

1. Part A:

- a. Create ORACLE SQL Statements with appropriate PK and FKs for each table

Solution:

a) create table ICECREAM (Ice_cream_ID int, Ice_cream_flavor varchar(20), price DECIMAL(19, 4), year_first_offered number(4), selling_status varchar(20), CONSTRAINT Ice_cream_ID_pk PRIMARY KEY (Ice_cream_ID), CONSTRAINT chk_selling_status CHECK (selling_status IN ('high', 'low', 'medium', 'none')));

b) create table INGREDIENT(Ingredient_ID int, Ingredient_name varchar(20), cost DECIMAL(19, 4), CONSTRAINT Ingredient_ID_pk PRIMARY KEY (Ingredient_ID));

c) create table RECIPE (Ice_cream_ID int, Ingredient_ID int, quantity_used DECIMAL(19, 4), CONSTRAINT fk_ICECREAM FOREIGN KEY (Ice_cream_ID) REFERENCES ICECREAM(Ice_cream_ID), CONSTRAINT fk_INGREDIENT FOREIGN KEY (Ingredient_ID) REFERENCES INGREDIENT(Ingredient_ID));

d) INSERT ALL

```
INTO ICECREAM VALUES (101, 'Berry', 4, 2010, '')
INTO ICECREAM VALUES (201, 'Vanilla', 2, 1981, 'high')
INTO ICECREAM VALUES (211, 'Cherry', 3, 1976, 'low')
INTO ICECREAM VALUES (311, 'Chocolate', 3, 1981, 'high')
INTO ICECREAM VALUES (321, 'Strawberry', 2, 1961, 'high')
INTO ICECREAM VALUES (405, 'Pistachio', 2.50, 2012, 'low')
INTO ICECREAM VALUES (406, 'Almond', 3, 2010, '')
INTO ICECREAM VALUES (407, 'Blackberry', 4, 2015, '')
INTO ICECREAM VALUES (510, 'Mint', 1.50, 1998, 'medium')
INTO ICECREAM VALUES (520, 'Cookie', 2, 2001, 'medium')
INTO ICECREAM VALUES (525, 'Green Tea', 4.50, 2012, 'low')
INTO ICECREAM VALUES (540, 'Raspberry', 3, 2012, '')
INTO ICECREAM VALUES (545, 'Banana', 1.50, 1992, 'medium')
INTO ICECREAM VALUES (550, 'Pineapple', 2, 2001, 'high')
INTO ICECREAM VALUES (560, 'coconut', 3.25, 2012, 'medium')
SELECT * FROM dual;
```

e) INSERT ALL

```
INTO INGREDIENT VALUES (1000, 'cocoa', 125)
INTO INGREDIENT VALUES (1100, 'Vanilla beans', 30)
INTO INGREDIENT VALUES (1200, 'Tea leaves', 35)
INTO INGREDIENT VALUES (1300, 'Raw almonds', 215)
```

INTO INGREDIENT VALUES (1400,	'Mint Leaves',	42)
INTO INGREDIENT VALUES (1500,	'Sugar',	5)
INTO INGREDIENT VALUES (1600,	'Cream',	25)
INTO INGREDIENT VALUES (1700,	'Pistachio',	45)
INTO INGREDIENT VALUES (1710,	'raspberry',	12)

SELECT * FROM dual;

f) INSERT ALL

INTO RECIPE VALUES (101,	1000,	30)
INTO RECIPE VALUES (540,	1000,	75)
INTO RECIPE VALUES (545,	1000,	55)
INTO RECIPE VALUES (101,	1100,	40)
INTO RECIPE VALUES (201,	1100,	45)
INTO RECIPE VALUES (407,	1200,	25)
INTO RECIPE VALUES (101,	1200,	20)
INTO RECIPE VALUES (201,	1200,	45)
INTO RECIPE VALUES (311,	1200,	40)
INTO RECIPE VALUES (321,	1300,	35)
INTO RECIPE VALUES (101,	1300,	80)
INTO RECIPE VALUES (540,	1300,	50)
INTO RECIPE VALUES (545,	1400,	15)
INTO RECIPE VALUES (405,	1400,	10)
INTO RECIPE VALUES (406,	1400,	27.5)
INTO RECIPE VALUES (201,	1500,	10)
INTO RECIPE VALUES (540,	1500,	5.5)
INTO RECIPE VALUES (211,	1500,	60)
INTO RECIPE VALUES (101,	1700,	5)
INTO RECIPE VALUES (520,	1700,	10)

SELECT * FROM dual;

