HW 6.1: 8, 12, 16, 26, 28, 48, 52, 72

8) How many different three-letter initials with none of the letters repeated can people have?

**26 x 25 x 24 = 15,600**

12) How many bit strings are there of length six or less, not counting the empty string?

**\_ \_ \_ \_ \_ \_ 26 + 25 + 24 + 23 + 22 + 2 + 20 = 127**

16) How many strings are there of four lowercase letters that have the letter *x* in them?

\_ \_ \_ \_ **25 x 25 x 25 x 4 = 62500**

\_ \_ \_ \_ **25 x 25 x 6 = 3750**

\_ \_ \_ \_ **25 x 4 = 100**

\_ \_ \_ \_ **1**

**Total 66,351**

26) How many strings of four decimal digits

**a)** do not contain the same digit twice?

\_ \_ \_ \_ **10 x 9 x 8 x 7 = 5040**

**b)** end with an even digit?

\_ \_ \_ \_ **10 x 10 x 10 x 4 = 4000 (if zero is counted, then 10 x 10 x 10 x 5) = 5000**

**c)** have exactly three digits that are 9s?

\_ \_ \_ \_ **9 x 4 = 36**

28) How many license plates can be made using either three digits followed by three uppercase English letters or three uppercase English letters followed by three digits?

###UUU: **10 x 10 x 10 x 26 x 26 x 26 =** **17576000**

UUU###: **10 x 10 x 10 x 26 x 26 x 26 =** **17576000**

**Total: 35,152,000**

48) How many bit strings of length seven either begin with two 0s or end with three 1s?

0 0 \_ \_ \_ \_ \_: **25 = 32**

\_ \_ \_ \_ 1 1 1: **24 = 16**

00\_ \_ 1 1 1: **22 = 4**

**Total: 48 - 4 = 44**

52) Every student in a discrete mathematics class is either a computer science or a mathematics major or is a joint major in these two subjects. How many students are in the class if there are 38 computer science majors (including joint majors), 23 mathematics majors (including joint majors), and 7 joint majors?

**38 + 23 - 7 = 54**

72) Use mathematical induction to prove the product rule for *m* tasks from the product rule for two tasks.

**- Let** **P(M) be the product rule for m tasks**

**- Basis Step: P(2) is true because we would n1 and n2 ways to complete the task, giving us n1n2 total ways to complete the task.**

**-Inductive Step: If we assume P(k) is true, where k is an int >= 2, then show that P(k+1) is also true.**

**-If we show that the task for k+1 requires more than one task, then we can show that nk+1,**

**where n1, n2, .... , nk+1**

**-This will give us n1n2 ... nk (nk+1) ways to complete the task.**

**- We have thus proven the inductive step and the basis step, showing that when k >= 2, then P(k) and P(k+1) is true.**