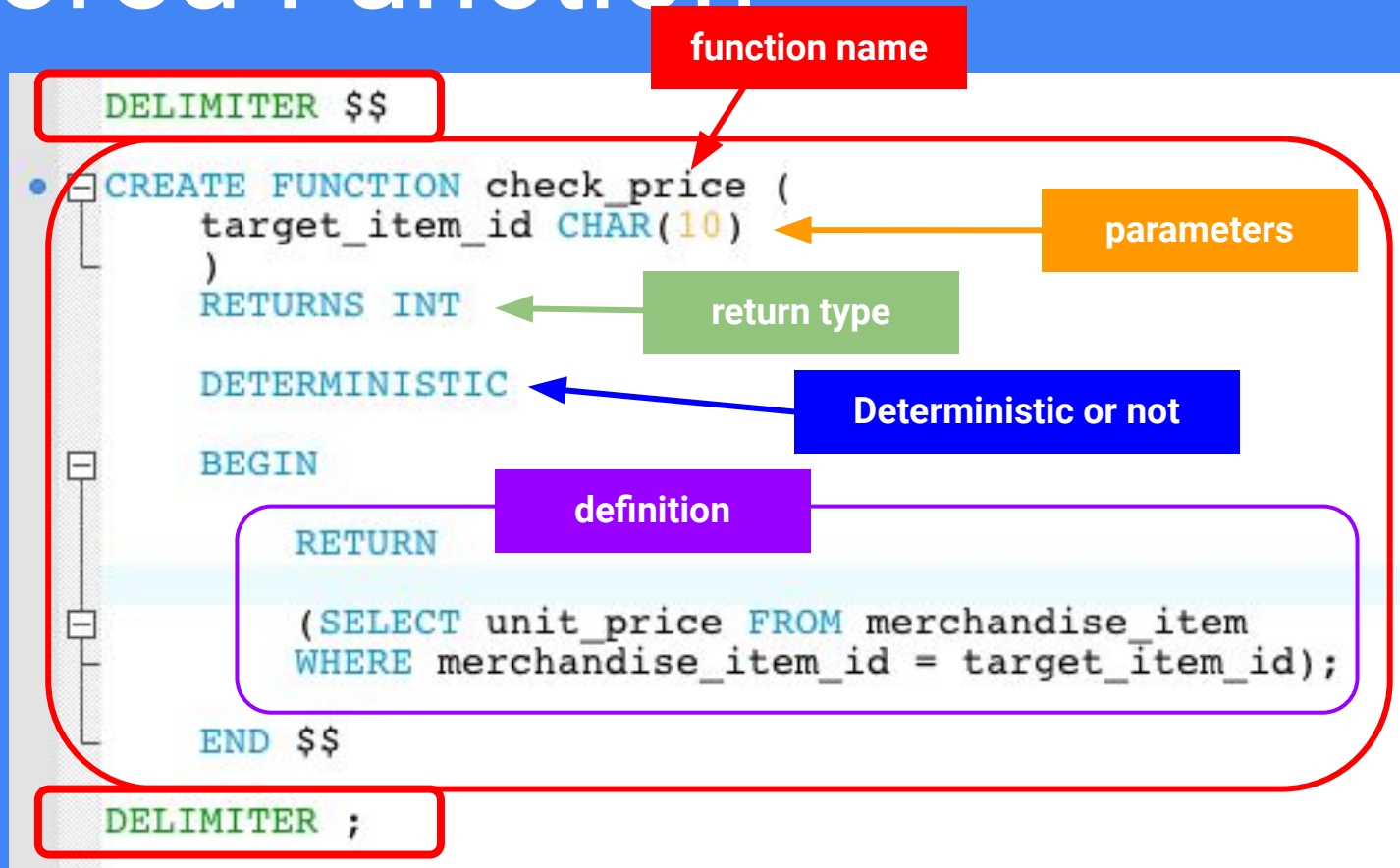
Topics



Common Table
Expression
(CTE)

