EXERCISES CHAPER 2.

Chapter 2

Exercise 1. For each of these relations, say whether they are *reflexive, complete, transitive, symmetric, asymmetric.*

(1) At least as old as on the set of people.

(2) Strictly older than on the set of people.

(3) Shares the same biological parents as on the set of people.

(4) Shares at least one biological with on the set of people.

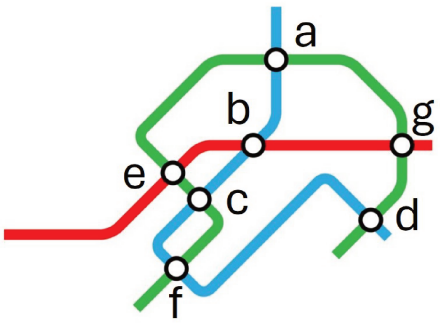
(5) $=$ on the set of numbers.

(6) $\geq$ on the set of numbers.

(7) $>$ on the set of numbers.

Exercise 2. Can you think of a relation on the set of all people that is neither symmetric nor assymetric?

Exercise 3. Consider the following subway map.



(1) What is the relation "has at least as many stops" on the set of all subway lines?

(2) What is the relation "is on the same line as" on the set of stations that aren't a vowel?

(3) What is the relation "is west of" on the red line stations?

Exercise 4. For the set $X = \{a, b, c\}$, identify if the following relations are complete and transitive. If a pair does not appear, you can assume the relation is not true for that pair.

(1) $R : aRa, bRb, cRc, aRb, bRc$

(2) $R : aRa, cRc, aRb, aRc, bRc$

(3) $R : aRa, bRb, cRc, aRb, bRc, aRc$

(4) $R : aRa, bRb, cRc, aRb, bRa, bRc, cRb, aRc, cRa$

(5) $R : aRa, bRb, cRc, aRb, bRa, aRc$

Exercise 5. Draw a fictional map of three countries $\{a, b, c\}$ where the relation "borders" is transitive and where every country shares a border with at least one other. The result must be an actual map-like sketch.

Exercise 6. Draw a fictional map of four countries $\{a, b, c, d\}$ where the relation "borders" is transitive and where every country shares a border with at least two others. The result must be an actual map-like sketch.