

CSI 35, Homework 1 on sections 9.1, 9.2.

Due by Feb 18 (or the following class).

Try these ten questions. Write all your working out and answers neatly by hand on your own notepaper, using lots of space so I can include corrections or comments. Otherwise I may deduct points or ask you to redo it. It is very important that you show clearly any work you had to do to get your answers. Just writing the answer down with no work shown is usually not enough. Each question is worth 5 points.

Section 9.1 Relations and their properties

- (1) Let $A = \{8, 9, 10\}$ and $B = \{w, x, y, z\}$. Give an example of a relation from A to B with five ordered pairs. Use the correct notation for your answer.
- (2) List the ordered pairs in the relation R on the set $\{3, 4, 5, 6, 7, 8\}$ where $(a, b) \in R$ if a divides b .
- (3) Let T be the relation $\{(2, 3), (3, 2), (4, 4)\}$ on the set $\{1, 2, 3, 4, 5\}$. Explain why T is or is not symmetric.
- (4) Give an example of a relation on the set $\{6, 7, 8, 9\}$ that is both reflexive and symmetric.
- (5) Let S be the relation on the set of real numbers that says $(x, y) \in S$ when $xy \geq 0$. Answer these questions about S , explaining your answers:
 - (a) Is S reflexive?
 - (b) Is S symmetric?
 - (c) Is S antisymmetric?
 - (d) Is S transitive?
- (6) For these relations from $\{1, 2, 3\}$ to $\{1, 2, 3, 4\}$,

$$R_1 = \{(1, 2), (2, 3), (3, 4)\},$$

$$R_2 = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 2), (3, 4)\},$$

find the new relations (a) $R_1 \cap R_2$ (b) $R_1 \oplus R_2$.

- (7) Let $R = \{(1, 2), (1, 3), (2, 3), (2, 4), (3, 1)\}$ and let $S = \{(2, 1), (3, 1), (3, 2), (4, 2)\}$. Compute the composition relation $S \circ R$
- (8) How many possible relations are there from a set with cardinality 3 to a set with cardinality 4?
(Hint: more than 1000.)

- (9) Let R be the relation $\{(1, 2), (1, 3), (2, 1), (2, 2), (2, 3)\}$ on the set $\{1, 2, 3\}$. Compute R^2 (the composition of R with itself) and then use this to decide if R is transitive.
- (10) (From Section 9.2) List all 4-tuples in the 4-ary relation

$$\{(a, b, c, d) \mid a, b, c, d \text{ are positive integers with } abcd = 6\}.$$

If you get stuck on a question or aren't sure if you understand it:

- Go over the relevant class notes or section in the textbook.
- Ask me about it after class.
- Come to my office hours: Mon 2:00 - 3:00, Wed 2:00 - 3:00 in CP 317.
- Go to the Math Tutorial Lab in-person in CP 303 or online.