Sql server interview questions and answers

1. When is the UPDATE_STATISTICS command used?

- When the processing of large data is done, this command is used.
- Whenever large number of deletions, modification or copy takes place into the tables, the indexes need to be updated to take care of these changes. UPDATE_STATISTICS performs this job.

2. Differentiate between a HAVING CLAUSE and a WHERE CLAUSE.

HAVING CLAUSE

- HAVING CLAUSE is used only with the SELECT statement.
- It is generally used in a GROUP BY clause in a query.
- If GROUP BY is not used, HAVING works like a WHERE clause.

WHERE Clause

- It is applied to each row before they become a part of the GROUP BY function in a query.

3. What do you understand by a view? What does the WITH CHECK OPTION clause for a view do?

- A view is a virtual table that consists of fields from one or more real tables.
- It is usually used to join multiple tables and get the data.
- The WITH CHECK OPTION for a view prevents any modification to the data that does not confirm to the WHERE clause of the view definition.
- This allows the data belonging to the view to be updated through the view.

4. Explain query execution plan?

- The optimizer available in SQL Server optimizes the code to be effectively executed.
- A query execution plan shows how this optimizer would run the query.
- Query execution plan can be viewed by:
  - Using the Show Execution Plan option available in Query Analyzer,
  - Displaying Estimated Execution Plan on the query dropdown menu.
- Use the SET SHOWPLAN_TEXT ON command before running a query and capturing the execution plan event in a SQL Server Profiler trace.

5. What is the function of SQL Server Agent Windows service?

- It is a Windows service which handles the tasks scheduled within the SQL Server environment. These tasks are also called as job and are stored with in SQL server. The jobs may run through a trigger, a predefined schedule or on demand.
- This service is very useful in determining why a particular job did not run as intended.

6. Comment on Transactions.
- Using transactions we can group all SQL commands into a single unit.  
- The transaction begins with some task and finishes only when all tasks within it are over.  
- The transaction gets over successfully only when all commands in it are successfully over. Even if one command fails, the whole transaction fails.  
- The BEGIN TRANSACTION, ROLLBACK TRANSACTION, and COMMIT TRANSACTION statements are used to work with transactions.  
- A group of tasks starts with the begin statement.  
- In case of any problem, the rollback command is executed to abort the transaction.  
- If all the tasks run successfully, all commands are executed through commit statement.

7. Differentiate between a primary key and a unique key.

- By default, clustered index on the column are created by the primary key whereas nonclustered index are created by unique key.  
- Primary key doesn't allow NULLs, but unique key allows one NULL.

8. What is recursion? Is it possible for a stored procedure to call itself or recursive stored procedure? How many levels of SP nesting is possible?

Recursion is method of problem solving where the solution is arrived at by repetitively applying the logic and solution to the subsets of the problem.

Transact-SQL supports recursion. So, yes it is possible for a stored procedure to call itself.

Stored procedures and managed code references can be nested up to 32 levels.

9. What are the advantages of using Stored Procedures?

- They help in reducing the network traffic and latency which in turn boosts application performance.  
- They help in promoting code reuse.  
- They provide better security to data.  
- It is possible to encapsulate the logic using stored procedures. This allows to change stored procedure code without affecting clients.  
- It is possible to reuse stored procedure execution plans, which are cached in SQL Server's memory. This reduces server overhead.

10. a.) What do you mean by an execution plan? Why is it used? How would you view it?

a.) An execution plan can be called as a road map that graphically or textually shows the data retrieval methods which have been chosen by the SQL Server query optimizer, for a stored procedure or ad-hoc query.

b.) It is used because it is a very useful tool for a developer to understand the performance characteristics of a query or stored procedure.

c.) There exists an option called "Show Execution Plan" in Query Analyzer. If this option is turned on, it will display query execution plan in separate window when the query is run again.

11. You want to implement the following relationships while designing tables. How would you do it?
a.) One-to-one
b.) One-to-many
c.) Many-to-many

a.) One-to-One relationship - can be implemented as a single table and rarely as two tables with primary and foreign key relationships.

b.) One-to-Many relationships - by splitting the data into two tables with primary key and foreign key relationships.

c.) Many-to-Many - by using a junction table with the keys from both the tables forming the composite primary key of the junction table.

12. Differentiate between DELETE and TRUNCATE.

- Truncate can not be rolled back while Delete can be.
- Truncate keeps the lock on table while Delete keeps the lock on each row.
- Truncate resets the counter of the Identity column while Delete doesn't do so.
- Trigger is not fired in Truncate while it happens in Delete.

13. What are the properties of the Relational tables?

Relational tables have six properties:
1. Values are atomic.
2. Column values are of the same kind.
3. Each row is unique.
4. The sequence of columns is insignificant.
5. The sequence of rows is insignificant.
6. Each column must have a unique name.

14. Explain the following.

a.) COLLATION.

Collation is a type of sort order. There are mainly three types of sort orders, namely:
   i.) Dictionary case sensitive
   ii.) Dictionary - case insensitive
   iii.) Binary.

b.) Stored Procedure

- It is a set of T-SQL statements combined together to perform a single task formed by combining many small tasks.
- When you actually run a Stored procedure, a set of statements is run.

15. What do you mean by ACID?

- ACID (Atomicity Consistency Isolation Durability) is a quality sought after in a reliable database. Here's the relevance of each quality:
  - Atomicity is an all-or-none proposition.
  - Consistency - it guarantees that your database is never left by a transaction in a half-finished state.
  - Isolation - it keeps transactions separated from each other until they’re finished.
  - Durability - it ensures that the database keeps a track of pending changes in a way that the server can recover from an abnormal termination.
16. Explain the following:

a.) Dirty pages.
These are the buffer pages that contain modifications which have not been written to disk.

b.) ETL - Extraction, Transformation, and Loading.
- It is the process of copying and cleaning data from heterogeneous sources.
- It is an important part of development projects for data warehousing and business intelligence.

