CS 171
Homework Assignment 1t

Given: January 17, 2012 **Due:** January 19, 2012

This assignment is due by the end of the class on the due date. Unless all problems carry equal weight, the point value of each problem is shown in [ ]. To receive full credit all your answers should be carefully justified. Each solution must be the student's own work. Assistance should be sought or accepted only from the course staff. Any violation of this rule will be dealt with harshly.

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1. Give answers to the following questions.

A. List the members of these sets.

(a) $\{x \mid x \text{ is a real number such that } x^2 = 1\}$
(b) $\{x \mid x \text{ is a positive integer less than } 12\}$
(c) $\{x \mid x \text{ is a square of an integer and } x < 100\}$
(d) $\{x \mid x \text{ is an integer such that } x^2 = 2\}$

B. Use the set builder notation to give a description of each of these sets.

(a) $\{0, 3, 6, 9, 12\}$
(b) $\{-3, -2, -1, 0, 1, 2, 3\}$
(c) $\{m, n, o, p\}$

C. What is the cardinality of each of the following sets?

(a) $\{a\}$
(b) $\{\{a\}\}$
(c) $\{a, \{a\}\}$
(d) $\{a, \{a\}, \{a, \{a\}\}\}$

D. Determine whether each of the following is true or false.

(a) $x \in \{x\}$
(b) $\{x\} \subseteq \{x\}$
(c) $\{x\} \in \{x\}$
(d) $\{x\} \in \{\{x\}\}$
(e) $\emptyset \subseteq \{x\}$
(f) $\emptyset \in \{x\}$

E. What is the power set of $\{a, b\}$, where a and b are distinct elements? What is its cardinality?

F. Find two sets A and B such that $A \in B$ and $A \subseteq B$.

2. One urn contains one blue ball (labeled B_1) and three red balls (labeled R_1, R_2, and R_3). A second urn contains two red balls (R_4 and R_5) and two blue balls (B_2 and B_3). An experiment is performed in which one of the two urns is chosen at random and then two balls are randomly chosen from it, one after the other without replacement. Construct the tree diagram showing all possible outcomes of this experiment. What is the total number of outcomes of this experiment?

3. A particular brand of shirt comes in 12 colors, has a male version and a female version, and comes in three sizes for each sex. How many different types of this shirt are made?

4. How many bit strings of length n, where n is a positive integer, start and end with 1s?