

Database Design - Group Assignment

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Course: **COMP5004: Introduction to SQL and DBM**

Program: Business Analytics
School: School of Business
College: St. Lawrence College

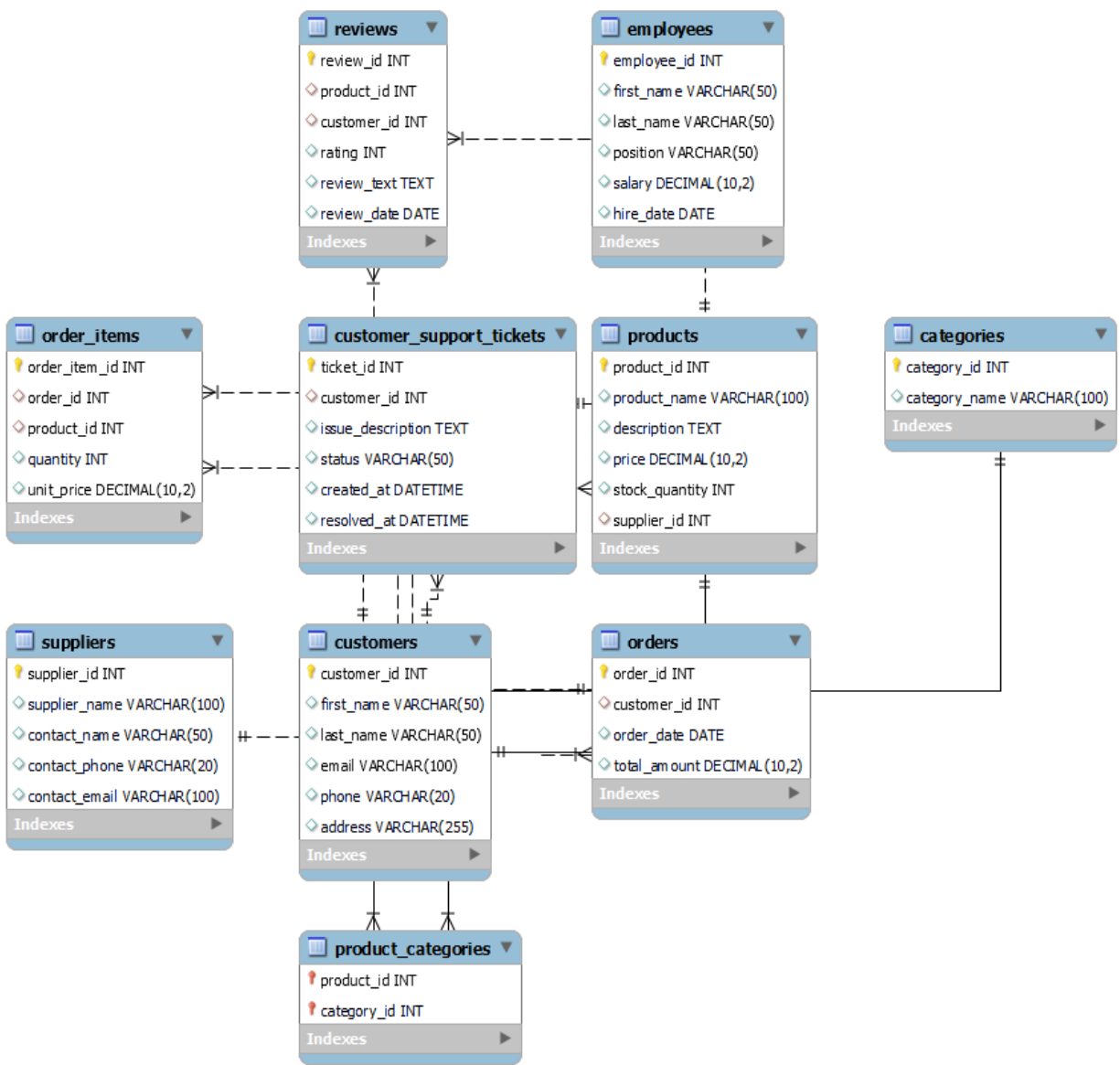
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Context of the Chosen Organization:

TechMart is a leading retailer specializing in a wide range of tech products, catering to both individual consumers and businesses. With a robust catalog that includes laptops, smartphones, tablets, wearables, and accessories, TechMart prides itself on offering cutting-edge technology from various renowned suppliers. The company is committed to providing exceptional customer service, supported by a dedicated team of employees who ensure prompt assistance and support for all customer needs. TechMart operates with a mission to enhance digital lifestyles through innovation and reliable technology solutions.

