Warmup #1

Consider the relations $R(A, B), S(B, C)$ and $T(C, D)$, such that their sizes in tuples are respectively $3 \times 10^4$, $2 \times 10^5$ and $10^4$.
Moreover, consider the query:

$$\sigma_{R.A<40}(R \bowtie S \bowtie T)$$

Estimate the size of the resulting relation given the following 3 pieces of information:

1. Selectivity of $R.B = S.B$ is $\frac{1}{3}$
2. Selectivity of $S.C = T.C$ is $\frac{1}{10}$
3. Selectivity of $R.A < 40$ is $\frac{1}{2}$

Warmup #2

List the ACID properties. Explain the usefulness of each.

Warmup #3

Assume there is a database with 2 objects $A$ and $B$ and consider two transactions $T_1$ and $T_2$.
Give an example an example of schedule composed by reads and writes of $T_1$ and $T_2$ that result in a read-write conflict.

Problem 4 (To Be Graded)

Assume that the following 2 plans answer the same query:

Plan A:

$$(\sigma_{\text{att}=3}A) \bowtie B$$

Plan B:

$$\sigma_{\text{att}=3}(A \bowtie B)$$

Answer the following questions:

1. If you had no knowledge of the data which one would you pick? Why?
2. Is there a situation in which you would prefer the other plan? Why?
Problem 5 (To Be Graded)

Consider the following (incomplete) schedule S:

<table>
<thead>
<tr>
<th>T1</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>R(X)</td>
<td>W(X)</td>
</tr>
<tr>
<td>R(X)</td>
<td></td>
</tr>
<tr>
<td>W(Y)</td>
<td></td>
</tr>
<tr>
<td>commit</td>
<td>commit</td>
</tr>
</tbody>
</table>

1. is this schedule serializable?

2. is this schedule conflict serializable?

3. is this schedule cascadeless?

4. is this schedule recoverable?

Moreover, If your answer is yes find the smallest change in the schedule that would make the answer no. If the answer is no find the smallest change in the schedule that would make it yes. Explain in detail why this change would have the desired effect.