2. Part B:


- Write queries to provide table structure and queries output

Solution

Queries

```
DESCRIBE ICECREAM;  
DESCRIBE INGREDIENT;  
DESCRIBE RECIPE;
```

Output



```
Run SQL Command Line  
SQL> DESCRIBE ICECREAM  
Name Null? Type  
-----  
ICE_CREAM_ID NOT NULL NUMBER(38)  
ICE_CREAM_FLAVOR VARCHAR2(20)  
PRICE NUMBER(19,4)  
YEAR_FIRST_OFFERED NUMBER(4)  
SELLING_STATUS VARCHAR2(20)  
SQL> DESCRIBE INGREDIENT  
Name Null? Type  
-----  
INGREDIENT_ID NOT NULL NUMBER(38)  
INGREDIENT_NAME VARCHAR2(20)  
COST NUMBER(19,4)  
SQL> DESCRIBE RECIPE  
Name Null? Type  
-----  
ICE_CREAM_ID NUMBER(38)  
INGREDIENT_ID NUMBER(38)  
QUANTITY_USED NUMBER(19,4)  
SQL>
```

3. Part C:

- Write queries to provide table contents and queries output

Solution

Queries

```
Select * from ICECREAM;  
Select * from INGREDIENT;  
Select * from RECIPE;
```

Output



```
Run SQL Command Line  
SQL> select * from ICECREAM;  
ICE_CREAM_ID ICE_CREAM_FLAVOR PRICE YEAR_FIRST_OFFERED  
SELLING_STATUS  
-----  
181 Berry 4 2010  
high  
201 Vanilla 2 1981  
low  
211 Cherry 3 1976  
ICE_CREAM_ID ICE_CREAM_FLAVOR PRICE YEAR_FIRST_OFFERED  
SELLING_STATUS  
-----  
high 211 Chocolate 3 1981  
high 321 Strawberry 2 1961  
low 405 Pistachio 2.5 2012  
ICE_CREAM_ID ICE_CREAM_FLAVOR PRICE YEAR_FIRST_OFFERED  
SELLING_STATUS  
-----  
medium 406 Blond 3 2010  
407 Blackberry 4 2015  
510 Mint 1.5 1998  
ICE_CREAM_ID ICE_CREAM_FLAVOR PRICE YEAR_FIRST_OFFERED  
SELLING_STATUS  
-----  
medium 520 Cookie 2 2001  
low 525 Green Tea 4.5 2012  
540 Raspberry 3 2012
```

```

Run SQL Command Line
SQL> select * from RECIPE;
ICE_CREAM_ID INGREDIENT_ID QUANTITY_USED
-----
181          1000          30
540          1000          75
545          1000          55
181          1100          40
281          1100          45
407          1200          25
181          1200          20
281          1200          45
311          1300          40
321          1300          35
181          1300          80
ICE_CREAM_ID INGREDIENT_ID QUANTITY_USED
-----
540          1300          50
545          1400          15
405          1400          10
406          1400          27.5
281          1500          10
540          1500          5.5
211          1500          60
181          1700          5
520          1700          10
20 rows selected.

```

```

Run SQL Command Line
SQL> select * from INGREDIENT;
INGREDIENT_ID INGREDIENT_NAME COST
-----
1000 cocoa          125
1100 Vanilla beans   30
1200 Tea leaves     35
1300 Raw almonds    215
1400 Mint leaves    42
1500 Sugar           5
1600 Cream          25
1700 Pistachio       45
1710 raspberry      12
9 rows selected.
SQL> _

```

4. Part D:

a. Each query/and its output in SQL (1 thru 13) and its result

1) What are the names of all ice creams?

Solution

select Ice_cream_flavor from ICECREAM order by Ice_cream_flavor;

Output

```

Run SQL Command Line
ICE_CREAM_FLAVOR
-----
Almond
Banana
Berry
Blackberry
Cherry
Chocolate
Cookie
Green Tea
Mint
Pineapple
Pistachio
ICE_CREAM_FLAVOR
-----
Raspberry
Strawberry
Vanilla
coconut
15 rows selected.

```

2) Which ice cream flavored were offered before 1999

Solution

select Ice_cream_flavor from ICECREAM where year_first_offered<1999 order by Ice_cream_flavor;

Output

```

Run SQL Command Line
ICE_CREAM_FLAVOR
-----
Banana
Cherry
Chocolate
Mint
Strawberry
Vanilla
6 rows selected.

```

3) How many flavored were offered before 1999.

Solution

select COUNT(Ice_cream_flavor) from ICECREAM where year_first_offered<1999;

Output



4) Give the count of ingredients used in ice cream 101.

Solution

select count(Ingredient_ID) from RECIPE where Ice_cream_ID=101;

Output



5) What are the ice cream flavors that use ingredient 1100?

Solution

select ICECREAM.Ice_cream_flavor from RECIPE,ICECREAM where RECIPE.Ingredient_ID=1100 and RECIPE.Ice_cream_ID=ICECREAM.Ice_cream_ID;

Output



6) What are the ingredients used in ice creams 201 or 540?

Solution

select DISTINCT INGREDIENT.Ingredient_name from RECIPE,INGREDIENT where (RECIPE.Ice_cream_ID=201 or RECIPE.Ice_cream_ID=540) and RECIPE.Ingredient_ID=INGREDIENT.Ingredient_ID;

Output

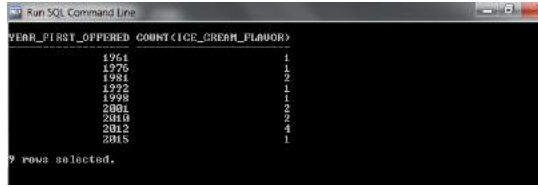


7) How many flavors were introduced each year?