EER Diagram



Content and structure of Each Table:

The TechMart database is structured to efficiently manage and organize crucial business data, ensuring optimal performance and scalability. The database includes essential entities like Customers, Suppliers, Products, Orders, Order_Items, Reviews, Employees, Categories, Product_Categories, and Customer_Support_Tickets, each capturing specific aspects of the business operations. Relationships between tables are established using foreign keys to maintain data integrity and facilitate complex queries. Memory allocation for each column is carefully determined based on expected data types and sizes, optimizing storage and retrieval efficiency, all while keeping future modifications (maintenance) in mind. This design supports comprehensive reporting and analysis, enhancing decision-making and operational efficiency.

Information

Table: categories

Columns:
category_id int AI PK
category_name varchar(100)

	category_id	category_name
▶	1	Computers
	2	Phones
	3	Tablets
	4	Wearables
	5	Accessories
*	NULL	NULL

Information

Table: customer_support_tickets

Columns:
ticket_id int AI PK
customer_id int
issue_description text
status varchar(50)
created_at datetime
resolved_at datetime

	ticket_id	customer_id	issue_description	status	created_at	resolved_at
▶	1	1	Order not received	Resolved	2024-01-16 10:00:00	2024-01-18 15:30:00
	2	2	Received wrong item	Resolved	2024-02-21 11:00:00	2024-02-23 14:00:00
	3	3	Item damaged	Pending	2024-03-06 12:00:00	NULL
	4	4	Refund not processed	Resolved	2024-04-11 13:00:00	2024-04-13 16:00:00
	5	5	Technical support needed	Pending	2024-05-16 14:00:00	NULL
*	NULL	NULL	NULL	NULL	NULL	NULL

Information

Table: customers

Columns:
customer_id int AI PK
first_name varchar(50)
last_name varchar(50)
email varchar(100)
phone varchar(20)
address varchar(255)

	customer_id	first_name	last_name	email	phone	address
▶	1	Mark	Wilson	mark.wilson@gmail.com	555-123-4567	123 Main St, New York, NY 10001
	2	Linda	Taylor	linda.taylor@yahoo.com	555-987-6543	456 Elm St, Los Angeles, CA 90001
	3	James	Anderson	james.anderson@outlook.com	555-234-5678	789 Oak St, Chicago, IL 60601
	4	Emma	Thomas	emma.thomas@gmail.com	555-345-6789	101 Pine St, San Francisco, CA 94101
	5	Michael	Jackson	michael.jackson@gmail.com	555-456-7890	202 Birch St, Austin, TX 78701
*	NULL	NULL	NULL	NULL	NULL	NULL

Information

Table: employees

Columns:
employee_id int AI PK
first_name varchar(50)
last_name varchar(50)
position varchar(50)
salary decimal(10,2)
hire_date date

	employee_id	first_name	last_name	position	salary	hire_date
▶	1	Mark	Wilson	Manager	80000.00	2023-01-01
	2	Linda	Taylor	Sales Associate	40000.00	2023-02-15
	3	James	Anderson	Support Representative	35000.00	2023-03-01
	4	Emma	Thomas	HR Specialist	45000.00	2023-04-10
	5	Michael	Jackson	IT Specialist	60000.00	2023-05-20
*	NULL	NULL	NULL	NULL	NULL	NULL

Information		order_item_id	order_id	product_id	quantity	unit_price
Table: order_items Columns: <u>order_item_id</u> int AI PK <u>order_id</u> int <u>product_id</u> int quantity int unit_price decimal(10,2)		1	1	1	1	1200.00
		2	2	2	1	800.00
		3	3	3	1	300.00
		4	4	4	1	200.00
		5	5	5	1	150.00
		*	NULL	NULL	NULL	NULL

