```
    ->   ADD COLUMN FirstName VARCHAR(60) NULL AFTER BirthDate,
    ->   ADD COLUMN LastName  VARCHAR(60) NULL AFTER FirstName;
ERROR 1054 (42S22): Unknown column 'BirthDate' in 'Student'
mysql> ALTER TABLE Student
    ->   ADD COLUMN BirthDate DATE NULL AFTER Gender;
Query OK, 0 rows affected (0.04 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> ALTER TABLE Student
    ->   ADD COLUMN BirthDate DATE NULL AFTER Gender;
ERROR 1060 (42S21): Duplicate column name 'BirthDate'
mysql> ALTER TABLE Student
    ->   ADD COLUMN FirstName VARCHAR(60) NULL AFTER BirthDate,
    ->   ADD COLUMN LastName  VARCHAR(60) NULL AFTER FirstName;
Query OK, 0 rows affected (0.04 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> UPDATE Student
    -> SET FirstName = SUBSTRING_INDEX(FullName, ' ', 1),
    ->     LastName  = NULLIF(TRIM(SUBSTRING(FullName FROM LENGTH(SUBSTRING_INDEX(FullName,' ',1))+2)), '');
Query OK, 5 rows affected (0.01 sec)
Rows matched: 5  Changed: 5  Warnings: 0

mysql> ALTER TABLE Student
    ->   ADD COLUMN ContactInfo JSON NULL AFTER LastName;
Query OK, 0 rows affected (0.03 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> UPDATE Student
    -> SET ContactInfo = JSON_OBJECT('address', Address, 'email', Email);
Query OK, 5 rows affected (0.02 sec)
Rows matched: 5  Changed: 5  Warnings: 0

mysql> CREATE INDEX idx_student_email_json ON Student ((JSON_UNQUOTE(JSON_EXTRACT(ContactInfo,'$.email'))));
ERROR 3757 (HY000): Cannot create a functional index on an expression that returns a BLOB or TEXT. Please consider using CAST.
mysql> CREATE INDEX idx_student_email_json ON Student ((JSON_UNQUOTE(JSON_EXTRACT(ContactInfo,'$.email'))));
ERROR 3757 (HY000): Cannot create a functional index on an expression that returns a BLOB or TEXT. Please consider using CAST.
mysql> ALTER TABLE Student
    ->   DROP COLUMN Address,
    ->   DROP COLUMN Email,
    ->   DROP COLUMN FullName;
Query OK, 0 rows affected (0.08 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql>
```

```
| عمر علي               | omar@example.com    | 01000000002 |
| منى إبراهيم           | mona@example.com    | 01000000030 |
| يوسف سالم             | youssef@example.com | NULL        |
+----------------------+---------------------+-------------+
6 rows in set (0.00 sec)

mysql> ALTER TABLE Student
    ->    ADD COLUMN Gender ENUM('male','female') NULL AFTER Address;
Query OK, 0 rows affected (0.03 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql>
mysql> USE iti_grades;
Database changed
mysql> ALTER TABLE Student
    ->    ADD COLUMN FirstName VARCHAR(60) NULL AFTER BirthDate,
    ->    ADD COLUMN LastName  VARCHAR(60) NULL AFTER FirstName;
ERROR 1054 (42S22): Unknown column 'BirthDate' in 'Student'
mysql> UPDATE Student
    -> SET FirstName = SUBSTRING_INDEX(FullName, ' ', 1),
    ->     LastName  = NULLIF(TRIM(SUBSTRING(FullName FROM LENGTH(SUBSTRING_INDEX(FullName,' ',1))+2)), '');
ERROR 1054 (42S22): Unknown column 'FirstName' in 'field list'
mysql> ALTER TABLE Student
    ->    ADD COLUMN ContactInfo JSON NULL AFTER LastName;
ERROR 1054 (42S22): Unknown column 'LastName' in 'Student'
mysql>
mysql> UPDATE Student
    -> SET ContactInfo = JSON_OBJECT('address', Address, 'email', Email);
ERROR 1054 (42S22): Unknown column 'ContactInfo' in 'field list'
mysql> CREATE INDEX idx_student_email_json ON Student ((JSON_UNQUOTE(JSON_EXTRACT(ContactInfo,'$.email'))));
ERROR 1054 (42S22): Unknown column 'ContactInfo' in 'functional index'
mysql> SET ContactInfo = JSON_OBJECT('address', Address, 'email', Email);
ERROR 1193 (HY000): Unknown system variable 'ContactInfo'
mysql> ALTER TABLE Student
    ->    ADD COLUMN ContactInfo JSON NULL AFTER LastName;
ERROR 1054 (42S22): Unknown column 'LastName' in 'Student'
mysql> ALTER TABLE Student
    ->    ADD COLUMN ContactInfo JSON NULL AFTER LastName;
ERROR 1054 (42S22): Unknown column 'LastName' in 'Student'
mysql> ALTER TABLE Student
    ->    ADD COLUMN ContactInfo JSON NULL AFTER LastName;
ERROR 1054 (42S22): Unknown column 'LastName' in 'Student'
mysql> ALTER TABLE Student
    ->    ADD COLUMN FirstName VARCHAR(60) NULL AFTER BirthDate,
    ->    ADD COLUMN LastName  VARCHAR(60) NULL AFTER FirstName;
```

```
            ADD COLUMN ContactInfo JSON NULL AFTER LastName;
ERROR 1054 (42S22): Unknown column 'LastName' in 'Student'
mysql> ALTER TABLE Student
    ->   ADD COLUMN FirstName VARCHAR(60) NULL AFTER BirthDate,
    ->   ADD COLUMN LastName  VARCHAR(60) NULL AFTER FirstName;
ERROR 1054 (42S22): Unknown column 'BirthDate' in 'Student'
mysql> ALTER TABLE Student
    ->   ADD COLUMN BirthDate DATE NULL AFTER Gender;
Query OK, 0 rows affected (0.04 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> ALTER TABLE Student
    ->   ADD COLUMN BirthDate DATE NULL AFTER Gender;
ERROR 1060 (42S21): Duplicate column name 'BirthDate'
mysql> ALTER TABLE Student
    ->   ADD COLUMN FirstName VARCHAR(60) NULL AFTER BirthDate,
    ->   ADD COLUMN LastName  VARCHAR(60) NULL AFTER FirstName;
Query OK, 0 rows affected (0.04 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> UPDATE Student
    -> SET FirstName = SUBSTRING_INDEX(FullName, ' ', 1),
    ->     LastName  = NULLIF(TRIM(SUBSTRING(FullName FROM LENGTH(SUBSTRING_INDEX(FullName,' ',1))+2)), '');
Query OK, 5 rows affected (0.01 sec)
Rows matched: 5  Changed: 5  Warnings: 0

mysql> ALTER TABLE Student
    ->   ADD COLUMN ContactInfo JSON NULL AFTER LastName;
Query OK, 0 rows affected (0.03 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> UPDATE Student
    -> SET ContactInfo = JSON_OBJECT('address', Address, 'email', Email);
Query OK, 5 rows affected (0.02 sec)
Rows matched: 5  Changed: 5  Warnings: 0

mysql> CREATE INDEX idx_student_email_json ON Student ((JSON_UNQUOTE(JSON_EXTRACT(ContactInfo,'$.email'))));
ERROR 3757 (HY000): Cannot create a functional index on an expression that returns a BLOB or TEXT. Please consider using CAST.
mysql> CREATE INDEX idx_student_email_json ON Student ((JSON_UNQUOTE(JSON_EXTRACT(ContactInfo,'$.email'))));
ERROR 3757 (HY000): Cannot create a functional index on an expression that returns a BLOB or TEXT. Please consider using CAST.
mysql> ALTER TABLE Student
    ->   DROP COLUMN Address,
    ->   DROP COLUMN Email,
    ->   DROP COLUMN FullName;
Query OK, 0 rows affected (0.08 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

