

SFWRENG 3DB3 Assignment 2 - ii. Relational Algebra

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Nov 2021

q1

$$R_{q1} := \Pi_{FirstName, LastName, DateofBirth} (\sigma_{Date='07/22/2020' \text{ AND } (Date-18 \text{ years}) \geq DateofBirth} (Order))$$

q2

$$R_{21} := ((\rho_{OC}(OrderContains) \triangleright \triangleleft_{OC.OrderID=Order.OrderID} (Order)) \triangleright \triangleleft_{OC.ProductID=BT.ProductID} \rho_{BT}(BelongsTo))$$

$$R_{22} := R_{21} \triangleright \triangleleft_{BT.ProductCategoryID=Cate.ProductCategoryID} \rho_{Cate}(ProductCategory)$$

$$R_{q2} := \delta(\Pi_{OC.ProductID, Cate.Name} (\sigma_{Year(Order.Date-Order.DateofBirth) \geq 20 \text{ AND } Year(Order.Date-Order.DateofBirth) \leq 35} (R_{22})))$$

q3

$$R_{31} := \gamma_{FirstName, LastName, DateofBirth, COUNT(*) \rightarrow freq} (WriteReview)$$

$$R_{32} := \gamma_{FirstName, LastName, DateofBirth, MAX(freq) \rightarrow maxfreq} (R_{31})$$

$$R_{33} := \Pi_{FirstName, LastName, DateofBirth} (\delta(\sigma_{(R_{31}.freq=maxfreq)} (R_{31})))$$

$$R_{34} := \rho_p(Person) \triangleright \triangleleft_{p.FirstName=R_{33}.FirstName \text{ AND } p.LastName=R_{33}.LastName \text{ AND } p.DateofBirth=R_{33}.DateofBirth} (R_{33})$$

$$R_{q3} := \Pi_{FirstName, LastName, DateofBirth, City, Country} (R_{34})$$

q4a

$$R_{4a1} := \gamma_{COUNT(TrackingNumber) \rightarrow C1} (HasShipment)$$

$$R_{4a2} := \gamma_{COUNT(TrackingNumber) \rightarrow C2} (\delta(HasShipment))$$

$$R_{q4a} := C1 - C2$$

q4b

$$R_{4b1} := \Pi_{TrackingNumber, OrderID} (\sigma_{freq > 2} (\gamma_{TrackingNumber, OrderID, COUNT(TrackingNumber) \rightarrow freq} (HasShipment)))$$

$$R_{4b2} := \rho_o(Order) \triangleright \triangleleft_{o.FirstName=p.FirstName \text{ AND } o.LastName=p.LastName \text{ AND } o.DateofBirth=p.DateofBirth \text{ AND } C_4} (\rho_p(Person))$$

$$R_{4b3} := \Pi_{TrackingNumber} (\sigma_{h.TrackingNumber=R_{4b1}.TrackingNumber \text{ AND } h.OrderID=o.OrderID} (R_{4b1} \times \rho_h(HasShipment) \times R_{4b2}))$$

$$* C_4 = p.Country='Canada' \text{ AND } p.PostalCode \text{ LIKE } 'M\%'$$

q5

$$R_{q5} := \Pi_{ProductID} (\sigma_{times=1} (\gamma_{ProductID, COUNT(ProductID) \rightarrow times} (BelongsTo)))$$

q6a

$$R_{6a1} := \Pi_{Brand} (\sigma_{t1=1} (\gamma_{Brand, COUNT(ProductID) \rightarrow t1} (Product)))$$

$$R_{q6a} := \Pi_{Product.ProductID, Product.Name, R_{6a1}.Brand} (R_{6a1} \bowtie_{Product.Brand=R_{6a1}.Brand} (Product))$$

q6b

$$R_m := \Pi_{oc.OrderID, oc.Quantitu*pro.price \rightarrow RDR1} (\rho_{oc}(orderContains) \bowtie_{oc.ProductID=pro.ProductID} (\rho_{pro}(Product)))$$

$$R_{m1} := \gamma_{OrderID, SUM(RDR1) \rightarrow Sales} (R_m)$$

$$R_{m2} := \gamma_{MAX(Sales) \rightarrow maxsales} (R_{m1})$$

$$R_{q6b} := \sigma_{Sales \geq maxsales} (R_{m1})$$

q7

$$R_{71} := (\rho_{pro}(Product)) \bowtie_{oc.ProductID=pro.ProductID} (\rho_{oc}(orderContains)) \bowtie_{oc.OrderID=or.OrderID} (\rho_{or}(Order))$$

$$R_{72} := \sigma_{Date \geq '07/01/2020' \text{ AND } Date \leq '07/31/2020'} (R_{71})$$

$$R_{73} := \Pi_{oc.OrderID, oc.ProductID, pro.Price*oc.quantity \rightarrow LineSales, pro.StoreID} (R_{72})$$

$$R_{74} := \Pi_{R_{73}.StoreID, R_{73}.LineSales, Store.Description, Store.StartDate} (R_{73} \bowtie_{R_{73}.StoreID=Store.StoreID} (Store))$$

$$R_{75} := \tau_{Revenue \text{ ASC}} (\Pi_{StoreID, Description, StartDate, Revenue} (\gamma_{StoreID, Description, StartDate, SUM(LineSales) \rightarrow Revenue} (R_{74})))$$