CTE Recursive

Stored Function



Stored Procedures

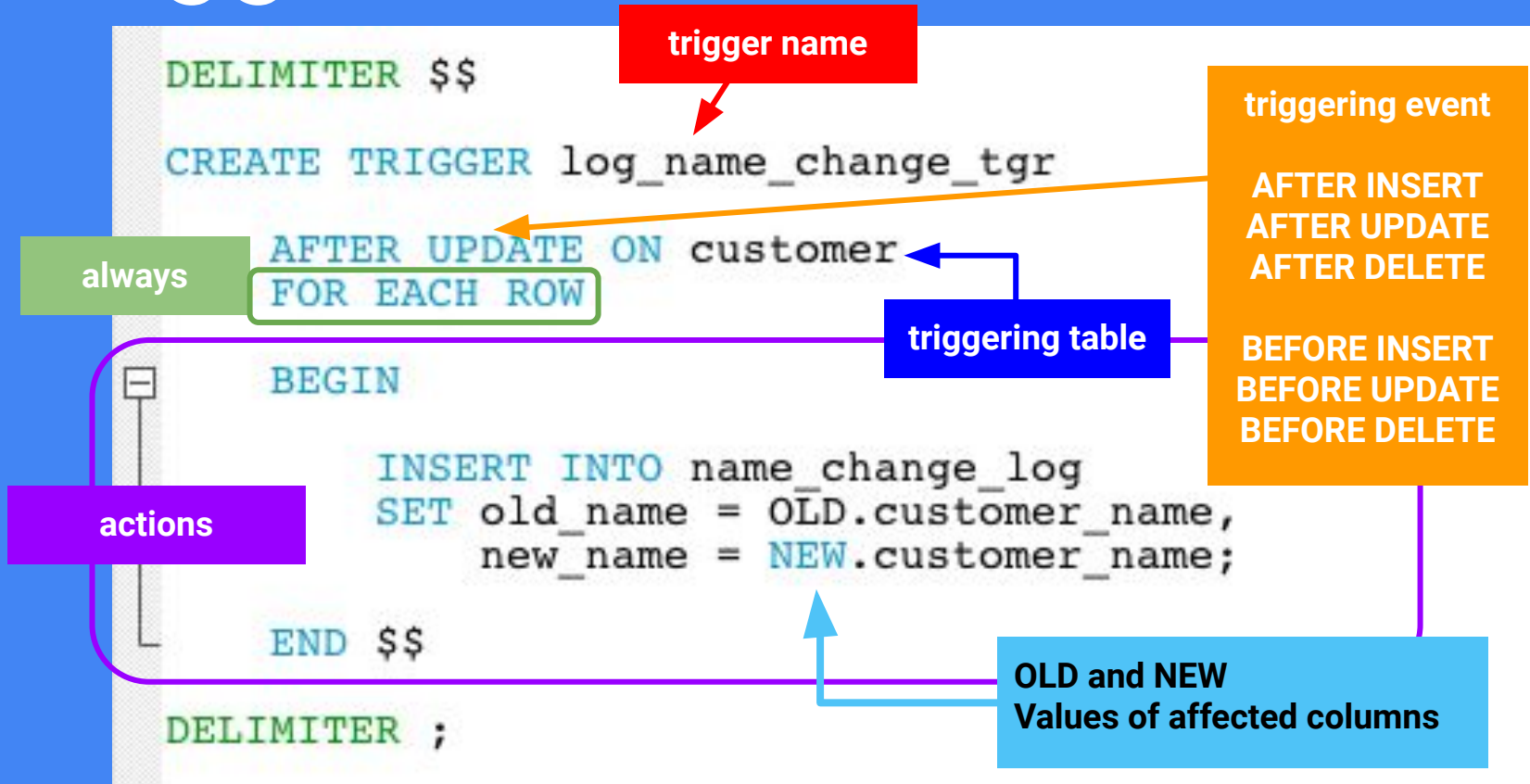
The diagram illustrates the components of a SQL stored procedure definition. It features a code block with the following SQL syntax:

```
DELIMITER $$  
  
CREATE PROCEDURE get_order_total (  
    IN request_order_id CHAR(10),  
    OUT order_total INT)  
  
BEGIN  
  
    SELECT SUM(unit_price * quantity)/100 INTO order_total  
    FROM customer_order_line_item, merchandise_item  
    WHERE  
        merchandise_item.merchandise_item_id  
        = customer_order_line_item.merchandise_item_id  
    AND  
        customer_order_line_item.customer_order_id  
        = request_order_id;  
  
END$$  
  
DELIMITER ;
```

