SCHOOL OF ENGINEERING AND TECHNOLOGY

COURSEWORK FOR

BSC (HONS) IN COMPUTER SCIENCE
BSC (HONS) INFORMATION TECHNOLOGY
BACHELOR OF SOFTWARE ENGINEERING (HONS)
BSC (HONS) INFORMATION SYSTEMS (DATA ANALYTICS)
BSC (HONS) INFORMATION TECHNOLOGY (COMPUTER NETWORKING AND SECURITY)
YEAR 1: ACADEMIC SESSION APRIL 2025

SEG1201: DATABASE FUNDAMENTALS

Answer Template and SQL Script and Video Presentation Submission:
Due date: Week 14 TUESDAY (5 AUGUST 2025), 11.59 pm

SEG1201: DATABASE FUNDAMENTALS

GROUP NAME:

MEMBER:

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INSTRUCTIONS

- This final assessment contributes 50% to your final grade.
- This assignment is primarily for Course Learning Outcome 2 - Implement a database design group project using appropriate tools such as Oracle SQL.

IMPORTANT

The University requires students to adhere to submission deadlines for any form of assessment. Penalties are applied in relation to unauthorized late submission of work.

Academic Honesty Acknowledgement

"We **Tiffany Fam Kar Ying, Tan Wei Ting, Angelyn Yek Yin Yin, Tang Jia Hui, Rachel Tan En Thong,** verify that this paper contains entirely our own work. We have not consulted with any outside person or materials other than what was specified (an interviewee, for example) in the assignment or the syllabus requirements. Further, we have not copied or inadvertently copied ideas, sentences, or paragraphs from another student. We realize the penalties *(refer to page 16, 5.5, Appendix 2, page 44 of the student handbook diploma and undergraduate programme)* for any kind of copying or collaboration on any assignment."

PART 1: GENERATE A CASE SCENARIO AND DESIGN A RELATIONAL DATA MODEL (35 MARKS)

1.0 Case Scenario

Rainforest Sabah Haven Wildlife Sanctuary is a wildlife rehabilitation and rescue sanctuary located deep within the outskirts of Kota Kinabalu in Sabah. Rainforest Sabah Haven Wildlife Sanctuary is dedicated to the long-term care, rescue, and rehabilitation of the injured and endangered wild animals that are native to Borneo. For example, there are endangered wild animals such as clouded leopards, proboscis monkeys, orangutans, pangolins, sun bears and hornbills.

In addition, the injured and endangered animals arrive at the Rainforest Sabah Haven Wildlife sanctuary via different channels. For instance, some animals were transferred from wildlife enforcement, referrals from local villages and even from rescue operations. When they arrive at the Rainforest Sabah Haven Wildlife sanctuary, they will be registered with a unique ID, age estimation, species name, their origin, which is either captive-born or wild, their gender and their current condition. Moreover, the status of the arrived animals was also recorded to emulate their stage in care. For example, the arrived animals may in rehabilitation, permanent residents, under observation and ready for release.

Furthermore, all the arrivals of the animals will undergo a general medical check within 24 hours of their arrival. After the medical check, they will then schedule a routine of health assessments. The assessments include the animal's weight, temperature, standardised health score that has a range from 1, which is critical to 5, which represents excellent and behaviour analysis. The records of the assessments will then help to monitor the animal's progress. This will then help the Rainforest Sabah Haven Wildlife Sanctuary to make decisions about the readiness of the animals to be released.

Based on the habitat type, the sanctuary will be divided into zones such as Wetland Habitat, Forest Canopy, Quarantine Units and Grassland Enclosure. Therefore, each zone will be assigned to the trained volunteers and specific staff members who are responsible for carrying out tasks like cleaning, medical observation, and feeding. Each staff member and trained volunteer will work within their scheduled role and shifts. The feeding schedules are highly varied and regulated by different species. During the feeding sessions, the quantity of food, the food type, the person responsible for the feeding and the time for feeding are all recorded. Besides, there are some additional enrichment activities, which are natural foraging and climbing training. The activities are recorded or conducted to promote the natural behaviours for eventual release.