```
Rows matched: 1  Changed: 1  Warnings: 0

mysql> UPDATE Student SET Gender='male',   BirthDate='1998-01-10' WHERE StudentID=3;
Query OK, 1 row affected (0.01 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> UPDATE Student SET Gender='female', BirthDate='2001-05-02' WHERE StudentID=4;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> UPDATE Student SET Gender='male',   BirthDate='1997-11-30' WHERE StudentID=5;
Query OK, 1 row affected (0.01 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql>
mysql>
mysql> UPDATE Student SET FirstName='Omar',   LastName='Ali'     WHERE StudentID=1;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> UPDATE Student SET FirstName='Sara',   LastName='Hassan'  WHERE StudentID=2;
Query OK, 1 row affected (0.01 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> UPDATE Student SET FirstName='Ahmed',  LastName='Nabil'   WHERE StudentID=3;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> UPDATE Student SET FirstName='Mona',   LastName='Ibrahim' WHERE StudentID=4;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> UPDATE Student SET FirstName='Youssef',LastName='Salem'   WHERE StudentID=5;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql>
mysql>
mysql> UPDATE Student
    -> SET ContactInfo = JSON_SET(ContactInfo, '$.address','Cairo, EG', '$.email','omar@example.com')
    -> WHERE StudentID=1;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql>
```

