The AUTO_INCREMENT column is MySQL's mechanism for generating asequence. This value serves as a unique identifier. By default it starts with 1 increments by 1. There is a provision to start at a particular number and to set desired increment value also.

AUTO_INCREMENT

- Operates on numeric datatypes
- automatically generates sequential numbers during insert operations

```
mysql> create table auto_1(
            c1 int auto_increment primary key,
            c2 varchar(20));
```

```
mysql>  insert into auto_1(c2) values ('tcs'),('hp'),('wipro');
```

c1	c2
1	tcs
2	hp
3	wipro

```
mysql> create table auto1(c1 int auto_increment primary key,
    ->                    c2 char(1));

mysql> insert into auto1(c2) values('a'),('b'),('c'),('d');
mysql> select * from auto1;
+----+------+
| c1 | c2   |
+----+------+
|  1 | a    |
|  2 | b    |
|  3 | c    |
|  4 | d    |
+----+------+
```

Suppose I want to change starting value. Follow the steps below.

```
mysql> create table auto2(c1 int auto_increment primary key,
    ->                    c2 char(1));
```

mysql> alter table auto2 auto_increment=100;

mysql> insert into auto2 (c2) values ('a'),('b'),('c'),('d');

mysql> select * from auto2;

```
+-----+------+
| c1  | c2   |
+-----+------+
| 100 | a    |
| 101 | b    |
| 102 | c    |
| 103 | d    |
+-----+------+
```

Even though adequate precautions are taken during design phase of the table, circumstances demand for structural changes in columns,datatypes,constraints etc. Alter is the solution. Following slide presents what all we can do with alter command.

Alter

ALTER TABLE

Add clause

- Add new columns(before/after)
- Add constraints

Modify/change

- Change null to not null
- Column names
- Column definition

Drop clause

- Drop Columns
- Drop Constraints

RENAME clause

- Rename Tables

We will check all the options of ALTER using an example.

mysql> Create table Test1(

```
-> c1            int ,
-> c2            date,
-> c3            char(1),
->   c4            varchar(10))
-> ;
```

Suppose I want to add a column after creation of table which leads to 2 questions.

1.Should I add column first?
2.Should I add column after?

Adding a Column

- Use the **ADD** clause to add columns.

New column

```
alter table test1 add c5 timestamp;
```

- The new column becomes the last column.

desc test1

```
+-------+-------------+------+-----+---------+-------+
| Field | Type        | Null | Key | Default | Extra |
+-------+-------------+------+-----+---------+-------+
| c1    | int         | YES  |     | NULL    |       |
| c2    | date        | YES  |     | NULL    |       |
| c3    | char(1)     | YES  |     | NULL    |       |
| c4    | varchar(10) | YES  |     | NULL    |       |
| c5    | timestamp   | YES  |     | NULL    |       |
+-------+-------------+------+-----+---------+-------+
```

```
mysql> alter table Test1 add c5 timestamp;
mysql> desc Test1;
+-------+-------------+------+-----+---------+-------+
| Field | Type        | Null | Key | Default | Extra |
+-------+-------------+------+-----+---------+-------+
| c1    | int         | YES  |     | NULL    |       |
| c2    | date        | YES  |     | NULL    |       |
| c3    | char(1)     | YES  |     | NULL    |       |
| c4    | varchar(10) | YES  |     | NULL    |       |
| c5    | timestamp   | YES  |     | NULL    |       |
+-------+-------------+------+-----+---------+-------+
```

```
mysql> alter table Test1 add c6 datetime first;
mysql> desc Test1;
+-------+-------------+------+-----+---------+-------+
| Field | Type        | Null | Key | Default | Extra |
```

```
+-------+-------------+------+-----+---------+-------+
| c6    | datetime    | YES  |     | NULL    |       |
| c1    | int         | YES  |     | NULL    |       |
| c2    | date        | YES  |     | NULL    |       |
| c3    | char(1)     | YES  |     | NULL    |       |
| c4    | varchar(10) | YES  |     | NULL    |       |
| c5    | timestamp   | YES  |     | NULL    |       |
+-------+-------------+------+-----+---------+-------+
```

mysql> alter table Test1 add c7 smallint after c2;
mysql> desc Test1;

```
+-------+-------------+------+-----+---------+-------+
| Field | Type        | Null | Key | Default | Extra |
+-------+-------------+------+-----+---------+-------+
| c6    | datetime    | YES  |     | NULL    |       |
| c1    | int         | YES  |     | NULL    |       |
| c2    | date        | YES  |     | NULL    |       |
| c7    | smallint    | YES  |     | NULL    |       |
| c3    | char(1)     | YES  |     | NULL    |       |
| c4    | varchar(10) | YES  |     | NULL    |       |
| c5    | timestamp   | YES  |     | NULL    |       |
+-------+-------------+------+-----+---------+-------+
```

