Staple!

Ord: ___ ___

Sets and Logic MHF3202 17HE | **Class-A** | Prof. JLF King Friday, 09Feb2024

A4: Short answer. Show no work. Write LARGE.
Write **DNE** if the object does not exist or the operation cannot be performed. NB: DNE $\neq \{\} \neq 0$.

___ a Prof. King thinks that submitting a ROBERT LONG PRIZE ESSAY [typically 2 prizes, \$600 total] is a *really good idea*. A ten-page essay is fine. Date for the emailed-PDF is Mon., 25 Mar., 2024.

Circle: **Yes** **True** ***Résumé material!***

___ b $B^E = \sum_{j=0}^{59} \binom{59}{j} \cdot 4^{2j}$, for posints $B=$ ____ & $E=$ ____.

___ c Write the free vars in each of these expressions.

$$\overbrace{\exists n \in \mathbb{N}:\ f(n) \subset \bigcup_{\ell=p-4}^{p+7} \underbrace{\{x \in \mathbb{Z} \mid \ell \cdot n \equiv_5 x^2\}}_{E1}}^{E2}$$

$E3$: _____. $E2$: _____. $E1$: _____.

___ d LBolt: GCD$(70, 42)=$ ____ $\cdot 70 +$ ____ $\cdot 42$.

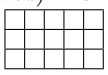
So (LBolt again) $G := \text{GCD}(70, 42, 60)=$ _____ and

____ $\cdot 70 +$ ____ $\cdot 42 +$ ____ $\cdot 60 = G$.

___ e The physics lab has atomic *zinc*, *tin*, *silver* and *gold*. I'm allowed to take 6 atoms, so I have [expressed as single integer] _____ many possibilities.

This number *also* equals the number-of-ways of picking K candies from T many types of candy, where $K =$ ____ $\notin \{1, 6\}$ and $T =$ ____ $\notin \{1, 4\}$.

OYOP: *In grammatical English* ***sentences****, write your essay on every 2nd line* (usually)*, so I can easily write between the lines.*

A5: An ***Lmino*** (pron. "ell-mino") comprises three squares in an "L" shape (all four orientations are allowed). For natnum N, let $\mathbf{R}_N$ denote the $3\times N$ board: I.e,  is the $\mathbf{R}_5$ board. Prove:

Theorem: When N is odd, then board $\mathbf{R}_N$ is not Lmino-tilable.

You will likely want to first *state* and *prove* a Lemma. Now use appropriate induction on N to prove the thm. Also: *Illustrate your proof* with (probably several) large, *labeled* pictures.

When N is even, our $\mathbf{R}_N$ has exactly _____ *many Lmino-tilings.*

A4:	___ ___ ___	105pts
A5:	___ ___	60pts
Total:	___ ___ ___	165pts

NAME: _____

Energetic *Proof-is-my-Middle-Name* Student

HONOR CODE: *"I have neither requested nor received help on this exam other than from my professor."*

Signature: _____