1. (Part1): Consider an on-line grading system:
   - TA can view (V) and add (A) everybody’s grade;
   - Instructors can add (A), update (U), and view (V) everybody’s grade;

Assume a generic framework of RBAC0. Customize it for the following class:

   - Instructor: INS
   - TA: TA
   - Students: S1, S2, S3

Define RBAC0 and RBAC1 components (Users, Roles, Permissions, PermissionAssignments, UserAssignments, Sessions, ...), what can be changed?

2. (Part2): Consider an on-line grading system:
   - Each student can only view his/her own grade;
   - TA can view (V) and add (A) everybody’s grade;
   - Instructors can add (A), update (U), and view (V) everybody's grade;

Assume a generic framework of RBAC0. Customize it for the following class:

   - Instructor: INS
   - TA: TA
   - Students: S1, S2, S3

Define RBAC0 components, what are the difficulties?

3. (Part3): Assume there exists a global variable “user-name” that stores the name of the activated user,

Define RBAC2 components.

A user can activate a role whenever the time constraints (defined over the role) are satisfied. Define a
new RBAC model (e.g., name it RBAC 4) based on RBAC 1 model (RBAC with role hierarchies) with the above capability and also specify the login (or create session) procedure in this model.

[Note: DO NOT copy the ideas mentioned by other researchers in their publications. Try to propose it yourself.]

3. Propose appropriate predicates formalizing “private roles” and “mutually disjoint roles” in RBAC.
   [Note: You can find the definitions of these concepts by a simple search]

4. Disjunction operator for composing the principals (A V B) is replaced in Abadi’s calculus with implication (or group membership).
   - Add this operator to the proposed logic by defining its semantics and providing the related axioms (which should be added to the proof theory of the logic).
   - Prove the soundness of the most important axiom.