Staple!

Sets and Logic MHF3202 2787 | **Class-V** | Prof. JLF King 31Aug2015

V4: Short answer. Show no work.

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

___ a Sequence $\vec{\mathbf{L}} := (L_n)_{n=0}^{\infty}$ is defined by $L_0 := 5$, $L_1 := 4$, and $\boxed{\forall n \in \mathbb{N}:\ L_{n+2} = 3L_{n+1} + 2L_n}$. This implies $\boxed{\forall k \in \mathbb{N}:\ L_k = [P{\cdot}\alpha^k + Q{\cdot}\beta^k]}$, for real numbers

$\alpha =$ ⌞. . . . . ⌟ $< \beta =$ ⌞. . . . . ⌟.

___ b The physics lab has atomic *zinc*, *tin*, *silver* and *gold*. I'm allowed to take 5 atoms, so I have [expressed as single integer] ⌞. . . . . ⌟ many possibilities.

___ c Mimicking what we did in class: From the 300×200 game-board, cut-out (remove) the $(35, 150)$-cell and one other cell at $P = (x, y)$. Circle those choices for P,

$(150, 160)$, $(14, 35)$, $(66, 77)$, $(195, 15)$, $(123, 4)$

which, if removed, would leave a board that *definitely* can**not** be domino-tiled.

___ d *On $\mathbb{R}_+$, define several relations: Say that $x\mathcal{R}y$ IFF $y - x < 17$. Define $\mathcal{P}$ by: $x\mathcal{P}y$ IFF $x^{\log(y)} = 5$. Say that $x\mathcal{I}y$ IFF $x + y$ is irrational.*

Use $\bullet\!|$ for the "divides" relation on the positive integers: $k \bullet\!| n$ iff there exists a posint r with $rk = n$.

d$_1$ Please circle those of the following relations that are *transitive* (on their domain of defn).

$\neq$ $\bullet\!|$ $\leqslant$ $\mathcal{R}$ $\mathcal{P}$ $\mathcal{I}$

d$_2$ Circle the *symmetric* relations:

$\neq$ $\bullet\!|$ $\leqslant$ $\mathcal{R}$ $\mathcal{P}$ $\mathcal{I}$

d$_3$ Circle the *reflexive* relations:

$\neq$ $\bullet\!|$ $\leqslant$ $\mathcal{R}$ $\mathcal{P}$ $\mathcal{I}$

OYOP: *In grammatical English* ***sentences****, write your essay on every* ***third*** *line* (usually)*, so that I can easily write between the lines. Do* **not** *restate the question.*

V5: On a 7×7 chessboard, 23 rooks are placed. Prove: ***Either*** *there exists a friendly 5-set, or disjoint-pair of friendly 4-sets.* [An n-set of rooks is ***friendly*** if the rooks lie on n distinct rows, and n distinct columns.] [*Hint:* PHP]

End of Class-V

V4:	___ ___	75pts
V5:	___ ___	75pts
Total:	___ ___ ___	150pts

Please PRINT your name and ordinal. Ta:

Ord: ⌞. . . . . ⌟

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

Signature: ⌞. . . . . ⌟