4.

------

- Combine Donation, Contains, Object, and Tag tables.

Supergroup (CN, NID, DID, who, phrase) :=

Π*CN, NID, DID, who, phrase* (Donation ⋈ Contains ⋈ Object ⋈ Tag)

- Donations catalogued entirely by only one staff person

Catalogue\_by1staff (CN, NID, DID, who, phrase) :=

Supergroup - Π*a.CN, a.NID, a.DID, a.who, a.phrase* (σ*a.NID = b.NID ⋀ a.who ≠ b.who* (ρ*a* Supergroup x ρ*b* Supergroup))

- Same tags used for at least two objects

More\_than2object (CN, NID, DID, who, phrase) :=

Π*c.CN, c.NID, c.DID, c.who, c.phrase* (σ*c.NID = d.NID ⋀ c.phrase = d.phrase ⋀ c.CN ≠ d.CN* (ρ*c* Catalogue\_by1staff x ρ*d* Catalogue\_by1staff))

- Same two tags used by employee never used in other donations

NeverUsed (NID, DID, who, phrase) :=

Π*NID, DID, who, phrase* More\_than2object - Π*NID, DID, More\_than2object.who, More\_than2object.phrase* (σ*More\_than2object.NID ≠ SuperGroup.NID ⋀ More\_than2object.who = SuperGroup.who ⋀ More\_than2object.phrase = SuperGroup.phrase* (More\_than2object x SuperGroup))

Solution (NID, DID, who) :=

Π*NID, DID,who* NeverUsed

9.

- Pairs of staff who catalogued together for the same donation.

Pairs (SID1, SID2, email1, email2, NID) :=

Π*a.SID, b.SID, a.email, b.email, a.NID* (σ*a.NID = b.NID ⋀ a.SID ≠ b.SID* (ρ*a* Supergroup x ρ*b* Supergroup))

# Find all staff that paired with more than one person.

Not\_isolating (SID) :=

Π*c.SID1* (σ*c.SID1 = d.SID1 ⋀ c.SID2 ≠ d.SID2* (ρ*c* Pair x ρ*d* Pair))

# Eliminate previously mentioned staff to find the isolating ones.

Qualify\_paris (SID1, SID2, email1, email2, NID) :=

Pairs - Π*SID1, SID2, emial1, email2, NID* (σ*Pairs.SID1 = Not\_isolating.SID* (Pairs x Not\_islating)) - Π*SID1, SID2, emial1, email2, NID* (σ*Pairs.SID2 = Not\_isolating.SID* (Pairs x Not\_islating))

# Removing duplicates such as A, B and B, A.

Remove\_pseudo (SID1, SID2, email1, email2, NID) :=

Qualify\_pairs - Π*e.SID1, e.SID2, e.email1, e.email2, e.NID* (σ*e.SID1 = f.SID2 ⋀ e.SID2 = f.SID1* (ρ*e* Qualify\_pairs x ρ*f* Qualify\_pairs))

Result (SID1, SID2, email1, email2) :=

Π*SID1, SID2, email1, email2* Remove\_Pseudo

Part2

4.

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# Combine Staff, Object, SecondaryTerm, PrimaryTerm, and Chenhall tables.

Supergroup (CN, Object.type, Staff.type) :=

Π*Object.type, Staff.type* (Staff ⋈*Staff.SID = Object.who* Object ⋈ SecondaryTerm ⋈ PrimaryTerm ⋈ Chenhall)

# Restrict “temp” staff to catalogue at all.

Temp (CN) :=

Π*CN* (σ*Staff.type = “temp”* Supergroup)

# Restrict “volunteer” and “intern” staff to catalogue “any other category” only.

volunteer&intern (CN) :=

Π*CN* (σ*(Staff.type = “volunteer” or “intern”) ⋀ (Object.type ≠ “personal artifacts” or “architectural”)* Supergroup)

Result:

Temp ∪ volunteer&intern = ∅