Information		order_id	customer_id	order_date	total_amount
Table: orders Columns: <u>order_id</u> int AI PK <u>customer_id</u> int order_date date total_amount decimal(10,2)		▶ 1	1	2024-01-15	1200.00
		2	2	2024-02-20	800.00
		3	3	2024-03-05	300.00
		4	4	2024-04-10	200.00
		5	5	2024-05-15	150.00
		*	NULL	NULL	NULL

Information		product_id	category_id
Table: product_categories Columns: <u>product_id</u> int PK <u>category_id</u> int PK		▶ 1	1
		2	2
		3	3
		4	4
		5	5
		*	NULL

Information		product_id	product_name	description	price	stock_quantity	supplier_id
Table: products Columns: <u>product_id</u> int AI PK product_name varchar(100) description text price decimal(10,2) stock_quantity int supplier_id int		▶ 1	Laptop	High performance laptop	1200.00	50	1
		2	Smartphone	Latest model smartphone	800.00	100	2
		3	Tablet	10-inch tablet	300.00	75	3
		4	Smartwatch	Wearable tech	200.00	200	4
		5	Headphones	Noise-cancelling headphones	350.00	150	5
		*	NULL	NULL	NULL	NULL	NULL

Information		review_id	product_id	customer_id	rating	review_text	review_date
Table: reviews Columns: <u>review_id</u> int AI PK <u>product_id</u> int <u>customer_id</u> int rating int review_text text review_date date		▶ 1	1	1	5	Excellent laptop!	2024-01-20
		2	2	2	4	Great phone, but a bit expensive.	2024-02-25
		3	3	3	3	Decent tablet for the price.	2024-03-10
		4	4	4	5	Love my new smartwatch!	2024-04-15
		5	5	5	4	Good sound quality.	2024-05-20
		*	NULL	NULL	NULL	NULL	NULL

Information		supplier_id	supplier_name	contact_name	contact_phone	contact_email
Table: suppliers		1	Tech Supplies Inc.	Tom Green	111-222-3333	tom.green@techsupplies.com
Columns:		2	Gadget World	Sara White	222-333-4444	sara.white@gadgetworld.com
supplier_id	int AI PK	3	Device Hub	Paul Brown	333-444-5555	paul.brown@devicehub.com
supplier_name	varchar(100)	4	ElectroMart	Mary Johnson	444-555-6666	mary.johnson@electromart.com
contact_name	varchar(50)	5	Digital Zone	Nancy Lee	555-666-7777	nancy.lee@digitalzone.com
contact_phone	varchar(20)	*	NULL	NULL	NULL	NULL
contact_email	varchar(100)					

Report Requirements (Additional requirements added)

The Report Requirements section outlines specific queries and data analysis tasks necessary to demonstrate the functionality and utility of the database. It includes structured SQL queries utilizing JOIN operations to integrate related data from multiple tables, UNION operations for combining distinct datasets, and aggregate functions (SUM, MIN, MAX, COUNT, AVG) to derive statistical insights. Additionally, it mandates the use of SQL functions for data manipulation and subqueries to handle nested queries for complex data retrieval. The section ensures comprehensive coverage of database functionalities essential for effective decision-making and operational insights within TechMart's business context.

- Business Question:** Which products have received the highest and lowest ratings?
Explanation: This question aims to identify products that have garnered the highest and lowest ratings from customer reviews. It helps gauge customer satisfaction and product popularity, influencing marketing strategies and inventory management.
- Business Question:** What is the total revenue generated from each product category?
Explanation: This question seeks to understand how much revenue each product category contributes to the overall sales. It provides insights into product performance and customer preferences, aiding in strategic decisions related to product assortment and pricing.
- Business Question:** How many orders were placed by each customer?
Explanation: This question quantifies the number of orders placed by individual customers. It helps in understanding customer behavior, loyalty, and potential for repeat business. This information is crucial for customer segmentation and personalized marketing efforts.
- Business Question:** What is the average quantity of products ordered per order?

Explanation: This question calculates the average number of products included in each order. It provides insights into purchasing patterns and order fulfillment efficiency, guiding inventory management and logistics strategies.

