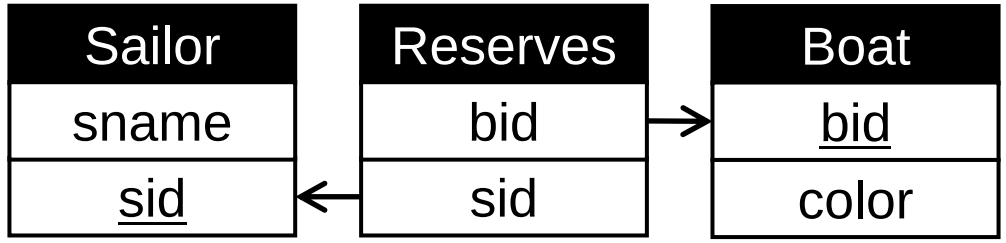
Recognizing relational patterns in SQL and Diagrams

- The next 6 pages will introduce you to 4 relational query patterns. We will show you how they are expressed in SQL and with Diagrams.

- Use the buttons below or the keyboard's left and right keys to navigate through the tutorial.

4 relational patterns

- This study measures whether you can quickly and correctly recognize 4 different relational patterns. They will be shown using many database schemas.
- This tutorial uses a Sailor / Reserves / Boat database:



- We will show these four relational query patterns using SQL and Diagrams:

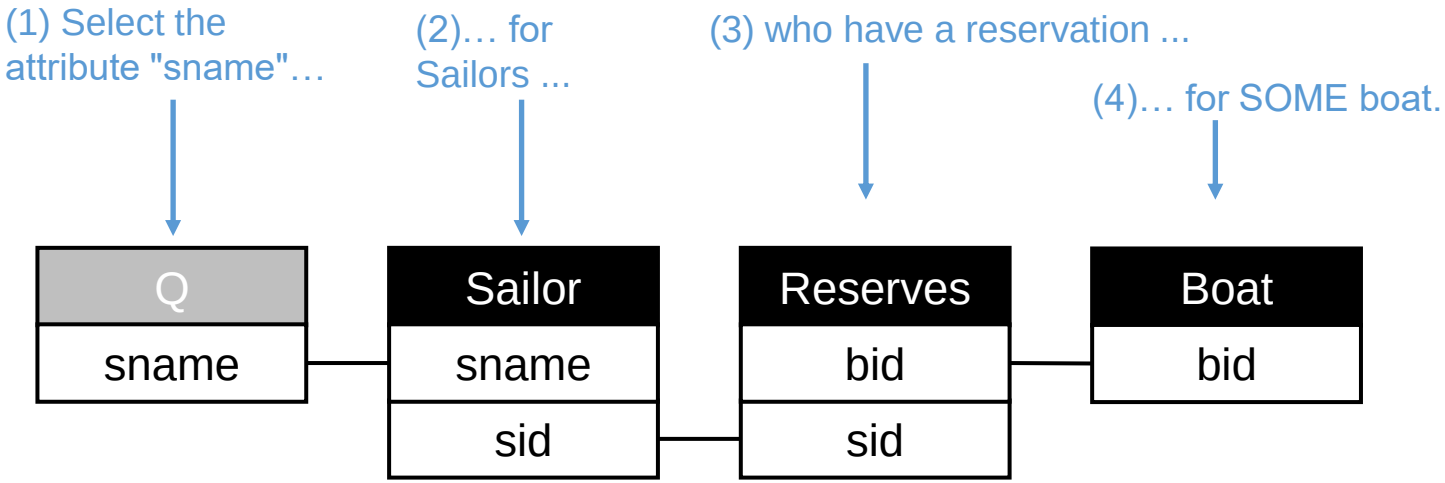
1. Find sailors who have reserved **some** boat.
2. Find sailors who have **not** reserved **any** boat.
3. Find sailors who have **not** reserved **all** boats.
4. Find sailors who have reserved **all** boats.

