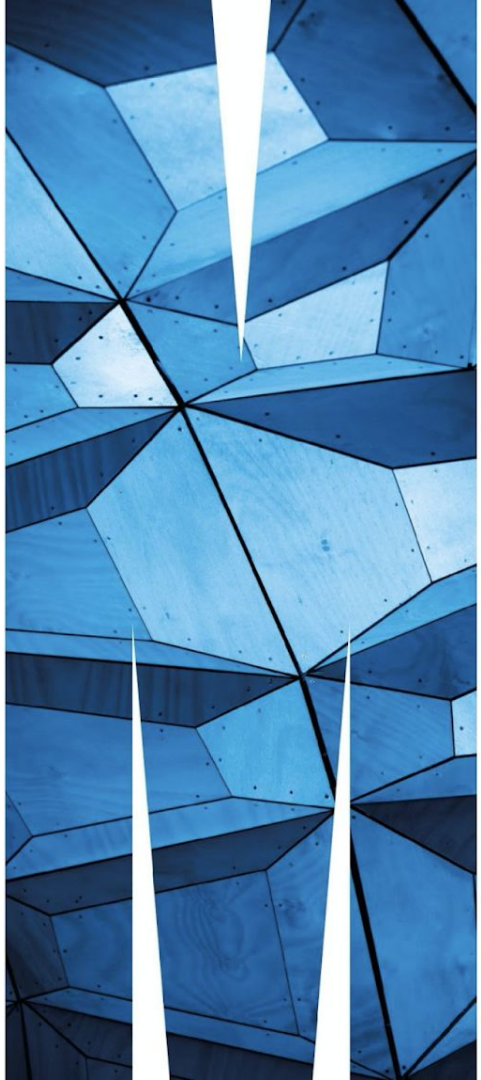
MONASH University

MONASH
INFORMATION
TECHNOLOGY



# SQL Advanced

GROUP OF EIGHT AUSTRALIA

# Outline

- **CASE**
- Subquery – nested, inline, correlated
- Views
- Joins - self join, outer join
- Set Operators
- Oracle Functions

# SQL CASE statement

The CASE statement used in the select list enables the query to evaluate an attribute and output a particular value based on that evaluation

```
SELECT
    unitcode,
    to_char(ofyear,'YYYY') as year,
    semester,
    case cltype
       when 'L' then 'Lecture'
       when 'T' then 'Tutorial'
    end as Classtype,
    case
    when clduration < 2 then clduration || 'hr Short class'
    when clduration = 2 then clduration || 'hr Standard class'
    else clduration || 'hr Long class'
    end as classduration
FROM uni.schedclass
ORDER BY unitcode, year, semester, classtype;
```

```
SELECT
    unitcode,
    to_char(ofyear,'YYYY') as year,
    semester,
    cltype,
    clduration
FROM uni.schedclass
ORDER BY unitcode, year, semester, cltype;
```

| UNITCODE | YEAR | SEMESTER | CLTYPE | CLDURATION |
|---|---|---|---|---|
| FIT1004 | 2013 | 1 | L | 2 |
| FIT1004 | 2013 | 1 | T | 2 |
| FIT1004 | 2013 | 1 | T | 2 |
| FIT1004 | 2013 | 2 | L | 2 |
| FIT1004 | 2013 | 2 | T | 2 |
| FIT1004 | 2013 | 2 | T | 2 |
| FIT1040 | 2013 | 1 | L | 2 |
| FIT1040 | 2013 | 1 | T | 2 |
| FIT1040 | 2013 | 2 | L | 2 |
| FIT1040 | 2013 | 2 | T | 2 |
| FIT1040 | 2013 | 2 | T | 2 |
| FIT1040 | 2013 | 2 | T | 2 |
| FIT2077 | 2013 | 1 | L | 1 |
| FIT2077 | 2013 | 1 | T | 3 |

```
SELECT
    unitcode,
    to_char(ofyear,'YYYY') as year,
    semester,
    case cltype
       when 'L' then 'Lecture'
       when 'T' then 'Tutorial'
    end as Classtype,
    case
    when clduration < 2 then clduration || 'hr Short class'
    when clduration = 2 then clduration || 'hr Standard class'
    else clduration || 'hr Long class'
    end as classduration
FROM uni.schedclass
ORDER BY unitcode, year, semester, classtype;
```

