MATH 20, SPRING 2011
HOMEWORK #1

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This assignment will be due on Wednesday, April 6 at 12:30 p.m. in the box outside 105 Kemeny. Look for the boxes labeled "Math 20, Spring 2011" and put your assignment in the left ("IN") box.

Remember to show your work. A correct answer with no work shown will receive minimal credit. Your solutions should be detailed enough that any of your classmates could understand them simply by reading them.

(1) (Section 1.2, #6) A die is loaded in such a way that the probability of each face turning up is proportional to the number of dots on that face. (For example, a six is three times as probable as a two.) What is the probability of getting an even number in one throw?

(2) (Section 1.2, #18)
   (a) For events $A_1, \ldots, A_n$, prove that $P(A_1 \cup \ldots \cup A_n) \leq P(A_1) + \ldots + P(A_n)$.
   (b) For events A and B, prove that $P(A \cap B) \geq P(A) + P(B) - 1$.

(3) (Section 1.2, #20) Explain why it is not possible to define a uniform distribution function (see Definition 1.3) on a countably infinite sample space.

(4) Let $\Omega = \{a, b, c\}$ be a sample space. Let $m(a) = \frac{1}{2}$, $m(b) = \frac{2}{5}$, and $m(c) = \frac{1}{10}$. Find the probabilities of all possible events in Ω. (Hint: an event is a subset of a sample space, and Ω has eight subsets.)

(5) Two dice are rolled. Let E be the event that the sum of the outcomes is odd and let F be the event that at least one one is rolled. Describe the events $E \cap F$, $\tilde{E} \cap F$, and $\tilde{E} \cup \tilde{F}$ in words.

(6) A card is drawn from an ordinary deck of 52 cards.
   (a) What is the probability that the card is a black ace or a red queen?
   (b) What is the probability that the card is a face card or a black card?
   (c) What is the probability that the card is not a heart nor a queen?

Suggested problems: Section 1.1: 8, 16; Section 1.2: 1-5, 9-11, 15, 21, 22