1. Find sailors who have reserved **some** boat.

SQL

```
SELECT S.sname
FROM Sailor S
WHERE EXISTS(
  SELECT *
  FROM Reserves R
  WHERE R.sid = S.sid
  AND EXISTS(
    SELECT *
    FROM Boat B
    WHERE B.bid = R.bid))
```

The Diagram for a query is read as follows:

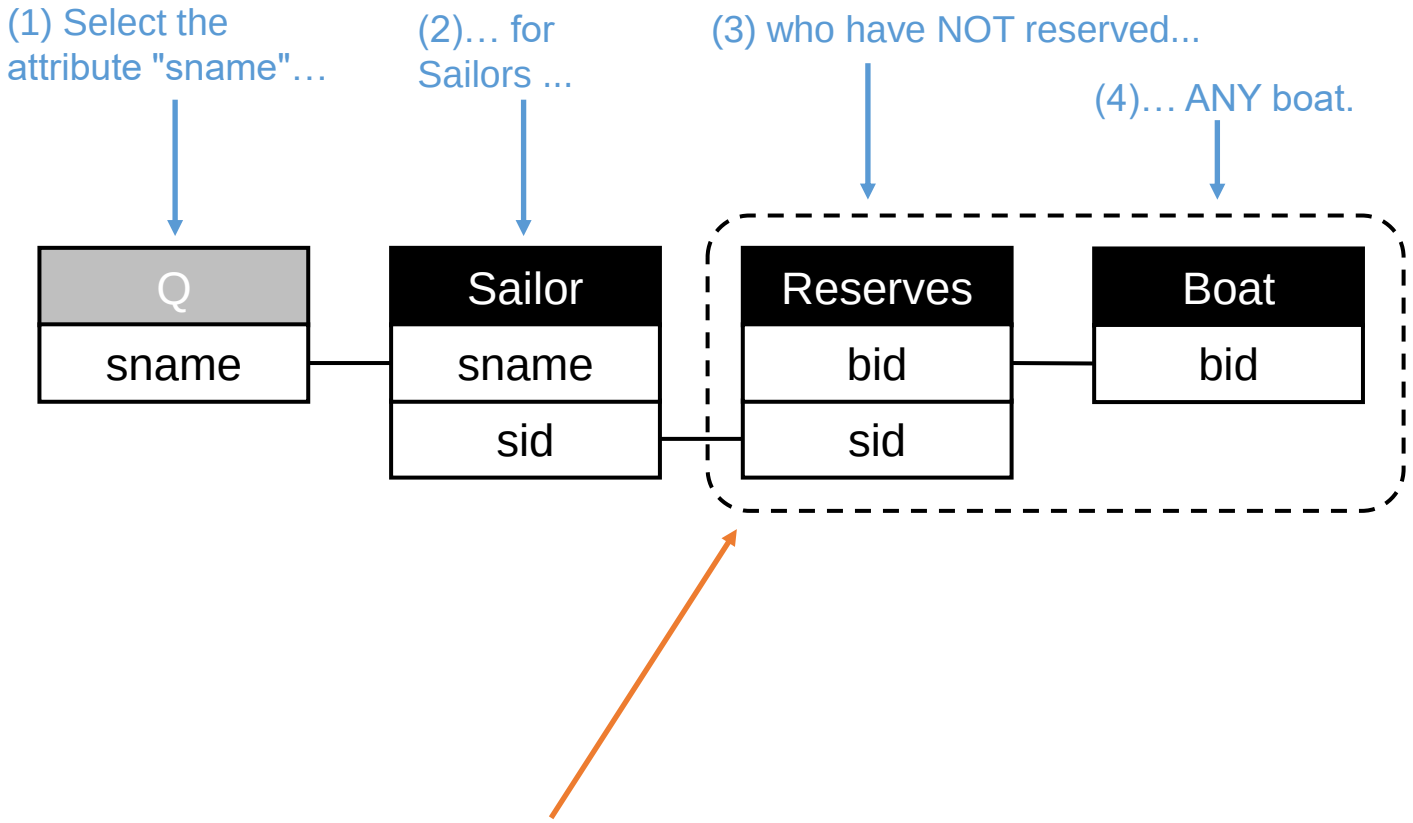


2. Find sailors who have **not** reserved **any** boat.

SQL

```
SELECT S.sname
FROM Sailor S
WHERE NOT EXISTS(
  SELECT *
  FROM Reserves R
  WHERE R.sid = S.sid
  AND EXISTS(
    SELECT *
    FROM Boat B
    WHERE B.bid = R.bid))
```