Annotations with arrows point to specific parts of the code:

- procedure name**: Points to `get_order_total` in the `CREATE PROCEDURE` statement.
- parameters**: Points to the `IN request_order_id CHAR(10),` and `OUT order_total INT` declarations.
- set output**: Points to the `INTO order_total` clause in the `SELECT` statement within the `BEGIN` block.
- definition**: Points to the entire SQL block, which is enclosed in a purple rounded rectangle.

Triggers



Common Table Expression

CTE name

column names

```
WITH order_line_item_cte (new_name, new_order_id, new_description, order_qty, new_unit_price, line_subtotal) AS  
(  
  SELECT  
    customer.customer_name,  
    customer_order_line_item.customer_order_id,  
    merchandise_item.description,  
    customer_order_line_item.quantity,  
    merchandise_item.unit_price / 100 AS "unit_price_decimal",  
    customer_order_line_item.quantity * merchandise_item.unit_price / 100 AS "line_total"  
  FROM customer_order_line_item, customer_order, customer, merchandise_item  
  WHERE  
    customer_order_line_item.merchandise_item_id = merchandise_item.merchandise_item_id AND  
    customer_order.customer_id = customer.customer_id AND  
    customer_order_line_item.customer_order_id = customer_order.customer_order_id  
  ORDER BY  
    customer_name,  
    customer_order_line_item.customer_order_id,  
    merchandise_item.description  
)
```

definition

number of columns
must agree

and they
correspond

```
SELECT * from order_line_item_cte;
```

use as if it's a read-only table

Common Table Expression

column names

```
WITH order_line_item_cte (new_name, new_order_id, new_description, order_qty, new_unit_price, line_subtotal) AS
```

⌵ (

new_name	new_order_id	new_description	order_qty	new_unit_price	line_subtotal
Harrison Kong	D000000001	Bamboo Notebook	4	2.0000	8.0000
Harrison Kong	D000000001	Dragon Painting	2	3.0000	6.0000
Harrison Kong	D000000001	Thor Statue	1	25.0000	25.0000
Harrison Kong	D000000002	Bamboo Notebook	20	2.0000	40.0000
Harrison Kong	D000000002	Dragon Painting	50	3.0000	150.0000
Harrison Kong	D000000002	Thor Statue	15	25.0000	375.0000
Mary Samaritan	D000000003	Dragon Painting	1000	3.0000	3000.0000
Mary Samaritan	D000000003	Thor Statue	500	25.0000	12500.0000

CTE Recursive

```
WITH RECURSIVE merchandise_cte (merchandise_item_id, depth, description, unit_price_decimal, alpha_sort, bundle_id)
-- defining the common table expression
AS (
    -- anchor
    SELECT
        merchandise_item_id,
        1,
        CAST(description AS CHAR(500)),
        CAST(unit_price / 100 AS DECIMAL(8, 2)),
        CAST(description AS CHAR(700)),
        bundle_id
    FROM merchandise_item
    UNION ALL
    -- recursive
    SELECT
        D.merchandise_item_id,
        depth + 1,
        CAST(CONCAT(REPEAT(" |_", depth), D.description) AS CHAR(500)),
        CAST(NULL AS DECIMAL(8, 2)),
        CAST(CONCAT(C.alpha_sort, " ", D.description) AS CHAR(700)),
        D.bundle_id
    FROM merchandise_cte AS C, merchandise_item AS D
    WHERE C.merchandise_item_id = D.bundle_id
)
-- using the common table expression
SELECT * FROM merchandise_cte
ORDER BY alpha_sort
```

column names

same number

rows from all the results set are combined!

