

Exercise 1:

a)

1NF

<u>orderId</u>	<u>date</u>	<u>customerId</u>	customerName	city	<u>itemId</u>	itemName	quantity	price
2301	23/02/2011	101	Martin	Prague	3786	Net	3	\$35,00
2301	23/02/2011	101	Martin	Prague	4011	Racket	6	\$65,00
2301	23/02/2011	101	Martin	Prague	9132	Pack-3	8	\$4,75
2302	25/02/2011	107	Herman	Madrid	5794	Pack-6	4	\$5,00
2303	27/02/2011	110	Pedro	Moscow	4011	Racket	2	\$65,00
2303	27/02/2011	110	Pedro	Moscow	3141	Cover	2	\$10,00

2NF and 3NF

<u>orderId</u>	<u>itemId</u>	quantity
2301	3786	3
2301	4011	6
2301	9132	8
2302	5794	4
2303	4011	2
2303	3141	2

<u>itemId</u>	itemName	price
3786	Net	\$35,00
4011	Racket	\$65,00
9132	Pack-3	\$4,75
5794	Pack-6	\$5,00
3141	Cover	\$10,00

<u>customerId</u>	customerName	city
101	Martin	Prague
107	Herman	Madrid
110	Pedro	Moscow

<u>orderId</u>	customerId	date
2301	101	23/02/2011
2302	107	25/02/2011
2303	110	27/02/2011

TABLE CREATION QUERY:

CREATE TABLE IF NOT EXISTS orders (

orderId INT,

itemId INT,

quantity INT,

PRIMARY KEY(orderId, itemId)

);

CREATE TABLE IF NOT EXISTS items (

itemId INT,

itemName VARCHAR(15),

price REAL,

PRIMARY KEY(itemId)

);

CREATE TABLE IF NOT EXISTS customers (

customerId INT,

customerName VARCHAR(15),

city VARCHAR(15),

PRIMARY KEY(customerId)

);

CREATE TABLE IF NOT EXISTS date_orders (

orderId INT,

customerId INT,

date DATE,

PRIMARY KEY(orderId)

);

TABLE INSERTION QUERY:

```
INSERT INTO orders VALUES ('2301','3786','3');
INSERT INTO orders VALUES ('2301','4011','6');
INSERT INTO orders VALUES ('2301','9132','8');
INSERT INTO orders VALUES ('2302','5794','4');
INSERT INTO orders VALUES ('2303','4011','2');
INSERT INTO orders VALUES ('2303','3141','2');
INSERT INTO items VALUES ('3786','Net','35.00');
INSERT INTO items VALUES (4011,'Racket','65.00');
INSERT INTO items VALUES (9132,'Pack-3','4.75');
INSERT INTO items VALUES (5794,'Pack-6','5.00');
INSERT INTO items VALUES (3141,'Cover','10.00');
INSERT INTO customers VALUES ('101','Martin','Prague');
INSERT INTO customers VALUES ('107','Herman','Madrid');
INSERT INTO customers VALUES ('110','Pedro','Moscow');
INSERT INTO date_orders VALUES ('2301', '101','2011-02-23');
INSERT INTO date_orders VALUES ('2302', '107','2011-02-25');
INSERT INTO date_orders VALUES ('2303', '110','2011-02-27');
```

b) Calculate the total number of items per order and the total amount to pay for the order:

```
SELECT orderId,
SUM(quantity) as amount_of_items,
SUM(items.price * orders.quantity) AS total_cost
FROM items
JOIN orders
on items.itemId = orders.itemId
GROUP BY orderId
ORDER BY orderId;
```

Obtain the customer whose purchase in terms of money has been greater than the others:

```
SELECT customers.customerID, customers.customerName FROM(
SELECT date_orders.customerId FROM (
SELECT orderId,
SUM(items.price * orders.quantity) AS total_cost
FROM items
JOIN orders
on items.itemId = orders.itemId
GROUP BY orderId
ORDER BY total_cost DESC
LIMIT 1
) as one
join date_orders
on date_orders.orderId=one.orderId
) as two
join customers
```

on customers.customerId=two.customerId;

Exercise 2

Original table:

school	teacher	course	room	grade	book	publisher	loanDate
Horizon Education Institute	Chad Russell	Logical Thinking	1.A01	1st grade	Learning and teaching in early childhood education	BOA Editions	09/09/2010
Horizon Education Institute	Chad Russell	Writing	1.A01	1st grade	Preschool, N56	Taylor & Francis Publishing	05/05/2010
Horizon Education Institute	Chad Russell	Numerical Thinking	1.A01	1st grade	Learning and teaching in early childhood education	BOA Editions	05/05/2010
Horizon Education Institute	E.F.Codd	Spatial, Temporal and Causal Thinking	1.B01	1st grade	Early Childhood Education N9	Prentice Hall	06/05/2010
Horizon Education Institute	E.F.Codd	Numerical Thinking	1.B01	1st grade	Learning and teaching in early childhood education	BOA Editions	06/05/2010
Horizon Education Institute	Jones Smith	Writing	1.A01	2nd grade	Learning and teaching in early childhood education	BOA Editions	09/09/2010
Horizon Education Institute	Jones Smith	English	1.A01	2nd grade	Know how to educate: guide for Parents and Teachers	McGraw Hill	05/05/2010
Bright Institution	Adam Baker	Logical Thinking	2.B01	1st grade	Know how to educate: guide for Parents and Teachers	McGraw Hill	18/12/2010
Bright Institution	Adam Baker	Numerical Thinking	2.B01	1st grade	Learning and teaching in early childhood education	BOA Editions	06/05/2010