The Diagram for a query is read as follows:



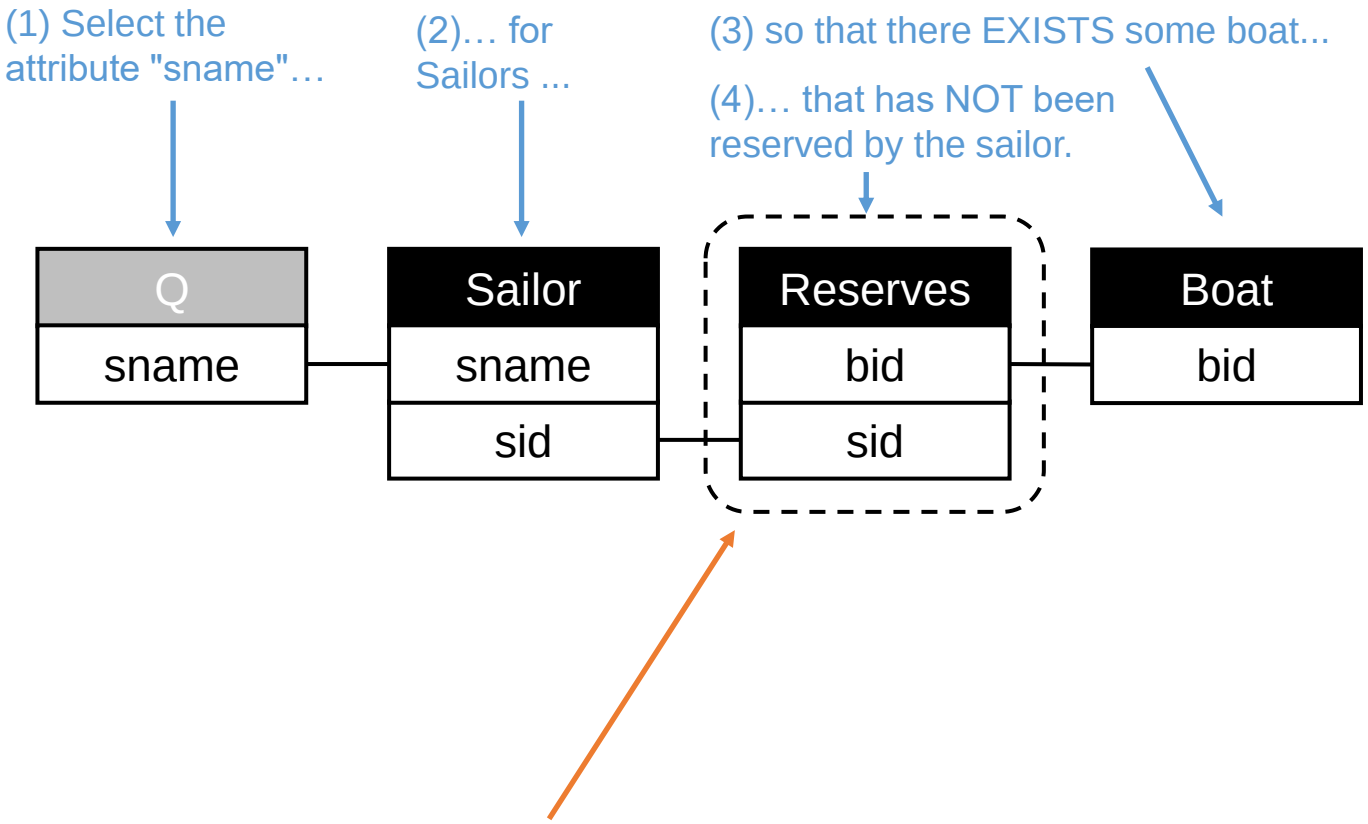
Dashed lines represent logical "NOT EXISTS" relationships.
Here is means that there does not exist any reservation for any boat.