q8a

$$R_{8a1} := \Pi_{ProductID} (Product) - \delta(\Pi_{ProductID} (OrderContains))$$

$$R_{q8a} := \Pi_{Product.ProductID, Product.Name, Product.Brand} (R_{8a1} \bowtie_{R_{8a1}.ProductID=Product.ProductID} (Product))$$

q8b

$$R_{q8b} := \Pi_{R_{q8a}.ProductID} (R_{q8a} \bowtie_{R_{q8a}.ProductID=Promotion.ProductID} (Promotion))$$

q9a

$$R_{9a1} := \Pi_{ProductCategoryID, CountPID} (\gamma_{ProductCategoryID, COUNT(ProductID) \rightarrow CountPID} (BelongsTo))$$

$$R_{9a2} := \delta(\rho_{bt}(BelongsTo) \bowtie_{bt.ProductID=hs.ProductID} (\rho_{hs}(HasWarranty)))$$

$$R_{9a3} := \Pi_{ProductCategoryID, CountWarr} (\gamma_{ProductCategoryID, Count(ProductID) \rightarrow CountWarr} (R_{9a2}))$$

$$R_{9a4} := \Pi_{ProductCategoryID} (R_{9a1} \bowtie_{R_{9a1}.CountPID=R_{9a3}.CountWarr \text{ AND } R_{9a1}.ProductCategoryID=R_{9a3}.ProductCategoryID} R_{9a3})$$

$$R_{9a} := \Pi_{R_{9a4}.ProductCategoryID, pc.Name} (R_{9a4} \triangleright \triangleleft_{R_{9a4}.ProductCategoryID=pc.ProductCategoryID} (\rho_{pc}(ProductCategory)))$$

q9b

$$R_{9b1} := \gamma_{p.StoreID, p.ProductCategoryID, COUNT(p.ProductID) \rightarrow CSt} (\rho_p(Product) \triangleright \triangleleft_{p.ProductID=bt.ProductID} (\rho_{bt}(BelongsTo)))$$

$$R_{9b2} := \Pi_{p.StoreID, p.ProductCategoryID, Cst} (R_{9b1})$$

$$R_{9b3} := \Pi_{R_{9b2}.StoreID} (R_{9a4} \triangleright \triangleleft_{R_{9a4}.ProductcategoryID=R_{9b2}.ProductcategoryID \text{ AND } R_{9a4}.CountPID=R_{9b2}.Cst} (R_{9b2}))$$

q10a

$$R_{10a1} := \Pi_{w.ProductID, w.Star} (\rho_w(WriteReview) \triangleright \triangleleft_{w.ProductID=bt.ProductID} \rho_{bt}(BelongsTo))$$

$$R_{10a2} := \Pi_{ProductID, AvgStar} (\gamma_{ProductID, AVG(Star) \rightarrow AvgStar} (R_{10a1}))$$

$$R_{10a3} := \Pi_{R_{10a2}.ProductID, R_{10a2}.AvgStar, bt.ProductCategoryID} (R_{10a2} \triangleright \triangleleft_{R_{10a2}.ProductID=bt.ProductID} \rho_{bt}(BelongsTo))$$

$$R_{10a4} := \Pi_{w.ProductID, bt.ProductCategoryID} (\rho_w(WriteReview) \triangleright \triangleleft_{w.ProductID=bt.ProductID} \rho_{bt}(BelongsTo))$$

$$R_{10a5} := \Pi_{bt.ProductCategoryID, AvgRe, CountStar} (\gamma_{ProductCategoryID, AVG(Star) \rightarrow AvgRe, COUNT(Star) \rightarrow CountStar} (R_{10a4}))$$

$$R_{10a6} := \Pi_{x1.ProductID, x1.AvgStar, y1.AvgRe, y1.CountStar} (\rho_{x1}(R_{10a3}) \triangleright \triangleleft_{x1.ProductCategoryID=y1.ProductCategoryID} \rho_{y1}(R_{10a5}))$$

$$R_{10a7} := \Pi_{ProductID, AvgStar, AllRe} (\gamma_{ProductID, AvgStar, SUM(AvgRe*CountStar)/SUM(CountStar) \rightarrow AllRe} (R_{10a6}))$$

$$R_{10a} := \Pi_{T.ProductID, p.Name, p.ModelNumber} (\sigma_{T.AvgStar > T.AllRe} (\rho_T(R_{10a7}) \triangleright \triangleleft_{T.ProductID=p.ProductID} (\rho_p(Product))))$$

q10b

$$R_{10b1} := \Pi_{ProductID} (R_{10a})$$

$$R_{10b2} := \delta(\Pi_{R_{10b1}.ProductID, p.Price} (R_{10b1} \triangleright \triangleleft_{R_{10b1}.ProductID=p.ProductID} (\rho_p(Product))))$$

$$R_{10b3} := \Pi_{ProductID, TotalQuan} (\gamma_{ProductID, SUM(quantity) \rightarrow TotalQuan} (OrderContains))$$

$$R_{10b} := \tau_{Revenue DESC} (\Pi_{A1.ProductID, A1.Price * A2.Quantity \rightarrow Revenue} ((\rho_{A1}(R_{10b2})) \triangleright \triangleleft_{A1.ProductID=A2.ProductID} (\rho_{A1}(R_{10b3}))))$$