

Date:

Name 1:

Name 2:

Answer the following questions in both relational algebra and SQL. The SQL must match the Relational Algebra. You can only use the operators discussed in class today.

Assume the following schema:

Classes(class, type, country, numGuns, bore, displacement)

Ships(shipname, class, launched)

Battles(battle, date)

Outcomes(shipname, battle, result)

1) List the **shipname** and **class** of ships that were sunk (result = 'sunk'). Answer this question with and without a join

$\pi_{\text{shipname}, \text{class}} [S \bowtie \sigma_{\text{result} = 'sunk'} O]$  or

$\pi_{\text{shipname}, \text{class}} S$   $\text{shipname} \in (\pi_{\text{shipname}} \sigma_{\text{result} = 'sunk'} O)$

2) List the **shipname** of ships that has never been in a battle. Answer this question with and without a join.

$\pi_{\text{shipname}} S - \pi_{\text{shipname}} O$

$\pi_{\text{shipname}} \sigma_{\text{battle is NULL}} [S \bowtie L O]$