| UNITCODE | YEAR | SEMESTER | CLASSTYPE | CLASSDURATION |
|---|---|---|---|---|
| FIT1004 | 2013 | 1 | Lecture | 2hr Standard class |
| FIT1004 | 2013 | 1 | Tutorial | 2hr Standard class |
| FIT1004 | 2013 | 1 | Tutorial | 2hr Standard class |
| FIT1004 | 2013 | 2 | Lecture | 2hr Standard class |
| FIT1004 | 2013 | 2 | Tutorial | 2hr Standard class |
| FIT1004 | 2013 | 2 | Tutorial | 2hr Standard class |
| FIT1040 | 2013 | 1 | Lecture | 2hr Standard class |
| FIT1040 | 2013 | 1 | Tutorial | 2hr Standard class |
| FIT1040 | 2013 | 2 | Lecture | 2hr Standard class |
| FIT1040 | 2013 | 2 | Tutorial | 2hr Standard class |
| FIT1040 | 2013 | 2 | Tutorial | 2hr Standard class |
| FIT1040 | 2013 | 2 | Tutorial | 2hr Standard class |
| FIT2077 | 2013 | 1 | Lecture | 1hr Short class |
| FIT2077 | 2013 | 1 | Tutorial | 3hr Long class |

# Outline

- Case
- **Subquery – nested, inline, correlated**
- Views
- Joins - self join, outer join
- Set Operators
- Oracle Functions

# Query

For each unit, find the students(studid) who obtained the maximum mark in the unit

# Subquery (NESTED)

- For each unit, find the students who obtained the maximum mark in the unit

| STUDID | UNITCODE | MARK |
|---|---|---|
| 11111111 | FIT1040 | 45 |
| 11111111 | FIT1004 | 65 |
| 11111112 | FIT1040 | 80 |
| 11111112 | FIT1004 | 90 |
| 11111113 | FIT1040 | 74 |
| 11111113 | FIT1004 | 72 |

```
select studid, unitcode, mark
from uni.enrolment
where (unitcode, mark) IN (select unitcode, max(mark)
                           from uni.enrolment
                           group by unitcode)
order by unitcode, studid;
```

| UNITCODE | MAX(MARK) |
|---|---|
| FIT1040 | 80 |
| FIT1004 | 90 |
| FIT5132 | 78 |
| FIT5136 | 80 |
| FIT2077 | 74 |
| FIT5131 | 88 |

- the subquery is independent of the outer query and is executed only once.

# Subquery (CORRELATED)

- For each unit, find the students who obtained the maximum mark in the unit

```
select studid, unitcode, mark
from uni.enrolment e1
where mark  =  (select max(mark)
                from uni.enrolment e2
                where e1.unitcode = e2.unitcode)
order by unitcode, studid;
```

| STUDID | UNITCODE | MARK |
|---|---|---|
| 11111111 | FIT1040 | 45 |
| 11111111 | FIT1004 | 65 |
| 11111112 | FIT1040 | 80 |
| 11111112 | FIT1004 | 90 |
| 11111113 | FIT1040 | 74 |
| 11111113 | FIT1004 | 72 |

- the subquery is related to the outer query and is ***evaluated once for each row of the outer query***
- correlated subqueries can also be used within update statements
  - outer update occurs based on value returned from subquery

```
SELECT
    unitcode,
    MAX(mark) AS max_mark
FROM
    uni.enrolment
GROUP BY
    unitcode;
```

| UNITCODE | MAX_MARK |
|---|---|
| FIT1040 | 80 |
| FIT1004 | 90 |
| FIT5132 | 78 |
| FIT5136 | 80 |
| FIT2077 | 74 |
| FIT5131 | 88 |

*Output is multi row multi column*

# Subquery (INLINE) – Derived table

- For each unit, find the students who obtained the maximum mark in the unit

| UNITCODE | MAX_MARK |
|---|---|
| FIT1040 | 80 |
| FIT1004 | 90 |
| FIT5132 | 78 |
| FIT5136 | 80 |
| FIT2077 | 74 |
| FIT5131 | 88 |

```
select studid, e.unitcode, mark
from
 (select unitcode, max(mark) as max_mark
  from uni. enrolment
  group by unitcode) max_table
  join uni.enrolment e on e.unitcode = max_table.unitcode and
                          e.mark = max_table.max_mark
order by unitcode, studid;
```

