Assignment 2 Part II: Relational Algebra

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Note: At times, relational algebra sets from previous questions were used in a future question in order to save space and time when working with repeated queries, especially for the part b of multiple questions.

$$R1 := \Pi_{FirstName,LastName,DateOfBirth}(\sigma_{DateOfBirth \leq '2003-11-05' \, AND \, Date='2020-07-22'}(Order))$$

$$R2 := \delta(\Pi_{Product.ProductID,ProductCategory.ProductCategoryID}(\sigma_{'1996-11-05' \leq Order.DateOfBirth \leq '2001-11-05'}$$
$$(Order \bowtie Product \bowtie OrderContains \bowtie ProductCategory \bowtie BelongsTo)))$$

$$RAa :=$$
$$\Pi_{FirstName,LastName,DateOfBirth,COUNT(FirstName)} \, \gamma_{FirstName,LastName,DateOfBirth,COUNT(FirstName)}(WriteReview)$$
$$RA := \Pi_{MAX(COUNT(FirstName))}(RAa)$$
$$R3 := \Pi_{WriteReview.FirstName,WriteReview.LastName,WriteReview.DateOfBirth,Person.City,Person.Country}$$
$$(\gamma_{WriteReview.FirstName,WriteReview.LastName,WriteReview.DateOfBirth,Person.City,Person.Country,COUNT(FirstName)}$$
$$(\sigma_{COUNT(FirstName)=RA}(WriteReview \bowtie Person))$$

$$R4a :=$$
$$\Pi_{COUNT(TrackingNumber)}(\Pi_{TrackingNumber}(\Upsilon_{TrackingNumber,COUNT(TrackingNumber)}(\sigma_{COUNT(TrackingNumber)>1}$$
$$(HasShipment)))$$
$$R4b := \delta(\Pi_{R4a.TrackingNumber}(\sigma_{LEFT(Person.PostalCode,1)='M'}(Person \bowtie Order \bowtie HasShipment \bowtie R4a)))$$

$$RB := \Pi_{ProductID,COUNT(ProductID)}(\gamma_{ProductID}(\sigma_{COUNT(ProductID)=1}(BelongsTo)))$$
$$R5 := \Pi_{ProductID}(RB)$$

$$RC := \Pi_{Brand}(\gamma_{Brand,COUNT(Name)}(\sigma_{COUNT(Name)=1}(Product)))$$
$$R6a := \Pi_{Product.ProductID,Product.Name,Product.Brand}(Product \bowtie RC)$$

$RDd :=$
$\Pi_{OrderContains.OrderID,(Product.Price*OrderContains.Quantity)}(\gamma_{OrderContains.OrderID,SUM(Product.Price*OrderContains.Quantity)}$
$((OrderContains)$

$RD := \Pi_{MAX(SUM(Product.Price*OrderContains.Quantity))}(RDd)$

$R6b := \Pi_{OrderContains.OrderId}(\gamma_{OrderContains.OrderID,SUM(Product.Price*OrderContains.Quantity)}$

$\quad (\sigma_{SUM(Product.Price*OrderContains.Quantity)=Rd}(OrderContains \bowtie Product)$

$R7 := \Pi_{Store.StoreID,Store.Description,Store.StartDate,SUM(Product.Price*OrderContains.Quantity)}$
$(\sigma_{Order.Date\ BETWEEN\ '2020-07-01'AND'2020-07-31'}$
$(\gamma_{Store.StoreID,Store.Description,Store.StartDate,SUM(Product.Price*OrderContains.Quantity)}$
$(\tau_{ASC}(SUM(Product.Price * OrderContains.Quantity))(Store \bowtie Product \bowtie OrderContains \bowtie Order)))$

$R8a :=$
$\Pi_{Product.ProductID,Product.Name,Product.Brand}(\sigma_{OrderContains.ProductID=NULL}(Product \bowtie_{LEFT} OrderContains))$

$R8b := \Pi_{Promotion.ProductID}(Promotion \bowtie R8a)$

$REe := \delta(\Pi_{ProductID}(HasWarranty))$

$RE := (\Pi_{BelongsTo.ProductCategoryID}(\sigma_{BelongsTo.ProductID\ NOT\ IN(REe)}(BelongsTo))$

$R9a := \delta(\Pi_{ProductCategory.ProductCategoryID,ProductCategory.Name}(\sigma_{ProductCategory.ProductCategoryID\ NOT\ IN(RE)}$

$\quad (ProductCategory \bowtie HasWarranty \bowtie BelongsTo)))$

$RFff := \delta(\Pi_{BelongsTo.ProductID}(\sigma_{BelongsTo.ProductID\ NOT\ IN(REe)}(BelongsTo)))$

$RFf :=$
$\Pi_{BelongsTo.ProductCategoryID,Product.StoreID}(\sigma_{Product.ProductID\ NOT\ IN(RFf)}(\gamma_{BelongsTo.ProductCategoryID,Product.StoreID}$

$(Product \bowtie BelongsTo \bowtie HasWarranty)))$

$RF :=$
$\delta(\Pi_{ProductCategoryID,MAX(StoreID}(\gamma_{ProductCategoryID,SUM(ProductCategoryID)}(\sigma_{SUM(ProductCategoryID=ProductCategoryID}$

$(Product \bowtie BelongsTo \bowtie HasWarranty))))$

$R9b := \Pi_{RF.MAX(StoreID)}(RF))$

$RGaa := \Pi_{ProdctCategoryID, ProductID}(BelongsTo)$

$RGa := \Pi_{RGaa.ProductCategoryID, AVG(WriteReview.Star)}(\gamma_{RGaa.ProductCategoryID, AVG(WriteReview.Star)}$
$(RGaa \bowtie WriteReview))$

$RGb := \Pi_{WriteReview.ProductID, BelongsTo.ProductCategoryID, AVG(WriteReview.Star)}$
$(\gamma_{WriteReview.ProductID, BelongsTo.ProductCategoryID, AVG(WriteReview.Star)}$
$(Product \bowtie BelongsTo \bowtie WriteReview))$

$RG := \delta(\Pi_{RGb.ProductID}(\sigma_{RGa.AVG(WriteReview.Star) \geq RGb.AVG(WriteReview.Star)}(RGa \bowtie RGb)))$

$\boldsymbol{R10a} := \delta(\Pi_{Product.ProductID, Product.ModelNumber, Product.Name}(\sigma_{Product.ProductID\ NOT\ IN(RG)}$

$(Product \bowtie WriteReview)))$

$RHa := \delta(\Pi_{Product.ProductID, Product.ModelNumber, Product.Name}(\sigma_{Product.ProductID\ NOT\ IN(RG)}$

$(Product \bowtie WriteReview)))$

$RH :=$
$\Pi_{RHa.ProductID, SUM(Product.Price*OrderContains.Quantity)}(\gamma_{RH.ProductID, SUM(Product.Price*OrderContains.Quantity)}$

$(\tau_{DSC}(SUM(Product.Price * OrderContains.Quantity))(Product \bowtie OrderContains \bowtie RHa)))$

$\boldsymbol{R10b} := \Pi_{RH.SUM(Product.Price*OrderContains.Quantity)}(RH))$