calls itself !!

recursive

stop condition

anchor

CTE Recursive - iteration 1

merchandise_item_id	depth	description	unit_price_decimal	alpha_sort	bundle_id
TOKYONOVEL	1	A Tokyo Love Story	20	A Tokyo Love Story	B000000003
B000000001	1	Asian Bundle	1050	Asian Bundle	NULL
BAMBOOBOOK	1	Bamboo Notebook	2	Bamboo Notebook	NULL
CANADAMPL	1	Canadian Maple Syrup	22	Canadian Maple Syrup	B000000004
B000000005	1	Chef's Gift Set	575	Chef's Gift Set	B000000006
TOKYOGUIDE	1	Downtown Tokyo Guide Book	35.99	Downtown Tokyo Guide Book	B000000003
DRAGONPTNG	1	Dragon Painting	anchor query		NULL
DUTCHOVEN	1	Dutch Oven			B000000005
B000000004	1	Gourmet Bundle			B000000006
ITALYPASTA	1	Italian Pasta Machine	499	Italian Pasta Machine	B000000005
B000000002	1	Japanese Bundle	68	Japanese Bundle	B000000001

merchandise_item_id	depth	description	unit_price_decimal	alpha_sort	bundle_id
B000000002	2	└─ Japanese Bundle	NULL	Asian Bundle Japanese Bundle	B000000001
TANGSCROLL	2	└─ Tang Dynasty Scroll	NULL	Asian Bundle Tang Dynasty Scroll	B000000001
THAIMAP	2	└─ Thailand Map	NULL	Asian Bundle Thailand Map	B000000001
DUTCHOVEN	2	└─ Dutch Oven	NULL	Chef's Gift Set Dutch Oven	B000000005
ITALYPASTA	2	└─ Italian Pasta Machine	NULL	Chef's Gift Set Italian Pasta Machine	B000000005
CANADAMPL	2	└─ Canadian Maple Syrup	recursive query	Canadian Maple Syrup	B000000004
USCOOKIES	2	└─ New Orleans Cookies		New Orleans Cookies	B000000004
KOILIGHT	2	└─ Koi Nightlight		Japanese Bundle Koi Nightlight	B000000002
KYOTOCBOOK	2	└─ Kyoto Cookbook	NULL	Japanese Bundle Kyoto Cookbook	B000000002
B000000003	2	└─ Tokyo Bundle	NULL	Japanese Bundle Tokyo Bundle	B000000002

CTE Recursive - iteration 2

from recursive iteration 1

merchandise_item_id	depth	description	unit_price_decimal	alpha_sort	bundle_id
B000000002	2	Japanese Bundle	NULL	Asian Bundle Japanese Bundle	B000000001
TANGSCROLL	2	Tang Dynasty Scroll	NULL	Asian Bundle Tang Dynasty Scroll	B000000001
THAIMAP	2	Thailand Map	NULL	Asian Bundle Thailand Map	B000000001
DUTCHOVEN	2	Dutch Oven	NULL	Chef's Gift Set Dutch Oven	
ITALYPASTA	2	Italian Pasta Machine	NULL	Chef's Gift Set Italian Pasta Machine	
CANADAMPL	2	Canadian Maple Syrup	NULL	Gourmet Bundle Canadian Maple Syrup	
USCOOKIES	2	New Orleans Cookies	NULL	Gourmet Bundle New Orleans Cookies	
KOILIGHT	2	Koi Nightlight	NULL	Japanese Bundle Koi Nightlight	
KYOTOCBOOK	2	Kyoto Cookbook	NULL	Japanese Bundle Kyoto Cookbook	
B000000003	2	Tokyo Bundle	NULL	Japanese Bundle Tokyo Bundle	