```
+--------+-----+
| Gender | Cnt |
+--------+-----+
| male   |   3 |
| female |   2 |
+--------+-----+
2 rows in set (0.01 sec)

mysql>
mysql>
mysql> SELECT FirstName, COUNT(*) AS Cnt
    -> FROM Student
    -> GROUP BY FirstName
    -> HAVING COUNT(*) > 2;
Empty set (0.00 sec)

mysql>
mysql>
mysql> SELECT CONCAT(s.FirstName,' ',COALESCE(s.LastName,'')) AS StudentName,
    ->        sub.Name AS SubjectName,
    ->        ex.Score, ex.ExamDate
    -> FROM Exam ex
    -> JOIN Student s ON s.StudentID = ex.StudentID
    -> JOIN Subject sub ON sub.SubjectID = ex.SubjectID
    -> ORDER BY StudentName, ex.ExamDate;
+-------------+-------------+-------+------------+
| StudentName | SubjectName | Score | ExamDate   |
+-------------+-------------+-------+------------+
| Ahmed Nabil | C           | 69.00 | 2025-10-14 |
| Omar Ali    | C           | 88.00 | 2025-10-10 |
| Omar Ali    | CPP         | 75.50 | 2025-10-12 |
| Sara Hassan | HTML        | 92.00 | 2025-10-11 |
| Sara Hassan | JS          | 81.00 | 2025-10-13 |
+-------------+-------------+-------+------------+
5 rows in set (0.00 sec)

mysql>
mysql>
mysql> DELETE ex
    -> FROM Exam ex
    -> JOIN Subject sub ON sub.SubjectID = ex.SubjectID
    -> WHERE sub.Name = 'C' AND ex.Score < 50;
Query OK, 0 rows affected (0.00 sec)

mysql>
```

```
mysql>
mysql>
mysql> SELECT Name, MaxScore
    -> FROM Subject
    -> ORDER BY MaxScore DESC, Name
    -> LIMIT 1;
+------+----------+
| Name | MaxScore |
+------+----------+
| C    |      100 |
+------+----------+
1 row in set (0.00 sec)

mysql>
mysql>
mysql> SELECT * FROM Student WHERE FirstName LIKE 'A%';
+-----------+--------+------------+-----------+----------+----------------------------------------------------------------+
| StudentID | Gender | BirthDate  | FirstName | LastName | ContactInfo                                                    |
+-----------+--------+------------+-----------+----------+----------------------------------------------------------------+
|         3 | male   | 1998-01-10 | Ahmed     | Nabil    | {"email": "ahmed@example.com", "address": "الإسكندرية"}        |
+-----------+--------+------------+-----------+----------+----------------------------------------------------------------+
1 row in set (0.00 sec)

mysql>
mysql>
mysql> SELECT COUNT(*) AS MohammedCount
    -> FROM Student
    -> WHERE FirstName='Mohammed' OR LastName='Mohammed';
+---------------+
| MohammedCount |
+---------------+
|             0 |
+---------------+
1 row in set (0.00 sec)

mysql>
mysql>
mysql> SELECT Gender, COUNT(*) AS Cnt
    -> FROM Student
    -> GROUP BY Gender;
+--------+-----+
| Gender | Cnt |
+--------+-----+
| male   |   3 |
| female |   2 |
```

```
+-------------+
| FemaleCount |
+-------------+
|           2 |
+-------------+
1 row in set (0.00 sec)

mysql>
mysql>
mysql> SELECT * FROM Student WHERE BirthDate < '1992-10-01';
Empty set (0.00 sec)

mysql>
mysql>
mysql> SELECT * FROM Student WHERE Gender='male' AND BirthDate < '1991-10-01';
Empty set (0.00 sec)

mysql>
mysql>
mysql> SELECT Name, MaxScore FROM Subject ORDER BY MaxScore DESC, Name;
+------+----------+
| Name | MaxScore |
+------+----------+
| C    |      100 |
| CPP  |      100 |
| CSS  |      100 |
| HTML |      100 |
| JS   |      100 |
+------+----------+
5 rows in set (0.00 sec)

mysql>
mysql>
mysql> SELECT Name, MaxScore
    -> FROM Subject
    -> ORDER BY MaxScore DESC, Name
    -> LIMIT 1;
+------+----------+
| Name | MaxScore |
+------+----------+
| C    |      100 |
+------+----------+
1 row in set (0.00 sec)

