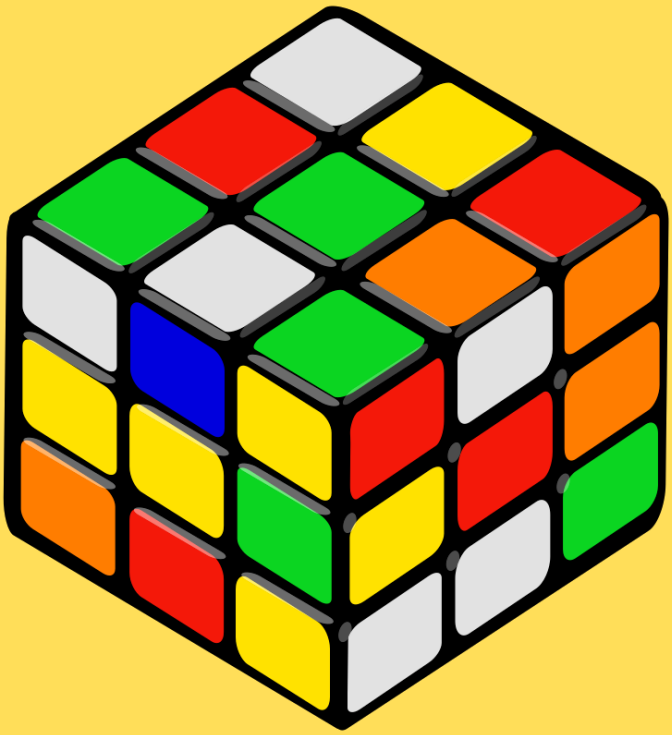
SQL Optimization Techniques



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- *SQL optimization techniques are methods to improve the performance of SQL databases by reducing query execution time and reducing resource usage.*

Some common SQL optimization techniques are :

- *Indexing.*
- *Avoiding using Wildcards.*
- *Normalization.*
- *Using appropriate Data types.*
- *Using correct Join types.*
- *Writing efficient WHERE clauses.*
- *Using aggregate functions wisely.*
- *Avoiding using subqueries.*
- *Use proper storage & backup methods.*
- *Monitoring performance.*

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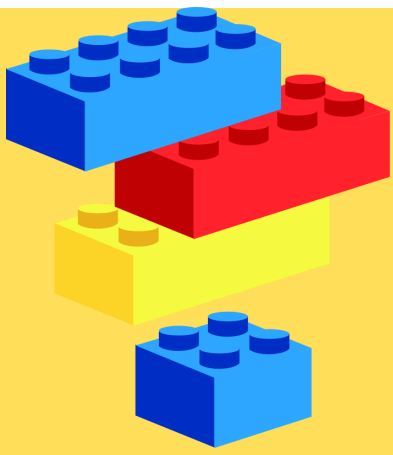
1.Indexing :

- *Using indexes to quickly find data in tables, reducing the number of rows that need to be scanned.*

- *Eg - Creating an index on a column used in the WHERE clause of a query can speed up the query execution time.*

```
CREATE INDEX idx_employee_id ON
employees (employee_id);
```



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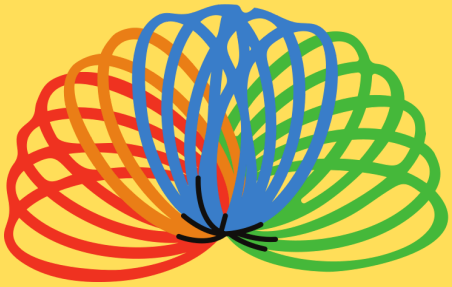
2. Avoid using wildcards :

- ***Wildcards slow down queries and should be used sparingly.***

```sql
-- Instead of:
SELECT * FROM customers WHERE name LIKE
'%Smith%';

-- Use:
SELECT * FROM customers WHERE name LIKE
'Smith%';
```



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3. Normalization :

- ***Normalization divides data into smaller, more manageable tables, reducing data redundancy and improving data integrity.***

```sql
-- Non-normalized table:
CREATE TABLE orders (order_id INT, customer_id
INT, customer_name VARCHAR(50),order_total
FLOAT);


-- Normalized tables:
CREATE TABLE customers (customer_id INT,
customer_name VARCHAR(50));

CREATE TABLE orders (order_id INT, customer_id
INT, order_total FLOAT);
```