- For each grade, compute the percentage of the students who got that grade

```
SELECT
    grade,
    COUNT(*) AS grade_count
FROM
    uni.enrolment
WHERE
    grade IS NOT NULL
GROUP BY
    grade
ORDER BY
    grade;
```

| GRADE | GRADE_COUNT |
|---|---|
| C | 10 |
| D | 13 |
| HD | 11 |
| N | 3 |
| P | 2 |

```
SELECT
   COUNT(*) AS total_rows
FROM
   uni.enrolment
WHERE
   grade IS NOT NULL;
```

| TOTAL_ROWS |
|---|
| 39 |

# Subquery (INLINE)

- For each grade, compute the percentage of the students who got that grade

```
SELECT
  grade,
  count(grade) as grade_count,
  (SELECT count(grade) from uni.enrolment) as total_rows,
  100*count(grade)/(SELECT count(grade) FROM uni.enrolment) as percentage
FROM uni.enrolment
where grade is NOT NULL
GROUP BY grade
order by grade;
```

| TOTAL_ROWS |
| --- |
| 39 |

# Use of subquery in INSERT

Student

| STU_NBR | STU_LNAME | STU_FNAME | STU_DOB |
|---|---|---|---|
| 11111111 | Bloggs | Fred | 01/JAN/90 |
| 11111112 | Nice | Nick | 10/OCT/94 |
| 11111113 | Wheat | Wendy | 05/MAY/90 |
| 11111114 | Sheen | Cindy | 25/DEC/96 |

| COLUMN_NAME | DATA_TYPE | NULLABLE |
|---|---|---|
| STU_NBR | NUMBER(8,0) | No |
| STU_LNAME | VARCHAR2(20 BYTE) | No |
| STU_FNAME | VARCHAR2(20 BYTE) | No |
| STU_DOB | DATE | No |

```
create table student2 (
  stu_nbr number(8) not null,
  stu_lname varchar2(20) not null,
  stu_fname varchar2(20) not null);
alter table student2 add constraint pk_student2 primary key (stu_nbr);

-- insert to an existing table via select
insert into student2
        (select stu_nbr, stu_lname, stu_fname from student);
```

| STU_NBR | STU_LNAME | STU_FNAME |
|---|---|---|
| 11111111 | Bloggs | Fred |
| 11111112 | Nice | Nick |
| 11111113 | Wheat | Wendy |
| 11111114 | Sheen | Cindy |

# Use of subquery in CREATE TABLE

Student

| STU_NBR | STU_LNAME | STU_FNAME | STU_DOB |
|---|---|---|---|
| 11111111 | Bloggs | Fred | 01/JAN/90 |
| 11111112 | Nice | Nick | 10/OCT/94 |
| 11111113 | Wheat | Wendy | 05/MAY/90 |
| 11111114 | Sheen | Cindy | 25/DEC/96 |

| COLUMN_NAME | DATA_TYPE | NULLABLE | D |
|---|---|---|---|
| STU_NBR | NUMBER(8,0) | No | ( |
| STU_LNAME | VARCHAR2(20 BYTE) | No | ( |
| STU_FNAME | VARCHAR2(20 BYTE) | No | ( |
| STU_DOB | DATE | No | ( |

```
-- Create table from existing data
CREATE TABLE student3
    AS
        ( SELECT
            stu_lname
            || ' '
            || stu_fname AS studentname
        FROM
            student
        );

select * from student3;
```

| STUDENTNAME |
|---|
| Bloggs Fred |
| Nice Nick |
| Wheat Wendy |
| Sheen Cindy |

# Outline

- Case
- Subquery – nested, inline, correlated
- **Views**
- Joins - self join, outer join
- Set Operators
- Oracle Functions

# Views

- A virtual table derived from one or more base tables.
- Sometimes used as "Access Control" to the database

```
CREATE OR REPLACE VIEW [view_name] AS
SELECT … ;
```

```
create or replace view max_view as
    select unitcode, max(mark) as max_mark
    from uni.enrolment
    group by unitcode;

select * from max_view
order by unitcode;
```

- What objects do I own?

```
select * from user_objects;
```

# Using Views

- For each unit, find the students who obtained the maximum mark in the unit

```
create or replace view max_view
 as select unitcode, max(mark) as max_mark
 from uni.enrolment group by unitcode;

select e.studid, e.unitcode, e.mark
from max_view v join uni.enrolment e on e.unitcode = v.unitcode
        and e.mark = v.max_mark
order by e.unitcode;
```