mysql> alter table test1 add constraint pk_test1 primary key(c1);
mysql> desc test1;

```
+-------+-------------+------+-----+---------+-------+
| Field | Type        | Null | Key | Default | Extra |
+-------+-------------+------+-----+---------+-------+
| c6    | datetime    | YES  |     | NULL    |       |
| c1    | int         | NO   | PRI | NULL    |       |
| c2    | date        | YES  |     | NULL    |       |
| c7    | smallint    | YES  |     | NULL    |       |
| c3    | char(1)     | YES  |     | NULL    |       |
| c4    | varchar(10) | YES  |     | NULL    |       |
| c5    | timestamp   | YES  |     | NULL    |       |
+-------+-------------+------+-----+---------+-------+
```

mysql> alter table test1 add constraint chk_test1 check(c3 in('P','F'));
mysql> alter table test1 add constraint UNI_Test1 UNIQUE(C4);
mysql> CREATE TABLE TEST2(C2 DATE PRIMARY KEY);

mysql> ALTER TABLE TEST1 ADD CONSTRAINT FK_TEST1 FOREIGN KEY(C2)
REFERENCES TEST2(C2);

```
mysql> SELECT CONSTRAINT_NAME, TABLE_NAME, CONSTRAINT_TYPE
    ->      FROM information_schema.TABLE_CONSTRAINTS
    ->      WHERE TABLE_NAME = 'TEST1';
+-----------------+------------+-----------------+
| CONSTRAINT_NAME | TABLE_NAME | CONSTRAINT_TYPE |
+-----------------+------------+-----------------+
| PRIMARY         | test1      | PRIMARY KEY     |
| UNI_Test1       | test1      | UNIQUE          |
```

```
| FK_TEST1        | test1      | FOREIGN KEY     |
| chk_test1       | test1      | CHECK           |
+-----------------+------------+-----------------+
```

mysql> ALTER TABLE TEST1 MODIFY C5 TIMESTAMP NOT NULL;
mysql> DESC TEST1;

```
+-------+-------------+------+-----+---------+-------+
| Field | Type        | Null | Key | Default | Extra |
+-------+-------------+------+-----+---------+-------+
| c6    | datetime    | YES  |     | NULL    |       |
| c1    | int         | NO   | PRI | NULL    |       |
| c2    | date        | YES  | MUL | NULL    |       |
| c7    | smallint    | YES  |     | NULL    |       |
| c3    | char(1)     | YES  |     | NULL    |       |
| c4    | varchar(10) | YES  | UNI | NULL    |       |
| C5    | timestamp   | NO   |     | NULL    |       |
+-------+-------------+------+-----+---------+-------+
```

mysql> alter table test1 modify c3 varchar(1);
mysql> desc test1;

```
-------+-------------+------+-----+---------+-------+
| Field | Type        | Null | Key | Default | Extra |
+-------+-------------+------+-----+---------+-------+
| c6    | datetime    | YES  |     | NULL    |       |
| c1    | int         | NO   | PRI | NULL    |       |
| c2    | date        | YES  | MUL | NULL    |       |
| c7    | smallint    | YES  |     | NULL    |       |
| c3    | varchar(1)  | YES  |     | NULL    |       |
| c4    | varchar(10) | YES  | UNI | NULL    |       |
| C5    | timestamp   | NO   |     | NULL    |       |
+-------+-------------+------+-----+---------+-------+
```

mysql> ALTER TABLE TEST1 RENAME COLUMN C5 TO C_5;
mysql> DESC TEST1;

```
+-------+-------------+------+-----+---------+-------+
| Field | Type        | Null | Key | Default | Extra |
+-------+-------------+------+-----+---------+-------+
| c6    | datetime    | YES  |     | NULL    |       |
| c1    | int         | NO   | PRI | NULL    |       |
| c2    | date        | YES  | MUL | NULL    |       |
| c7    | smallint    | YES  |     | NULL    |       |
| c3    | char(1)     | YES  |     | NULL    |       |
| c4    | varchar(10) | YES  | UNI | NULL    |       |
| C_5   | timestamp   | NO   |     | NULL    |       |
+-------+-------------+------+-----+---------+-------+
```

mysql> alter table test1 rename to test_1;

