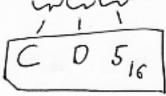
Problem 1. (4 pts)

a) Convert 100111₂ from binary to decimal.

b) Convert 391₁₀ from decimal to octal (base 8).

c) Convert 110011010101_2 from binary to hexadecimal.



d) Convert 4612₈ from octal to binary.

100 110 001 0102

Problem 2. (4 pts)

Use Mathematical Induction to prove that

$$1 \cdot 2^{0} + 2 \cdot 2^{1} + 3 \cdot 2^{2} \cdot \cdot \cdot \cdot n \cdot 2^{n-1} = (n-1)2^{n} + 1$$

Problem 3: (3 pts)

Construct an argument using the rules of inference to show that the hypotheses "There is someone at York who has been to Banff" and "Everyone who has been to Banff visits Lake Louise" imply the conclusion "Therefore, someone at York has visited Lake Louise". Use the predicates B(x) for "x has been to Banff' Y(x1) for "x is at York" and LL(x) for "x has visited the Lake Louise".

Lake Louise .		
1)	3 x (Yix) A B(x))	Hypotheric
2)	Yx (B(X) → LL(X))	Hypothesis
3)	Y(c) 1 B(c)	Existential Instantiation from1
4)	B(c) → LL(C)	Universal Instantiation from 2
5)	BCC)	Simplification from 3
6)	LL(c)	Modus Penen From 4,5
7)	Ycc)	Simplification from 3)
8)	Ycc) 1 LLCc)	Conjunction from 517)
91	3x (YIX)ALLIX	1) Existential generalization from

necessary to name these steps

Problem 4. (3 pts) (Leave your answers to the problems below in combinatorial form; do not work out factorials.)

a) How many bit strings of length 16 either begin with one 1 or end with three 0's?

Begin with
$$1 - 2^{15}$$
End with 000 2^{13}
Both 2^{12}
total $2^{15} + 2^{13} - 2^{12}$

b) Suppose a department contains 15 men and 12 women. How many ways are there to form a committee with four members if it must have more women than men?

c) How many functions are there from the set $\{1, \dots n\}$ to the set $\{1, \dots m\}$ if both 1 and n must be assigned different values?

A Some n > 2

Choose values for 1, n in
$$m \times (m-1)$$
 ways

Choose values for n-2 others in m^{n-2} ways

tota($m(m-1)$ $m^{n-2} = m(m-1)$

d) How many ways are there to choose a fourteen cookies from the 17 varieties at a cookie store if at least six chocolate chip cookies must be choosen?