**Please note VIEWS MUST NOT be used for Assignment 2**

# Outline

- Case
- Subquery – nested, inline, correlated
- Views
- **Joins - self join, outer join**
- Set Operators
- Oracle Functions

# Self Join

- Show the name of the manager for each employee.

```
SELECT
    empno,
    empname,
    empinit,
    mgrno
FROM
    emp.employee;
```

| | EMPNO | EMPNAME | EMPINIT | MGRNO |
|---|---|---|---|---|
| 1 | 7839 | KING | CC | (null) |
| 2 | 7566 | JONES | JM | 7839 |
| 3 | 7902 | FORD | MG | 7566 |
| 4 | 7369 | SMITH | N | 7902 |
| 5 | 7698 | BLAKE | R | 7839 |
| 6 | 7499 | ALLEN | JAM | 7698 |
| 7 | 7521 | WARD | TF | 7698 |
| 8 | 7654 | MARTIN | P | 7698 |
| 9 | 7782 | CLARK | AB | 7839 |
| 10 | 7788 | SCOTT | SCJ | 7566 |
| 11 | 7844 | TURNER | JJ | 7698 |
| 12 | 7876 | ADAMS | AA | 7788 |
| 13 | 7900 | JONES | R | 7698 |
| 14 | 7934 | MILLER | TJA | 7782 |

```
SELECT *
FROM emp.employee e1 JOIN emp.employee e2
ON e1.mgrno = e2.empno;
```

e1 e2

| | EMPNO | EMPNAME | EMPINIT | MGRNO | EMPNO_1 | EMPNAME_1 | EMPINIT_1 | MGRNO_1 |
|---|---|---|---|---|---|---|---|---|
| 1 | 7902 | FORD | MG | 7566 | 7566 | JONES | JM | 7839 |
| 2 | 7788 | SCOTT | SCJ | 7566 | 7566 | JONES | JM | 7839 |
| 3 | 7900 | JONES | R | 7698 | 7698 | BLAKE | R | 7839 |
| 4 | 7499 | ALLEN | JAM | 7698 | 7698 | BLAKE | R | 7839 |
| 5 | 7521 | WARD | TF | 7698 | 7698 | BLAKE | R | 7839 |
| 6 | 7654 | MARTIN | P | 7698 | 7698 | BLAKE | R | 7839 |
| 7 | 7844 | TURNER | JJ | 7698 | 7698 | BLAKE | R | 7839 |
| 8 | 7934 | MILLER | TJA | 7782 | 7782 | CLARK | AB | 7839 |
| 9 | 7876 | ADAMS | AA | 7788 | 7788 | SCOTT | SCJ | 7566 |
| 10 | 7782 | CLARK | AB | 7839 | 7839 | KING | CC | (null) |
| 11 | 7698 | BLAKE | R | 7839 | 7839 | KING | CC | (null) |
| 12 | 7566 | JONES | JM | 7839 | 7839 | KING | CC | (null) |
| 13 | 7369 | SMITH | N | 7902 | 7902 | FORD | MG | 7566 |

Joined rows
1,12
2,12
3,11

*Note some columns have been hidden*

**Why now only 13 rows?**

```
SELECT e1.empno, e1.empname, e1.empinit, e1.mgrno,
       e2.empname AS MANAGER
FROM emp.employee e1  JOIN emp.employee e2
       ON e1.mgrno = e2.empno
ORDER BY e1.empname;
```

| | EMPNO | EMPNAME | EMPINIT | MGRNO | MANAGER |
|---|---|---|---|---|---|
| 1 | 7876 | ADAMS | AA | 7788 | SCOTT |
| 2 | 7499 | ALLEN | JAM | 7698 | BLAKE |
| 3 | 7698 | BLAKE | R | 7839 | KING |
| 4 | 7782 | CLARK | AB | 7839 | KING |
| 5 | 7902 | FORD | MG | 7566 | JONES |
| 6 | 7900 | JONES | R | 7698 | BLAKE |
| 7 | 7566 | JONES | JM | 7839 | KING |
| 8 | 7654 | MARTIN | P | 7698 | BLAKE |
| 9 | 7934 | MILLER | TJA | 7782 | CLARK |
| 10 | 7788 | SCOTT | SCJ | 7566 | JONES |
| 11 | 7369 | SMITH | N | 7902 | FORD |
| 12 | 7844 | TURNER | JJ | 7698 | BLAKE |
| 13 | 7521 | WARD | TF | 7698 | BLAKE |

