B0B36DBS: **Database Systems** | Classes 6 and 7: **SQL: Data Querying**

01: Department Teachers

```
SELECT *
FROM teacher
WHERE (department = "KSI");
```

```
SELECT id, name, phone, department …
```

```
… WHERE department = "KSI"
```

02: Study Results

```
SELECT code, title, result
FROM Enrollment NATURAL JOIN Course
WHERE (student = 4301) AND (semester = 181)
ORDER BY result, title DESC;
```

```
… FROM Enrollment NATURAL INNER JOIN Course …
```

```
… FROM Enrollment AS E JOIN Course AS C ON (E.code = C.code) …
```

```
… FROM Enrollment AS E JOIN Course AS C
WHERE (E.code = C.code) AND (student = 4301) AND (semester = 181) …
```

```
… WHERE (E.code = C.code) AND (E.student = 4301) AND (E.semester = 181) …
```

```
… FROM Enrollment AS E, Course AS C
WHERE (E.code = C.code) AND (student = 4301) AND (semester = 181) …
```

```
… ORDER BY result ASC, name DESC
```

03: Subordinate Teachers

```
SELECT T2.name
FROM
   Teacher AS T1
   JOIN Department AS D ON (T1.id = D.chair)
   JOIN Teacher AS T2 ON (D.name = T2.department)
WHERE (T1.name = "Tomáš Skopal");
```

```
SELECT T2.name
FROM
   Teacher AS T2
   JOIN Department AS D ON (T2.department = D.name)
   JOIN Teacher AS T1 ON (D.chair = T1.id)
WHERE (T1.name = "Tomáš Skopal");
```

```
SELECT T2.name
FROM Teacher AS T1 JOIN Department AS D JOIN Teacher AS T2
WHERE (T1.name = "Tomáš Skopal") AND (T1.id = D.chair) AND (D.name = T2.department);
```

04: Permitted Courses

```
SELECT DISTINCT code, title
FROM
   Schedule JOIN
   Course ON (course = code)
WHERE (semester = 182) AND (day = "MON" OR day = "FRI");
```

```
SELECT DISTINCT C.code, C.title
FROM
   Schedule AS S
   JOIN Course AS C ON (S.course = C.code)
WHERE (S.semester = 182) AND (S.day = "MON" OR S.day = "FRI");
```

```
… WHERE (semester = 182) AND (day IN ("MON", "FRI"))
```

```
SELECT code, title
FROM Course
WHERE
   code IN (
      SELECT DISTINCT course
      FROM Schedule
      WHERE (semester = 182) AND (day = "MON" OR day = "FRI")
   );
```

```
SELECT code, title
FROM Course
WHERE
   EXISTS (
      SELECT *
      FROM Schedule
      WHERE (course = code) AND (semester = 182) AND (day = "MON" OR day = "FRI")
   );
```

```
SELECT code, title
FROM Course
WHERE
   code = ANY (
      SELECT course
      FROM Schedule
      WHERE (semester = 182) AND (day = "MON" OR day = "FRI")
   );
```

```
… code = SOME (…) …
```

```
SELECT code, title
FROM
   Course
   NATURAL JOIN (
      SELECT DISTINCT course AS code
      FROM Schedule
      WHERE (semester = 182) AND (day = "MON" OR day = "FRI")
   );
```

```
   SELECT code, title
   FROM Schedule JOIN Course ON (course = code)
   WHERE (semester = 182) AND (day = "MON")
UNION
   SELECT code, title
   FROM Schedule JOIN Course ON (course = code)
   WHERE (semester = 182) AND (day = "FRI");
```

```
… UNION DISTINCT …
```

05: Prohibited Courses

Incorrect:

```
SELECT code, title
FROM Schedule JOIN Course ON (course = code)
WHERE (semester = 182) AND NOT (day = "MON" OR day = "FRI");
```

```
… WHERE (semester = 182) AND (day <> "MON" AND day <> "FRI")
```

```
… WHERE NOT((semester = 182) AND (day = "MON" OR day = "FRI"))
```

Correct:

```
SELECT code, title
FROM Course
WHERE
   code NOT IN (
      SELECT DISTINCT course
      FROM Schedule
      WHERE (semester = 182) AND (day = "MON" OR day = "FRI")
   );
```

```
SELECT code, title
FROM Course
WHERE
   NOT EXISTS (
      SELECT *
      FROM Schedule
      WHERE (course = code) AND (semester = 182) AND (day = "MON" OR day = "FRI")
   );
```

```
SELECT code, title
FROM Course
WHERE
   code <> ALL (
      SELECT course
      FROM Schedule
      WHERE (semester = 182) AND (day = "MON" OR day = "FRI")
   );
```

```
   SELECT code, title
   FROM Course
EXCEPT
   SELECT code, title
   FROM Schedule JOIN Course ON (course = code)
   WHERE (semester = 182) AND (day = "MON" OR day = "FRI")
```

```sql
SELECT code, title
FROM Course
WHERE
   code IN (
        SELECT code
        FROM Course
      EXCEPT
        SELECT course AS code
        FROM Schedule
        WHERE (semester = 182) AND (day = "MON" OR day = "FRI")
   );
```

```sql
SELECT code, title
FROM
   Course
   LEFT OUTER JOIN Schedule ON
      (code = course) AND (semester = 182) AND (day = "MON" OR day = "FRI")
WHERE (course IS NULL);
```