17. Differentiate between a Local and a Global temporary table?

- A local temporary table exists only for the duration of a connection or, if defined inside a compound statement, for the duration of the compound statement.

- Global temporary tables (created with a double "##") are visible to all sessions.
- Global temporary tables are dropped when the session that created it ends, and all other sessions have stopped referencing it.

18. Explain different types of Locks in SQL Server.

There are 3 kinds of locks in SQL Server

i.) Shared locks - they are used for operations which do not allow any change or update of data. For e.g. SELECT.

ii.) Update locks - they are used when SQL Server wants to modify a page. The update page lock is then promoted to an exclusive page lock before actually making the changes.

iii.) Exclusive locks - they are used for the data modification operations. For e.g. UPDATE, INSERT, or DELETE.

SQL Server interview online test!

- Sql server interview test - part 1 (40 questions)
- Sql server interview test - part 2 (28 questions)
- Sql Server interview test - part 3 (25 questions)
- Database concepts interview test (20 questions)

What is SQL Injection?
What is DBCC? Give few examples.
What is difference between View and Materialized view?
What is CTE (Common Table Expression)?
What is difference between clustered and non clustered index?
What is use of EXCEPT clause? How it differs from NOT IN clause.
What is difference between Index Seek vs. Index Scan?
What is ROW_NUMBER function?
What is Trigger?
What is Scheduled job and how to create it?
What is OPENXML in SQL Server?
What are Sparse columns?
What is RANK function?
What are cursors and when they are useful?
What is log shipping?
What is SQL Profiler?
What is Similarity and Difference between Truncate and Delete in SQL?
What is Normalization of database? What are its benefits?
What is Fill factor?
What are different types of replication in SQL Server?
What is REPLACE and STUFF function in SQL Server?
Give an example to search for a string in all stored procedure in SQL Server.
What are Magic tables in SQL Server?
What is difference between stored procedure and user defined function?
What are ACID properties of Transaction?
What are COMMIT and ROLLBACK in SQL?
What is a Linked Server?
What is a WITH(NOLOCK)?
What are the basic functions for master, msdb, model, tempdb databases?
List few advantages of Stored procedure

Can you explain about buffer cash and log Cache in sql server?

**Latest answer:** Buffer Cache: Buffer cache is a memory pool in which data pages are read. It performance of the buffer cache is indicated as follows:.............
Read answer

What is a Trace frag? Where do we use it?

**Latest answer:** Temporary setting of specific server characteristics is done by trace tags. DBCC TRACEON is the command to set the trace flags. Once activated, trace flag will be in effect until the server is restarted..............
Read answer

SSIS interview questions

Difference between control flow and data flow?, If you want to send some data from Access database to SQL server database. What are different component of SSIS will you use?, Explain why variables called the most powerful component of SSIS?.............
Read answer

Describe how to use Linked Server.

**Latest answer:** MS SQL Server supports the connection to different OLE DB on an ad hoc basis. This persistent connection is referred as Linked Server.............
Read answer

Explain how to send email from database.

**Latest answer:** SQL Server has a feature for sending mail. Stored procedures can also be used for sending mail on demand. With SQL Server 2005, MAPI client is not needed for sending mails.............
Read answer

Explain how to make remote connection in database

**Latest answer:** The following is the process to make a remote connection in database: - Use SQL Server Surface Area Configuration Tool for enabling the remote connection in database.............
Read answer

Difference between cross join and Full outer join.

**Latest answer:** Cross Join : No join conditions are specified. Results in pairs of rows. Results in Cartesian product of two tables.............
**Explain the purposes of OPENXML clause sql server stored procedure.**

**Latest answer:** OPENXML parses the XML data in SQL Server in an efficient manner. It’s primary ability is to insert XML data to the RDB. It is also possible to query the data by using OpenXML.

**What is the order in which the SQL query is executed?**

**Latest answer:** The following is the order of executing SQL query: The query goes to the shared pool that has information like parse tree and execution plan for the corresponding statement.

**Explain how to store pdf file in sql server.**

**Latest answer:** Create a column as type ‘blob’ in a table. Read the content of the file and save in ‘blob’ type column in a table.

**Explain the concepts and capabilities of SQL Server.**

**Latest answer:** Microsoft SQL server is a relational database management system. It uses MS- SQL as the query language. SQL Server offers a high level of security, reliability and scalability depending on the business needs.

**SQL Server interview questions for freshers and experienced**

**SQL Server 2008 interview questions**

- Explain inline variable assignment in sql server 2008 with an example.
- What is Compound Operators in sql server 2008? Explain with an example.
- SQL Server 2008 introduces automatic auditing. Explain its benefits.

**Explain the use of keyword WITH ENCRYPTION. Create a Store Procedure with Encryption.**

**Latest answer:** WITH ENCRYPTION Indicates that SQL Server will convert the original text of the CREATE PROCEDURE statement to an encrypted format. Users that have no access to system.

**What is a linked server in SQL Server?**

**Latest answer:** A linked server allows remote access. Using this, we can issue distributed queries, update, commands, and transactions across different data sources.

**Features and concepts of Analysis Services**

**Latest answer:** Analysis service provides a combined view of the data used in OLAP or Data mining. Services here refer to OLAP, Data mining. Analysis services assists in creating, designing.
What is Analysis service repository?

**Latest answer:** Each server running analysis service has a repository to store objects of the computer running Analysis Services an Analysis service repository stores the information about the............
Read answer

What is SQL service broker?

**Latest answer:** SQL service broker provides asynchronous queuing functionality to SQL server. Once message is sent to the SQL server............... Read answer

What is user defined datatypes and when you should go for them?

**Latest answer:** User defined datatypes is created by using base SQL Server data type by providing a descriptive name.............. Read answer

What is bit datatype?

**Latest answer:** Bit datatype is used to store boolean information............. Read answer

What is lock escalation?

**Latest answer:** Lock escalation from SQL Server 7.0 onwards, is dynamically managed by SQL Server. It is............ Read answer

What is blocking?

**Latest answer:** Blocking happens when one connection from an application holds a lock and a second............ Read answer

What is Public Role in SQL Server?