mysql> desc test_1;

```
+-------+-------------+------+-----+---------+-------+
```

```
| Field | Type        | Null | Key | Default | Extra |
+-------+-------------+------+-----+---------+-------+
| c6    | datetime    | YES  |     | NULL    |       |
| c1    | int         | NO   | PRI | NULL    |       |
| c2    | date        | YES  | MUL | NULL    |       |
| c7    | smallint    | YES  |     | NULL    |       |
| c3    | char(1)     | YES  |     | NULL    |       |
| c4    | varchar(10) | YES  | UNI | NULL    |       |
| C_5   | timestamp   | NO   |     | NULL    |       |
+-------+-------------+------+-----+---------+-------+
```

mysql> alter table test_1 drop column c4;
Qmysql> desc test_1;

```
+-------+-----------+------+-----+---------+-------+
| Field | Type      | Null | Key | Default | Extra |
+-------+-----------+------+-----+---------+-------+
| c6    | datetime  | YES  |     | NULL    |       |
| c1    | int       | NO   | PRI | NULL    |       |
| c2    | date      | YES  | MUL | NULL    |       |
| c7    | smallint  | YES  |     | NULL    |       |
| c3    | char(1)   | YES  |     | NULL    |       |
| C_5   | timestamp | NO   |     | NULL    |       |
+-------+-----------+------+-----+---------+-------+
```

mysql> alter table test_1 drop constraint chk_test1;

mysql> SELECT CONSTRAINT_NAME, TABLE_NAME, CONSTRAINT_TYPE
-> FROM information_schema.TABLE_CONSTRAINTS
-> WHERE TABLE_NAME = 'TEST_1';

```
+-----------------+------------+-----------------+
| CONSTRAINT_NAME | TABLE_NAME | CONSTRAINT_TYPE |
+-----------------+------------+-----------------+
| PRIMARY         | test_1     | PRIMARY KEY     |
| FK_TEST1        | test_1     | FOREIGN KEY     |
+-----------------+------------+-----------------+
```

mysql> ALTER TABLE test_1
-> ALTER C_5 SET DEFAULT '2022-08-05';
mysql> desc test_1;

```
+-------+-----------+------+-----+---------------------+-------+
| Field | Type      | Null | Key | Default             | Extra |
+-------+-----------+------+-----+---------------------+-------+
| c6    | datetime  | YES  |     | NULL                |       |
| c1    | int       | NO   | PRI | NULL                |       |
| c2    | date      | YES  | MUL | NULL                |       |
| c7    | smallint  | YES  |     | NULL                |       |
| c3    | varchar(1)| YES  |     | NULL                |       |
| C_5   | timestamp | NO   |     | 2022-08-05 00:00:00 |       |
+-------+-----------+------+-----+---------------------+-------+
```

ON DELETE CASCADE/ON DELETE SET NULL

```
mysql>create table pri_tab(c1 int primary key,c2 varchar(1));

mysql>create table for_tab(c1 int,
                        c3 date,
                         foreign key(c1) references pri_tab(c1));


mysql> insert into pri_tab values(1,'a');

mysql> insert into for_tab values(1,curdate());

mysql> insert into for_tab values(1,curdate()-1);
mysql> delete from pri_tab;
ERROR 1451 (23000): Cannot delete or update a parent row: a foreign key constraint
fails (`demo`.`for_tab`, CONSTRAINT `for_tab_ibfk_1` FOREIGN K
EY (`c1`) REFERENCES `pri_tab` (`c1`))


mysql>alter table for_tab drop constraint for_tab_ibfk_1;

mysql> alter table for_tab drop constraint for_tab_ibfk_1;
Query OK, 0 rows affected (0.06 sec)
Records: 0   Duplicates: 0   Warnings: 0

mysql> alter table for_tab add constraint fk_for foreign key(c1) references
    -> pri_tab(c1) on delete cascade;
mysql> select * from pri_tab;
+----+------+
| c1 | c2   |
+----+------+
|  1 | a    |
+----+------+

mysql> select * from for_tab;
+------+------------+
| c1   | c3         |
+------+------------+
|    1 | 2022-08-10 |
|    1 | 2022-08-09 |
+------+------------+


mysql> start transaction;
```

mysql> delete from pri_tab;

mysql> select * from for_tab;

mysql> rollback;

mysql> select * from for_tab;

```
+------+------------+
| c1   | c3         |
+------+------------+
|    1 | 2022-08-10 |
|    1 | 2022-08-09 |
+------+------------+
2 rows in set (0.00 sec)
```

mysql> alter table for_tab drop constraint fk_for;

mysql> alter table for_tab add constraint fk_for foreign key(c1) references pri_tab(c1) on delete set null;

mysql> select * from for_tab;

```
+------+------------+
| c1   | c3         |
+------+------------+
|    1 | 2022-08-10 |
|    1 | 2022-08-09 |
+------+------------+
```

mysql> select * from pri_tab;

```
+----+------+
| c1 | c2   |
+----+------+
|  1 | a    |
+----+------+
```

mysql> start transaction;

mysql> delete from pri_tab;

```
Query OK, 1 row affected (0.00 sec)
```

mysql> select * from for_tab;