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4.Use appropriate data types :

- *Use the smallest data type that can accommodate your data to save disk space and improve performance.*

```
-- Instead of:
CREATE TABLE customers (customer_id INT,
is_active TINYINT);


-- Use:
CREATE TABLE customers (customer_id
INT,is_active BOOLEAN);
```

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5. Use the correct join type :

- ***Choosing the correct join type can improve query performance and return the expected results.***

```sql
-- Inner join:
SELECT customers.*, orders.*
FROM customers
JOIN orders
ON customers.customer_id = orders.customer_id;


-- Left join:
SELECT customers.*, orders.*
FROM customers
LEFT JOIN orders
ON customers.customer_id = orders.customer_id;
```

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6.Write efficient WHERE clauses :

- *Use the correct comparison operators and avoid using complex expressions in WHERE clauses to improve query performance.*

```
-- Instead of:
SELECT * FROM customers WHERE (age > 30 AND
salary > 50000) OR (age < 30 AND salary <
30000);


-- Use:
SELECT * FROM customers WHERE (age > 30 OR age
< 30) AND (salary > 50000 OR salary < 30000);
```

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7. Use aggregate functions wisely :

- *Aggregate functions like SUM, AVG, and COUNT can simplify complex queries and improve performance.*

```sql
-- Find the average order total:
SELECT AVG(order_total)
FROM orders;


-- Find the total order count:
SELECT COUNT(order_id)
FROM orders;
```

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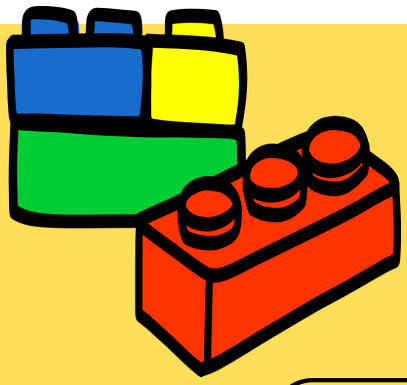
8. Avoid using subqueries :

- *Subqueries can slow down queries and reduce performance. Consider alternative methods like joins or temporary tables.*

```sql
-- Instead of:
SELECT * FROM customers WHERE customer_id IN
(SELECT customer_id FROM orders);


-- Use:
SELECT customers.*, orders.*
FROM customers
JOIN orders
ON customers.customer_id = orders.customer_id;
```



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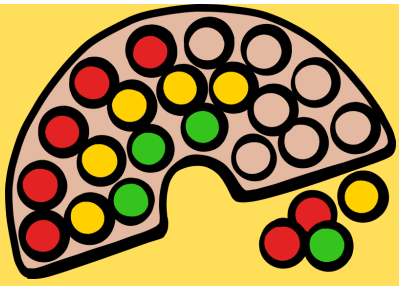
9. Use proper storage and backup methods :

- ***Proper storage and backup methods can ensure data availability and recoverability in case of data loss.***

```
-- Store data in multiple locations:
CREATE TABLESPACE primary_tablespace
LOCATION '/path/to/primary/location';

CREATE TABLESPACE secondary_tablespace
LOCATION '/path/to/secondary/location';


-- Backup data regularly:
CREATE BACKUP TO '/path/to/backup/location';
```



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10. Monitor performance :

- ***Monitor performance regularly to detect and resolve performance issues, and to identify opportunities for optimization.***

```
-- Use the EXPLAIN command:
EXPLAIN SELECT * FROM customers WHERE age > 30;


-- Use performance monitoring tools:
SET
```

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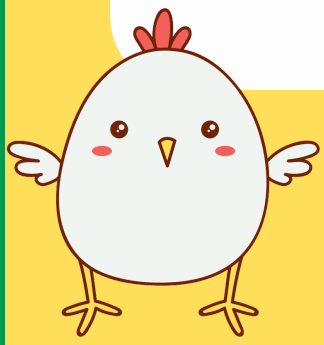

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