3. Find sailors who have **not** reserved **all** boats.

SQL

```
SELECT S.sname
FROM Sailor S
WHERE EXISTS(
  SELECT *
  FROM Boat B
  WHERE NOT EXISTS(
    SELECT *
    FROM Reserves R
    WHERE R.bid = B.bid
    AND R.sid = S.sid))
```

The Diagram for a query is read as follows:



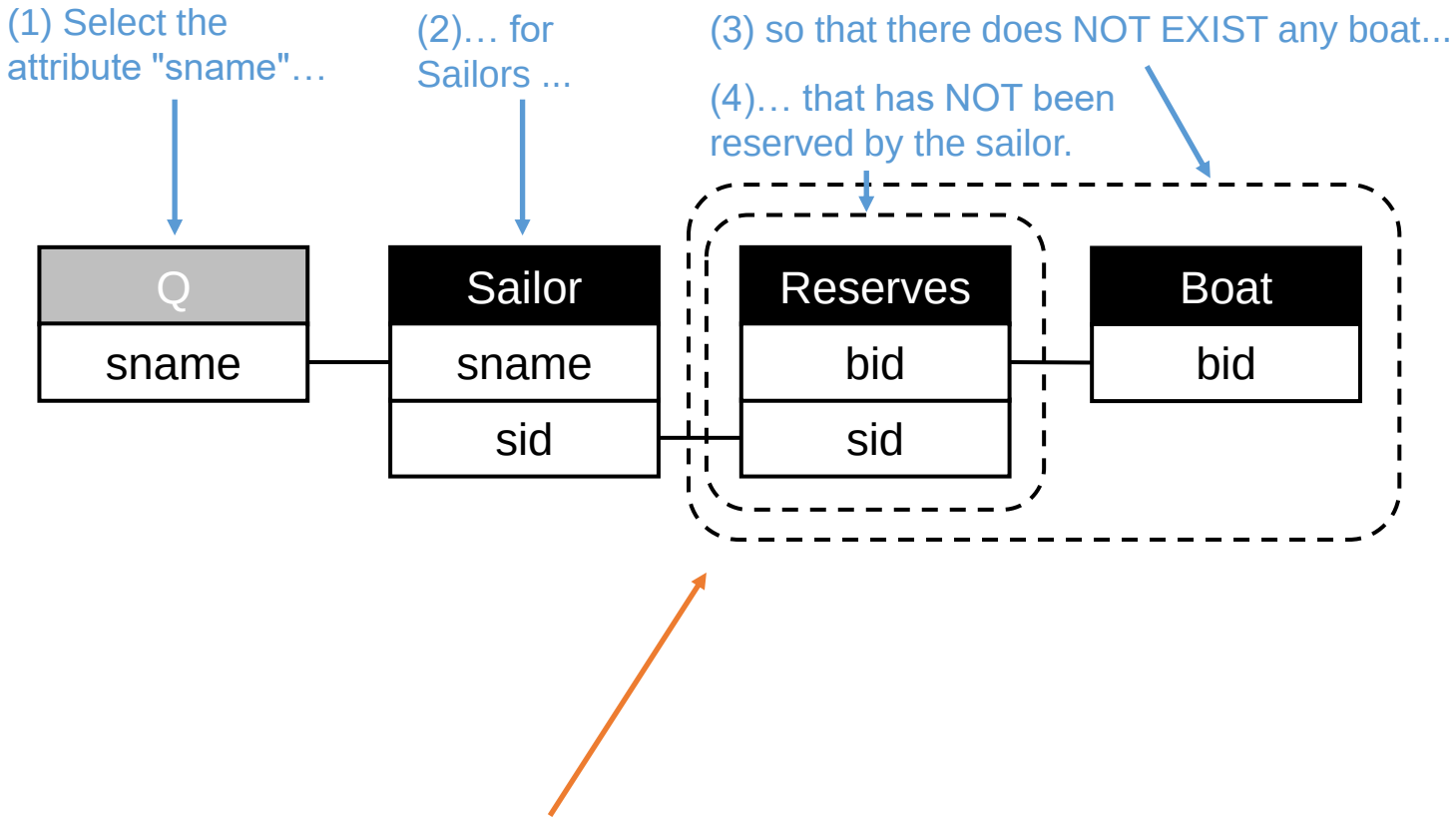
Here the negation box means that there "EXISTS some boat which the sailor has NOT reserved" (thus that the sailor has NOT reserved ALL boats).