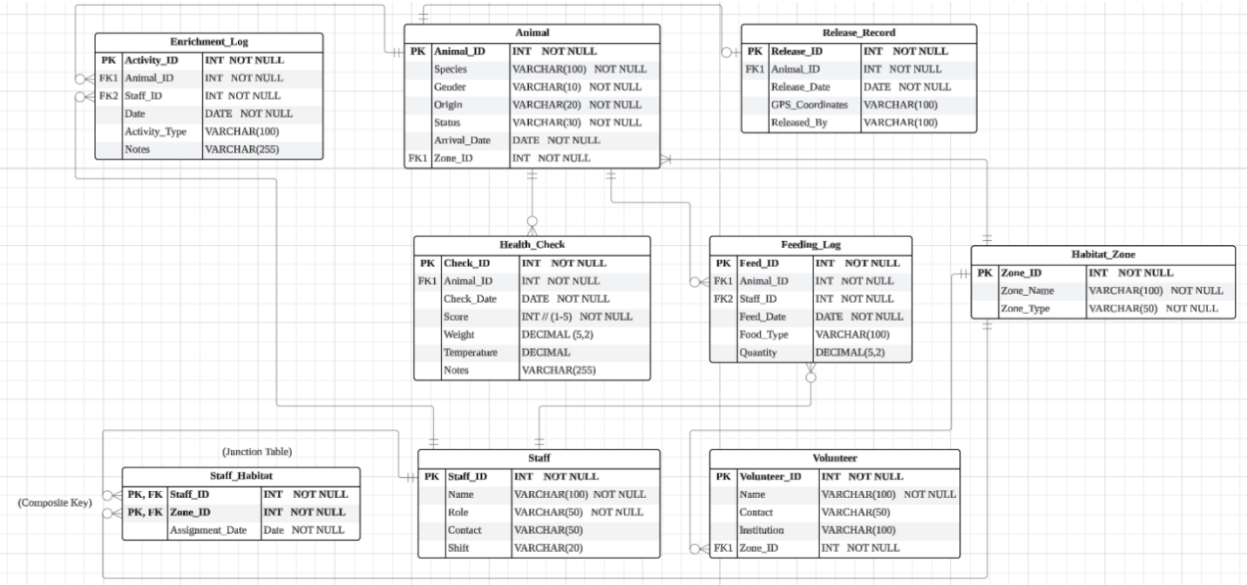
Some animals are released and tagged in the monitored areas. The data that was released involves release date, species tracking category and GPS coordinates. As a result, tracking events such as the re-rescue events is then organised when the follow-up reports are made.

Lastly, the relational database is required by the sanctuary to handle the complexity of daily operations. The sanctuary system must involve in tracking the habitat assignment, animal health, feeding schedules, enrichment activities, staff tasks and consequently in releasing the details in a secure and consistent manner. The journey for each animal from rescue to rehabilitation and possible release must be easily accessible and fully documented. This database will then help the staff to maintain accurate health and care histories. It will also support the research efforts by providing real-time and reliable data. With this system, the Rainforest Sabah Haven Wildlife sanctuary can be more efficient in fulfilling its mission to protect endangered wildlife animals while maintaining high standards of accountability and care.

2.0 Business Rules

1. Every animal rescued will be seen to have a health check in less than 24 hours.
2. Animals whose health score is less than 3 cannot be considered to be released.
3. Each staff member can only be allocated a maximum of 2 habitat zones at a given time.
4. All the activities associated with enrichment of all the animals in the rehabilitation should be documented not less than once every 7 days.
5. Each feeding log has to be registered after the feeding period with no more than 1 hour.
6. Each of the volunteers will belong to just a single habitat zone.
7. Released animals has to be recorded GPS coordinates and responsible staff ID.
8. The animals that are classified as ‘Released’ should be accompanied by a release record.
9. Bodies recorded temperature while health checks must be between 36 degrees Celsius and 39 degrees Celsius.
10. Wildlife animals has to remain inside a medical zone for minimum 48 hours.

