

SQL problem

Exams

student	score
Alice	10
Alice	90
Bob	20
Bob	80
Carl	null

alice	max - min	80
bob		60
carl	null	

```
select student
from exams
group by student
having max(score) - min(score) >= all(
    select max(score) - min(score)
    from exams

    group by student
)
```

Without WHERE score IS NOT NULL, we lose Alice because her differential is not \geq null.

Transactions
Joe Sells

beer	price
Bud	2.5
Miller	3

a) serializable don't care

Stage	Sally sees	Joe sees	Committed	Uncommitted
initial	b=2.5, m=3	b=2.5, m=3	b=2.5, m=3	
S1 (max)	b=2.5, m=3	b=2.5, m=3	b=2.5, m=3	
S3 (del)	b=2.5, m=3	nothing	b=2.5, m=3	del(b,m)
S4 (ins)	b=2.5, m=3	h=3.5	b=2.5, m=3	del(b,m); h=3.5
Joe commits	b=2.5, m=3		h=3.5	
S2 (min)	b=2.5, m=3		h=3.5	
Sally commits			b=2.5, m=3	

b) repeatable read don't care

Stage	Sally sees	Joe sees	Committed	Uncommitted
initial	b=2.5, m=3	b=2.5, m=3	b=2.5, m=3	
S1 (max)	b=2.5, m=3	b=2.5, m=3	b=2.5, m=3	
S3 (del)	b=2.5, m=3	nothing	b=2.5, m=3	del(b,m)
S4 (ins)	b=2.5, m=3	h=3.5	b=2.5, m=3	del(b,m); h=3.5
Joe commits	b=2.5, m=3, h=3.5		h=3.5	
S2 (min)	b=2.5, m=3, h=3.5		h=3.5	
Sally commits			b=2.5, m=3, h=3.5	

c) read committed don't care

Stage	Sally sees	Joe sees	Committed	Uncommitted
initial	b=2.5, m=3	b=2.5, m=3	b=2.5, m=3	
S1 (max)	b=2.5, m=3	b=2.5, m=3	b=2.5, m=3	
S3 (del)	b=2.5, m=3	nothing	b=2.5, m=3	del(b,m)
S4 (ins)	b=2.5, m=3	h=3.5	b=2.5, m=3	del(b,m); h=3.5
Joe commits	h=3.5		h=3.5	
S2 (min)	h=3.5		h=3.5	
Sally commits			h=3.5	

d) read uncommitted don't care

Stage	Sally sees	Joe sees	Committed	Uncommitted
initial	b=2.5, m=3	b=2.5, m=3	b=2.5, m=3	
S1 (max)	b=2.5, m=3	b=2.5, m=3	b=2.5, m=3	
S3 (del)	nothing	nothing	b=2.5, m=3	del(b,m)
S4 (ins)	h=3.5	h=3.5	b=2.5, m=3	del(b,m); h=3.5
Joe commits	h=3.5		h=3.5	
S2 (min)	h=3.5		h=3.5	
Sally commits			h=3.5	

DTD1

<SP>

```
<Project>
  <Student StudID = "0518">
  </Student>
  <Student StudID = "0529">
  </Student>
</Project>
<Project>
  <Student StudID = "0530">
  </Student>
</Project>
```

</SP>

DTD2

<SP>

```
<Student>
  <Project ProjNum = "123">
  </Project>
</Student>
<Student>
  <Project ProjNum = "456">
  </Project>
</Student>
```

</SP>

DTD3

<SP>

```
<Student StudID = "0518">
</Student>
<Student StudID = "0529">
</Student>
<Project stud = "0518">
</Project>
<Project stud = "0518">
</Project>
```

</SP>

DTD4

<SP>

```
<Project ProjNum = "123">
</Project>
<Project ProjNum = "456">
</Project>
<Project ProjNum = "789">
</Project>
<Student proj = "123 456">
</Student>
<Student proj = "123">
</Student>
```

</SP>