

CSI 2350
Exam 3
April 3, 2007

Definitions. (1 pt each)

1. _____ is an ordered arrangement of the elements of a set
2. _____ the study of arrangements of objects
3. _____ when more than k objects are placed in k boxes, there must be a box containing more than one object
4. _____ the counting of arrangements of objects
5. _____ an unordered selection of r elements of a set
6. _____ a subset of the sample space of an experiment
7. _____ events E and F such that $p(E \cap F) = p(E)p(F)$
8. _____ the weighted average of a random variable, with values of the random variable weighted by the probability of the outcomes
9. _____ an experiment with two possible outcomes
10. _____ the set of possible outcomes of an experiment
11. _____ the representation of the composite of relations R and S
12. _____ the representation for the inverse of a relation R
13. _____ a set of elements called vertices and ordered pairs of these elements
14. _____ a path that begins and ends at the same vertex
15. _____ a relation that is reflexive, antisymmetric, and transitive

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For problems 16-25, assume there are 30 students in the class. Provide the formula for the answer. You may also provide a numeric answer, but it is not required. 5 pts each.

16. 10 students are selected at random to answer a question. Assuming a student can be asked multiple questions, how many different ways can students be asked a question?

17. 10 students are selected at random to answer a question. After answering, the student leaves the room. Now how many different ways can students be asked questions?

18. 5 students are selected at random for a class demonstration. How many different groups of students are possible?

19. For the previous question, how many different groups are possible if the same student can be selected more than once?

20. A student was totally unprepared for a 20-question multiple choice exam. As a result, he had to randomly guess which of the four answers would be correct. What is the probability that the student will make an A (i.e., get 18 or more questions correct)?

21. For the previous question, how many questions is the student expected to get right?

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For problems 25-31, the set $A=\{1,2,3,4\}$, and R is a relation on $A \times A$.

25. Assume $R = \{(1,1),(1,2),(1,3),(1,4)\}$, place an X in the blank if R satisfies the property.
(3 pts)

_____ reflexive _____ irreflexive _____ symmetric

_____ asymmetric _____ antisymmetric _____ transitive

26. Assume $R=\{(1,1),(1,2),(1,3),(1,4),(2,2),(2,1),(3,3),(3,1),(4,4),(4,1)\}$, place an X in the blank if R satisfies the property. (3 pts)

_____ reflexive _____ irreflexive _____ symmetric

_____ asymmetric _____ antisymmetric _____ transitive

27. Assume $R=\{(1,2),(2,3),(3,1),(3,4),(4,1),(4,2),(4,3),(4,4)\}$. Provide the matrix representation of the relation. (4 pts)

28. For the same R as in problem 28, provide the directed graph representation of the relation. (4 pts)

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29. For the same R as in problem 28, what is added by the reflexive closure? (4 pts)
30. For the same R as in problem 28, what is added by the symmetric closure? (4 pts)
31. Provide an example relation R (over the same A) that is both symmetric and antisymmetric. (4 pts)
32. For the same R as in problem 28, use Warshall's algorithm to find the transitive closure. (9 pts)

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33. Extra Credit: Although Blaise Pascal died when James Bernoulli was only 8 years old, they shared some common interests. Provide a hypothetical conversation the two could have had.