

$$1. \forall s: \text{Student} \bullet \exists a: \text{Appointment} \bullet (a, s) \in \text{Books}$$

Predicate: If for all students, there exists an appointment that each student books. That is, every existing student books at least one appointment.

- predicate
- false

$$2. \{a: \text{Appointment} \mid \exists s: \text{Student} \bullet (s, a) \in \text{Books}\}$$

A set of Appointments for which there exists a Student who books them. That is, the set of all appointments booked by a student.

- set
- {Appt 4721, Appt 8923, Appt 7136, Appt 1162}

$$3. \{t: \text{Tutor} \mid \exists \text{sub}: \text{Subject} \bullet (t, \text{sub}) \in \text{Signs up for}\}$$

A set of Tutors for which there exists a Subject which those Tutors sign up for. That is, the set of all Tutors who sign up for a Subject.

- set
- {David, Jacob, Joe, Kelly}

Jacob Hreshchyskyh

Task 1 cont.

$$4. \exists s: \text{Student} \circ s.\text{credit} < 3 \wedge \# \{a: \text{Appointment} \mid (s, a) \in \text{books}\} > 1$$

Predicate: If there is a student whose credit is less than 3 and whose number of appointments that that student books is greater than 1.

- predicate.

- false

$$5. \exists t: \text{Tutor} \circ \exists \text{sub}: \text{Subject} \circ \text{sub.name} = \text{SER} \wedge (t, \text{sub}) \in \text{sign up for} \\ \wedge \exists a: \text{Appointment} \circ a.\text{time} = 12:00 \wedge (t, a) \in \text{Oversees}$$

Predicate: If there is a Tutor who signs up for an existing Subject whose name is SER and there is a 12:00 Appointment that that Tutor Oversees.

- predicate

- false

$$6. \{s: \text{Student} \mid \exists a: \text{Appointment} \circ (s, a) \in \text{books} \wedge \exists t: \text{Tutor} \circ (t, a) \in \\ \text{Oversees} \wedge t.\text{name} = \text{David} \wedge s.\text{credits} < 5\}$$

The set of all Students with fewer than 5 credits who book an appointment with a Tutor, whose name is David, overseeing that appointment.

- set

- {Jim}

Jacob Hreshchyskyh Task 1 cont.

7. $\{a: \text{Appointment} \mid \exists t: \text{Tutor} \cdot (t, a) \in \text{Oversees} \wedge \exists \text{sub}: \text{Subject} \cdot (t, \text{sub}) \in \text{Signs_up_for} \wedge \text{sub.name} = \text{History_Of_Engineering} \wedge \nexists s: \text{Student} \cdot (s, a) \in \text{Books}\}$

The set of all appointments overseen by a Tutor who signs up for a subject whose name is History Of Engineering and which no student has booked.

- set
- {Appt 7791}

Task 2

1. Set of all appointments where the time is 13:30. Which appointments are in this set?

- $\{a: \text{Appointment} \mid a.\text{time} = 13:30\}$
- {Appt 7136, Appt 7791}

2. Predicate evaluating to true if there is a student who has booked Appt 7791. Would this be true or false?

- $\exists s: \text{Student} \cdot \exists a: \text{Appointment} \cdot (s, a) \in \text{Books} \wedge a.\text{id} = 7791$
- false

3. Set of all appointments booked by Jim. Which appointments are in the set?

- $\{a: \text{Appointments} \mid \exists s: \text{Student} \cdot (s, a) \in \text{Books} \wedge s.\text{name} = \text{Jim}\}$
- {}

Jacob Hreshchyskyh Task 2 cont.

4. Set of all tutors who have signed up for more than 1 subject. Which tutors are in this set?

- $\{t: \text{Tutor} \mid \#\{sub: \text{Subject} \mid (t, sub) \in \text{Signs-up-for}\} > 1\}$
- $\{\text{Jacob}\}$

5. Set of all subjects Jacob has signed up for. Which subjects are in this set?

- $\{sub: \text{Subject} \mid \exists t: \text{Tutor} \circ t.name = \text{Jacob} \wedge (t, sub) \in \text{Signs-up-for}\}$
- $\{\text{Discrete Math, SER}\}$

6. The number of appointments Kelly oversees. How many appointments is this?

- $\#\{a: \text{Appointment} \mid \exists t: \text{Tutor} \circ t.name = \text{Kelly} \wedge (t, a) \in \text{Oversees}\}$
- 1

7. Predicate that evaluates to true if each appointment has at least 1 student booked. Would this evaluate to true or false?

- $\forall a: \text{Appointment} \circ \exists s: \text{Student} \circ (s, a) \in \text{Books}$
- false

8. Predicate that evaluates to true if student X (use X as a placeholder for the name of the student) still has enough credit to book an appointment and does not have an appointment at time Y yet. For which values of X and Y would this evaluate to true?

(In requirements, 1 credit = 1 tutoring appointment)

- $\exists s: \text{Student} \circ s.name = X \wedge s.credit \geq 1 \wedge \nexists a: \text{Appointment} \circ a.time = Y$

- True for Dwight if $Y \neq 11:30$

True for Jim if $Y \neq 12:00$ and $Y \neq 13:30$

True for Pam if $Y \neq 14:00$

True for Michael if Y is any time.

Jacob Hreshchyshyn Task 2 cont.

9. Predicate that evaluates to true if all tutors oversee more than 1 appointment. Does this evaluate to true or false?
- $\# \{a: \text{Appointment} \mid \forall t: \text{Tutor} \bullet (t, a) \in \text{Oversees}\} > 1$
 - false

10. Set of all students with the name X (use X as a placeholder for the name) that are booked for an appointment with id Y (use Y as a placeholder for the id).
- $\{s: \text{Student} \mid s.\text{name} = X \wedge \exists a: \text{Appointment} \bullet (s, a) \in \text{Books} \wedge a.\text{id} = Y\}$

There is no need to determine what sets would result from various X and Y values.