Part 1

1. $\Pi_{lname(Athelete)}$ - Π_{lname} (σAthelete.AID = Result.AID (Athelete ⋈ Result))

2. Π_{lname} $\sigma_{gold=0\wedge silver=0\wedge bronze=0}$ Athlete

3. AtLeastTwo: σE1.EID != E2.EID ⋀ E1.SID=E2.SID [(ρE1 Event)×(ρE2 Event)]
Answer = Πsname(σStadium.SID = AtLeastTwo.SID(AtLeastTwo × Stadium))

4. Canadians(AID, sport) := $\Pi_{AID, sport}$ $\sigma_{cname='Canada}$ (Athlete ⋈ Country)
Answer(sport) := Π_{sport}(Canadians ⋈ Result)

5) Swimming = σsport = "swimming"(Athelete)
NotTop = ΠS1.fname, S1.lname(σS1.gold<S2.gold (ρS1Swimming x ρS2Swimming))
Answer = Πfname, lname (Swimming)- NotTop

6. Gold(CID) := Π_{CID} $\sigma_{gold > 0}$ Athlete
Silver(CID) := Π_{CID} $\sigma_{silver > 0}$ Athlete
Bronze(CID) := Π_{CID} $\sigma_{bronze > 0}$ Athlete
AllMedal(CID) := Gold ∩ Silver ∩ Bronze
Answer(cname) := Π_{cname} (AllMedal ⋈ Country)

7.NotFirstTicket = ΠT1.EID (σT1.dateIssued>T2.dateIssued ^ T1.timeIssued>T2.timeIssued
(ρT1 Ticket x ρT2Ticket))
FirstTicket = ΠEID(Ticket) – NotFirstTicket
GoldAthelete = ΠAID(σmedal = "gold"(FirstTicket ⋈ Result))
Country_ID = ΠCID(GoldAthelete⋈Athlete)
Country_name = Πcname(σCID = Country_ID⋈Country))

8. MexicoGold(AID, fname, lname, gold) := $\Pi_{AID, fname, lname, gold}$ $\sigma_{cname='Mexico'}$ (Athlete ⋈ Country)
NotTop(AID, fname, lname, gold) := $\Pi_{M1.AID, M1.fname, M1.lname, M1.gold}$ $\sigma_{M1.gold < M2.gold}$ [(ρ_{M1} MexicoGold) x (ρ_{M2} MexicoGold)]
NotSecond(AID, fname, lname, gold) := $\Pi_{M1.AID, M1.fname, M1.lname, M1.gold}$ $\sigma_{M1.gold < M2.gold}$ [(ρ_{M1} NotTop) x (ρ_{M2} NotTop)]
Answer(fname, lname) := $\Pi_{fname, lname}$ (MexicoGold - NotSecond)

9.AtleastTwo_Ticket = σT1.TID != T2.TID ∧ T1.EID = T2.EID[(ρT1 Ticket)×(ρT2 Ticket)]
Answer = ΠEvent.sport(σEvent.EID = AtleastTwo_Ticket.EID^Event.date = AtleastTwo_Ticket.dateIssued(Event x AtleastTwo_Ticket))

10. NotMost(AID, fname, lname, CID, gold) := $\Pi_{A1.AID,\ A1.fname,\ A1.lname,\ A1.CID,\ A1.gold}\ \sigma_{A1.gold < A2.gold}$ [(ρ_{A1} Athlete) x (ρ_{A2} Athlete)]
MostGold(AID, fname, lname, CID, gold) := ($\Pi_{AID,\ fname,\ lname,\ CID,\ gold}$ Athlete) - NotMost
Answer(fname, lname, cname, gold) := $\Pi_{AID,\ fname,\ lname,\ cname,\ gold}$ (MostGold ⋈ Country)

11. Cannot be expressed

12. NoTicket(EID) := (Π_{EID} Event) - (Π_{EID} Ticket)
GoldMeal(AID, EID) := $\Pi_{AID,\ EID}\ \sigma_{medal='gold'}$ (NoTicket ⋈ Result)
Answer(fname, lname) := $\Pi_{fname,\ lname}$(Athlete ⋈ GoldMedal)

Part 2

1. σR1.EID = R2.EID AND R1.AID = R2.AID AND R1.medel != R2.medal ((ρR1 Result)×(ρR2 Result)) = Ø

2. $\sigma_{dateIssued>date \vee (dateIssued=date \wedge timeIssued \geq time)}$ (Event ⋈ Ticket) = ∅

3. Cannot be expressed

4. $\sigma_{Athlete.AID=Result.AID \wedge Event.EID=Result.EID \wedge Athlete.sport \neq Event.sport}$ (Athlete ⨯ Result ⨯ Event) = ∅