mysql>
```

```
| FemaleCount |
+-------------+
|           2 |
+-------------+
1 row in set (0.00 sec)

mysql>
mysql>
mysql> SELECT * FROM Student WHERE BirthDate < '1992-10-01';
Empty set (0.00 sec)

mysql>
mysql>
mysql> SELECT * FROM Student WHERE Gender='male' AND BirthDate < '1991-10-01';
Empty set (0.00 sec)

mysql>
mysql>
mysql> SELECT Name, MaxScore FROM Subject ORDER BY MaxScore DESC, Name;
+------+----------+
| Name | MaxScore |
+------+----------+
| C    |      100 |
| CPP  |      100 |
| CSS  |      100 |
| HTML |      100 |
| JS   |      100 |
+------+----------+
5 rows in set (0.00 sec)

mysql>
mysql>
mysql> SELECT Name, MaxScore
    -> FROM Subject
    -> ORDER BY MaxScore DESC, Name
    -> LIMIT 1;
+------+----------+
| Name | MaxScore |
+------+----------+
| C    |      100 |
+------+----------+
1 row in set (0.00 sec)

mysql>
```

```
mysql> UPDATE Student
    -> SET ContactInfo = JSON_SET(ContactInfo, '$.address','Cairo, EG', '$.email','omar@example.com')
    -> WHERE StudentID=1;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> SELECT StudentID, FirstName, LastName, Gender, BirthDate, ContactInfo
    -> FROM Student;
+-----------+-----------+----------+--------+------------+-------------------------------------------------------------------+
| StudentID | FirstName | LastName | Gender | BirthDate  | ContactInfo                                                       |
+-----------+-----------+----------+--------+------------+-------------------------------------------------------------------+
|         1 | Omar      | Ali      | male   | 2000-03-15 | {"email": "omar@example.com", "address": "Cairo, EG"}             |
|         2 | Sara      | Hassan   | female | 1999-07-21 | {"email": "sara@example.com", "address": "الجيزة"}                |
|         3 | Ahmed     | Nabil    | male   | 1998-01-10 | {"email": "ahmed@example.com", "address": "الإسكندرية"}           |
|         4 | Mona      | Ibrahim  | female | 2001-05-02 | {"email": "mona@example.com", "address": "القاهرة"}              |
|         5 | Youssef   | Salem    | male   | 1997-11-30 | {"email": "youssef@example.com", "address": "المنصورة"}          |
+-----------+-----------+----------+--------+------------+-------------------------------------------------------------------+
5 rows in set (0.00 sec)

mysql>
mysql> SELECT StudentID, FirstName, LastName, Gender, BirthDate, ContactInfo
    -> FROM Student;
+-----------+-----------+----------+--------+------------+-------------------------------------------------------------------+
| StudentID | FirstName | LastName | Gender | BirthDate  | ContactInfo                                                       |
+-----------+-----------+----------+--------+------------+-------------------------------------------------------------------+
|         1 | Omar      | Ali      | male   | 2000-03-15 | {"email": "omar@example.com", "address": "Cairo, EG"}             |
|         2 | Sara      | Hassan   | female | 1999-07-21 | {"email": "sara@example.com", "address": "الجيزة"}                |
|         3 | Ahmed     | Nabil    | male   | 1998-01-10 | {"email": "ahmed@example.com", "address": "الإسكندرية"}           |
|         4 | Mona      | Ibrahim  | female | 2001-05-02 | {"email": "mona@example.com", "address": "القاهرة"}              |
|         5 | Youssef   | Salem    | male   | 1997-11-30 | {"email": "youssef@example.com", "address": "المنصورة"}          |
+-----------+-----------+----------+--------+------------+-------------------------------------------------------------------+
5 rows in set (0.00 sec)

mysql>
mysql>
mysql> SELECT * FROM Student WHERE Gender='male';
+-----------+--------+------------+-----------+----------+-------------------------------------------------------------------+
| StudentID | Gender | BirthDate  | FirstName | LastName | ContactInfo                                                       |
+-----------+--------+------------+-----------+----------+-------------------------------------------------------------------+
|         1 | male   | 2000-03-15 | Omar      | Ali      | {"email": "omar@example.com", "address": "Cairo, EG"}             |
|         3 | male   | 1998-01-10 | Ahmed     | Nabil    | {"email": "ahmed@example.com", "address": "الإسكندرية"}           |
|         5 | male   | 1997-11-30 | Youssef   | Salem    | {"email": "youssef@example.com", "address": "المنصورة"}          |
+-----------+--------+------------+-----------+----------+-------------------------------------------------------------------+
3 rows in set (0.00 sec)