**Latest answer:** Every database has a public role which holds all the default permissions for the users in a database.................. Read answer

Discuss about SQL Server Login.

**Latest answer:** SQL server login is used to connect to SQL server. This used when login in through the windows login credentials is not existent............ Read answer

Discuss about Builtin\Administrator.

**Latest answer:** The built in Administrator Account is basically used during some setup to join some machine in the domain........ Read answer

Failover clustering overview
Latest answer: Failover clustering is mainly used for data availability. Typically in a failover cluster, there are two machines. One machine provides the basic services and the second is available to run.

Describe the XML support SQL server extends.

Latest answer: SQL server can return XML document using FOR XML clause.

Explain in brief how SQL server enhances scalability of the database system.

Latest answer: SQL Server has efficient ways to enhance scalability of the database system.

What is SQL Server English Query?

Latest answer: SQL Server English Query helps to build applications that can accept query.

What is the purpose of SQL Profiler in SQL server?

Latest answer: SQL Profiler captures SQL Server events from a server. The events are saved.

What are the ways available in SQL Server to execute SQL statements?

Latest answer: SQL Server uses different ways to execute SQL statements which are listed below.

Explain Full-Text Query in SQL Server.

Latest answer: SQL Server supports searches on character string columns using Full-Text Query.

Explain the phases a transaction has to undergo.

Latest answer: The several phases a transaction has to go through are listed here.

What is XPath?

Latest answer: XPath is a language defined by the W3C, used to select nodes from XML documents.

Define the rules for designing Files and File groups in SQL Server.

Latest answer: A file or file group can only be used by one database. For example, the files abc.mdf and abc.ndf contains.

What are the Authentication Modes in SQL Server?
Latest answer: SQL Server supports two security (authentication) modes.
Read answer

Explain Data Definition Language, Data Control Language and Data Manipulation Language.

Latest answer: Data definition language is used to define and manage all attributes and properties of a database.
Read answer

What are the steps to process a single SELECT statement?

Latest answer: SQL Server uses the following steps to process a single SELECT statement.
Read answer

What are the restrictions while creating batches in SQL Server?

Latest answer: CREATE DEFAULT, CREATE PROCEDURE, CREATE RULE, CREATE TRIGGER, and CREATE VIEW statements.
Read answer

Explain GO Command.

Latest answer: GO Command is used to signal the end of a batch.
Read answer

What is the significance of NULL value and why should we avoid permitting null values?

Latest answer: Null means no entry has been made. It implies that the value is either unknown or undefined.
Read answer

What is the difference between UNION and UNION ALL?

Latest answer: UNION command selects distinct and related information from two tables. On the other hand.
Read answer

What is use of DBCC Commands?

Latest answer: Database Consistency Checker Commands give details in form of statistics about the SQL Server.
Read answer

What is Log Shipping?

Latest answer: UNION command selects distinct and related information from two tables. On the other hand.
Read answer

What is the difference between a Local and a Global temporary table?

Latest answer: A local temporary table lives until the connection is valid or until the duration of a compound statement.
Read answer
What is the STUFF and how does it differ from the REPLACE function?

**Latest answer:** STUFF function is used to insert a string into another string by deleting some characters specified. Read answer

Sql Server interview - May 7, 2011 by Swati Parakh

Explain various data region available in SSRS with their use.

Data regions are report items used to display data from a single dataset. You can perform grouping, sorting and various aggregate functions on data in data region. In SSRS 2005, there were 4 data regions:-

1. Table
2. Matrix
3. List
4. Chart

While in SSRS 2008, there are one additional data region namely Gauge.

Let's explain each one of them:

1. Table - Table Data region has fixed tabular structure i.e. fixed number of columns. It is useful for displaying data grouped by row. You can have maximum of 1 report item per cell. The size of table depends on number of rows dataset fetches i.e., if number of rows returned by dataset is more; it can expand to multiple pages.

2. Matrix – A matrix data region display data in pivot table format, hence also popularly known as pivot table or crosstab report. It has minimum of one row group and one column group. The size of matrix data region depends on columns and rows fetched.

3. List - A list data region is free layout. It is useful for complex reporting resign. The list can be used to display multiple table and matrix. Each getting data from different dataset.

4. Chart – This data region is for displays the data graphically i.e., in form of chart. A various chart types are available in SSRS 2008 namely line, pie chart, columns etc.

5. Gauge - This can be used in a table or matrix to show the relative value of a field in a range of values in the data region. You can also add a gauge to the design surface to show a single relative value.

What are various ways to enhance the SSRS report? Explain.

There are various ways in which you can enhance your report:

1. Display your data in graphic format using Chart Region.
2. Use sorting.
3. If couple of reports are related, you can make them interactive using connect them using bookmark link, hyper link or drill through report link.
4. Adding sub-report. Sub-report is a stand-alone report which can be link to another report based on its content using parameter.
5. Add custom fields. Custom fields provide with same functionality as alias columns provide in SQL server query. It is the timing of the operation that differs from the alias columns. The calculation is performed on dataset by report server.
7. Using custom code. SSRS allows including custom code written in VB.Net.
8. Add document map (navigational links to report item once report is rendered) to report.
What are various aggregate functions that are available?

The following are various aggregate functions available:-
1. SUM
2. AVG
3. COUNT
4. COUNTDISTINCT
5. MAX
6. MIN
7. STDEV
8. STDEVVP
9. VAR
10. VARP

By default, SUM is the aggregate function used for numeric data type.

How do you integrate the SSRS reports in your application?

There are 3 ways in which you can integrate reports into your application:-
1. Navigating to URL i.e. https://servername\reportservername\reportname – This is simplest and most popular way. A separate login might be required since we are directly calling the report from report server. Address of report server gets expose to user.
2. Using IFrame, Browser control or Report Viewer Control – In this approach, we embed the URL of report server in our application, hence address of report server is not exposed. No separate window opens. A user does not come to know that he has moved to different server.
3. Programmatically sending a web request using SOAP to report server.

