Part II: Free Response. Remember to check conditions!
1. A professional soccer player succeeds in scoring a goal on 84% of his penalty kicks. Assume that the success of each kick is independent.

   (a) In a series of games, what is the probability that the first time he <u>fails</u> to score a goal is on his fifth penalty kick?   [4]

   (b) What is the probability that he scores on 5 or fewer of his next 10 penalty kicks?   [4]

   (c) Suppose that our soccer player is out of action with an injury for several weeks. When he returns, he only scores on 5 of his next 10 penalty kicks. Is this evidence that his success rate is now less than 84%? Explain.
                                                                                                  [2]

2. Meadowbrook School surveys the families of its students and determines the following: if a family is chosen at random, the probability that they own a dog is 0.38, the probability they own a cat is 0.23, and the probability they own both a dog and a cat is 0.12.

   (a) Let D = randomly-chosen family owns a dog, and C = randomly-chosen family owns a cat. Sketch a Venn diagram or two-way table that summarizes the probabilities above.
                                                                                                  [2]

   (b) Find each of the following.   [2 each]

      i.   The probability that a randomly-selected family owns a dog or a cat.

      ii. The probability that a randomly-selected family owns a dog or <u>doesn't</u> own a cat.

      iii. The probability that they don't own a dog, given that they don't own a cat.

3. Many fire stations handle emergency calls for medical assistance as well as those requesting firefighting equipment. A particular station says that the probability that an incoming call is for medical assistance is 0.81. This can be expressed as P(call is for medical assistance) = 0.81. Assume each call is independent of other calls.

(a) Describe what the Law of Large Numbers says in the context of this probability.

[2]

(b) What is the probability that two of the next four calls are for medical assistance?

[4]

(c) You want to estimate the probability that exactly three of the next four calls are for medical assistance. Describe the design of a simulation to estimate this probability. Explain clearly how you will use the partial table of random digits below to carry out your simulation.

[3]

(d) Carry out 5 trials of your simulation. Mark on or above each line of the table so that someone can clearly follow your method.

[3]

177	70348 72871 63419 57363 29685 43090 18763 31714
178	24005 52114 26224 39078 80798 15220 43186 00976
179	85063 55810 10470 08029 30025 29734 61181 72090
180	11532 73186 92541 06915 72954 10167 12142 26492
181	59618 03914 05208 84088 20426 39004 84582 87317