Sets and Logic	**Class-W**	Prof. JLF King
MHF3202 7860		31Aug2015

W4: Short answer. Show no work.

Please write **DNE** in a blank <u>if</u> the described object does not exist or if the indicated operation cannot be performed.

___ ___ a Prof. King believes that writing in complete, coherent sentences is crucial in communicating Mathematics, improves posture, and whitens teeth. Circle one:

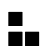
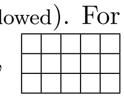
True! **Yes!** ***wH'at S a?sEnTENcE***

___ ___ b On a 5-element set, the number of reflexive symmetric binrels is ______.

On a 3-element set, there are ______ many equivalence relations.

___ ___ c On $\Omega := [1..29]\times[1..29]$, define binary-relation **C** by: $(x,\alpha)\,\mathbf{C}\,(y,\beta)$ IFF $x\cdot\beta \equiv_{30} y\cdot\alpha$. Statement "*Relation* **C** *is an* ***equivalence relation***" is: *T* *F*

OYOP: *In grammatical English* ***sentences****, write your essays on every* ***third*** *line* (usually)*, so that I can easily write between the lines. Do* **<u>not</u>** *restate the question.* Start each essay on a <u>new</u> sheet-of-paper. Please number the pages "1 of 57", "2 of 57"... (or "1/57", "2/57"...) I suggest you put your name on each sheet.

W5: An ***Lmino*** (pron. "ell-mino") comprises three  squares in an "L" shape (all four orientations are allowed). For natnum N, let $\mathbf{B}_N$ denote the $3\times N$ board: I.e,  is the $\mathbf{B}_5$ board. Prove:

Theorem: When N is odd, then board $\mathbf{B}_N$ is <u>not</u> 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, <u>*labeled*</u> pictures.

W6: Interval-of-integers $\mathbf{J} := [101..200)$ has 99 elements. A subset $S \subset \mathbf{J}$ is ***Big*** if $|S| = 51$. Subset $S \subset \mathbf{J}$ is ***Perfect*** if there exist *distinct* members $x,y \in S$ st. $x + y = 300$.

Prove that Big $\Rightarrow$ Perfect. [*Hint:* PHP. <u>*Carefully*</u> specify what your pigeon-holes are.]

End of Class-W

W4:	___ ___	60pts
W5:	___ ___	50pts
W6:	___ ___	45pts
Total:	___ ___ ___	155pts