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 that we have learned in class.

Assume the following schema:

Classes(class, type, country, numGuns, bore, displacement)
Ships(shipname, class, launched)
Battles(battle, date)
Outcomes(shipname, battle, result)

a) List the **shipname** of ships (in Ships) that have not been "sunk" in a Battle.

$$\Pi_{shipname} \ S \ - \ \Pi_{shipname} \ \sigma_{outcome = 'sunk'} \ O$$

select shipname from Ships EXCEPT

select shipname from Outcomes where
                        outcome = 'sunk';

b) List the **shipname** of ships that participated in both battles: "Yellow Sea" and "Tsushima".

$$(\Pi_{shipname} \ \sigma_{battle = 'Yellow Sea'} \ O) \cap$$
$$(\Pi_{shipname} \ \sigma_{battle = 'Tsushima'} \ O)$$

Select shipname from Outcomes where battle = 'Yellow Sea'
Select shipname from Outcomes where battle = 'Tsushima' INTERSECT

c) List the **shipname** of ships that were launched in 1912 or that were sunk in 1912.

ships
launched → $\Pi_{shipname} \ \sigma_{launched = 1912} \ S \ \cup$
in 1912.
$\Pi_{shipname} \ \sigma_{battle \ IN \ (\Pi_{battle} \ \sigma_{date = 1912} \ B) \ AND \ result = 'sunk'} \ O$

<u>find those from a 1912 battle.</u>   <u>were sunk.</u>

select shipname from ships where launched = 1912 UNION

select shipname from outcomes where battle IN

(select battle from Battles where date = 1912)
AND   result = 'sunk'