3.0 Entity Relationship Diagram.



3.1 ERD Design Table (Crow's Foot with 9 Entities)

Entity Name	Attributes	Relationships
Animal	Animal_ID (PK), Species, Gender, Origin, Status, Arrival_Date, Habitat_Zone_ID (FK)	One Animal → Zero or Many Health_Check One Animal → Zero or Many Feeding_Log One Animal → Zero or Many Enrichment_Log One Animal → Zero or One Release_Record One or Many Animals → Only One Habitat_Zone
Health_Check	Check_ID (PK), Animal_ID (FK), Check_Date, Score, Weight, Temperature, Notes	Zero or Many Health_Check → Only One Animal
Staff	Staff_ID (PK), Name, Role, Contact, Shift	One Staff → Zero or Many Feeding_Log One Staff → Zero or Many Enrichment_Log One Staff → Zero or Many Staff_Habitat
Volunteer	Volunteer_ID (PK), Name, Contact, Institution, Assigned_Zone (FK)	Zero or Many Volunteer → Only One Habitat_Zone
Feeding_Log	Feed_ID (PK), Animal_ID (FK), Staff_ID (FK),	Zero or Many Feeding_Log → Only One Animal

	Feed_Date, Food_Type, Quantity	Zero or Many Feeding_Log → Only One Staff
Enrichment_Log	Activity_ID (PK), Animal_ID (FK), Date, Activity_Type, Notes, Staff_ID (FK)	Zero or Many Enrichment_Log → Only One Animal Zero or Many Enrichment_Log → Only One Staff
Release_Record	Release_ID (PK), Animal_ID (FK), Release_Date, GPS_Coordinates, Released_By	Zero or One Release_Record → Only One Animal
Habitat_Zone	Zone_ID (PK), Zone_Name, Zone_Type	One Habitat_Zone → One or Many Animals One Habitat_Zone → Zero or Many Volunteers One Habitat_Zone → Zero or Many Staff_Habitat
Staff_Habitat	Staff_ID (PK, FK), Zone_ID (PK, FK), Assignment_Date	Zero or Many Staff_Habitat → Only One Staff Zero or Many Staff_Habitat → Only One Habitat_Zone

3.2 Keys and Attributes Table (10 Entities)

Primary Key = PK

Foreign Key(s) = FK

Composite Key = CK

Entity Name	PK	FK	CK	Attributes
Animal	Animal_ID	Habitat_Zone_ID → Habitat_Zone(Zone_ID)	No	Animal_ID, Species, Gender, Origin, Status, Arrival_Date, Habitat_Zone_ID
Health_Check	Check_ID	Animal_ID → Animal(Animal_ID)	No	Check_ID, Animal_ID, Check_Date, Score, Weight, Temperature, Notes

Staff	Staff_ID	—	No	Staff_ID, Name, Role, Contact, Shift
Volunteer	Volunteer_ID	Assigned_Zone → Habitat_Zone(Zone_ID)	No	Volunteer_ID, Name, Contact, Institution, Assigned_Zone
Feeding_Log	Feed_ID	Animal_ID → Animal(Animal_ID), Staff_ID → Staff(Staff_ID)	No	Feed_ID, Animal_ID, Staff_ID, Feed_Date, Food_Type, Quantity
Enrichment_Log	Activity_ID	Animal_ID → Animal(Animal_ID), Staff_ID → Staff(Staff_ID)	No	Activity_ID, Animal_ID, Date, Activity_Type, Notes, Staff_ID
Release_Record	Release_ID	Animal_ID → Animal(Animal_ID)	No	Release_ID, Animal_ID, Release_Date, GPS_Coordinates, Released_By
Habitat_Zone	Zone_ID	—	No	Zone_ID, Zone_Name, Zone_Type
Staff_Habitat	Staff_ID + Zone_ID	Staff_ID → Staff(Staff_ID), Zone_ID → Habitat_Zone(Zone_ID)	Yes	Staff_ID, Zone_ID, Assignment_Date

NOTE: Staff_Habitat (CK) = Yes (Staff_ID, Zone_ID)

4.0 Constraints

NOTE: Below table no constraints related to NULL values and primary key/foreign key constraints considered as user check constraints in our database.