5. **Business Question:** Which customers have submitted the most support tickets?

Explanation: identify customers who have submitted the highest number of support tickets. This helps in understanding customer support needs and possibly addressing recurring issues or providing special attention to frequent customers.

6. **Business Question:** What is the total salary expense for each position?

Explanation: This question examines the total expenditure on salaries for different positions within the organization. It helps in budget planning, resource allocation, and ensuring competitive compensation packages to attract and retain talent.

7. **Business Question:** Which supplier has the highest total stock quantity of products?

Explanation: This question identifies the supplier with the largest inventory volume supplied to TechMart. It assists in supplier relationship management, inventory optimization, and ensuring product availability.

8. **Business Question:** What is the average rating given by customers in each product category?

Explanation: This question computes the average rating provided by customers for products within each category. It provides insights into customer satisfaction levels across different product types, influencing marketing strategies and product development.

9. **Business Question:** How many products are out of stock?

Explanation: This question counts the number of products that are currently unavailable for sale due to insufficient stock. It guides inventory management practices, and procurement decisions, and helps in minimizing stockouts.

10. **Business Question:** Retrieve order details with customer information and product details

Explanation: This is designed to fetch comprehensive information about orders placed in the TechMart database, including details about the customers who placed the orders and the products that were ordered.

11. **Business Question:** Concatenate customer first and last names

Explanation: Combine the first name and last name of customers into a single string

Queries and Results:

1.

The screenshot shows the SQL Server Enterprise Manager interface. The 'Report_Query' tab is active, displaying a query to find the highest and lowest ratings for products. The query is as follows:

```
-- Business Question: Which products have received the highest and lowest ratings?
SELECT p.product_name, MAX(r.rating) AS max_rating, MIN(r.rating) AS min_rating
FROM Products p
LEFT JOIN Reviews r ON p.product_id = r.product_id
GROUP BY p.product_name;
```

The 'Result Grid' shows the following data:

product_name	max_rating	min_rating
Laptop	5	5
Smartphone	4	4
Tablet	3	3
Smartwatch	5	5
Headphones	4	4

The 'Output' pane shows the execution results of the query, indicating that 5 row(s) were returned.

2.

The screenshot shows the SQL Server Enterprise Manager interface. The 'Report_Query' tab is active, displaying a query to find the total revenue generated from each product category. The query is as follows:

```
-- Business Question: What is the total revenue generated from each product category?
SELECT c.category_name, SUM(o.total_amount) AS total_revenue
FROM Categories c
LEFT JOIN Product_Categories pc ON c.category_id = pc.category_id
LEFT JOIN Products p ON pc.product_id = p.product_id
LEFT JOIN Order_Items oi ON p.product_id = oi.product_id
LEFT JOIN Orders o ON oi.order_id = o.order_id
GROUP BY c.category_name;
```

The 'Result Grid' shows the following data:

category_name	total_revenue
Computers	1200.00
Phones	800.00
Tablets	300.00
Wearables	200.00
Accessories	150.00

The 'Output' pane shows the execution results of the query, indicating that 5 row(s) were returned.

3.

Insert2* Report_Query* x CreatingDatabase InsertingData SQL File 20

Don't Limit

```

16 -- Business Question: How many orders were placed by each customer?
17 SELECT c.first_name, c.last_name, COUNT(o.order_id) AS order_count
18 FROM Customers c
19 LEFT JOIN Orders o ON c.customer_id = o.customer_id
20 GROUP BY c.first_name, c.last_name

```

Result Grid

category_name	total_revenue
Computers	1200.00
Phones	800.00
Tablets	300.00
Wearables	200.00
Accessories	150.00

Result 14 x Read Only

Output

Action Output

#	Time	Action	Message	Duration / Fetch
163	14:08:48	SELECT o.order_id, c.first_name AS customer_first_name, c.last_name AS customer_last_name, ...	5 row(s) returned	0.000 sec / 0.000 sec
164	14:11:43	SELECT c.category_name, SUM(o.total_amount) AS total_revenue FROM Categories c LEFT JO...	5 row(s) returned	0.000 sec / 0.000 sec

4.

