Warmup #1 (Textbook Problem 6.5)

Solutions:

a. \( \{ t \mid \exists q \in r \ (q[A] = t[A]) \} \)

b. \( \{ t \mid t \in r \land t[B] = 17 \} \)

c. \( \{ t \mid \exists p \in r \ \exists q \in s \ (t[A] = p[A] \land t[B] = p[B] \land t[C] = p[C] \land t[D] = q[D] \land t[E] = q[E] \land t[F] = q[F]) \} \)

d. \( \{ t \mid \exists p \in r \ \exists q \in s \ (t[A] = p[A] \land t[F] = q[F] \land p[C] = q[D]) \} \)

Warmup #2

TRC: \( \{ t \mid \exists s \in \text{works} \ (t[\text{person_name}] = s[\text{person_name}] \land s[\text{company_name}] = \text{“First Bank Corporation”}) \} \)

TRC: \( \{ t \mid \exists r \in \text{employee} \ \exists s \in \text{works} \ (t[\text{person_name}] = r[\text{person_name}] \land t[\text{city}] = r[\text{city}] \land r[\text{person_name}] = s[\text{person_name}] \land s[\text{company_name}] = \text{“First Bank Corporation”}) \} \)

TRC: \( \{ t \mid t \in \text{employee} \land (\exists s \in \text{works} \ (s[\text{person_name}] = t[\text{person_name}] \land s[\text{company_name}] = \text{“First Bank Corporation”} \land s[\text{salary}] > 10000)) \} \)

TRC: \( \{ t \mid \exists e \in \text{employee} \ \exists w \in \text{works} \ \exists c \in \text{company} \ (t[\text{person_name}] = e[\text{person_name}] \land e[\text{person_name}] = w[\text{person_name}] \land w[\text{company_name}] = c[\text{company_name}] \land e[\text{city}] = c[\text{city}] ) \} \)
Warmup #3 (Textbook Problem 7.20)

Consider the E-R diagram in Figure 7.29, which models an online bookstore.

1. List the entity sets and their primary keys.

   - author(name, address, URL) has primary key name.
   - book(ISBN, title, year) has primary key ISBN.
   - publisher(name, address, phone, URL) has primary key name.
   - shopping_basket(basket_id) has primary key basket_id.
   - warehouse(code, address, phone) has primary key code.
   - customer(email, name, address, phone) has primary key email.

   (Note that the original problem has a typo that in the diagram basket_id was not underlined. Please do not subtract points if the student followed the original problem.)

2. Suppose the bookstore adds Blu-ray discs and downloadable video to its collection. The same item may be present in one or both formats, with differing prices. Extend the E-R diagram to model this addition, ignoring the effect on shopping baskets.

3. Now extend the E-R diagram, using generalization, to model the case where a shopping basket may contain any combination of books, Blu-ray discs, or downloadable video.
Problem 4 - To Be Graded

- order
  - order_id
  - date
  - status

- contains
  - item
    - item_id
    - name
    - price

- makes
  - amount

- customer
  - cust_id
  - first_name
  - last_name
  - street
  - city
  - state
  - zip_code

- region
  - region_id
  - name
  - street
  - city
  - state
  - zip_code

- belongs_to
To track which items are sold in a region, we would add an additional relationship, sold by, that would have a mn relationship between region and item, and also add region_id to the contains table.

To make the customer reviews, we would add an additional table, review. To ensure the authenticity of the review, we would add a 1m relation between this table and order. To do create that relation, we need order_id on the review table.

Updated schema as follows:

\[
\text{sold by}(\text{region id}, \text{item id}, \text{quantity})
\]

\[
\text{contains}(\text{order id}, \text{item id}, \text{number}, \text{region id})
\]

\[
\text{review}(\text{item id}, \text{cust id}, \text{order id}, \text{stars}, \text{comments})
\]

**Problem 5 - To Be Graded**

1. \{ P | \exists C \in \text{Car} (C[\text{model}] = "Toyota" \land P[\text{license}] = C[\text{license}]) \land \exists A \in \text{Accident} (C[\text{license}] = A[\text{license}] \land A[\text{accident date time}] \geq "01-01-2015 00:00" \land A[\text{accident date time}] < "01-01-2016 00:00") \}

2. \{ R | \exists A \in \text{Accident} ( R[\text{license}] = A[\text{license}] \land R[\text{accident date time}] = A[\text{accident date time}] ) \land \exists O \in \text{Owns} ( A[\text{license}] = O[\text{license}] \land A[\text{driver ssn}] \neq O[\text{SSN}] ) \}

3. \{ Q | \exists P \in \text{Person} ( Q[\text{name}] = P[\text{name}] \land Q[\text{address}] = P[\text{address}] ) \land \exists A \in \text{Accident} ( A[\text{driver ssn}] = P[\text{SSN}] \land A[\text{damage amount}] > 1000 ) \}