HW #3

1. A toy manufacturer buys ball bearings from three different suppliers—50% of his total order comes from supplier 1, 30% from supplier 2, and the rest from supplier 3. Past experience has shown that the quality control standards of the three suppliers are not all the same. Of the ball bearings produced by supplier 1, 2% are defective, while suppliers 2 and 3 produce defective bearings 3% and 4% of the time, respectively. What proportion of the ball bearings in the toy manufacturer's inventory are defective?

2. Urn I contains two red chips and four white chips; urn II contains three red and one white. A chip is drawn at random from urn I and transferred to urn II. Then a chip is drawn from urn II. What is the probability the chip drawn from urn II is red?

3. Urn I contains two white chips (w_1, w_2) and one red chip (r_1); urn II has one white chip (w_3) and two red chips (r_2, r_3). One chip is drawn at random from urn I and transferred to urn II. Then one chip is drawn from urn II (see Figure 2.7.1). Suppose a red chip is selected from urn II. What is the probability the chip *transferred* was white?

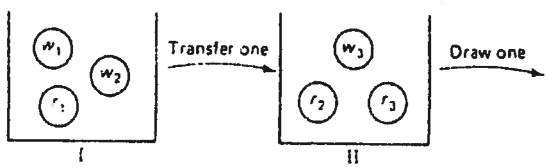

Figure 2.7.1

4. A weather satellite is sending a binary code of 0s and 1s describing a developing tropical storm. Channel noise, though, can be expected to introduce a certain amount of transmission error. Suppose 70% of the message being relayed is 0s and there is an 80% chance of a given 0 or 1 being received properly. If a 1 is received, what is the probability that a 0 was sent?

5. Consider the problem of screening for cervical cancer. Let C be the event "a woman has the disease" and B be the event "positive biopsy"—that is, B occurs when the diagnostic procedure indicates that a woman *does* have cervical cancer. We will assume that $P(C) = 0.0001$, $P(B \mid C) = 0.90$ (the test correctly identifies 90% of all the women who do have the disease), and $P(B \mid C^C) = 0.001$ (the test gives one false positive, on the average, out of every 1000 patients). Find $P(C \mid B)$, the probability a woman actually does have cervical cancer given the biopsy says she does.

$(C^c \equiv \bar{C})$