4. Find sailors who have reserved **all** boats.

SQL

```
SELECT S.sname
FROM Sailor S
WHERE NOT EXISTS(
  SELECT *
  FROM Boat B
  WHERE NOT EXISTS(
    SELECT *
    FROM Reserves R
    WHERE R.bid = B.bid
    AND R.sid = S.sid))
```

The Diagram for a query is read as follows:

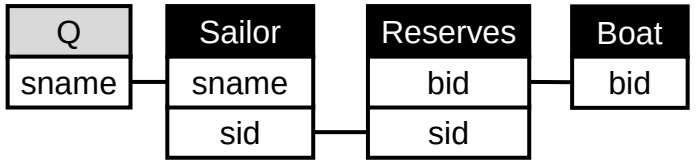


SQL and diagrams cannot express "FOR ALL" statements directly (here we are trying to express that "ALL boats have been reserved by a sailor"). Instead, we use a double negation ("there does NOT EXIST any boat that was NOT reserved by a sailor")

Overview of the 4 query patterns

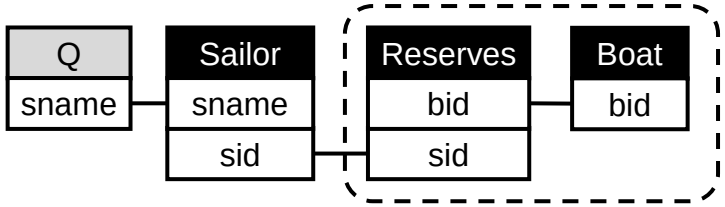
```
SELECT S.sname
FROM Sailor S
WHERE EXISTS(
  SELECT *
  FROM Reserves R
  AND R.sid = S.sid
  WHERE EXISTS(
    SELECT *
    FROM Boat B
    WHERE B.bid = R.bid))
```

Find sailors who have reserved **some** boat.



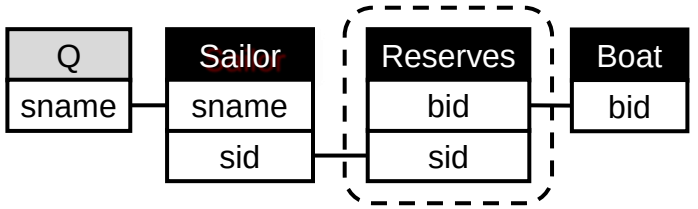

```
SELECT S.sname
FROM Sailor S
WHERE NOT EXISTS(
  SELECT *
  FROM Reserves R
  AND R.sid = S.sid
  WHERE EXISTS(
    SELECT *
    FROM Boat B
    WHERE B.bid = R.bid))
```

Find sailors who have **not** reserved **any** boat.



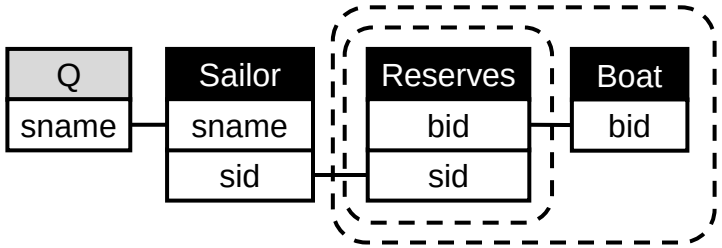

```
SELECT S.sname
FROM Sailor S
WHERE EXISTS(
  SELECT *
  FROM Boat B
  WHERE NOT EXISTS(
    SELECT *
    FROM Reserves R
    WHERE R.bid = B.bid
    AND R.sid = S.sid))
```

Find sailors who have **not** reserved **all** boats.




```
SELECT S.sname
FROM Sailor S
WHERE NOT EXISTS(
  SELECT *
  FROM Boat B
  WHERE NOT EXISTS(
    SELECT *
    FROM Reserves R
    WHERE R.bid = B.bid
    AND R.sid = S.sid))
```

Find sailors who have reserved **all** boats.



Recognizing relational patterns in SQL and Diagrams

You can always go back to the tutorial and the pattern overview while answering the questions.

To do that, click on the Tutorial PDF Link at the bottom of the test.