Database Normalisation

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Class
1i

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1 Hands-On

ISBN	Title	AuthorID	AuthorName	AuthorPhone	PubID	PublisherName	PublisherPhone	Price
0-103-45678-9	Iliad	3	Homer	333-333-3333	1	Big House	123-456-7890	$25.00
0-12-333433-3	On Liberty	8	Mill	888-888-8888	1	Big House	123-456-7890	$25.00
0-91-335678-7	Fairie Queene	7	Spencer	777-777-7777	1	Big House	123-456-7890	$15.00
0-99-999999-9	Emma	1	Bronte	111-111-1111	1	Big House	123-456-7890	$20.00
1-1111-1111-1	C++	4	Roman	444-444-4444	1	Big House	123-456-7890	$29.95
1-22-233700-0	Visual Basic	4	Roman	444-444-4444	1	Big House	123-456-7890	$25.00
0-123-45678-0	Ulysses	6	Joyce	666-666-6666	2	Alpha Press	999-999-9999	$34.00
0-555-55555-9	MacBeth	5	Shakespeare	555-555-5555	2	Alpha Press	999-999-9999	$12.00
0-91-045678-5	Hamlet	5	Shakespeare	555-555-5555	2	Alpha Press	999-999-9999	$20.00
0-99-777777-7	King Lear	5	Shakespeare	555-555-5555	2	Alpha Press	999-999-9999	$49.00
0-11-345678-9	Moby Dick	2	Melville	222-222-2222	3	Small House	714-000-0000	$49.00
0-12-345678-9	Jane Eyre	1	Bronte	111-111-1111	3	Small House	714-000-0000	$49.00
0-321-32132-1	Balloon	11	Snoopy	321-321-2222	3	Small House	714-000-0000	$34.00
0-321-32132-1	Balloon	12	Grumpy	321-321-0000	3	Small House	714-000-0000	$34.00
0-321-32132-1	Balloon	13	Sleepy	321-321-1111	3	Small House	714-000-0000	$34.00
0-55-123456-9	Main Street	9	Smith	123-222-2222	3	Small House	714-000-0000	$22.95
0-55-123456-9	Main Street	10	Jones	123-333-3333	3	Small House	714-000-0000	$22.95

Figure 1: Un-normalised BOOKSHELF

1. Convert the table into normalised relation and give proper names for the tables

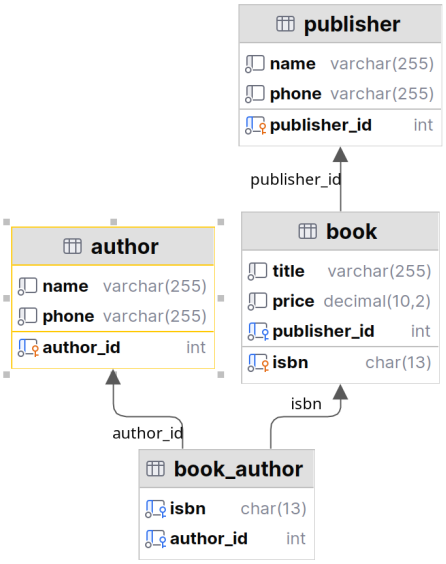

Figure 2: Normalised BOOKSHELF

	author_id	name	phone
1	1	Bronte	111-111-1111
2	2	Melville	222-222-2222
3	3	Homer	333-333-3333
4	4	Roman	444-444-4444
5	5	Shakespeare	555-555-5555
6	6	Joyce	666-666-6666
7	7	Spencer	777-777-7777
8	8	Mill	888-888-8888
9	9	Smith	123-222-2222
10	10	Jones	123-333-3333
11	11	Snoopy	321-321-2222
12	12	Grumpy	321-321-0000
13	13	Sleepy	321-321-1111

Figure 3: Author table

	isbn	title	price	publisher_id
1	0-103-45678-9	Iliad	25.00	1
2	0-11-345678-9	Moby Dick	49.00	3
3	0-12-333433-3	On Liberty	25.00	1
4	0-12-345678-9	Jane Eyre	49.00	3
5	0-123-45678-0	Ulysses	34.00	2
6	0-321-32132-1	Balloon	34.00	3
7	0-55-123456-9	Main Street	22.95	3
8	0-555-55555-9	MacBeth	12.00	2
9	0-91-045678-5	Hamlet	20.00	2
10	0-91-335678-7	Fairie Queene	15.00	1
11	0-99-777777-7	King Lear	49.00	2
12	0-99-999999-9	Emma	20.00	1
13	1-1111-1111-1	C++	29.95	1
14	1-22-233700-0	Visual Basic	25.00	1

Figure 4: Book table

	publisher_id	name	phone
1	1	Big House	123-456-7890
2	2	Alpha Press	999-999-9999
3	3	Small House	714-000-0000

Figure 5: Publisher table

	isbn	author_id
1	0-103-45678-9	3
2	0-12-333433-3	8
3	0-91-335678-7	7
4	0-99-999999-9	1
5	1-1111-1111-1	4
6	1-22-233700-0	4
7	0-123-45678-0	6
8	0-555-55555-9	5
9	0-91-045678-5	5
10	0-99-777777-7	5
11	0-11-345678-9	2
12	0-12-345678-9	1
13	0-321-32132-1	11
14	0-321-32132-1	12
15	0-321-32132-1	13
16	0-55-123456-9	9
17	0-55-123456-9	10