Insert2* Report_Query* x CreatingDatabase InsertingData SQL File 20

Don't Limit

```

22 -- Business Question: What is the average quantity of products ordered per order?
23 SELECT AVG(oi.quantity) AS avg_quantity_per_order
24 FROM Order_Items oi
25
26 -- Business Question: Which customers have submitted the most support tickets?

```

Result Grid

avg_quantity_per_order
1.0000

Result 15 x Read Only

Output

Action Output

#	Time	Action	Message	Duration / Fetch
164	14:11:43	SELECT c.category_name, SUM(o.total_amount) AS total_revenue FROM Categories c LEFT JO...	5 row(s) returned	0.000 sec / 0.000 sec
165	14:12:25	SELECT AVG(oi.quantity) AS avg_quantity_per_order FROM Order_Items oi	1 row(s) returned	0.000 sec / 0.000 sec

5.

Insert2* Report_Query* x CreatingDatabase InsertingData SQL File 20

Don't Limit

```

26 -- Business Question: Which customers have submitted the most support tickets?
27 SELECT c.first_name, c.last_name, COUNT(t.ticket_id) AS ticket_count
28 FROM Customers c
29 LEFT JOIN Customer_Support_Tickets t ON c.customer_id = t.customer_id
30 GROUP BY c.first_name, c.last_name
31 ORDER BY ticket_count DESC;

```

Result Grid

first_name	last_name	ticket_count
John	Doe	1
Jane	Smith	1
Bob	Johnson	1
Alice	Brown	1
Charlie	Davis	1

Result 16 x

Output

Action Output

#	Time	Action	Message	Duration / Fetch
165	14:12:25	SELECT AVG(oi.quantity) AS avg_quantity_per_order FROM Order_Items oi	1 row(s) returned	0.000 sec / 0.000 sec
166	14:14:52	SELECT c.first_name, c.last_name, COUNT(t.ticket_id) AS ticket_count FROM Customers c LEF...	5 row(s) returned	0.000 sec / 0.000 sec

6.

Insert2* Report_Query* x CreatingDatabase InsertingData SQL File 20

Don't Limit

```

32
33 -- Business Question: What is the total salary expense for each position?
34 SELECT position, SUM(salary) AS total_salary_expense
35 FROM Employees
36 GROUP BY position;
37

```

Result Grid

position	total_salary_expense
Manager	80000.00
Sales Associate	40000.00
Support Representative	35000.00
HR Specialist	45000.00
IT Specialist	60000.00

Result 17 x

Output

Action Output

#	Time	Action	Message	Duration / Fetch
166	14:14:52	SELECT c.first_name, c.last_name, COUNT(t.ticket_id) AS ticket_count FROM Customers c LEF...	5 row(s) returned	0.000 sec / 0.000 sec
167	14:16:03	SELECT position, SUM(salary) AS total_salary_expense FROM Employees GROUP BY position	5 row(s) returned	0.000 sec / 0.000 sec

7.

Insert2* Report_Query* x CreatingDatabase InsertingData SQL File 20

Don't Limit

```

38 -- Business Question: Which supplier has the highest total stock quantity of products?
39 SELECT s.supplier_name, SUM(p.stock_quantity) AS total_stock_quantity
40 FROM Suppliers s
41 LEFT JOIN Products p ON s.supplier_id = p.supplier_id
42 GROUP BY s.supplier_name
43 ORDER BY total_stock_quantity DESC
44 LIMIT 1;

```

Result Grid

supplier_name	total_stock_quantity
ElectroMart	200

Result 18 x Read Only

Output

Action Output

#	Time	Action	Message	Duration / Fetch
167	14:16:03	SELECT position, SUM(salary) AS total_salary_expense FROM Employees GROUP BY position	5 row(s) returned	0.000 sec / 0.000 sec
168	14:16:41	SELECT s.supplier_name, SUM(p.stock_quantity) AS total_stock_quantity FROM Suppliers s LE...	1 row(s) returned	0.000 sec / 0.000 sec

8.