mysql>
```

```
| CPP      |     75.50 |    75.50 | 75.500000 |
| HTML     |     92.00 |    92.00 | 92.000000 |
| JS       |     81.00 |    81.00 | 81.000000 |
+----------+-----------+----------+-----------+
4 rows in set (0.00 sec)

mysql> SELECT s.FullName, COUNT(e.SubjectID) AS SubjectsCount
    -> FROM Enrollment e
    -> JOIN Student s ON s.StudentID = e.StudentID
    -> GROUP BY s.FullName
    -> HAVING COUNT(e.SubjectID) > 1;
+-----------------+---------------+
| FullName        | SubjectsCount |
+-----------------+---------------+
| عمر علي         |             2 |
| سارة حسن        |             2 |
+-----------------+---------------+
2 rows in set (0.00 sec)

mysql> SELECT s.FullName, COUNT(e.SubjectID) AS SubjectsCount
    -> FROM Enrollment e
    -> JOIN Student s ON s.StudentID = e.StudentID
    -> GROUP BY s.FullName
    -> HAVING COUNT(e.SubjectID) > 1;
+-----------------+---------------+
| FullName        | SubjectsCount |
+-----------------+---------------+
| عمر علي         |             2 |
| سارة حسن        |             2 |
+-----------------+---------------+
2 rows in set (0.00 sec)

mysql> SELECT s.FullName, s.Email, p.PhoneNumber
    -> FROM Student s
    -> LEFT JOIN Phone p ON s.StudentID = p.StudentID
    -> ORDER BY s.FullName;
+-------------------+---------------------+-------------+
| FullName          | Email               | PhoneNumber |
+-------------------+---------------------+-------------+
| أحمد نبيل         | ahmed@example.com   | 01000000020 |
| سارة حسن          | sara@example.com    | 01000000010 |
| عمر علي           | omar@example.com    | 01000000001 |
| عمر علي           | omar@example.com    | 01000000002 |
| منى إبراهيم       | mona@example.com    | 01000000030 |
| يوسف سالم         | youssef@example.com | NULL        |
```

```
    ->   DROP FOREIGN KEY fk_phone_student;
ERROR 1091 (42000): Can't DROP 'fk_phone_student'; check that column/key exists
mysql>
mysql> ALTER TABLE Phone
    ->   ADD CONSTRAINT fk_phone_student
    ->   FOREIGN KEY (StudentID) REFERENCES Student(StudentID)
    ->   ON DELETE CASCADE ON UPDATE CASCADE;
Query OK, 5 rows affected (0.11 sec)
Records: 5  Duplicates: 0  Warnings: 0

mysql>
mysql>
mysql> ALTER TABLE Enrollment
    ->   DROP FOREIGN KEY fk_enr_student,
    ->   DROP FOREIGN KEY fk_enr_subject;
ERROR 1091 (42000): Can't DROP 'fk_enr_student'; check that column/key exists
mysql>
mysql> ALTER TABLE Enrollment
    ->   ADD CONSTRAINT fk_enr_student
    ->     FOREIGN KEY (StudentID) REFERENCES Student(StudentID)
    ->     ON DELETE CASCADE ON UPDATE CASCADE,
    ->   ADD CONSTRAINT fk_enr_subject
    ->     FOREIGN KEY (SubjectID) REFERENCES Subject(SubjectID)
    ->     ON DELETE CASCADE ON UPDATE CASCADE;
Query OK, 5 rows affected (0.09 sec)
Records: 5  Duplicates: 0  Warnings: 0

mysql>
mysql>
mysql> ALTER TABLE Exam
    ->   DROP FOREIGN KEY fk_exam_student,
    ->   DROP FOREIGN KEY fk_exam_subject;
ERROR 1091 (42000): Can't DROP 'fk_exam_student'; check that column/key exists
mysql>
mysql> ALTER TABLE Exam
    ->   ADD CONSTRAINT fk_exam_student
    ->     FOREIGN KEY (StudentID) REFERENCES Student(StudentID)
    ->     ON DELETE CASCADE ON UPDATE CASCADE,
    ->   ADD CONSTRAINT fk_exam_subject
    ->     FOREIGN KEY (SubjectID) REFERENCES Subject(SubjectID)
    ->     ON DELETE CASCADE ON UPDATE CASCADE;
Query OK, 5 rows affected (0.11 sec)
Records: 5  Duplicates: 0  Warnings: 0

mysql>
```