Solution

select year_first_offered, COUNT(Ice_cream_flavor) from ICECREAM group by year_first_offered order by year_first_offered;

Output



8) How many ingredients have an 'a' and an 'l' in their names in that order?

Solution

select count(Ingredient_name) from INGREDIENT where Ingredient_name LIKE '%a%l%';

Output

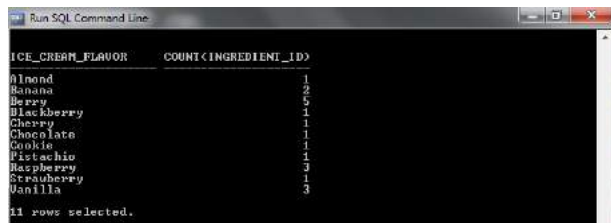


9) How many ingredients are in each ice cream flavor?

Solution

select ICECREAM.Ice_cream_flavor, count(Ingredient_ID) from RECIPE, ICECREAM where RECIPE.Ice_cream_ID=ICECREAM.Ice_cream_ID group by ICECREAM.Ice_cream_flavor order by ICECREAM.Ice_cream_flavor;

Output



10) Give the names of ice creams that do not have selling status.

Solution

select Ice_cream_flavor from ICECREAM where TRIM(selling_status) IS NULL;

Output



11) Give the average price of vanilla, almond and Pistachio ice creams.

Solution

```
select avg(price) from ICECREAM where Ice_cream_flavor LIKE '%Vanilla%' or Ice_cream_flavor LIKE '%Almond%' or Ice_cream_flavor LIKE '%Pistachio%';
```

Output



12) Give the count of ice creams by their selling status.

Solution

```
select selling_status,COUNT(Ice_cream_flavor) from ICECREAM group by selling_status order by selling_status;
```

Output

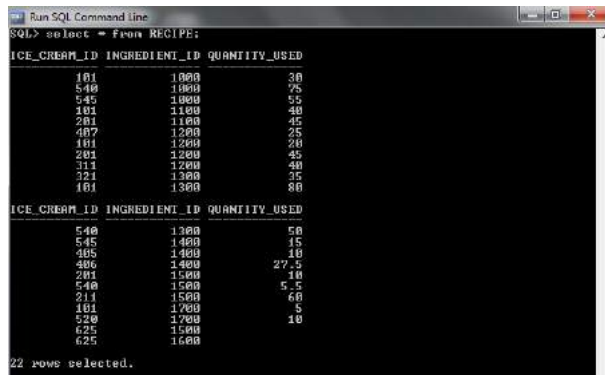


13) Add an ice cream peanut butter id number 625 and uses ingredients 1500 and 1600.

Solution

```
INSERT INTO ICECREAM(Ice_cream_ID, Ice_cream_flavor) VALUES (625, 'peanut butter');
INSERT ALL
INTO RECIPE(Ice_cream_ID, Ingredient_ID) VALUES (625, 1500)
INTO RECIPE(Ice_cream_ID, Ingredient_ID) VALUES (625, 1600)
SELECT * FROM dual;
```

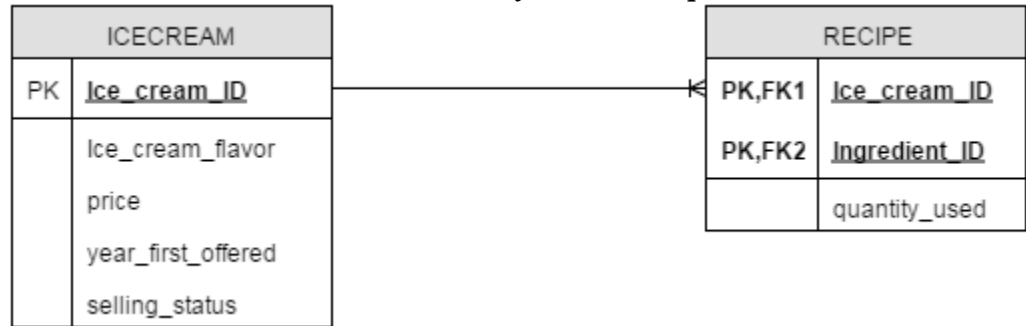
Output



5. Part E:

a. Draw the relationship (1:1 or 1:m or m:n) between the following:

i. ICECREAM and RECIPE – *1 to Many Relationship*



Description

The table ICECREAM and RECIPE follows 1 to Many Relationship. As each ice cream in ICECREAM table can hold one or more ingredients.

ii. INGREDIENT and RECIPE - *1 to Many Relationship*



Description:

The table INGREDIENT and RECIPE follows 1 to Many Relationship. As each ingredient in INGREDIENT table can be used as ingredient in one or more ice-creams