


# Quiz 3 Relational Alegbra

**Due** Sep 20 at 10:25am      **Points** 100      **Questions** 5  
**Available** after Sep 20 at 10am      **Time Limit** None

## Instructions

This quiz is 25 minutes long and contains only multiple choice questions. Make sure to submit before time is up.

**Having an issue with the quiz?** Please send an email to the course staff ([rkheni@wpi.edu](mailto:rkheni@wpi.edu)) (<mailto:cvieira@wpi.edu>) with "CS542 Quiz" included in the subject line any time during the quiz. If you require help through zoom then please join the zoom link <https://wpi.zoom.us/j/2094237642>  (<https://wpi.zoom.us/j/2094237642>).

## Attempt History

	Attempt	Time	Score
LATEST	<a href="#">Attempt 1</a>	23 minutes	20 out of 100

Score for this quiz: **20** out of 100

Submitted Sep 20 at 10:23am

This attempt took 23 minutes.

### Question 1

0 / 20 pts

Database describing “ships” that participate in wars. Each ship belongs to a specific “class”. For each ShipClass, we maintain some basic information. Then, there are many “missions” stored in the database. We store in “Results”, which ship participated in which mission, and what was the ship’s status, i.e., OK, Damaged, or Sunk.

**ShipClass**(name, type, country, numGuns, designYear, weight)

ShortName “C”

**Ships**(shipName, className, builtYear)

ShortName "S"

**Missions**(missionName, date)

ShortName "M"

**Results**(shipName, missionName, status)

ShortName "R"

**Primary keys are underlined**

**Choose the relational algebra statement that best selects the class name of the ship named 'Blue Shark'.**

Hint: if multiple queries are valid, the best one is the query that avoids unnecessary operations, such as joins.

☐  $\pi_{className}(\sigma_{shipName='Blue Shark'}(C \bowtie S))$

☐  $\pi_{className}(\sigma_{shipName='Blue Shark'}(C_{name=shipName} \bowtie (S)))$

**Correct Answer**

☐  $\pi_{className}(\sigma_{shipName='Blue Shark'}(S))$

☐  $\sigma_{shipName='Blue Shark'}(\pi_{className}(S))$

**You Answered**

☒  $\sigma_{shipName='Blue Shark'}(S)$

This will select the right data, but it will output all columns. We only want to see the className column!

## Question 2

0 / 20 pts

Database describing "ships" that participate in wars. Each ship belongs to a specific "class". For each ShipClass, we maintain some basic information. Then, there are many "missions" stored in the database. We store in

“Results”, which ship participated in which mission, and what was the ship’s status, i.e., OK, Damaged, or Sunk.

**ShipClass**(name, type, country, numGuns, designYear, weight)

ShortName “C”

**Ships**(shipName, className, builtYear)

ShortName “S”

**Missions**(missionName, date)

ShortName “M”

**Results**(shipName, missionName, status)

ShortName “R”

**Primary keys are underlined**

**Choose the relational algebra statement that best reports the name of each mission took place after Jan2010 along with the number of ships that participated in that mission.**

Hint: if multiple queries are valid, the best one is the query that avoids unnecessary operations, such as joins.

☐  $\gamma_{\text{missionName, CNT} \leftarrow \text{count}(\text{shipName})} (S \bowtie \sigma_{\text{date} > \text{Jan-2010}}(M))$

☐  $\sigma_{\text{date} > \text{Jan-2010}} (\gamma_{\text{missionName, CNT} \leftarrow \text{count}(\text{shipName})} (R \bowtie M))$

☐  $\gamma_{\text{missionName, CNT} \leftarrow \text{count}(\text{shipName})} (R \bowtie \sigma_{\text{date} > \text{Jan-2010}}(M)) - \pi_{\text{missionName}} (\sigma_{\text{count}(\text{shipName}) = 0} (R \bowtie M))$

**Correct Answer**

☐  $\gamma_{\text{missionName, CNT} \leftarrow \text{count}(\text{shipName})} (R \bowtie \sigma_{\text{date} > \text{Jan-2010}}(M))$

**You Answered**

☒  $\sigma_{\text{date} > \text{Jan-2010}} (\gamma_{\text{missionName, date, CNT} \leftarrow \text{count}(\text{shipName})} (R \bowtie M))$

This aggregation reports too many columns. the date column is not supposed to be reported, only the mission name and number of ships should be reported.

### Question 3

20 / 20 pts

Database describing “ships” that participate in wars. Each ship belongs to a specific “class”. For each ShipClass, we maintain some basic information. Then, there are many “missions” stored in the database. We store in “Results”, which ship participated in which mission, and what was the ship’s status, i.e., OK, Damaged, or Sunk.

**ShipClass**(name, type, country, numGuns, designYear, weight)

ShortName “C”

**Ships**(shipName, className, builtYear)

ShortName “S”

**Missions**(missionName, date)

ShortName “M”

**Results**(shipName, missionName, status)

ShortName “R”

**Primary keys are underlined**

**Report the class names for which no ships participated in missions.**

Hint: if multiple queries are valid, the best one is the query that avoids unnecessary operations, such as joins.

Correct!

☒  $\pi_{\text{name} \leftarrow \text{className}}(\text{C}) - (\pi_{\text{className}}(\text{S} \bowtie \text{R}))$

☐  $\pi_{\text{className} \leftarrow \text{name}}(\text{C}) - (\pi_{\text{className}}(\text{S} \bowtie \text{M}))$

- ☐  $(\pi_{\text{className}}(S \bowtie R)) - (\pi_{\text{name} \leftarrow \text{className}}(C))$
- ☐  $\pi_{\text{className} \leftarrow \text{shipName}}(C) - (\pi_{\text{className}}(S \bowtie R))$

Question 4

0 / 20 pts

Given the following table:

S		
A	X	Z
2	18	Mike
2	20	John
5	30	Wang
7	40	JohnSmith

What is the output of the following relational algebra?

$\gamma_{A, \text{SumX} \leftarrow \text{SUM}(X)}(S)$

- ☐

SumX
108

Correct Answer

- ☐

A	SumX
2	38
5	30
7	40

You Answered

- ☒

A	SumX
16	108

A	SumX
18	2
20	2
30	5
40	7



The aggregation groups column A by value, then sums column B for each unique value of A. The output should have as many rows as there are unique values of A in S. Column A should contain these unique values, and column "SumX" should contain the aggregated sum.

### Question 5

0 / 20 pts

Given the following two tables:

R		
A	B	C
1	10	a
2	20	a
3	30	x
4	20	x

S	
A	X
2	18
2	20
5	30
7	40

**What is the output of the following relational algebra?**

$\delta(\pi_B(R)) \cup \pi_{B \leftarrow X}(S)$

orrect Answer

☐

B
10
20
30
18
40

☐

B
10
20
20
30
18
40

☐

B
10
20
20
30
18
20
30
40

You Answered

B
10
20
30
18
20
30
40



This is a union over sets, so no duplicates should be preserved. Why is this a union over sets?

$\delta(\pi_B(R))$  deletes duplicates and creates the set:

B
10
20
30

and  $\pi_B \leftarrow \chi(S)$  creates the set:

B
18
20
30
40

Quiz Score: **20** out of 100