	Constraints	Type	SQL Snippet	Justification

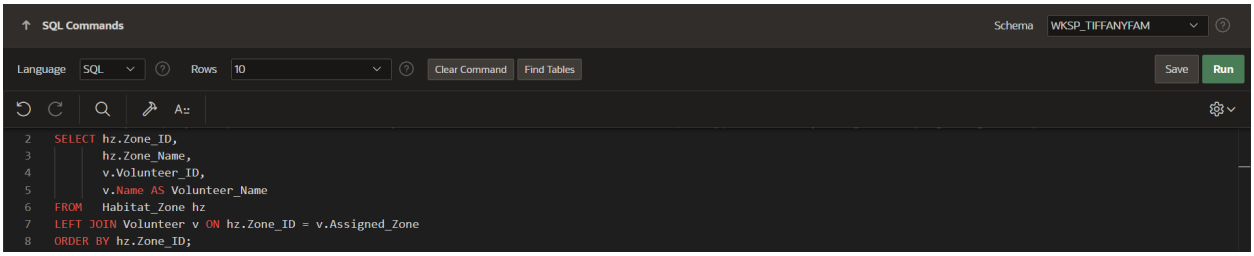
1	Gender must be either 'Male' or 'Female'	CHECK	CHECK (Gender IN ('Male', 'Female'))	Ensures gender consistency for breeding, medical, and reporting purposes.
2	Health score must be between 1 and 5	CHECK	CHECK (Score BETWEEN 1 AND 5)	Enforces valid health scores, ensuring consistent and standardized health data.
3	Temperature must be between 36.0°C and 39.0°C	CHECK	CHECK (Temperature BETWEEN 36 AND 39)	Validates that recorded temperatures are within biologically significant ranges for animals.
4	Feedback log quantity must be numeric and in proper units (kg, g, ml, L)	CHECK	`CHECK (REGEXP_LIKE(Quantity, '^[0-9]+(.[0-9]+)?\s?(kg	"g" represents grams, a common unit for measuring small quantities.
5	Volunteer contact must follow specific phone number format	CHECK	CHECK (REGEXP_LIKE(Contact, '^\d{3}-\d{7,8}$'))	Maintains consistency in staff scheduling, preventing invalid shift entries.
6	Staff shift must be one of the predefined options	CHECK	CHECK (Shift IN ('Morning', 'Afternoon', 'Evening', 'Night', 'Day'))	Maintains consistency in staff scheduling, preventing invalid shift entries.
7	Each animal can only have one release record	UNIQUE	UNIQUE (Animal_ID)	Prevents duplicate release entries for the same animal, ensuring data integrity for animal release tracking.
8	Staff can only be assigned to a maximum of 2 zones	CHECK	SELECT COUNT(*) INTO v_count FROM Staff_Habitat WHERE Staff_ID = :NEW.Staff_ID; IF v_count >= 2 THEN	Avoids over-assignment of staff, ensuring manageable workloads and

			RAISE_APPLICATION_ERRO R(-20002, 'Staff cannot be assigned to more than 2 zones.'); END IF;	effective staffing in zones.
9	Enrichment logs must be recorded every 7 days for rehabilitation animals	CHECK	SELECT MAX(Activity_Date) INTO v_last_activity FROM Enrichment_Log WHERE Animal_ID = :NEW.Animal_ID; IF v_last_activity IS NOT NULL AND :NEW.Activity_Date - v_last_activity > 7 THEN RAISE_APPLICATION_ERRO R(-20003, 'Enrichment log overdue for rehabilitation animal.'); END IF;	Ensures regular and timely enrichment activities for animals under rehabilitation, supporting their behavioral health.
10	Feedback log must be recorded within 1 hour after feeding time	CHECK	IF ABS(SYSDATE - :NEW.Feed_Date) * 24 > 1 THEN RAISE_APPLICATION_ERRO R(-20004, 'Feed log must be recorded within 1 hour after feeding time.'); END IF;	Ensures feed logs are timely and accurate, supporting reliable diet monitoring and proper animal nutrition.

PART 2: IMPLEMENT AND QUERY A DATABASE USING SQL (30 MARKS)

(We optional put all the SQL code and Outputs picture in below)

a. A query that requires an outer join.



Results | Explain | Describe | Saved SQL | History

ZONE_ID	ZONE_NAME	VOLUNTEER_ID	VOLUNTEER_NAME
1	Wetland Habitat	-	-
2	Forest Canopy	201	Lim Jia Hui
2	Forest Canopy	205	Norhayati
3	Quarantine Unit A	206	James Robert
4	Quarantine Unit B	208	Tanaka Hiroshi
5	Grassland Enclosure	202	Amirul Hakim
6	Nocturnal House	207	Siti Aishah
7	Primate Sanctuary	203	Priya Devi
8	Aviary	204	Wong Ken Min

Justification:

This SQL statement retrieves all the habitat zones in the Habitat_Zone table together with the volunteers assigned to them in the Volunteer table. It incorporates a LEFT JOIN such that the zones that do not have volunteers will not be eliminated when retrieving various results. This will assist the tracking of covered and uncovered areas to plan and manage these areas.

b. A minimum 4 tables join with a group by function query.

