1) The resulting table is:

|  |  |  |
| --- | --- | --- |
| LASTNAME | FIRSTNAME | SID |
| Snowdon | Jonathan | 8871 |
| Winter | Abigail | 11035 |
| Patel | Deepa | 14662 |
| Starck | Jason | 19992 |
| Johnson | Peter | 32105 |

This query starts by finding all the Presidents of Student groups in the ‘StudentGroup’ table. Once knowing the student ID numbers of the presidents the query goes to the ‘Student’ table and grabs all the students that are not listed as presidents of student groups.

2) A = {1,2,3} and B = {Djengo, Simone, Hugin}

A x B = {(1, Djengo), (1, Simone), (1, Hugin), (2, Djengo), (2, Simone), (2, Hugin), (3, Djengo), (3, Simone), (3, Hugin)}

3) P({a,{a}}) = {0, {a}, {{a}}, {a, {a}})

By P I mean “Power set of” and by 0 I mean the empty set.

4)P({Djengo, Simone, Hugin}) – P({Djengo, Simone, Joon}) = {{Hugin}, {Djengo, Hugin}, {Simone, Hugin}, {Djengo, Simone, Hugin}}

An easier way to do this other than just computing the power sets independently and taking the difference was to just take the sets involving Hugin because the sets that don’t involve Hugin are subtracted out because the exact same sets will be created from the powerset that involves Joon.

5)

a) “X and Y were born on the same date” over the universe of all humans

**Reflexive**: R(x, x) for all x

A person will always have the same birthday as himself or herself. **TRUE**

**Symmetric**: R(x,y) -> R(y,x)

If person A has the same date of birth as person B then person B will have the same date of birth as person A for all persons A and B. **TRUE**

**Transitive**: R(x,y) ^ R(y,z) -> R(x,z)

Person 1 and Person 2 have the same birthday. Person 2 has the same birthday as person 3. For all persons 1,2, and 3 they will all have the exact same date of birth and so person 1 and 3 have the same date of birth. TRUE

b) “x is an ancestor of y” over the universe of all humans

**Reflexive**: R(x, x) for all x

One cannot be an ancestor of oneself. Ex: Raymond Elward is an ancestor of Raymond Elward. **FALSE**

**Symmetric**: R(x,y) -> R(y,x)

An ancestor is typically a person more remote than a grandparent from whom one is descended. Thomas Elward is an ancestor of Raymond Elward, which implies Raymond Elward is an ancestor of Thomas Elward. The implication is **FALSE**

**Transitive**: R(x,y) ^ R(y,z) -> R(x,z)

Y has an ancestor x and z has an ancestor y then it holds true that x is an ancestor of z. Following a chain of descendents makes this true for all humans x,y and z. **TRUE**

c) “x = y+1” over the universe of the integers {…, -3, -2, -1, 0, 1, 2, 3, …}

**Reflexive**: R(x, x) for all x

Let x =2. 2 = 2+1 is a false statement thus the relation is not reflexive. **FALSE**

**Symmetric**: R(x,y) -> R(y,x)

Let x = 2 and y = 1; 2 = 1 + 1 -> 1 = 2 + 1. The symmetric implication is false thus making this relation not symmetric. **FALSE**

**Transitive**: R(x,y) ^ R(y,z) -> R(x,z)

Let x =3, y = 2 and z=1; 3=2+1 ^ 2=1+1 -> 3=1+1. The transitive implication is proven **FALSE**.

d) “x\*y >= 0” over the universe of real numbers

**Reflexive**: R(x, x) for all x

Multiplying two of the same numbers together will not change whether it is greater than or equal to zero. **TRUE**

**Symmetric**: R(x,y) -> R(y,x)

Whether x or y comes first when being multiplied will not change the resulting product. **TRUE**

**Transitive**: R(x,y) ^ R(y,z) -> R(x,z)

The value of being equal to or greater than zero will not be affected if it is translated to x and z based from the truths that x and y’s product and y and z’s product are both above zero (or equal to it). **TRUE**

6) R(x,y) = "|x| = |y|" over the universe of real numbers where |x| is the absolute value of x

a) **Reflexive**: R(x, x) for all x

The absolute value of x will always be the same as the absolute value of x. **TRUE**

**Symmetric**: R(x,y) -> R(y,x)

If the absolute vale of x is equal to the absolute vale of y then that give both sides of the equation the same value and switching x and y will change nothing. **TRUE**

**Transitive**: R(x,y) ^ R(y,z) -> R(x,z)

The established equation "|x| = |y|" gives each side of the equation the same value. If then "|y| = |z|" it is truthfully implied that the values of |x| and |z| with be the same. **TRUE**

b) [0]R contains all natural numbers and is thus the only equivalence class for the relation R(x,y) = "|x| = |y|" over the universe of real numbers where |x| is the absolute value of x

7)

a) R(x,y) = "x + y = 0"

**Reflexive**: R(x, x) for all x

The only time when x plus itself will equal zero is when x equals zero. This makes the statement reflexive because 0 + 0 = 0. **TRUE**

**Anti-symmetric**: R(x,y) ^ R(y,x) -> x = y

The equation implies that x and y are the same distance away from zero on a number line. But they are not equal because they have to be in different directions on the number line. Ex: x = 2, y = -2; 2+(-2) = 0 AND (-2)+2=0 -> 2 = -2. Since 2 does not equal -2 this is not an Anti-symmetric relation. **FALSE**

**Transitive**: R(x,y) ^ R(y,z) -> R(x,z)

Ex: x = 2, y = -2, z = 2; 2+(-2) = 0 AND (-2) + 2 = 0 -> 2 + 2 = 0. Since 2 plus 2 does not equal 0 this is not a transitive relation. **FALSE**

**Ordering Relation**? NO

b) R(x,y) = "x \* y >= 0"

**Reflexive**: R(x, x) for all x

A number multiplied by itself will always be equal to or greater than zero making this a reflexive statement. **TRUE**

**Anti-symmetric**: R(x,y) ^ R(y,x) -> x = y

Ex: let x = 2 and y = 10; 2 \*20 >= 0 AND 20 \* 2 >= 0 -> 2 = 20. Since the implication that 2 = 20 is a false statement this relationship is not Anti-symmetric. **FALSE**

**Transitive**: R(x,y) ^ R(y,z) -> R(x,z)

The relationship between x and y implies that they are both positive or they are both negative because that is the only way that their product will be greater than or equal to zero. Thus if x and y are on the same side of a number line and y and z are on the same side as well then it must be true that z and x are on the same side too. That makes this relationship transitive. **TRUE**

**Ordering Relation**? NO

c) R(x,y) = "x = 2y"

**Reflexive**: R(x, x) for all x

Ex: x = 2. 2 = 2(2) is a false statement so this relation is **FALSE**

**Anti-symmetric**: R(x,y) ^ R(y,x) -> x = y

Ex: x = 4, y = 2; 4 = 2(2) AND 2 = 2(4) -> 4 = 2 is a false statement so this relation is **FALSE**

**Transitive**: R(x,y) ^ R(y,z) -> R(x,z)

Ex: x = 4, y = 2, and z = 1; 4 = 2(2) AND 2 = 2(1) -> 4 = 2(1) is a false statement so this relation is **FALSE**

**Ordering Relation**? NO

8) The thing I found most enjoyable about class this week was the SQL queries and connecting those student tables. The most frustrating thing I found about the class and the work this week was wrapping my brain around trying to prove things that are so obviously true that my instinct has taken away the concept of how exactly I got from point a to b.