merchandise_item

merchandise_item_id	description	unit_price	qoh	bundle_id
B000000001	Asian Bundle	105000	20	NULL
B000000002	Japanese Bundle	6800	93	B000000001
B000000003	Tokyo Bundle	5000	93	B000000002
B000000004	Gourmet Bundle	2550	56	B000000006
B000000005	Chef's Gift Set	57500	9	B000000006
B000000006	King's Feast	599000	5	NULL
BAMBOOCBOOK	Bamboo Notebook	200	464	NULL
CANADAMPL	Canadian Maple Syrup	2200	251	B000000004
DRAGONPTNG	Dragon Painting	300	23	NULL
DUTCHOVEN	Dutch Oven	10900	16	B000000005
ITALYPASTA	Italian Pasta Machine	49900	10	B000000005
KENYANDRUM	Kenyan Drum	6250	14	NULL
KOILIGHT	Koi Nightlight	2250	176	B000000002
KYOTOCBOOK	Kyoto Cookbook	1675	12	B000000002
MAORISPEAR	Maori Spear	50000	5	B000000006
KAYANDRUM	Kayan Drum	1450	240	NULL

merchandise_item_id	depth	description	unit_price_decimal	alpha_sort	bundle_id
KOILIGHT	3	Koi Nightlight	NULL	Asian Bundle Japanese Bundle Koi Nightlight	B000000002
KYOTOCBOOK	3	Kyoto Cookbook	NULL	Asian Bundle Japanese Bundle Kyoto Cookbook	B000000002
B000000003	3	Tokyo Bundle	NULL	Asian Bundle Japanese Bundle Tokyo Bundle	B000000002
TOKYONOVEL	3	A Tokyo Love Story	NULL	Japanese Bundle Tokyo Bundle A Tokyo Love Story	B000000003
TOKYOGUIDE	3	Downtown Tokyo Guide Book	NULL	Japanese Bundle Tokyo Bundle Downtown Tokyo Guide Book	B000000003

CTE Recursive - iteration 3

from recursive iteration 2

merchandise_item_id	depth	description	unit_price_decimal	alpha_sort	bundle_id
KOILIGHT	3	_ Koi Nightlight	NULL	Asian Bundle Japanese Bundle Koi Nightlight	B000000002
KYOTOCBOOK	3	_ Kyoto Cookbook	NULL	Asian Bundle Japanese Bundle Kyoto Cookbook	B000000002
B000000003	3	_ Tokyo Bundle	NULL	Asian Bundle Japanese Bundle Tokyo Bundle	B000000003
TOKYONOVEL	3	_ A Tokyo Love Story	NULL	Japanese Bundle Tokyo Bundle A Tokyo Love Story	B000000003
TOKYOGUIDE	3	_ Downtown Tokyo Guide Book	NULL	Japanese Bundle Tokyo Bundle Downtown Tokyo Guide Book	B000000003

