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You are the DB of a large company, with databases that have millions of tuples. You need to improve the performance of your DB.

For the following queries, what indexes will speed up their execution? Assume $R(a, b, c)$, $S(a, d, e)$

1. $\Pi_{a,b}R$

None .

(If index-only plans are allowed an index on (a,b) will help...

2. $\Pi_{a,b}\sigma_{b=3}R$

Index on b

3. $S \bowtie R$

At least one of the tables having an index on a

4. $\sigma_{a>10}R$

A dense index on a might help, but most likely too many tuples will be returned, making the index too expensive.

A sparse index on a (with R ordered by a will be ideal).