E10: Exercises on Selectivity Estimation

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Consider relation R(A, B, C). Assume:
- R contains 10000 records.
- A has 50 distinct values in the range 1..50
- B has 100 distinct values in the range 1..100

Estimate the sizes of the following operations assuming uniform distribution and independent conditions:

1. \( \sigma_{A=10} \) R
2. \( \sigma_{A=10} \land 20<B \) R
3. \( \sigma_{C=1} \) R
4. \( \sigma_{C=10} \land A=10 \) R
5. \( \sigma_{C=10} \land A=10 \land 20<B \) R
Exercise #1 (cont.)

1. $\sigma_{A=10} R$
   - $10000 \times (1 / 50) = 200$

2. $\sigma_{A=10 \land 20 < B} R$
   - Condition $A=10$, selectivity = $1 / 50$
   - Condition $20 < B$, selectivity = $80 / 100$
   - Overall selectivity = $(1 / 50) \times (80 / 100) = 8 / 500$
   - Estimated result size = 160

3. $\sigma_{C=1} R$
   - 1 (note that C is the primary key)
4. $\sigma_{C=10 \land A=10} R$
   - Condition $C=10$, selectivity = $1 / 10000$
   - Condition $A = 10$, selectivity = $1 / 50$
   - Overall selectivity = $1 / 10000 \times 1 / 50 = 1 / 500000$
   - Estimated result size = $10000 / 500000 = 0.02$

5. $\sigma_{C=10 \land A=10 \land 20<B} R$
   - Condition $C=10$, selectivity = $1 / 10000$
   - Condition $A = 10$, selectivity = $1 / 50$
   - Condition $20 < B$, selectivity = $80 / 100$
   - Overall selectivity = $1 / 10000 \times 1 / 50 \times 20 / 100 = 8 / 5000000$
   - Estimated result size = $0.016$