Staple!

Ord: ___ ___

Abstract Algebra
MAS4301 09B1

Class-A

Prof. JLF King
Wednesday, 25Sep2019

Hello. Write **DNE** if the object does not exist or the operation cannot be performed. NB: **DNE** $\neq \{\} \neq 0 \neq$ *Empty-word*.

Let F and R be the ***flip*** and ***rotation*** in the dihedral group $\mathbb{D}_N$, with $\mathtt{F}^2 = \mathbf{e}$, $\mathtt{R}^N = \mathbf{e}$ and RFRF=**e**. Use $\mathtt{R}^j$ and $\mathtt{R}^j\mathtt{F}$ as the standard form of each element in $\mathbb{D}_N$.

Fill-in *all* blanks on this sheet **including** the blanks for the essay question.

A5: Show no work.

___ ___ **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** Euler $\varphi(29{,}000{,}000) =$ ________.

Express your answer as a product $p_1{}^{e_1} \cdot p_2{}^{e_2} \cdot \ldots$ of *primes* to posint powers, with $p_1 < p_2 < \ldots$.

___ ___ **c** There are ________ non-id-elt involutions in $\mathbb{D}_{104}$.

___ ___ **d** Each $h \in \mathbb{D}_{10}$ yields an inner-auto $J_h(x) := hxh^{-1}$. Writing elts in form $\mathtt{R}^k\,\mathtt{F}^s$, two *distinct* $\alpha, \beta \in \mathbb{D}_{10}$ with $J_\alpha = J_\beta$ are $\alpha=$ ________ and $\beta=$ ________.

___ ___ **e** In $\mathbb{S}_{15}$, in terms of multinomial-coeffs and factorials: There are ________ many solo 15-cycles. And the

$\#\left\{\begin{matrix}\text{Elements of}\\ \text{order 35}\end{matrix}\right\} =$ ________.

___ ___ **f** Cards $0, 1, \ldots, 7$ are fed into a shuffling machine, then the output is fed back in, resulting in $5, 4, 0, 2, 6, 7, 1, 3$. So after the first pass, the cards were in order

___ ___ ___ ___ ___ ___ ___ ___.

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

A6: A group G engenders its group of inner-automorphisms $\text{Inn}(G) := \{J_h \mid h \in G\}$, where $J_h(x) := hxh^{-1}$.

PROVE: *Each finite group G satisfies*

$$\dagger\text{:} \qquad \left|\text{Inn}(G)\right| = \frac{|G|}{|\mathrm{Z}(G)|},$$

where $\mathrm{Z}(G)$ is the center of G.

End of Class-A

A-Home:	___ ___ ___	295pts
A5:	___ ___ ___	110pts
A6:	___ ___	45pts
Total:	___ ___ ___	450pts