Express use of Expression builder.

Expressions provide us with flexibility to customize our report. It is written in Visual basic and is used throughout the report to to retrieve, calculate, display, group, sort, filter, parameterize, and format the data in a report. They start with equal sign (=).

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Functionality</th>
<th>Property, Context and Dialog Box</th>
<th>Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Format data in a text box depending on value</td>
<td>Colour for a placeholder inside of a text box in the details row for a Tablix</td>
<td>=IIF(Fields!TotalDue.Value &lt; 10000,&quot;Red&quot;,&quot;Black&quot;)</td>
</tr>
<tr>
<td>2</td>
<td>Dynamic page header or footer content. Value for a placeholder inside of a text box that is placed in the page header or footer.</td>
<td></td>
<td>=&quot;Page &quot; &amp; Globals!PageNumber &amp; &quot; of &quot; &amp;Globals!TotalPages</td>
</tr>
<tr>
<td>3</td>
<td>Specify page breaks for every 20 rows in a Tablix with no other groups.</td>
<td>Group expression for a group in a Tablix.</td>
<td>=Ceiling(RowNumber(Nothing)/20)</td>
</tr>
<tr>
<td>4</td>
<td>Shows the user ID of the person running the report</td>
<td>Value</td>
<td>=User!UserID</td>
</tr>
<tr>
<td>5</td>
<td>To get first day of the month</td>
<td>Value</td>
<td>=DateSerial(Year(Today()),Month(Today()),1)</td>
</tr>
</tbody>
</table>
To get the current date Value =Today()

To get last day of the month Value =DateAdd("d",-1,DateSerial(Year(Today()),Month(Today())+1,1))

---

**Sql Server interview - July 10, 2011 by Swati Parakh**

**Difference between drill down and drill through report.**

Both the drill down and drill through report provide interactive functionality to the SSRS report. The differences are as follows:-

<table>
<thead>
<tr>
<th>Trait</th>
<th>Drill Down</th>
<th>Drill Through</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrieves Data</td>
<td>Data retrieved at the same time as main report</td>
<td>Data retrieved one click on link of drill through report</td>
</tr>
<tr>
<td>Is processed and rendered when</td>
<td>With the main report</td>
<td>When link is clicked</td>
</tr>
<tr>
<td>Performance</td>
<td>Slower since retrieves all data with main report</td>
<td>Faster (but does not retrieve all data with main report)</td>
</tr>
<tr>
<td>Is displayed</td>
<td>Within main report</td>
<td>Separately either in separate window or tab</td>
</tr>
</tbody>
</table>

---

**What’s the use of custom fields in report?**

Custom fields can be defined as alias column of the report since the operation is performed on report server rather than on database server. The custom field is very useful for the data manipulation like adding some fields whose value can be calculated based on expression, text e.g. instead of CName fetched from database, I want the dataset to display Customer Name etc.

We can add custom fields as right click on dataset, select add in Dataset window. The New field dialog box will open, we can add name of custom field and also mention whether it is database field or calculated one. If it is calculated, then we can mention the computation in this window.

---

**Can we use custom code in SSRS? If so, explain how we can do.**

Yes, we can. SSRS allows developer to add custom code in your report. You can write the code directly into embedded VB.Net and call it using property expression or you can write a custom class library and refer it in report server. The advantage of first method is that it is simple and easy to use but disadvantage is that it is available for that report only. While the second method has advantage of being available for multiple reports but it has much of configuration overhead.

To write custom code, right click on Report Designer outside report body and select Properties and go to Code tab and you can write custom code here.

To add custom class library, right click on Report Designer outside report body and select Properties and go to Reference tab and add the reference by browsing to the assembly of your class library. Note that you need to create class library and then compile it before referencing it in your SSRS report.

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**Sql Server interview - July 16, 2011 by Swati Parakh**
Difference between report and query parameter. Why do we need different type of parameter?

<table>
<thead>
<tr>
<th></th>
<th>Query Parameter</th>
<th>Report Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defined At</td>
<td>Database Level</td>
<td>Report Level</td>
</tr>
<tr>
<td>Created</td>
<td>Automatically if database query or stored procedure has a parameter</td>
<td>Automatically if report has some query parameter and is mapped to query parameter</td>
</tr>
<tr>
<td>processed</td>
<td>On Database Server</td>
<td>On Report Server</td>
</tr>
<tr>
<td>Use</td>
<td>Filtering of Data, Security of Data</td>
<td>Manipulate data, interconnect reports, filtering data</td>
</tr>
<tr>
<td>Processing Output</td>
<td>Number of records returned is based on query parameter</td>
<td>Number of records presented is based on query. Note- Records processed on report parameter would be same as records returned based on query parameter.</td>
</tr>
<tr>
<td>Filtering data based on them</td>
<td>Performance is good</td>
<td>Full set of records is retrieved then filtered. Hence, performance is low</td>
</tr>
</tbody>
</table>

How does your SSRS maintain security?

Reporting services maintain role based security. When a user logs into reporting services, a Report Manager (whose duty is to maintain security of Reporting Services) first checks the identity of user and then determine what rights he have to perform on report.

Report Manager manages the security at 2 levels –
1. System-level – Administer the report server globally
2. Item-level – Security at report and dataset level

System-level roles are:-
1. System Administrator – can manage report server and report manager security
2. Site User - view basic information like report properties and schedules.

Item-level roles – User can use any of predefined item-level roles or create their own roles by using combination of predefined item-level roles.
Pre-defined Item-level roles are:-
1. Browser – can navigate to report and run them.
2. My Reports – these users’ rights is restricted to reports present in their MyReports folder. However, they can create, view and manage reports in their folder.
3. Publisher – As name suggest, publisher user has rights to publish reports to Reporting Server database.
4. Content Manager – has all permission at item-level.

SQL Server interview questions and answers - submitted by Arpit Jain

What is SQL Injection?

- SQL Injection is an attack in which attacker take the advantage of insecure application over internet by running the SQL command against the database and to steal information from it that too using GUI of the
website.