# NATURAL JOIN

**Student**

| ID | NAME |
|---|---|
| 1 | Alice |
| 2 | Bob |
| 3 | Chris |

**Mark**

| ID | SUBJECT | MARK |
|---|---|---|
| 1 | 1004 | 95 |
| 2 | 1045 | 55 |
| 1 | 1045 | 90 |
| 4 | 1004 | 100 |

**Natural Join gives no information for Chris and the student with ID 4**

| ID | NAME | ID_1 | SUBJECT | MARK |
|---|---|---|---|---|
| 1 | Alice | 1 | 1004 | 95 |
| 2 | Bob | 2 | 1045 | 55 |
| 1 | Alice | 1 | 1045 | 90 |

**Select * from student s join mark m on s.id = m.id;**
***Note that this is an EQUI JOIN* (an inner join)**

# FULL OUTER JOIN

**Student**

| ID | NAME |
|---|---|
| 1 | Alice |
| 2 | Bob |
| 3 | Chris |

**Mark**

| ID | SUBJECT | MARK |
|---|---|---|
| 1 | 1004 | 95 |
| 2 | 1045 | 55 |
| 1 | 1045 | 90 |
| 4 | 1004 | 100 |

**Get (incomplete) information of both Chris and student with ID 4**

| ID | NAME | ID_1 | SUBJECT | MARK |
|---|---|---|---|---|
| 1 | Alice | 1 | 1004 | 95 |
| 2 | Bob | 2 | 1045 | 55 |
| 1 | Alice | 1 | 1045 | 90 |
| (null) | (null) | 4 | 1004 | 100 |
| 3 | Chris | (null) | (null) | (null) |

```
select * from
student s full outer join mark m on s.id = m.id;
```

# LEFT OUTER JOIN

**Student**

| ID | NAME |
|---|---|
| 1 | Alice |
| 2 | Bob |
| 3 | Chris |

**Mark**

| ID | SUBJECT | MARK |
|---|---|---|
| 1 | 1004 | 95 |
| 2 | 1045 | 55 |
| 1 | 1045 | 90 |
| 4 | 1004 | 100 |

**Get (incomplete) information of only Chris**

| ID | NAME | ID_1 | SUBJECT | MARK |
|---|---|---|---|---|
| 1 | Alice | 1 | 1004 | 95 |
| 2 | Bob | 2 | 1045 | 55 |
| 1 | Alice | 1 | 1045 | 90 |
| 3 | Chris | (null) | (null) | (null) |

```
select * from
student s left outer join mark m
on s.id = m.id;
```

# RIGHT OUTER JOIN

**Student**

| ID | NAME |
|---|---|
| 1 | Alice |
| 2 | Bob |
| 3 | Chris |

**Mark**

| ID | SUBJECT | MARK |
|---|---|---|
| 1 | 1004 | 95 |
| 2 | 1045 | 55 |
| 1 | 1045 | 90 |
| 4 | 1004 | 100 |

**Get (incomplete) information of the student with ID 4**

| ID | NAME | ID_1 | SUBJECT | MARK |
|---|---|---|---|---|
| 1 | Alice | 1 | 1045 | 90 |
| 1 | Alice | 1 | 1004 | 95 |
| 2 | Bob | 2 | 1045 | 55 |
| (null) | (null) | 4 | 1004 | 100 |

```
select * from
student s right outer join mark m
on s.id = m.id;
```

Employee

| ID | Name | Manager |
|---|---|---|
| 1 | Alice | 2 |
| 2 | Bob | 3 |
| 3 | Chris | |

## Q1. What is the output from the following SQL:

```
select e1.name as name, e2.name as manager
from employee e1 right outer join employee e2
     on e1.manager = e2.id;
```

(A)

```
NAME       MANAGER
---------- --------
Alice      Bob
Bob        Chris
           Alice
```