Language SQL | Rows 10 | Clear Command | Find Tables | Save | Run

```
SELECT hz.Zone_Name,
       s.Name AS Staff_Name,
       COUNT(f.Feed_ID) AS Feed_Count
FROM   Feedback_Log f
JOIN   Animal a ON f.Animal_ID = a.Animal_ID
JOIN   Habitat_Zone hz ON a.Zone_ID = hz.Zone_ID
JOIN   Staff s ON f.Staff_ID = s.Staff_ID
GROUP BY hz.Zone_Name, s.Name
ORDER BY hz.Zone_Name, Feed_Count DESC;
```

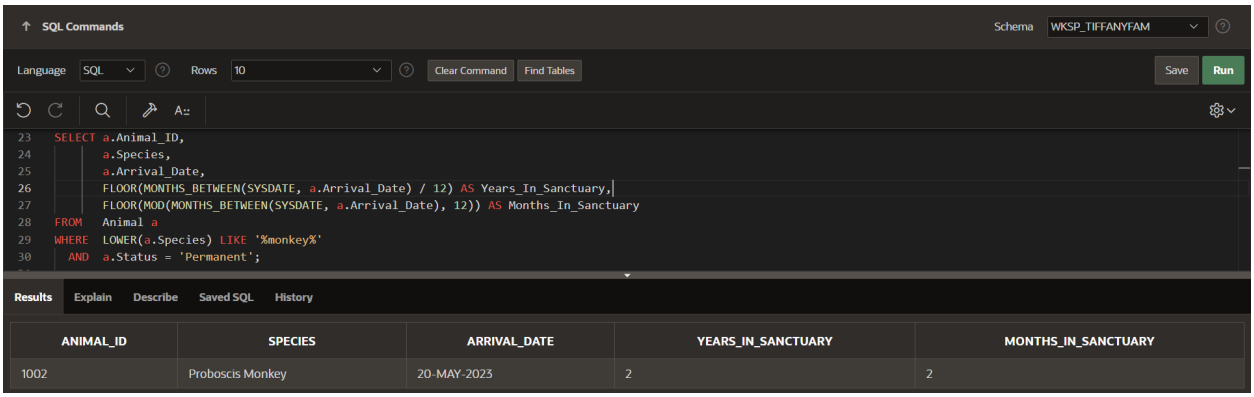
Results | Explain | Describe | Saved SQL | History

ZONE_NAME	STAFF_NAME	FEED_COUNT
Aviary	Ahmad bin Ismail	1
Forest Canopy	Mohd Ali	1
Forest Canopy	Mei Ling	1
Grassland Enclosure	Sarah Johnson	1
Nocturnal House	David Smith	1
Nocturnal House	Fatimah Yusof	1
Primate Sanctuary	Ahmad bin Ismail	1
Primate Sanctuary	Rajesh Kumar	1

Justification:

This query will be able to summarize the amount of feedback logs per staff member per habitat zone. It assists in evaluating employee participation and feedback activity across different zones.

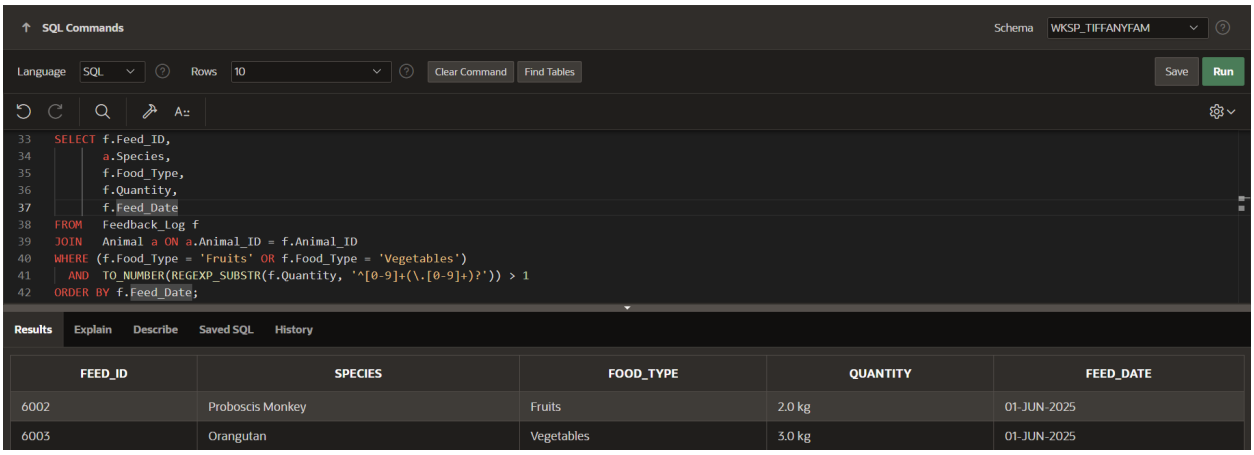
c. A string pattern matching and date function query.