All columns are atomic, no duplicate tuples and values are of the same domain. So, the relation is already in 1NF.

1NF: Mark Teacher and Course as candidate keys.

School	<u>Teacher</u>	<u>Course</u>	Room	Grade	Book	Publisher	loanDate
...

2NF: Because of partial dependencies, we need to decompose the table to get NF2.

School, Grade, and Room fully depend on Teacher.

<u>Teacher</u>	School	Grade	Room
...

Book, Publisher and loanDate depend on combination of Teacher + Course.

<u>Teacher</u>	<u>Course</u>	Book	Publisher	loanDate
...

3NF: The relations have no transitive functional dependencies, therefore it is 3NF, however Book-Publisher relation can be split into separate table to reduce redundancy.

<u>Teacher</u>	School	Grade	Room
...

<u>Teacher</u>	<u>Course</u>	Book	loanDate
...

Book	Publisher
...	...

BCNF:

<u>Teacher</u>	School	Grade	Room
...

<u>Teacher</u>	<u>Course</u>	Book	loanDate
...

Book	Publisher
...	...

We get the following dependencies:

Teacher → School, Grade, Room

Teacher, Course → Book, loanDate

Book → Publisher

Creation query:

```
CREATE TABLE IF NOT EXISTS places(
```

```
  teacher VARCHAR(30),
```

```
  school VARCHAR(50),
```

```
  grade VARCHAR(15),
```

```
  room VARCHAR(10),
```

```
  PRIMARY KEY(teacher)
```

```
);
```

```
CREATE TABLE IF NOT EXISTS courses(
```

```
  teacher VARCHAR(30),
```

```
  course VARCHAR(40),
```

```
  book VARCHAR(100),
```

```
  loanDate DATE,
```

```
  PRIMARY KEY(teacher, course)
```

```
);
```

```
CREATE TABLE IF NOT EXISTS books(
```

```
  book VARCHAR(100),
```

```
  publisher VARCHAR(50),
```

```
  PRIMARY KEY(book)
```

```
);
```

Insertion query:

```
INSERT INTO places VALUES ('Chad Russell', 'Horizon Education Institute', '1st grade', '1.A01');
```

```
INSERT INTO places VALUES ('E.F.Codd', 'Horizon Education Institute', '1st grade', '1.B01');
```

```
INSERT INTO places VALUES ('Jones Smith', 'Horizon Education Institute', '2nd grade', '1.A01');
```

INSERT INTO places VALUES ('Adam Baker', 'Bright Institution', '1st grade', '1.A01');
INSERT INTO courses VALUES ('Chad Russell', 'Logical Thinking', 'Learning and teaching in early childhood education','2010-09-09');
INSERT INTO courses VALUES ('Chad Russell', 'Writing', 'Preschool N56','2010-05-05');
INSERT INTO courses VALUES ('Chad Russell', 'Numerical thinking', 'Learning and teaching in early childhood education','2010-05-05');
INSERT INTO courses VALUES ('E.F.Codd', 'Spatial, Temporal and Causal Thinking', 'Early Childhood Education N9','2010-05-06');
INSERT INTO courses VALUES ('E.F.Codd', 'Numerical Thinking', 'Learning and teaching in early childhood education','2010-05-06');
INSERT INTO courses VALUES ('Jones Smith', 'Writing', 'Learning and teaching in early childhood education','2010-09-09');
INSERT INTO courses VALUES ('Jones Smith', 'English', 'Know how to educate: guide for Parents and Teachers','2010-05-05');
INSERT INTO courses VALUES ('Adam Baker', 'Logical Thinking', 'Know how to educate: guide for Parents and Teachers','2010-12-18');
INSERT INTO courses VALUES ('Adam Baker', 'Numerical Thinking', 'Learning and teaching in early childhood education','2010-05-06');
INSERT INTO books VALUES ('Learning and teaching in early childhood education', 'BOA Editions');
INSERT INTO books VALUES ('Preschool N56', 'Taylor & Francis Publishing');
INSERT INTO books VALUES ('Early Childhood Education N9', 'Prentice Hall');
INSERT INTO books VALUES ('Know how to educate: guide for Parents and Teachers', 'McGraw Hill');