Insert2* Report_Query* x CreatingDatabase InsertingData SQL File 20

Don't Limit

```

45
46 -- Business Question: What is the average rating given by customers in each product category?
47 SELECT c.category_name, AVG(r.rating) AS avg_rating
48 FROM Categories c
49 LEFT JOIN Product_Categories pc ON c.category_id = pc.category_id
50 LEFT JOIN Products p ON pc.product_id = p.product_id
51 LEFT JOIN Reviews r ON p.product_id = r.product_id
52 GROUP BY c.category_name;

```

Result Grid

category_name	avg_rating
Computers	5.0000
Phones	4.0000
Tablets	3.0000
Wearables	5.0000
Accessories	4.0000

Result 19 x Read Only

Output

Action Output

#	Time	Action	Message	Duration / Fetch
168	14:16:41	SELECT s.supplier_name, SUM(p.stock_quantity) AS total_stock_quantity FROM Suppliers s LE...	1 row(s) returned	0.000 sec / 0.000 sec
169	14:17:13	SELECT c.category_name, AVG(r.rating) AS avg_rating FROM Categories c LEFT JOIN Product...	5 row(s) returned	0.000 sec / 0.000 sec

9.

Insert2* Report_Query* x CreatingDatabase InsertingData SQL File 20

52 GROUP BY c.category_name;
53
54 -- Business Question: How many products are out of stock?
55 SELECT COUNT(*) AS out_of_stock_count
56 FROM Products
57 WHERE stock_quantity = 0;
58
59 -- Retrieve order details with customer information and product details

Result Grid | Filter Rows: | Export: | Wrap Cell Content: |

out_of_stock_count
0

Result 20 x | Read Only

Output

Action Output

#	Time	Action	Message	Duration / Fetch
✓ 169	14:17:13	SELECT c.category_name, AVG(r.rating) AS avg_rating FROM Categories c LEFT JOIN Product...	5 row(s) returned	0.000 sec / 0.000 sec
✓ 170	14:17:46	SELECT COUNT(*) AS out_of_stock_count FROM Products WHERE stock_quantity = 0	1 row(s) returned	0.000 sec / 0.000 sec

10.

Insert2* Report_Query* x CreatingDatabase InsertingData SQL File 20

59 -- Retrieve order details with customer information and product details
60 SELECT o.order_id, c.first_name AS customer_first_name, c.last_name AS customer_last_name,
61 p.product_name, oi.quantity, oi.unit_price
62 FROM Orders o
63 JOIN Customers c ON o.customer_id = c.customer_id
64 JOIN Order_Items oi ON o.order_id = oi.order_id
65 JOIN Products p ON oi.product_id = p.product_id;

Result Grid | Filter Rows: | Export: | Wrap Cell Content: |

order_id	customer_first_name	customer_last_name	product_name	quantity	unit_price
1	John	Doe	Laptop	1	1200.00
2	Jane	Smith	Smartphone	1	800.00
3	Bob	Johnson	Tablet	1	300.00
4	Alice	Brown	Smartwatch	1	200.00
5	Charlie	Davis	Headphones	1	150.00

Result 21 x | Read Only

Output

Action Output

#	Time	Action	Message	Duration / Fetch
✓ 170	14:17:46	SELECT COUNT(*) AS out_of_stock_count FROM Products WHERE stock_quantity = 0	1 row(s) returned	0.000 sec / 0.000 sec
✓ 171	14:18:21	SELECT o.order_id, c.first_name AS customer_first_name, c.last_name AS customer_last_name, ...	5 row(s) returned	0.000 sec / 0.000 sec

11.

```
67 -- Concatenate customer first and last names
68 • SELECT CONCAT(first_name, ' ', last_name) AS full_name FROM Customers;
69
```

Result Grid

full_name
John Doe
Jane Smith
Bob Johnson
Alice Brown
Charlie Davis

Result 22 x

Output

Action Output

#	Time	Action	Message	Duration / Fetch
✓ 171	14:18:21	SELECT o.order_id, c.first_name AS customer_first_name, c.last_name AS customer_last_name, ...	5 row(s) returned	0.000 sec / 0.000 sec
✓ 172	14:18:58	SELECT CONCAT(first_name, ' ', last_name) AS full_name FROM Customers	5 row(s) returned	0.000 sec / 0.000 sec

Thank you, END...