Justification:

This query gets permanent sanctuary animals with “monkey” in their species name and determines how many months they have been in care by calculating using the `MONTHS_BETWEEN`. It assists staff in monitoring long term primates such as proboscis monkeys for welfare, medical and enrichment planning.

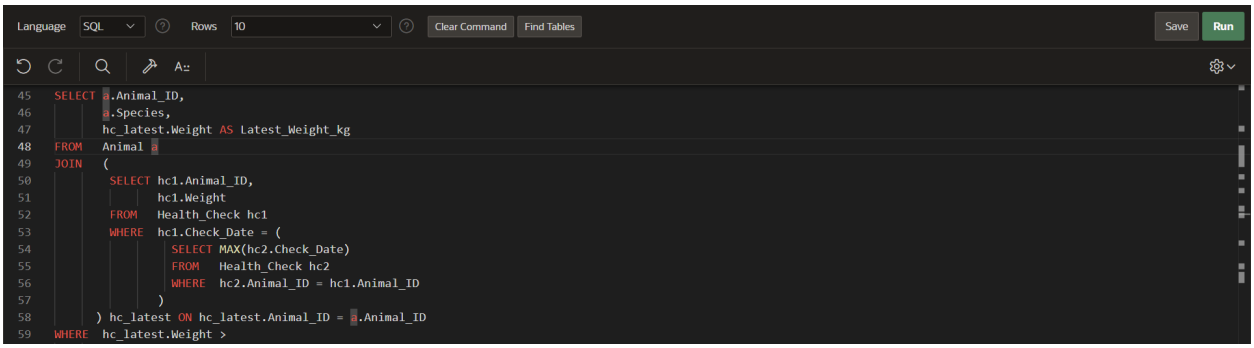
d. A query having both OR and AND.

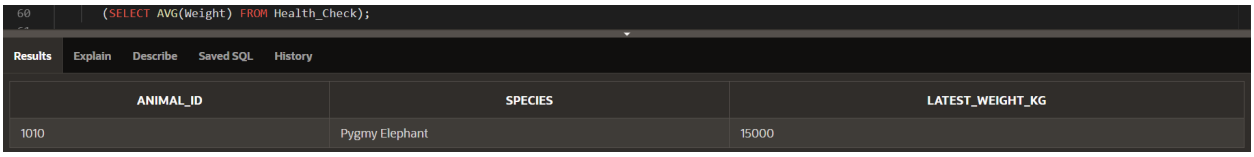


Justification:

This query responds to all the records about feeding, in which the food can be either fruit OR vegetable AND the quantity is higher than 1 kilogram. It aids in overseeing mass plant-based meals, evaluating nutrition needs, eliminating overfeeding as well as promoting the health of the animals in general by staff in sanctuaries and nutritionists.

e. A query that consists of at least 2 subqueries.





Results | Explain | Describe | Saved SQL | History

ANIMAL_ID	SPECIES	LATEST_WEIGHT_KG
1010	Pygmy Elephant	15000

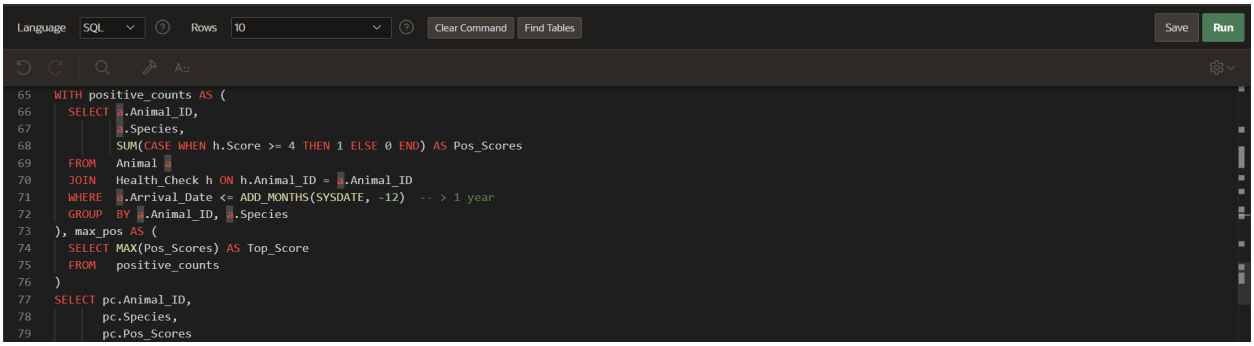
Justification:

