Exam 1 Practice A 25X

Problem 1

There are 2504 computer science students at a school. Of these, 1876 have taken a course in Java, 999 have taken a course in Linux, and 345 have taken a course in C. Further, 876 have taken courses in both Java and Linux, 231 have taken courses in both Linux and C, and 290 have taken courses in both Java and C. If 189 of these students have taken courses in Linux, Java, and C, how many of these 2504 students have not taken a course in any of these three programming languages?

Problem 2

The predicates below are applicable to any candies x, y:

`choc`(x)	candy x contains chocolate
`nut`(x)	candy x contains nuts
`pop`(x)	candy x is popular
`same_comp`(x, y)	candy x and y are made by the same company

Using the predicates above, express each english statement with logic:

i Snickers bars have chocolate, but no nuts

ii all popular candies contain nuts

iii there is no candy which is both popular and doesn't contains nuts. (Hint: use $\neg\exists$ here)

iv By negating the existential quantifier and applying DeMorgan's law, write a logically equivilent form of the statement immediately above. Note that these manipulations may be applied to the english sentence or the logical expression, if you're stuck on one try the other.

v For every candy with nuts, there is another candy made by the same manufacturer which doesn't have nuts.

Problem 3

i Convert the number 753 from decimal to binary using Euclid's Division Algorithm (the fast method).

ii Convert the binary number $(10100101)_2$ to decimal. Show each of the powers of two to be added to reproduce the value.

iii Convert the decimal number 45263 to base 16 (hexadecimal) using Euclid's Division Method:

iv Solve for x in the equation below:
$(BFF)_{16} = (x)_{10}$

Problem 4
If F_n is the n-th Fibonacci number, prove by induction that F_n and F_{n+1} have no common factors (that is, $\gcd(F_n, F_{n+1}) = 1$)

Problem 5 ★ Monochromatic Rectangle
Every point of an integer grid 20x20 is colored in blue, red or green. Prove that there is a rectangle with all four corners of same color.