- This attack can happen with the applications in which SQL queries are generated in the code.
- The attacker tries to inject their own SQL into the statement that the application will use to query the database.
- For example suppose the below query string is used for a search feature in a website and a user may have the inserted “Arpit” as the keyword to search. If in the code behind the keyword is directly used into the SQL statement, it will be like.

\[
\text{String sql = "Select EmpName, City from EmployeeMaster where EmpName like ‘%’ + txtSearch.Text + ‘%’;}
\]

But the attacker might enter the keyword like

\`
' UNION SELECT name, type, id from sysobjects;
\`

This way attacker can get details of all the objects of the application database and using that attacker can steal further information.

**What is DBCC? Give few examples.**

- DBCC stands for Database Consistency Checker.
- These commands are used to check the consistency of the database like validation tasks, maintenance and status checks.

For example –

1. DBCC CHECKALLOC – It is used to check that all pages are correctly allocated in database.
2. DBCC CHECKDB – It is used to check that
3. DBCC SQLPERF – It generates a report for the current usage of
4. DBCC SQLFILEGROUP – It used to check all the tables file group for any design.

**What is difference between View and Materialized view?**

- View result set doesn’t save anywhere on disk and executes the query definition whenever they are called, while materialized view are disk based and its result set table is updated periodically.
- Materialized view is similar to regular views but the output of select query has been saved to a table.
- View shows the latest data all the time while the materialized view only shows the fresh data after its result table is updated either by setting a schedule or based on the change in the underlying tables.
- The performance of the view depends on how good the selected statement the view has. If the select statement has too many joins then it the view will perform poorly.
- While in the case of materialized view, we are querying a table, which may also be indexed, that increase its performance.

**What is CTE (Common Table Expression)?**

- When a complex SQL statement has number of joins then it can be made easier by using Common Table Expression.
- Consider the following SQL statement.

\[
\text{SELECT * FROM (}
\text{SELECT emp.EmpName,dept.Department,emp.Gender FROM Employee emp}
\text{left join Department dept on emp.DeptID = dept.DeptID) E}
\text{WHERE E.Gender = ‘Male’}
\text{ORDER BY T.EmpName}
\]

The syntax of CTE is as follow

- The CTE Name (followed by WITH keyword)
- The Column List (Optional)
- The Query (Appears within parentheses after the AS keyword)

If we write the above messy query using CTE it would be like

```sql
WITH E(EmpName, Department, Gender) AS
(SELECT emp.EmpName, dept.Department, emp.Gender FROM Employee emp
  left join Department dept on emp.DeptID = dept.DeptID )
SELECT * FROM E
WHERE E.Gender = 'Male'
ORDER BY E.EmpName
```

This way the query can be made more readable and easy to understand.

What is difference between clustered and non clustered index?

- A table can have only one Clustered Index at a time which is generally created on primary key and can have more than one non clustered indexes (maximum up to 999)
- The leaf level of clustered index is actual data pages of the table. Whereas in case of non-clustered index the leaf level is a pointer to the data.
- Non-clustered index is faster than clustered index because when we use DML statement on clustered index, performance issues may occurred since it has to update the index every time a DML statement is executed.
- Syntax of creative clustered / non clustered index is as follow

```sql
CREATE [CLUSTERED | NON CLUSTERED] INDEX index_name ON <object> (column [ASC | DESC] [,...n])
```

What is use of EXCEPT clause? How it differs from NOT IN clause.

-When we combine two queries using EXCEPT clause, it will returns distinct rows from the first SELECT statement that are not returned by the second one.
-EXCEPT clause works the same way as the UNION operator of SQL and MINUS clause in Oracle.
- The syntax of EXCEPT clause is as follow

```sql
SELECT column1 [, column2 ] FROM table1 [ , table2 ] [WHERE condition]
EXCEPT
SELECT column1 [, column2 ] FROM table1 [ , table2 ] [WHERE condition]
```

-The difference between EXCEPT and NOT IN clause is EXCEPT operator returns all distinct rows from the rows returned by first select statement which does not exist in the rows returned by second select statement. On the other hand “NOT IN” will return all rows from returned by first select statement which does not exist in the rows returned by second select statement.

What is difference between Index Seek vs. Index Scan?
Index Seek and Index Scan are operation for query tuning in execution plans. Table Scan scans every record of the table. So the cost of proportional is the number of rows of that table. The Index Scan is preferred only when the table is small. Index Seek only touches the rows which qualify and the pages that contain that qualifying rows, so the cost of proportional is the number of qualifying rows and pages instead of the number of rows in the table. Index seek is preferred for highly sensitive queries.

What is ROW_NUMBER function?

- RANK is one of the Ranking functions which are used to give rank to each row in the result set of a SELECT statement.
- For using this function first specify the function name, followed by the empty parentheses.
- Then specify the OVER function. For this function, you have to pass an ORDER BY clause as an argument. The clause specifies the column(s) that you are going to rank.
- For Example
  SELECT ROW_NUMBER() OVER(ORDER BY Salary DESC) AS [RowNumber], EmpName, Salary, [Month], [Year] FROM EmpSalary
- In the result you will see that the highest salary got the first rank and the lowest salary got the last rank. Here the rows with equal salaries will not get same ranks.

What is Trigger?

- In SQL the Trigger is the procedural code that executed when you INSERT, DELETE or UPDATE data in the table.
- Triggers are useful when you want to perform any automatic actions such as cascading changes through related tables, enforcing column restrictions, comparing the results of data modifications and maintaining the referential integrity of data across a database.
- For example, to prevent the user to delete the any Employee from EmpDetails table, following trigger can be created.

  create trigger del_emp
  on EmpDetails
  for delete
  as
  begin
  rollback transaction
  print "You cannot delete any Employee!"
  end

- When someone will delete a row from the EmpDetails table, the del_emp trigger cancels the deletion, rolls back the transaction, and prints a message "You cannot delete any Employee!"

What is Scheduled job and how to create it?