This SQL statement shows the animals where the most recent weight known is more than the mean weight among all the Health_Check records. It employs a subquery (hc_latest) that has the latest weight of each animal, by locating the most recent (Check_Date per AnimalID) in the Health_Check table. Then it combines with the Animal table to have species data and sieves on animals where the latest weight of an animal is greater than the mean. Only one species in the output, Pygmy Elephant (15000kg) exceed the average of the database.

f. Answer the following question based on your chosen scenario

Scenario: Animals > 1 year with highest number of positive (score ≥ 4) health checks.

Why useful: Pinpoints long-term success stories for health studies & release planning.



```
80  FROM   positive_counts pc
81  JOIN   max_pos mp ON pc.Pos_Scores = mp.Top_Score
82  ORDER  BY pc.Pos_Scores DESC;
```

Results | Explain | Describe | Saved SQL | History

ANIMAL_ID	SPECIES	POS_SCORES
1002	Proboscis Monkey	1
1001	Clouded Leopard	1

Justification:

This question singles out those animals that have the greatest levels of positive health scores (score ≥ 4) on any given animal within a 1 year record. It makes a temporary outcome (positive_counts) containing the count of each animal, selects the highest value, and chooses those which satisfy it. Proboscis monkey and Clouded leopard are the only ones with 1 positive score on the output (most in the previous year).

PART 4: DEMONSTRATION (10 MARKS)

Each member of the group (showing their faces) must show and explain his/her work in the video.

Note: A submission without any presentation will be capped at 30 marks or a fail grade.

During the 15-minute video presentation, team members must be ready to:

1. Run the SQL codes from Part 2
2. Effectively communicate your project's goals, design choices, and how it addresses the chosen scenario.
3. Show that your database system works as intended and fulfills the requirements of the scenario.
4. Deliver a clear, organized, and engaging presentation that highlights the key aspects of your project.

List each student's presentation here. Please update the following table accordingly.

No	ID	Name	Questions to present
i)	23052301	Tiffany Fam Kar Ying	Demonstrate full **batch SQL script execution** (table creation + insert). Execute and explain **SQL queries (d-f)**:

			- String pattern + date function - Query using `OR` and `AND` - Subqueries with statistical analysis Briefly explain **how these queries help staff decision-making** (e.g., release planning, nutrition).
ii)	23021355	Angelyn Yek Yin Yin	Run and explain **SQL queries (a–c)**: - Outer Join with Habitat & Volunteers - GROUP BY (staff–zone feeding summary) - Monkey care duration with `MONTHS_BETWEEN` Emphasize **why these queries are useful for management**, e.g. staff allocation, habitat planning.
iii)	23094709	Tan Wei Ting	Present the **Case Scenario** clearly: - What is the sanctuary? - What's the system's purpose? Explain the **Business Rules** (with logic behind each). Emphasize **real-world relevance** of rules.
iv)	23093495	Tan Wen Xi	Explain the **ERD Diagram** in detail: - 9 Entities and their relationships Clarify **primary, foreign, and composite keys** Identify any possible **alternate/candidate keys**.
v)	23094378	Tang Jia Hui	Present **Constraints 6–10** from Section 4.0: - Gender validation - Temperature range - Volunteer zone FK - One-time release enforcement - Feed quantity as numeric string Make **summary** in these constraints. Mention **why these constraints matter** in our database.
vi)	23056674	Rachel Tan En Thong	Present **Constraints 1–5** from Section 4.0: - Health check within 24h - Min health score for release - Max 2 habitat zones per staff - Weekly enrichment - Feed log time ≤ 1 hour **Intro** constraints and **why**. Mention **why these constraints matter** in our database.