Grade 10 Computing

Unit 3 · Databases and SQL

ANSWER KEY · FOR TEACHERS

Full marks 30

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. database
2. DBMS
3. record
4. field
5. primary key
6. composite key
7. foreign key
8. redundant

K · 4

Each carries 0.5 mark.

2 Multiple choice

i. **b.** Two students can have the same name, and a name can be spelled differently or changed. K · 1

A primary key must be unique and stable. Two Sita Shresthas in one school are common, and names get corrected or changed. An ID given by the school is unique by design.

ii. **b.** So it is written once: changing a class's teacher is one change, and the copies can't disagree. U · 1

The teacher belongs to the class, not to each student. Written once, in the class's row, it can't be spelled differently for different students, and one change updates the whole class.

iii. **c.** many-to-many: a third table of loans, each row joining one member to one book A · 1

Many on both sides needs a linking table. Each row of a **loans** table says one member borrowed one book on a date, so the loans also keep the library's history.

iv. **c.** `UPDATE marks SET mark = 72 WHERE student_id = 102 AND subject_id = 'SCI';` A · 1

UPDATE changes rows that already exist, and the WHERE must pick exactly the one row: the composite key, student and subject. The first would change all 240 marks; the INSERT would be refused, because the row (102, SCI) already exists and the key must be unique.

v. **b.** Each index takes space, and every new or changed row must update all 30 indexes, so saving data gets slower. U · 1

Indexes speed up searches on their fields but slow down every change, and take space. Index the fields that are searched often; leave the rest.

3 What does it give?

ANSWER

i.

member	COUNT(*)
Anisha	3
Binod	2

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ii. U · 4

book	member
Seto Bagh	Binod
Muna Madan	Deepa
Seto Bagh	Anisha

iii. No rows.

iv. `5 3`: five loans were borrowed before 20 September, and three of them have been returned.

MARKING SCHEME

- ✓ i: Anisha 3 and Binod 2 only; HAVING drops Deepa and Kiran, who have one loan each.
- ✓ ii: the three loans with no return date, oldest first.
- ✓ iii: no rows: NULL isn't equal to anything, not even NULL, so `= NULL` is never true (it needs `IS NULL`).
- ✓ iv: 5 and 3: `COUNT(*)` counts every row, `COUNT(returned)` only the rows where returned isn't NULL.

4 What does it print?

MARKING SCHEME A · 3

- ✓ `Sunrise 70`, `Valley 50`, `Hillside 35`: one row per school, Sunrise's two visits added (42 + 28 students), largest first.
- ✓ `(2, 50)`: `fetchone()` gives the one row as a tuple: two Grade 8 visits, the larger 50.
- ✓ `52`: `row[0]` is 2 and `row[1]` is 50.

5 Which check catches it?

MARKING SCHEME U · 3

- ✓ 130: range check; 10C: list (lookup) check, the foreign key.
- ✓ Empty name: presence check; 13/05/2011: format check.
- ✓ 139 again: uniqueness check (the primary key); 67 for 76: no validation check, only verification.

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6 Write the queries

ANSWER **A · 4**

i. `SELECT name, born FROM students WHERE class_id = '10B' AND born >= '2011-06-01' ORDER BY name;`

ii. `SELECT class_id, COUNT(*) FROM students GROUP BY class_id;`

iii. `SELECT AVG(mark) FROM marks WHERE subject_id = 'MATH';`

iv.

```
SELECT students.name, marks.mark
FROM marks
JOIN students ON marks.student_id = students.student_id
WHERE marks.subject_id = 'COMP' AND marks.mark >= 90
ORDER BY marks.mark DESC;
```

Run on the school database, they give: i. Dipesh Prajapati 2011-11-15, Santosh Nepali 2011-09-24, Sarita Bajracharya 2011-09-16; ii. 10A 10, 10B 10, 9A 10, 9B 11; iii. 62.4; iv. Dipesh Prajapati 98, Sabina Ghimire 95, Anisha Tamang 93, then Sagar Kayastha and Binod Karki with 91.

MARKING SCHEME

- ✓ i: both conditions joined with AND, the date in quote marks and written year-month-day, `ORDER BY name`.
- ✓ ii: `GROUP BY class_id` with `COUNT(*)`.
- ✓ iii: `AVG(mark)` with `WHERE subject_id = 'MATH'` (no GROUP BY needed for one subject).
- ✓ iv: **marks** joined to **students** on student_id, both conditions in WHERE, `ORDER BY marks.mark DESC`.

7 Find and fix the bug

ANSWER **A · 3**

i. WHERE looks at one row at a time, before the rows are grouped, so there is no count yet to compare. A condition on a group's COUNT, SUM or AVG goes in HAVING, after GROUP BY.

ii.

```
SELECT class_id, COUNT(*)
FROM students
GROUP BY class_id
HAVING COUNT(*) > 10;
```

It gives one row: 9B, 11.

MARKING SCHEME

- ✓ WHERE picks single rows before grouping; no count exists yet.
- ✓ The condition moved to HAVING, after GROUP BY.
- ✓ The answer: 9B with 11 students.

8 Short answer

MARKING SCHEME **U · 2**

- ✓ Names aren't unique: there are two students called Sita Shrestha (108 in 9A and 139 in 10B), so both their marks went into one group.
- ✓ Group by the primary key, `students.student_id`, which makes one group per student.

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9 Think

ANSWER HA · 2

Real names break it: a name with a space (Sita Shrestha), a short form with a dot (Ram B. Thapa), a name in Devanagari (सीता श्रेष्ठ). A student whose real name is refused may be written down wrongly, which is worse than no check: a check that is too strict makes people type false data to get past it. A better rule checks only what must be true: the name is not empty, and not absurdly long (say, at most 100 characters).

MARKING SCHEME

- ✓ Real names are refused (spaces, dots, Nepali script), so people type false data to get past it.
- ✓ A better rule: only a presence check and a sensible length limit.

10 Activity: Try to break the rules

(not marked)

WHAT STUDENTS SHOULD FIND

- 130 for student 141: refused by the CHECK rule, `mark BETWEEN 0 AND 100` (a range check).
- Student 999: refused by the foreign key, because there is no student 999 (a lookup check, referential integrity).
- A second Science mark for 141: refused because (student_id, subject_id) is the primary key (a uniqueness check).
- Class 10C: refused by the foreign key, because there is no class 10C in **classes** (a lookup check).
- 70 for Asmita (student 121): **saved.** She is a real student with no marks yet, and 70 breaks no rule.

Marks by level	Knowledge	Understanding	Application	Higher ability	**Total**
Marks	5	11	12	2	**30**

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