1. $\Pi_{\text{first\_name, middle\_initial, last\_name}}(\sigma_{\text{date} >= '2020\text{-}03\text{-}19'::\text{date}}(\text{data\_officer}))$

2. Not possible, no way to count in relational algebra

3. $\rho(\text{do1}, \Pi_{\text{appointed\_date, first\_name, middle\_initial, last\_name}}(\text{data\_officer}))$
$\rho(\text{do2}, \text{do1})$

$\text{do1} - \Pi_{\text{do1.appointed\_date, do1.first\_name, do1.middle\_initial, do1.last\_name}}(\text{do1} \bowtie_{\text{do1.appointed\_date} < \text{do2.appointed\_date}} \text{do2})$

4. $\rho(\text{doa1}, \Pi_{\text{officer\_id, allegation\_id}}(\text{data\_officerallegation}))$
$\rho(\text{doa2}, \text{doa1})$
$\rho(\text{doa3}, \text{doa1})$

$\Pi_{\text{id, first\_name, last\_name}}(\text{data\_officer}) \bowtie_{\text{id} = \text{doa1.officer\_id}}$

$\Pi_{\text{doa1.officer\_id}}((\text{doa1} \bowtie_{\text{doa1.officer\_id} = \text{doa2.officer\_id} \wedge \text{doa1.allegation\_id} < \text{doa2.allegation\_id}} \text{doa2}) \bowtie_{\text{doa2.officer\_id} = \text{doa3.officer\_id} \wedge \text{doa1.allegation\_id} < \text{doa3.allegation\_id} \wedge \text{doa2.allegation\_id} < \text{doa3.allegation\_id}} \text{doa3})$

5. Not possible, no way to sum or count in relational algebra

6. $\rho(\text{doa1}, \Pi_{\text{officer\_id, allegation\_id}}(\text{data\_officerallegation}))$
$\rho(\text{doa2}, \text{doa1})$
$\rho(\text{do1}, \Pi_{\text{officer\_id, lastunit}}(\text{data\_officer}))$; $\rho(\text{do2}, \text{do1})$
$\Pi_{\text{doa1.officer\_id, do1.lastunit, doa2.officer\_id, do2.lastunit}}(\sigma_{\text{do1.lastunit} != \text{do2.lastunit}}($

$\text{do2} \bowtie_{\text{do2.id} = \text{doa2.officer\_id}} ($ $\text{do1} \bowtie_{\text{do1.id} = \text{doa1.officer\_id}} ($

$\text{doa1} \bowtie_{\text{doa1.allegation\_id} = \text{doa2.allegation\_id} \wedge \text{doa1.officer\_id} < \text{doa2.officer\_id}} \text{doa2}))))$

7. Not possible no way to count or average in relational algebra

8. $\rho(do1, \pi_{rank, sustained\_count}(data\_officer))$
$\rho(do1, do2)$

$$do1 - \pi_{do1.rank, do1.sustained\_count}\left(\frac{do1}{do2}\right)^{\bowtie}_{do1.sustained\_count < do2.sustained\_count \wedge do1.rank = do2.rank}$$

9. Not possible no way to count in relational algebra

10. Not possible no way to count in relational algebra