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?

**_ _ _ _ _ _ $2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2 + 2^0 = 127$**

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 _ _ _ _ _: **$2^5 = 32$**

_ _ _ _ 1 1 1: **$2^4 = 16$**

00_ _ 1 1 1: **$2^2 = 4$**

**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 $n_{k+1}$, where n1, n2, .... , $n_{k+1}$**

**-This will give us n1n2 ... nk ($n_{k+1}$) 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.**