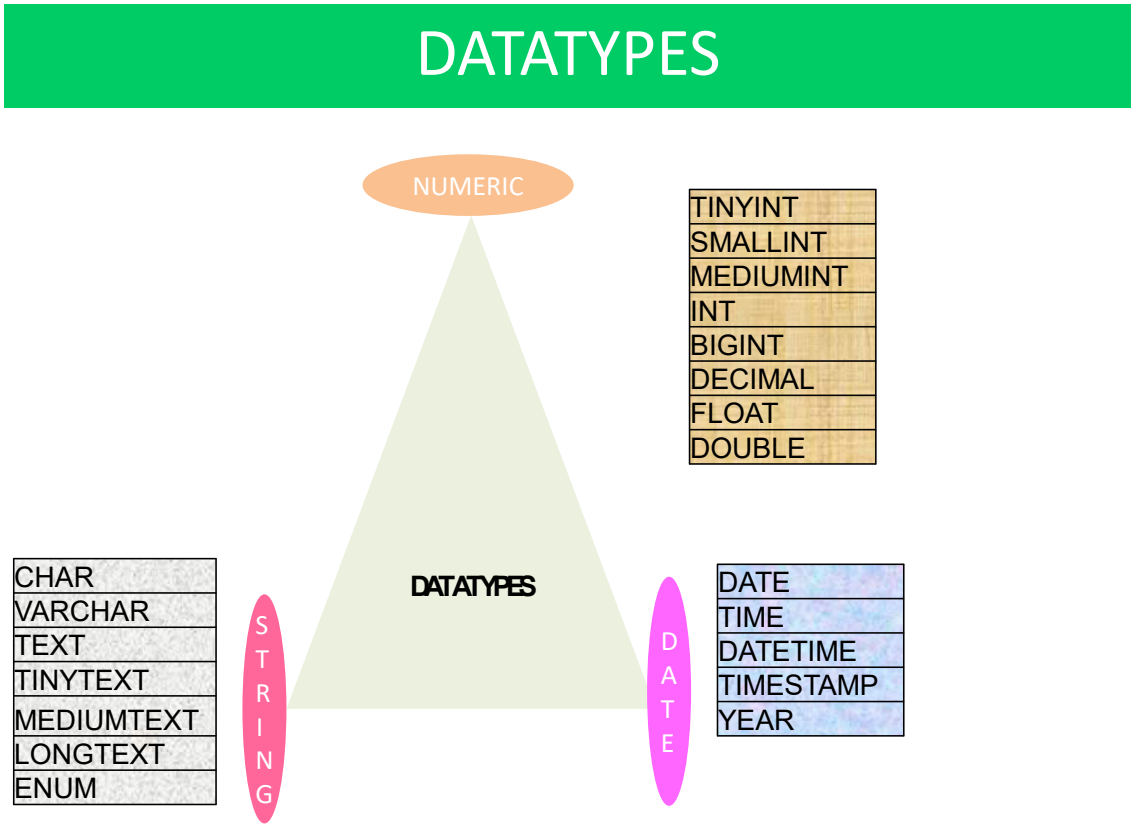
```
+------+------------+
| c1   | c3         |
+------+------------+
| NULL | 2022-08-10 |
| NULL | 2022-08-09 |
+------+------------+
2 rows in set (0.00 sec)
```

mysql> rollback;

mysql> alter table for_tab drop constraint fk_for;

mysql> alter table for_tab add constraint fk_for foreign key(c1) references pri_tab(c1);