(B)

```
NAME       MANAGER
---------- ----------
Alice      Bob
Bob        Chris
Chris
```

```
SELECT
    *
FROM
    employee;
```

| ID | NAME | MANAGER |
|---|---|---|
| 1 | Alice | 2 |
| 2 | Bob | 3 |
| 3 | Chris | (null) |

```
SELECT
    e1.name    AS name,
    e2.name    AS manager
FROM
    employee  e1
    RIGHT OUTER JOIN employee  e2 ON
e1.manager = e2.id;
```

e1 Employee

| ID | NAME | MANAGER |
|---|---|---|
| 1 | Alice | 2 |
| 2 | Bob | 3 |
| 3 | Chris | (null) |

e2 Manager

| ID | NAME | MANAGER |
|---|---|---|
| 1 | Alice | 2 |
| 2 | Bob | 3 |
| 3 | Chris | (null) |

| NAME | MANAGER |
|---|---|
| (null) | Alice |
| Alice | Bob |
| Bob | Chris |

**Employee**

| ID | Name | Salary |
|---|---|---|
| 1 | Alice | 100,000 |
| 2 | Bob | 150,000 |
| 3 | Chris | 200,000 |

**Project**

| Project | Cost | EmpID |
|---|---|---|
| Alpha | 4000 | 1 |
| Beta | 3000 | 2 |
| Gamma | 5000 | 2 |

**Q2. Which of the following shows, for *each* employee, the total amount of projects they are assigned to? (E.g., Alice is assigned to Alpha with total cost 4000, Bob is assigned to Beta and Gamma with total cost 8000)**

A. select e.name, sum(cost) as total from employee e left outer join project p on e.id = p.empid group by e.name;

B. select e.name, sum(cost) as total from employee e right outer join project p on e.id = p.empid group by e.name;

C. select e.name, NVL(sum(cost),0) as total from employee e left outer join project p on e.id = p.empid group by e.name;

D. None of the above

**Q3. Two or more queries that are connected using a set operator have to be union compatible. When would two relations be union compatible? It is when the two relations have:**

A. the same degree and similar domain for the attributes

B. the same degree and attributes' name

C. the same degree and cardinality.

D. the same cardinality.

# Outline

- Case
- Subquery – nested, inline, correlated
- Views
- Joins - self join, outer join
- **Set Operators**
- Oracle Functions

# Relational Set Operators

- Using the set operators you can combine two or more sets to create new sets (relations)
- Union All
  - –All rows selected by either query, including all duplicates
- Union
  - –All rows selected by either query, removing duplicates (e.g,, DISTINCT on Union All)
- Intersect
  - –All distinct rows selected by both queries
- Minus
  - –All distinct rows selected by the first query but not by the second
- All set operators have equal precedence. If a SQL statement contains multiple set operators, Oracle evaluates them from the left to right if no parentheses explicitly specify another order.
- The two sets must be UNION COMPATIBLE (i.e., same number of attributes and similar data types)

# MINUS

- List the name of staff who are not a chief examiner in an offering.

```
select staffid, stafflname, stafffname
from uni.staff
where staffid IN
    (select staffid from uni.staff
    minus
    select chiefexam from uni.offering);
```

| STAFFID |
|---|
| 1 |
| 2 |
| 3 |
| 4 |
| 5 |
| 6 |
| 7 |

| CHIEFEXAM |
|---|
| 1 |
| 1 |
| 1 |
| 1 |
| 3 |
| 4 |
| 5 |
| 5 |
| 7 |
| 7 |
| 7 |
| 7 |
| 7 |
| 7 |

| STAFFID | STAFFLNAME | STAFFFNAME |
|---|---|---|
| 2 | Burbage | Charity |
| 6 | Umbridge | Dolores |

# UNION

- Create a list of units with its average mark. Give the label “Below distinction” to all units with the average less than 70 and “Distinction and Above” for those units with average greater or equal to 70.

| UNITCODE | AVERAGE | AVERAGE_STATUS |
|---|---|---|
| FIT5131 | 77.5 | Distinction and Above |
| FIT5136 | 75.5 | Distinction and Above |
| FIT5132 | 74 | Distinction and Above |
| FIT1004 | 71.7 | Distinction and Above |
| FIT1040 | 70 | Distinction and Above |
| FIT2077 | 64.5 | Below Distinction |

1. Select units with average marks less than 70 and set status
2. Select units with average marks greater or equal to 70 and set status
3. Take a union of 1 and 2

```
SELECT unitcode, AVG(mark) AS Average, 'Below Distinction' AS Average_Status
FROM
  uni.enrolment
GROUP BY
  unitcode
HAVING
  AVG(mark) < 70
UNION
SELECT unitcode, AVG(mark) AS Average, 'Distinction and Above' AS Average_Status
FROM
  uni.enrolment
GROUP BY
  unitcode
HAVING
  AVG(mark) >= 70
ORDER BY
  Average DESC ;
```

# INTERSECTION

- Find students who have the same surname as a staff member's surname.