merchandise_item

merchandise_item_id	description	unit_price	qoh	bundle_id
B000000001	Asian Bundle	105000	20	NULL
B000000002	Japanese Bundle	6800	93	B000000001
B000000003	Tokyo Bundle	5000	93	B000000002
B000000004	Gourmet Bundle	2550	56	B000000006
B000000005	Chef's Gift Set	57500	9	B000000006
B000000006	King's Feast	599000	5	NULL
BAMBOOBOOK	Bamboo Notebook	200	464	NULL
CANADAMPL	Canadian Maple Syrup	2200	251	B000000004
DRAGONPTNG	Dragon Painting	300	23	NULL
DUTCHOVEN	Dutch Oven	10900	16	B000000005
ITALYPASTA	Italian Pasta Machine	49900	10	B000000005
KENYANDRUM	Kenyan Drum	6250	14	NULL
KOILIGHT	Koi Nightlight	2250	178	B000000002
KYOTOCBOOK	Kyoto Cookbook	1675	123	B000000002
MAORISPEAR	Maori Spear	50000	5	B000000006
MAYANPRYMD	Mayan Pyramid	1450	240	NULL
TANGSCROLL	Tang Dynasty Scroll	100000	20	B000000001
THAIMAP	Thailand Map	4600	976	B000000001
THORSTATUE	Thor Statue	2500	98	NULL
TOKYOGUIDE	Downtown Tokyo Guide Book	3599	93	B000000003
TOKYONOVEL	A Tokyo Love Story	2000	145	B000000003
			56	B000000004

merchandise_item_id	depth	description	unit_price_decimal	alpha_sort	bundle_id
TOKYONOVEL	4	_ _ A Tokyo Love Story	NULL	Asian Bundle Japanese Bundle Tokyo Bundle A Tokyo Love Story	B000000003
TOKYOGUIDE	4	_ _ Downtown Tokyo Guide Book	NULL	Asian Bundle Japanese Bundle Tokyo Bundle Downtown Tokyo Guide Book	B000000003

CTE Recursive - iteration 4

from recursive iteration 3

merchandise_item_id	depth	description	unit_price_decimal	alpha_sort	bundle_id
TOKYONovel	4	└└└└ A Tokyo Love Story	NULL	Asian Bundle Japanese Bundle Tokyo Bundle A Tokyo Love Story	B000000003
TOKYOGUIDE	4	└└└└ Downtown Tokyo Guide Book	NULL	Asian Bundle Japanese Bundle Tokyo Bundle Downtown Tokyo Guide Book	B000000003

merchandise_item

No match =

Stop condition met

merchandise_item_id	description	unit_price	qoh	bundle_id
B000000001	Asian Bundle	105000	20	NULL
B000000002	Japanese Bundle	6800	93	B000000001
B000000003	Tokyo Bundle	5000	93	B000000002
B000000004	Gourmet Bundle	2550	56	B000000006
B000000005	Chef's Gift Set	57500	9	B000000006
B000000006	King's Feast	599000	5	NULL
BAMBOOBOOK	Bamboo Notebook	200	464	NULL
CANADAMPL	Canadian Maple Syrup	2200	251	B000000004
DRAGONPTNG	Dragon Painting	300	23	NULL
DUTCHOVEN	Dutch Oven	10900	16	B000000005
ITALYPASTA	Italian Pasta Machine	49900	10	B000000005
KENYANDRUM	Kenyan Drum	6250	10	NULL
KOILIGHT	Koi Nightlight	2250	178	B000000002
KYOTOCBOOK	Kyoto Cookbook	1675	123	B000000002
MAORISPEAR	Maori Spear	50000	5	B000000006
MAYANPRYMD	Mayan Pyramid	1450	240	NULL
TANGSCROLL	Tang Dynasty Scroll	100000	20	B000000001
THAIMAP	Thailand Map	4600	976	B000000001
THORSTATUE	Thor Statue	2500	98	NULL
TOKYOGUIDE	Downtown Tokyo Guide Book	3599	93	B000000003
TOKYONovel	A Tokyo Love Story	2000	145	B000000003
USCOOKIES	New Orleans Cookies	799	56	B000000004