- If we want to execute any procedural code automatically on specific time either once or repeatedly then we can create a Scheduled job for that code.
- Following are the steps to create a Scheduled Job.

  1. Connect to your database of SQL server in SQL Server Management Studio.
  2. On the SQL Server Agent. There you will find a Jobs folder. Right click on jobs and choose Add New.
  3. A New Job window will appear. Give a related name for the job.
  4. Click next on the "Steps" in the left menu. A SQL job can have multiple steps either in the form of SQL statement or a stored procedure call.
5. Click on the "Schedules" in the left menu. A SQL job can contain one or more schedules. A schedule is basically the time at which sql job will run itself. You can specify recurring schedules also.

-Using scheduled job you can also create alert and notifications.

What is OPENXML in SQL Server?

-OPENXML provides an easy way to use an XML document as a data-source for your procedures.

-OPENXML data can be manipulated the same way we deal with database tables by treating xml tags in the form of columns and the value in the form of rows.

-By using OPENXML Data can be inserted or updated very quickly without multiple trips to the database.

-Example:

DECLARE @count int
DECLARE @xml varchar(5000)
SET @xml ='<Employees>
<Employee id="1">  
<Name>Arpit</Name>
<Employee id="2">  
<Name>Rahul</Name>
</Employee>
</Employees>'

EXEC sp_xml_preparedocument @count OUTPUT, @xml
SELECT * 
FROM OPENXML (@count, Employees/Employee')
WITH (id Varchar(10), Name varchar(100) 'Name', PhoneNo Varchar(50) 'PhoneNo')
EXEC sp_xml_removedocument @index

It will give following result.
1 Arpit 1234
2 Rahul 2211

What are Sparse columns?

- Sparse column is a type of column which is used to optimize storage for null values.
- When a column there is big number of null then by defining that column as spars column we can save a large amount of disk space.
- The drawback of sparse column is that it requires more space for the non null values. When we define a column as sparse it requires additional 4 Byte for not null values.
- For example, a DATETIME column in a non-sparse column required 8 bytes of storage whereas if we define that column as a sparse column then it will require 12 bytes.
- It is not possible to set ROWGUIDCOL and IDENTITY properties in sparse column.

What is RANK function?

-RANK is one of the Ranking functions which are used to give rank to each row in the result set of a SELECT statement.
For using this function first specify the function name, followed by the empty parentheses.

Then specify the OVER function. For this function, you have to pass an ORDER BY clause as an argument. The clause specifies the column(s) that you are going to rank.

For Example

```
SELECT RANK() OVER(ORDER BY Salary DESC) AS [RowNumber], EmpName, Salary, [Month], [Year] FROM EmpSalary
```

- In the result you will see that the highest salary got the first rank and the lowest salary got the last rank.
- Here the rows with equal salaries will get same ranks.
- Remember that the rank depends on the row's position in the result set, not on the sequential number of the row.

What are cursors and when they are useful?

- When we execute any SQL operations, SQL Server opens a work area in memory which is called Cursor.
- When it is required to perform the row by row operations which are not possible with the set-based operations then Cursor is used.
- There are two of cursors

1. Implicate Cursor
   SQL Server automatically manages cursors for all data manipulation statements. These cursors are called implicit cursors.

2. Explicit Cursor
   When the programmer wants to perform the row by row operations for the result set containing more than one row, then he explicitly declare a cursor with a name.
   They are managed by OPEN, FETCH and CLOSE.

%FOUND, %NOFOUND, %ROWCOUNT and %ISOPEN attributes are used in both types of cursors.

What is log shipping?

- SQL has introduced Log Shipping feature to synchronize the Distributed Database Server. Synchronize the database by copying Transaction logs, Backing up, Restoring data. SQL Server Job Agents is used to make these processes automatic.
- In the case of failure the Log Shipping will not transfer the server. That means it will not redirect your application to other server. This has to be done manually.

- Log shipping synchronizes the database only. The main functions of Log Shipping are as follows:

  1. To Back up the transaction log of the primary database
  2. To Copy the transaction log backup to every secondary server
  3. To Restore the transaction log backup on the secondary database

What is SQL Profiler?

- SQL Server provides a graphical tool which helps system administrators to monitor T-SQL statements of Database
Engine.

- SQL Profiler can capture and store data related to every event to a file or a table.

- SQL Server Profiler can be used

1. To create a trace
2. To store the trace results in a table.
3. To watch the trace results when the trace runs
4. To replay the trace results
5. To start, stop, pause, and modify the trace results

What is Similarity and Difference between Truncate and Delete in SQL?

Similarity

- These both command will only delete data of the specified table, they cannot remove the whole table data structure.

Difference

- TRUNCATE is a DDL (data definition language) command whereas DELETE is a DML (data manipulation language) command.

- We can’t execute a trigger in case of TRUNCATE whereas with DELETE command, we can execute a trigger.

- TRUNCATE is faster than DELETE, because when you use DELETE to delete the data, at that time it store the whole data in rollback space from where you can get the data back after deletion. In case of TRUNCATE, it will not store data in rollback space and will directly delete it. You can’t get the deleted data back when you use TRUNCATE.

- We can use any condition in WHERE clause using DELETE but you can’t do it with TRUNCATE.

- If table is referenced by any foreign key constraints then TRUNCATE will not work.

What is Normalization of database? What are its benefits?

- Normalization is set of rules that are to be applied while designing the database tables which are to be connected with each other by relationships. This set of rules is called Normalization.

- Benefits of normalizing the database are
  1. No need to restructure existing tables for new data.
  2. Reducing repetitive entries.
  3. Reducing required storage space
  4. Increased speed and flexibility of queries.

What is Fill factor?

- The 'fill factor' option indicate how full SQL Server will create each index page.
- When the index page doesn’t have free space for inserting a new row, SQL Server will create new index page and transfer some rows from the previous index page to the new index page. This process is called page split.
- If we want to reduce the number of page splits then we can use Fill factor option. Using Fill factor SQL will reserve some space on each index page.
- The fill factor is a value from 1 through 100 that indicates the percentage of the index page to be left empty.
The default value for fill factor is 0.
- If the table contains the data which is not changed frequently then we can set the fill factor option to 100. When the table's data is modified frequently, we can set the fill factor option to 80% or as we want.