- Find the common surnames in staff and student table.
- Find students with the surname present in 1

```
SELECT studid, studfname, studlname
FROM
  uni.student
WHERE
  studlname IN
  ( SELECT DISTINCT studlname
    FROM
      uni.student
    INTERSECT
    SELECT DISTINCT stafflname
    FROM
      uni.staff)
ORDER BY studid;
```

| STAFFLNAME |
|---|
| Burbage |
| Dumbledore |
| Flitwick |
| Hagrid |
| McGonagall |
| Snape |
| Umbridge |

| STUDLNAME |
|---|
| Brown |
| Chan |
| Chung |
| Dewa |
| Dowe |
| Dumbledore |
| Gupta |
| Lee |
| Long |
| Nguyen |
| Ryan |
| Short |
| Smith |
| Solo |
| Tse |
| White |

# Outline

- Case
- Subquery – nested, inline, correlated
- Views
- Joins - self join, outer join
- Set Operators
- **Oracle Functions**

| Function Type | Applicable to | Example |
|---|---|---|
| Arithmetic | Numerical data | SELECT ucode, round(avg(mark))<br>FROM enrolment<br>GROUP BY ucode; |
| Text | Alpha numeric data | SELECT studsurname<br>FROM enrolment<br>WHERE upper(studsurname) LIKE 'B%'; |
| Date | Date/Time-related data | |
| General | Any data type | NVL function |
| Conversion | Data Type conversion | SELECT<br>to_char(empmsal,'$0999.99')<br>FROM employee; |
| Group | Sets of Values | avg(), count(), etc |
| | | |

**See document on Moodle**

```
SELECT
    unitcode,
    extract(year from ofyear) as year,
    semester,
    decode (cltype, 'L', 'Lecture',
                    'T', 'Tutorial') as Classtype,
    case
    when clduration < 2 then clduration || 'hr Short class'
    when clduration = 2 then clduration || 'hr Standard
class'
    else clduration || 'hr Long class'
    end as classduration
FROM uni.schedclass
ORDER BY unitcode, year, semester, classtype;
```

```
SELECT
    unitcode,
    lpad(extract(year from ofyear) || ' S' || semester,10,' ') as offering,
    decode (cltype, 'L', 'Lecture',
                    'T', 'Tutorial') as Classtype,
    case
    when clduration < 2 then clduration || 'hr Short class'
    when clduration = 2 then clduration || 'hr Standard class'
    else clduration || 'hr Long class'
    end as classduration
FROM uni.schedclass
ORDER BY unitcode, offering, classtype;
```

| UNITCODE | OFFERING | CLASSTYPE | CLASSDURATION |
|---|---|---|---|
| FIT1004 | 2013 S1 | Lecture | 2hr Standard class |
| FIT1004 | 2013 S1 | Tutorial | 2hr Standard class |
| FIT1004 | 2013 S1 | Tutorial | 2hr Standard class |
| FIT1004 | 2013 S2 | Lecture | 2hr Standard class |
| FIT1004 | 2013 S2 | Tutorial | 2hr Standard class |
| FIT1004 | 2013 S2 | Tutorial | 2hr Standard class |
| FIT1040 | 2013 S1 | Lecture | 2hr Standard class |
| FIT1040 | 2013 S1 | Tutorial | 2hr Standard class |
| FIT1040 | 2013 S2 | Lecture | 2hr Standard class |
| FIT1040 | 2013 S2 | Tutorial | 2hr Standard class |
| FIT1040 | 2013 S2 | Tutorial | 2hr Standard class |
| FIT1040 | 2013 S2 | Tutorial | 2hr Standard class |
| FIT2077 | 2013 S1 | Lecture | 1hr Short class |
| FIT2077 | 2013 S1 | Tutorial | 3hr Long class |

## Q4. Given the following oracle syntax for round function:

**ROUND(n [,integer]) where n is a number and integer determines the decimal point;**

**what would be the right SELECT clause for rounding the average mark of all marks in the enrolment (not including the NULL values) to the nearest 2 decimal point?**

A. SELECT avg(round(mark,2))
B. SELECT round(avg(mark,2))
C. SELECT round(avg(mark),2)
D. SELECT avg(mark(round(2)))