DATATYPES



TINY,SMALL,MEDIUM,INT,BIGINT

SLNO	DATATYPE	VALUE	DIGITS
1	tinyint	255	3
2	smallint	32767	5
3	Mediumint	8388607	7
4	Int		11
5	bigint	2^{63}-1	20

mysql> insert into tiny_int values(256,'p');
ERROR 1264 (22003): Out of range value for column 'c1' at row 1

mysql> insert into small_int values(32768,'p');
ERROR 1264 (22003): Out of range value for column 'c1' at row 1

mysql> insert into medium_int values(8388608,'p');
ERROR 1264 (22003): Out of range value for column 'c1' at row 1

mysql> insert into int_1 values(2147483648,'p');
ERROR 1264 (22003): Out of range value for column 'c1' at row 1

mysql> insert into big_int values(1111111111111111111,'p');
ERROR 1264 (22003): Out of range value for column 'c1' at row 1

DROP TABLE

The DROP TABLE statement allows a table to be removed from a MySQL database. This statement deletes the entire structure as well as the content of the table.

```
mysql> create table drop1 as select * from salgrade;
mysql> create table drop2 as select * from salgrade;
mysql> create table drop3 as select * from salgrade;
mysql> create table drop4 as select * from salgrade;

mysql> # dropping single table
mysql> drop table drop1;
Query OK, 0 rows affected (0.03 sec)

mysql> # dropping multiple tables
mysql> drop table drop2,drop3,drop4;
Query OK, 0 rows affected (0.04 sec)


mysql> drop table pri_tab;
ERROR 3730 (HY000): Cannot drop table 'pri_tab' referenced by a foreign key constraint 'fk_for' on table 'for_tab'.
```

mysql> set foreign_key_checks=0;
Query OK, 0 rows affected (0.00 sec)

mysql> drop table pri_tab;
Query OK, 0 rows affected (0.03 sec)

mysql> drop table for_tab;
Query OK, 0 rows affected (0.02 sec)

mysql> create view v3 as select * from emp natural join dept;
Query OK, 0 rows affected (0.01 sec)

mysql> select * from v3;

DEPTNO	EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DNAME	LOC
10	7782	CLARK	MANAGER	7839	1981-06-09	2450	NULL	ACCOUNTING	NEW YORK
10	7839	KING	PRESIDENT	NULL	1981-11-17	5000	NULL	ACCOUNTING	NEW YORK
10	7934	MILLER	CLERK	7782	1982-01-23	1300	NULL	ACCOUNTING	NEW YORK
20	7369	SMITH	CLERK	7902	1980-12-17	800	NULL	RESEARCH	DALLAS
20	7566	JONES	MANAGER	7839	1981-04-02	2975	NULL	RESEARCH	DALLAS
20	7788	SCOTT	ANALYST	7566	1987-07-13	3000	NULL	RESEARCH	DALLAS
20	7876	ADAMS	CLERK	7788	1987-07-13	1100	NULL	RESEARCH	DALLAS
20	7902	FORD	ANALYST	7566	1981-12-03	3000	NULL	RESEARCH	DALLAS
30	7499	ALLEN	SALESMAN	7698	1981-02-20	1600	300	SALES	CHICAGO
30	7521	WARD	SALESMAN	7698	1981-02-22	1250	500	SALES	CHICAGO
30	7654	MARTIN	SALESMAN	7698	1981-09-28	1250	1400	SALES	CHICAGO
30	7698	BLAKE	MANAGER	7839	1981-05-01	2850	NULL	SALES	CHICAGO
30	7844	TURNER	SALESMAN	7698	1981-09-08	1500	0	SALES	CHICAGO
30	7900	JAMES	CLERK	7698	1981-12-03	950	NULL	SALES	CHICAGO

mysql> delete from v3;
ERROR 1395 (HY000): Can not delete from join view 'demo.v3'

mysql> create view v4 as select * from salgrade where grade=3 with check option;
Query OK, 0 rows affected (0.01 sec)

mysql> select * from v4;

GRADE	LOSAL	HISAL
3	1401	2000

mysql> update v4 set grade=5;
ERROR 1369 (HY000): CHECK OPTION failed 'demo.v4'
mysql> select * from v4;

GRADE	LOSAL	HISAL
3	1401	2000

TRNSACTION:

By default, insert,update,delete operations are autocommit; If at all it has to be rolled back,we need to use START TRANSACTION.

mysql> select * from defa_tab;

```
+-----+---------------------+
| C1  | C2                  |
+-----+---------------------+
| 100 | 2022-08-09 07:26:18 |
| 200 | 2022-08-09 07:28:26 |
+-----+---------------------+
```

mysql> start transaction;
mysql> delete from defa_tab where c1=200;

mysql> select * from defa_tab;

```
+-----+---------------------+
| C1  | C2                  |
+-----+---------------------+
| 100 | 2022-08-09 07:26:18 |
+-----+---------------------+
```

mysql> rollback;.