What are different types of replication in SQL Server?

There are three types of replication in SQL SERVER

1. Snapshot Replication.
   - In Snapshot Replication snapshot of one database is transferred to another database.
   - In this replication data can be refreshed periodically and all data will be copied to another database every time the table is refreshed.

2. Transactional Replication
   - In transactional replication data will be same as in snapshot replication, but later only the transactions are synchronized instead of replicating the whole database.
   - We can specify the refresh of database either continuously or on periodic basis.

3. Merge Replication
   - Merge replication replicate data from multiple sources into a single central database.
   - The initial load will be same as in snapshot replication but later it allows change of data both on subscriber and publisher, later when they come on-line it detects and combines them and updates accordingly.

What is REPLACE and STUFF function in SQL Server?

STUFF: This function is used to replace the part of string with some another string.

Syntax:

STUFF (String1, Position, Length, String2)
String1 - String to be overwritten
Position - Starting Position for overwriting
Length - Length of replacement string
String2 - String to overwrite

Example:
SELECT STUFF('Arpit',2,2,'mit')
Output: Amit

REPLACE: This function is used to replace all the occurrences of particular string by another string.

Syntax:

REPLACE(String1, String2, String3)

Example:
SELECT REPLACE('Arpit Jain','i','m')
Output: Arpmt Jamn

If you want to replace the first occurrence of "i", Replace wouldn't work, because it always replaces ALL occurrences
Give a example to search for a string in all stored procedure in SQL Server.

-Suppose we have a EmpDetails table in our database and there are certain number of stored procedures in database. We want to know in which stored procedure(s) table EmpDetails is used.

-We can use following query

```sql
SELECT
    sys.objects.name, sys.objects.type, sys.objects.type_desc,
    sys.objects.schema_id, sys.syscomments.text
FROM sys.objects
INNER JOIN sys.syscomments ON sys.objects.object_id = sys.syscomments.id
where sys.syscomments.text like '%EmpDetails%'
And type = 'P'
```

What are Magic tables in SQL Server?

-In SQL Server there are two system tables “Inserted” and “Deleted” called Magic tables.

-These are not the physical tables but the virtual tables generally used with the triggers to retrieve the inserted, deleted or updated rows.

-When a record is inserted in the table that record will be there on INSERTED Magic table.

-When a record is updated in the table that existing record will be there on DELETED Magic table and modified data will be there in INSERTED Magic table.

-When a record is deleted from that table that record will be there on DELETED Magic table.

What is difference between stored procedure and user defined function?

- It is not possible to change the table data with the use of User defined functions but you can do it by using stored procedure.
- The execution of User defined function will be stopped if any error occurred in it. But in the case of Stored procedure when an error occurs the execution will ignore the error and jumps to the next statement.
- We can use User defined function in XML FOR clause but we can use stored procedure in XML FOR clause.
- It is not possible to make permanent changes to server environment whereas stored procedure can change some of the server environment.
- User defined functions do not return output parameters while stored procedure can return output parameters.

What are ACID properties of Transaction?

Following are the ACID properties for Database.

Atomicity – Transactions may be set of SQL statements. If any of statement fails then the entire transaction fails. The transaction follows all or nothing rule.

Consistency – This property says that the transaction should be always in consistent state. If any transaction is going
to effect the database’s consistent state then the transaction could be rolled back.

Isolation – This property says that one transaction can not retrieve the data that has been modified by any other transaction until its completed.

Durability – When any transaction is committed then it must be persisted. In the case of failure only committed transaction will be recovered and uncommitted transaction will be rolled back.

What are COMMIT and ROLLBACK in SQL?

COMMIT statement is used to end the current transaction and once the COMMIT statement is executed the transaction will be permanent and undone.

Syntax: COMMIT;

Example:
BEGIN
UPDATE EmpDetails SET EmpName = ‘Arpit’ where Dept = ‘Developer’
COMMIT;
END;

ROLLBACK statement is used to end the current transaction and undone the changes which was made by that transaction.

Syntax: ROLLBACK [TO] Savepoint_name;

Example
BEGIN
Statement1;
SAVEPOINT mysavepoint;
BEGIN
Statement2;
EXCEPTION
WHEN OTHERS THEN
ROLLBACK TO mysavepoint;
Statement5;
END;
END;

What is a Linked Server?

• When we want to query on remote database server along with the local database server then we can add the remote SQL server to local SQL server in a same group using the concept called Linked Server.
• We can query on both servers using T-SQL.
• We can use stored Procedure sp_addlinkedserver, sp_addlinkedsrvlogin to add new Linked Server.
• By using Linked Server we can SQL statement in clean and easy way to retrieve, join and combine remote data with local data.

What is a WITH(NOLOCK)?

• WITH(NOLOCK) is used to unlock the data which is locke by the transaction that is not yet committed. This command is used before SELECT statement.
• When the transaction is committed or rolled back then there is no need to use NOLOCK function because
the data is already released by the committed transaction.

- Syntax: WITH(NOLOCK)
- Example:
  ```sql
  SELECT * FROM EmpDetails WITH(NOLOCK)
  ```
- WITH(NOLOCK) is similar as READ UNCOMMITTED

What are the basic functions for master, msdb, model, tempdb databases?

- The Master database contains catalog and data for all databases of the SQL Server instance and it holds the engine together. Because SQL Server cannot start if the master database is not working.
- The msdb database contains data of database backups, SQL Agent, DTS packages, SQL Server jobs, and log shipping.
- The tempdb contains temporary objects like global and local temporary tables and stored procedures.
- The model is a template database which is used for creating a new user database.

List few advantages of Stored procedure.

- By using stored procedures we can reuse the code.
- Stored procedure helps in reducing network traffic and latency.
- Stored procedures provide better security to your data.
- Stored procedure is cached in SQL Server's memory. So it helps to reduce the server overhead. It also enhances application performance.
- Stored procedures help us in the encapsulation of the code. The code of the stored procedure can be changed without affecting application.
What are DMVs?

