561hw5

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1 Q1

$\pi_{s.sid,s.sname,b.bookno,b.title}((Student_s \times Book_b)$
$\bowtie_{(s.sname='Eric' \vee s.sname='Anna') \wedge s.sid=t.sid \wedge b.price>20 \wedge t.bookno=b.bookno})(buys_t)$

$\pi_{s.sid,s.sname,b.bookno,b.title}$
$(\sigma_{(s.sname='Eric' \vee s.sname='Anna') \wedge s.sid=t.sid \wedge b.price>20 \wedge t.bookno=b.bookno})(Student_s \times Book_b \times buys_t)$

$\pi_{s.sid,s.sname,b.bookno,b.title}$
$(\sigma_{s.sid=t.sid \wedge b.price>20 \wedge t.bookno=b.bookno})(\sigma_{(s.sname='Eric' \vee s.sname='Anna')} Student_s \times Book_b \times buys_t)$

$\pi_{s.sid,s.sname,b.bookno,b.title}$
$(\sigma_{s.sid=t.sid \wedge t.bookno=b.bookno})(\sigma_{(s.sname='Eric' \vee s.sname='Anna')} Student_s \times \sigma_{(b.price>20)} Book_b \times buys_t)$

$\pi_{sid,sname,bookno,title}(\sigma_{(s.sname='Eric' \vee s.sname='Anna')} Student_s \bowtie_{s.sid=t.sid} (\sigma_{(b.price>20)} Book_b \bowtie buys_t))$

2 Q2

$\pi_{s.sid}((Student_s \times Book_b)$
$\bowtie_{(s.sname='Eric' \vee s.sname='Anna') \wedge s.sid=t.sid \wedge b.price>20 \wedge t.bookno=b.bookno})(buys_t)$

$\pi_{s.sid}$
$(\sigma_{(s.sid=t.sid \wedge t.bookno=b.bookno)}(\sigma_{(s.sname='Eric' \vee s.sname='Anna')} Student_s \times \sigma_{(b.price>20)} Book_b \times buys_t)$

$(\pi_{sid}(\sigma_{(s.sname='Eric' \vee s.sname='Anna')} Student_s) \cap (\pi_{sid}(buys_t \ltimes \sigma_{(b.price>20)} Book_b))$

3 Q3

$\pi_{(s.sid,b1.price,b2.price)}((\pi_{sid}(\sigma_{name\neq Eric}(Student)))\times Book_{b_1} \bowtie_{(b1.bookno\neq b2.bookno \wedge b1.price>60 and b2.price\geq 50)} Book_{b_2} \bowtie_{(t1.bookno=b1.bookno \wedge t1.sid=s.sid)} buys_{t_1} \bowtie_{(t2.bookno=b2.bookno \wedge t2.sid=s.sid)} buys_{t_2})$

$\pi_{(s.sid,b1.price,b2.price)}((\pi_{sid}(\sigma_{name\neq Eric}(Student)))\times \sigma_{b1.price>60} Book_{b_1} \bowtie_{(b1.bookno\neq b2.bookno)} \sigma_{b2.price\geq 50} Book_{b_2} \bowtie_{(t1.bookno=b1.bookno \wedge t1.sid=s.sid)} buys_{t_1} \bowtie_{(t2.bookno=b2.bookno \wedge t2.sid=s.sid)} buys_{t_2})$

$\pi_{sid,b_1.price,b_2.price}((\sigma_{name\neq Eric}(Student)) \bowtie (Buys \bowtie \sigma_{b1.price>60}(Book_{b_1}) \bowtie_{b1.bookno\neq b2.bookno} (Buys \bowtie \sigma_{b2.price\geq 50}(Book_{b_2}))$
)

4 Q4

$\pi_{sid}(\pi_{sid,sname}(Student) - \pi_{sid,sname}(Student \bowtie_{sid=sid} (Buys) \bowtie_{Bookno=bookno \wedge price>50} (Book)))$

$\pi_{sid}(Student) - \pi_{sid}(Student \bowtie_{sid=sid} (Buys) \bowtie_{Bookno=bookno \wedge price>50} (Book))$

$\pi_{sid}(Student) - \pi_{sid}((Buys) \bowtie_{Bookno=bookno \wedge price>50} (Book))$

$\pi_{sid}(Student) - \pi_{sid}((Buys) \bowtie_{Bookno=bookno} \pi_{bookno}(\sigma_{price>50}(Book)))$

$\pi_{sid}(Student) - \pi_{sid}((Buys) \ltimes \pi_{bookno}(\sigma_{price>50}(Book)))$

5 Q5

$\pi_{sid,sname}(\pi_{sid,sname,2007}(student \times book) \cap \pi_{sid,sname,bookno}((student \times book) \bowtie_{sid=sid \wedge bookno=bookno \wedge price<25} buys))$

$\pi_{sid,sname}(student) \cap \pi_{sid,sname}((student \times \sigma_{price<25}(book)) \ltimes_{sid=sid \wedge bookno=bookno} buys)$

6 Q6

$\pi_{bookno}(\pi_{s.sid,s.sname,b.BookNo,b.title}(student_s \times book_b) -$
$\pi_{s.sid,s.sname,b.BookNo,b.title}((student_s \times book) \bowtie_{s.sid=t.sid \wedge t.bookno=b.bookno \wedge price<20}$
$buys))$

$\pi_{bookno}(\pi_{s.sid,s.sname,b.BookNo,b.title}(student_s \times book_b) -$
$\pi_{s.sid,s.sname,b.BookNo,b.title}((student_s \times \pi_{price<20}book) \bowtie_{s.sid=t.sid \wedge t.bookno=b.bookno}$
$buys))$

$\pi_{bookno}(\pi_{s.sid,b.BookNo}(student_s \times book_b) -$
$\pi_{s.sid,b.BookNo}((\pi_{s.sid=t.sid \wedge t.bookno=b.bookno}buys) \ltimes \pi_{price<20}book))$

7 Q7

(student s1 s2 bought same book and that book cost more than 80) $\subseteq (s1, s2boughtsamebook)$

(the s1 <> s2 and s1 = buys implys to s1 = buys, we can remove s2)
since buys.sid belongs to student.sid we can use buys.sid
$\pi_{sid}(tudent) - \pi_{sid}(buys)$