Figure 6: Book-Author table

2. Check if your new database can answer the following queries:

   (a) Regenerate the original table as shown above using the normalised database

```
CREATE TABLE book
(
    isbn         CHAR(13)       NOT NULL PRIMARY KEY,
    title        VARCHAR(255)   NOT NULL,
    price        DECIMAL(10, 2) NOT NULL,
    publisher_id INT            NOT NULL
);

CREATE TABLE author
(
    author_id INT          NOT NULL PRIMARY KEY,
    name      VARCHAR(255) NOT NULL,
    phone     VARCHAR(255) NOT NULL
);

CREATE TABLE book_author
(
    isbn      CHAR(13) NOT NULL,
    author_id INT      NOT NULL
);

CREATE TABLE publisher
(
    publisher_id INT          NOT NULL PRIMARY KEY,
    name         VARCHAR(255) NOT NULL,
    phone        VARCHAR(255) NOT NULL
);

ALTER TABLE book
    ADD FOREIGN KEY (publisher_id) REFERENCES publisher (publisher_id);
ALTER TABLE book_author
    ADD FOREIGN KEY (isbn) REFERENCES book (isbn);
ALTER TABLE book_author
    ADD FOREIGN KEY (author_id) REFERENCES author (author_id);
```

(b) Display all books authored by Shakespeare

```sql
SELECT
    book.isbn as isbn, title, publisher.name as publisher_name, price
FROM
    book_author
INNER JOIN book
    ON book_author.isbn = book.isbn
INNER JOIN author
    ON book_author.author_id = author.author_id
INNER JOIN publisher
    ON book.publisher_id = publisher.publisher_id
WHERE author.name = 'Shakespeare';
```

	isbn	title	publisher_name	price
1	0-555-55555-9	MacBeth	Alpha Press	12.00
2	0-91-045678-5	Hamlet	Alpha Press	20.00
3	0-99-777777-7	King Lear	Alpha Press	49.00

Figure 7: Query Result

(c) Count the number of Books authored by each author. (AuthorID, AuthorName, NumberofBooks)

```
SELECT
    author.author_id as author_id,
    author.name as author_name,
    COUNT(author.name) as number_of_books
FROM book_author
INNER JOIN book
    ON book_author.isbn = book.isbn
INNER JOIN author
    ON book_author.author_id = author.author_id
GROUP BY author.author_id;
```

	author_id	author_name	number_of_books
1	1	Bronte	2
2	2	Melville	1
3	3	Homer	1
4	4	Roman	2
5	5	Shakespeare	3
6	6	Joyce	1
7	7	Spencer	1
8	8	Mill	1
9	9	Smith	1
10	10	Jones	1
11	11	Snoopy	1
12	12	Grumpy	1
13	13	Sleepy	1

Figure 8: Query Result

(d) What are the books authored by Shakespeare or Roman, displaying the ISBN, Title, Authorname, PublisherName, Price

```sql
SELECT
    book.isbn as isbn,
    title,
    author.name as author_name,
    publisher.name as publisher_name,
    price
FROM
    book_author
INNER JOIN book
    ON book_author.isbn = book.isbn
INNER JOIN author
    ON book_author.author_id = author.author_id
INNER JOIN publisher
    ON book.publisher_id = publisher.publisher_id
WHERE author.name = 'Shakespeare' or author.name = 'Roman';
```

	isbn	title	author_name	publisher_name	price
1	1-1111-1111-1	C++	Roman	Big House	29.95
2	1-22-233700-0	Visual Basic	Roman	Big House	25.00
3	0-555-55555-9	MacBeth	Shakespeare	Alpha Press	12.00
4	0-91-045678-5	Hamlet	Shakespeare	Alpha Press	20.00
5	0-99-777777-7	King Lear	Shakespeare	Alpha Press	49.00

Figure 9: Query Result

(e) Display the books (ISBN, Title, AuthorID, AuthorName) publised by Small

```
SELECT
    book.isbn as isbn,
    title,
    author.author_id as author_id,
    author.name as author_name
FROM
    book_author
INNER JOIN book
ON book_author.isbn = book.isbn
INNER JOIN author
ON book_author.author_id = author.author_id
INNER JOIN publisher
        ON book.publisher_id = publisher.publisher_id
WHERE publisher.name = 'Small House';
```

	isbn	title	author_id	author_name
1	0-11-345678-9	Moby Dick	2	Melville
2	0-12-345678-9	Jane Eyre	1	Bronte
3	0-321-32132-1	Balloon	11	Snoopy
4	0-321-32132-1	Balloon	12	Grumpy
5	0-321-32132-1	Balloon	13	Sleepy
6	0-55-123456-9	Main Street	9	Smith
7	0-55-123456-9	Main Street	10	Jones

Figure 10: Query Result

(f) What is the total price of the books published by each publisher. (PubID, PublisherName, TotalPrice)

```
SELECT
    publisher.publisher_id as publisher_id,
    publisher.name as publisher_name,
    SUM(book.price) as book_price
FROM
    book
INNER JOIN publisher
        ON book.publisher_id = publisher.publisher_id
GROUP BY publisher.publisher_id;
```

	publisher_id	publisher_name	book_price
1	1	Big House	139.95
2	2	Alpha Press	115.00
3	3	Small House	154.95

Figure 11: Query Result

(g) How many books were published by each publisher? (PubID, PublisherName, NumberofBooks)

```
SELECT
    publisher.publisher_id as publisher_id,
    publisher.name as publisher_name,
    COUNT(publisher.publisher_id) as number_of_books
FROM
    book
INNER JOIN publisher
   ON book.publisher_id = publisher.publisher_id
GROUP BY publisher.publisher_id;
```

	publisher_id	publisher_name	number_of_books
1	1	Big House	6
2	2	Alpha Press	4
3	3	Small House	4

Figure 12: Query Result