Dynamic management views (DMVs) and functions return server state information that can be used to monitor the health of a server instance, diagnose problems, and tune performance; that is, they let you see what is going on inside SQL Server. They were introduced in SQL Server 2005 as an alternative to system tables. One example is viewing operating system wait statistics via this query:

```
SELECT * FROM sys.dm_os_wait_stats;
```

Another example is examining current sessions, much like the `sp_who2` command:

```
SELECT * FROM sys.dm_exec_sessions;
```

What are temp tables? What is the difference between global and local temp tables?

Temporary tables are temporary storage structures. You may use temporary tables as buckets to store data that you will manipulate before arriving at a final format. The hash (#) character is used to declare a temporary table as it is prepended to the table name. A single hash (#) specifies a local temporary table.

```
CREATE TABLE #tempLocal ( nameid int, fname varchar(50), lname varchar(50) )
```

Local temporary tables are available to the current connection for the user, so they disappear when the user disconnects.

```
CREATE TABLE ##tempGlobal ( nameid int, fname varchar(50), lname varchar(50) )
```

Global temporary tables may be created with double hashes (##). These are available to all users via all connections, and they are deleted only when all connections are closed.

```
CREATE TABLE ##tempGlobal ( nameid int, fname varchar(50), lname varchar(50) )
```

Once created, these tables are used just like permanent tables; they should be deleted when you are finished with them. Within SQL Server, temporary tables are stored in the Temporary Tables folder of the tempdb database.

How are transactions used?

Transactions allow you to group SQL commands into a single unit. The transaction begins with a certain task and ends when all tasks within it are complete. The transaction completes successfully only if all commands within it complete successfully. The whole thing fails if one command fails. The `BEGIN TRANSACTION`, `ROLLBACK TRANSACTION`, and `COMMIT TRANSACTION` statements are used to work with transactions. A group of tasks starts with the `BEGIN` statement. If any problems occur, the rollback command is executed to abort. If everything goes well, all commands are permanently executed via the `COMMIT` statement.

What is the difference between a clustered and a nonclustered index?

A clustered index affects the way the rows of data in a table are stored on disk. When a clustered index is used, rows are stored in sequential order according to the index column value; for this reason, a table can contain only one clustered index, which is usually used on the primary index value.
A nonclustered index does not affect the way data is physically stored; it creates a new object for the index and stores the column(s) designated for indexing with a pointer back to the row containing the indexed values.

You can think of a clustered index as a dictionary in alphabetical order, and a nonclustered index as a book’s index.

What are DBCC commands?

Basically, the Database Consistency Checker (DBCC) provides a set of commands (many of which are undocumented) to maintain databases -- maintenance, validation, and status checks. The syntax is DBCC followed by the command name. Here are three examples:

- **DBCC CHECKALLOC** -- Check disk allocation consistency.
- **DBCC OPENTRAN** -- Display information about recent transactions.
- **DBCC HELP** -- Display Help for DBCC commands.

What is the difference between truncate and delete?

Truncate is a quick way to empty a table. It removes everything without logging each row. Truncate will fail if there are foreign key relationships on the table. Conversely, the delete command removes rows from a table, while logging each deletion and triggering any delete triggers that may be present.

What does the NOLOCK query hint do?

Table hints allow you to override the default behavior of the query optimizer for statements. They are specified in the FROM clause of the statement. While overriding the query optimizer is not always suggested, it can be useful when many users or processes are touching data. The NOLOCK query hint is a good example because it allows you to read data regardless of who else is working with the data; that is, it allows a dirty read of data -- you read data no matter if other users are manipulating it. A hint like NOLOCK increases concurrency with large data stores.

```
SELECT * FROM table_name (NOLOCK)
```

Microsoft advises against using NOLOCK, as it is being replaced by the READUNCOMMITTED query hint. There are lots more query hints with plenty of information online.

What is a CTE?

A common table expression (CTE) is a temporary named result set that can be used within other statements like SELECT, INSERT, UPDATE, and DELETE. It is not stored as an object and its lifetime is limited to the query. It is defined using the WITH statement as the following example shows:

```
WITH ExampleCTE (id, fname, lname) AS
```
SELECT id, firstname, lastname FROM table

A CTE can be used in place of a view in some instances.

What is a view? What is the WITH CHECK OPTION clause for a view?

A view is a virtual table that consists of fields from one or more real tables. Views are often used to join multiple tables or to control access to the underlying tables.

The WITH CHECK OPTION for a view prevents data modifications (to the data) that do not confirm to the WHERE clause of the view definition. This allows data to be updated via the view, but only if it belongs in the view.

What is a query execution plan?

SQL Server has an optimizer that usually does a great job of optimizing code for the most effective execution. A query execution plan is the breakdown of how the optimizer will run (or ran) a query. There are several ways to view a query execution plan. This includes using the Show Execution Plan option within Query Analyzer; Display Estimated Execution Plan on the query dropdown menu; or use the SET SHOWPLAN_TEXT ON command before running a query and capturing the execution plan event in a SQL Server Profiler trace.

What does the SQL Server Agent Windows service do?

SQL Server Agent is a Windows service that handles scheduled tasks within the SQL Server environment (aka jobs). The jobs are stored/defined within SQL Server, and they contain one or more steps that define what happens when the job runs. These jobs may run on demand, as well as via a trigger or predefined schedule. This service is very important when determining why a certain job did not run as planned -- often it is as simple as the SQL Server Agent service not running.

What is the default port number for SQL Server?

If enabled, the default instance of Microsoft SQL Server listens on TCP port 1433. Named instances are configured for dynamic ports, so an available port is chosen when SQL Server starts. When connecting to a named instance through a firewall, configure the Database Engine to listen on a specific port, so that the appropriate port can be opened in the firewall.

The list of possible questions is endless. I am sure these questions will spawn debate and discussion.