Incorrect:

```sql
… WHERE (course = NULL)
```

06: Inactive Students

```sql
SELECT S.name, S.address
FROM Student AS S
WHERE
   NOT EXISTS (
      SELECT *
      FROM Enrollment AS E
      WHERE (E.student = S.id) AND (E.semester IN (181, 182))
   );
```

…

07: Promising Students

```sql
SELECT DISCTINCT S.name
FROM
   Student AS S
   JOIN Enrollment AS E ON (S.id = E.student)
   JOIN Schedule AS U ON (E.code = U.course) AND (E.semester = U.semester)
   JOIN Teacher AS T ON (U.teacher = T.id)
WHERE (E.semester = 182) AND (T.department = "KSI");
```

```sql
SELECT DISCTINCT S.name
FROM
   Student AS S JOIN Enrollment AS E JOIN Schedule AS U JOIN Teacher AS T
WHERE
      (E.semester = 182) AND (T.department = "KSI")
   AND
      (S.id = E.student)
      AND
      (E.code = U.course) AND (E.semester = U.semester)
      AND
      (U.teacher = T.id);
```

```sql
SELECT S.name
FROM Student AS S
WHERE
  EXISTS (
    SELECT *
    FROM
      Enrollment AS E
      JOIN Schedule AS U ON (E.code = U.course) AND (E.semester = U.semester)
      JOIN Teacher AS T ON (U.teacher = T.id)
    WHERE (E.student = S.id) AND (E.semester = 182) AND (T.department = "KSI")
  );
```

```sql
SELECT S.name
FROM Student AS S
WHERE
  EXISTS (
    SELECT E.*
    FROM Enrollment AS E
    WHERE
      (E.student = S.id) AND (E.semester = 182) AND
      EXISTS (
        SELECT U.*
        FROM Schedule AS U
        WHERE
          (U.course = E.code) AND (U.semester = E.semester) AND
          EXISTS (
            SELECT T.*
            FROM Teacher AS T
            WHERE (T.id = U.teacher) AND (T.department = "KSI")
          )
      )
  );
```

08: Loyal Students

```sql
SELECT S.name
FROM Student AS S
WHERE
  EXISTS (
    SELECT *
    FROM Enrollment AS E
    WHERE (E.student = S.id) AND (E.semester = 182)
  )
  AND
  NOT EXISTS (
    SELECT *
    FROM
      Enrollment AS E
      JOIN Schedule AS U ON (E.code = U.course) AND (E.semester = U.semester)
      JOIN Teacher AS T ON (U.teacher = T.id)
    WHERE (E.student = S.id) AND (E.semester = 182) AND (T.department <> "KSI")
  );
```

09: Timetable Conflicts

```
SELECT T.name
FROM Teacher AS T
WHERE
  EXISTS (
    SELECT *
    FROM
      (Schedule AS U1 JOIN Room AS R1 ON (U1.room = R1.number))
      JOIN
      (Schedule AS U2 JOIN Room AS R2 ON (U2.room = R2.number))
      ON
           (U1.semester = U2.semester) AND
           (U1.teacher = U2.teacher) AND
           (U1.day = U2.day)
        AND
          (U1.time < U2.time)
    WHERE
      (U1.teacher = T.id) AND (U1.semester = 191)
      AND
      (
        ((U1.building = U2.building) AND (U1.time + 90 + 15 > U2.time))
        OR
        ((U1.building <> U2.building) AND (U1.time + 90 + 60 > U2.time))
      )
  );
```

```
SELECT DISTINCT T.name
FROM
  (Schedule AS U1 JOIN Room AS R1 ON (U1.room = R1.number))
  JOIN
  (Schedule AS U2 JOIN Room AS R2 ON (U2.room = R2.number))
  ON
       (U1.semester = U2.semester) AND
       (U1.teacher = U2.teacher) AND
       (U1.day = U2.day)
    AND
       (U1.time < U2.time)
  JOIN Teacher AS T ON (U1.teacher = T.id)
WHERE
  (U1.semester = 191)
  AND
  (
    ((U1.building = U2.building) AND (U1.time + 90 + 15 > U2.time))
    OR
    ((U1.building <> U2.building) AND (U1.time + 90 + 60 > U2.time))
  );
```

10-A: Room Statistics

```
SELECT AVG(capacity) AS average, COUNT(number) AS count
FROM Room;
```

```
SELECT AVG(ALL capacity) AS average, COUNT(ALL number) AS count …

… COUNT(*) AS count …
```

10-B: Building Statistics

```
SELECT building, SUM(capacity) AS sum
FROM Room
GROUP BY building;
```

11: Enrollment Statistics

```
SELECT title, COUNT(*) as students, AVG(result) AS average
FROM Course NATURAL JOIN Enrollment
WHERE (semester = 181)
GROUP BY code, title
HAVING (students >= 10)
ORDER BY average;
```