merchandise_item_id	depth	description	unit_price_decimal	alpha_sort	bundle_id
TOKYONOVEL	1	A Tokyo Love Story	20	A Tokyo Love Story	B000000003
B000000001	1	Asian Bundle	1050	Asian Bundle	NULL
B000000002	2	___ Japanese Bundle	NULL	Asian Bundle Japanese Bundle	B000000001
KOILIGHT	3	___ ___ Koi Nightlight	NULL	Asian Bundle Japanese Bundle Koi Nightlight	B000000002
KYOTOCBOOK	3	___ ___ Kyoto Cookbook	NULL	Asian Bundle Japanese Bundle Kyoto Cookbook	B000000002
B000000003	3	___ ___ Tokyo Bundle	NULL	Asian Bundle Japanese Bundle Tokyo Bundle	B000000002
TOKYONOVEL	4	___ ___ ___ A Tokyo Love Story	NULL	Asian Bundle Japanese Bundle Tokyo Bundle A Tokyo Love Story	B000000003
TOKYOGUIDE	4	___ ___ ___ Downtown Tokyo Guide Book	NULL	Asian Bundle Japanese Bundle Tokyo Bundle Downtown Tokyo Guide Book	B000000003
TANGSCROLL	2	___ Tang Dynasty Scroll	NULL	Asian Bundle Tang Dynasty Scroll	B000000001
THAIMAP	2	___ Thailand Map	NULL	Asian Bundle Thailand Map	B000000001
BAMBOOBOOK	1	Bamboo Notebook	2	Bamboo Notebook	NULL
CANADAMPL	1	Canadian Maple Syrup	22	Canadian Maple Syrup	B000000004
B000000005	1	Chef's Gift Set	575	Chef's Gift Set	B000000006
DUTCHOVEN	2	___ Dutch Oven	NULL	Chef's Gift Set Dutch Oven	B000000005
ITALYPASTA	2	___ Italian Pasta Machine	NULL	Chef's Gift Set Italian Pasta Machine	B000000005
TOKYOGUIDE	1	Downtown Tokyo Guide Book	35.99	Downtown Tokyo Guide Book	B000000003
DRAGONPTNG	1	Dragon Painting	3	Dragon Painting	NULL
DUTCHOVEN	1	Dutch Oven	109	Dutch Oven	B000000005
B000000004	1	Gourmet Bundle	25.5	Gourmet Bundle	B000000006
CANADAMPL	2	___ Canadian Maple Syrup	NULL	Gourmet Bundle Canadian Maple Syrup	B000000004
USCOOKIES	2	___ New Orleans Cookies	NULL	Gourmet Bundle New Orleans Cookies	B000000004
ITALYPASTA	1	Italian Pasta Machine	499	Italian Pasta Machine	B000000005
B000000002	1	Japanese Bundle	68	Japanese Bundle	B000000001
KOILIGHT	2	___ Koi Nightlight	NULL	Japanese Bundle Koi Nightlight	B000000002
KYOTOCBOOK	2	___ Kyoto Cookbook	NULL	Japanese Bundle Kyoto Cookbook	B000000002
B000000003	2	___ Tokyo Bundle	NULL	Japanese Bundle Tokyo Bundle	B000000002
TOKYONOVEL	3	___ ___ A Tokyo Love Story	NULL	Japanese Bundle Tokyo Bundle A Tokyo Love Story	B000000003
TOKYOGUIDE	3	___ ___ Downtown Tokyo Guide Book	NULL	Japanese Bundle Tokyo Bundle Downtown Tokyo Guide Book	B000000003

CTE Recursive - Web App View

 World Peace Gifts		
Shipping Department		
Offerings		
Item ID	Description	Unit Price
TOKYONOVEL	A Tokyo Love Story	\$20.00
B000000001	<div><div>▼ Asian Bundle</div><div><div>▼ Japanese Bundle</div><div>Koi Nightlight</div><div>Kyoto Cookbook</div><div>▼ Tokyo Bundle</div><div>A Tokyo Love Story</div><div>Downtown Tokyo Guide Book</div><div>Tang Dynasty Scroll</div><div>Thailand Map</div></div></div>	\$1050.00
BAMBOOBOOK	Bamboo Notebook	\$2.00
CANADAMPL	Canadian Maple Syrup	\$22.00