

SOCW1001

=blfcXi Whob ho GcWW K cf_

HYfa 'C bY''##'&\$&\$

7ci fgY^{*}Cj Yfj]Yk

[']GhJZ'7cbhJWh'8YhJ]`g'

'7cbj Ybcfg'

B Ua Y	9a U]`	5j U]`UV]`]hm	@cWUhjcb	D∖cbY
A UfYY '<][[]bg	a "\][[]bg4 i bgk "YXi "Ui	A cbXUm'%' da žcf	%), 'A cfj Yb	\$('%'-,+
		VmUddc]bha Ybh	6fck b 6i] X]b[&&,

'Hi hcfg'

B Ua Y	9a U]`	5j U]`UV]`] m	@cWUhjcb	D\cbY
8ca]b]Wj Ub; YghY`	X"j Ub[YgHY`4 i bgk "YXi "Ui	'\$ a]bg df]cf hc h\Y h hcf]U`	%* + A cfj Yb 6fck b 6i]`X]b[b#U
@]gU`: fUbW]g	`"ZFUbW]g4 i bgk "YXi "Ui	'\$ a]bg df]cf hc h\Y h hcf]U`	%* + A cfj Yb 6fck b 6i]`X]b[b#J
:]cbU [*] A U[YY	Za U[YY4 i bgk "YXi "Ui	- 0	%* + A cfj Yb 6fck b 6i]`X]b[b#U
BY``]Y`Dc``UfX! K\Ufhcb	b"dc``UfX!k \Uffcb4 i bgk "YXi "Ui		%* + A cfj Yb 6fck b 6i]`X]b[b#U

GWXcc`7cbHJWhi±bZcfa Uh]cb

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A cfj Yb 6fck b 7 &\$

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d\cbY. '\$&'-',) '% \$+

7ci fgY 8YHJ] g

7 fYX]hDc]bhg**

Gi a a UfmcZ'h\Y'7ci fgY

GiVYWh5fYU. EaU[S^I ad]

5ggYgga Ybh

 $\label{eq:continuous} K YY_g`\% (``cZ`YWi fYg`UbX`hi hcf]U`g`k]```Wcj Yf`WcbhYbhih\Uh]g`X]fYWhmfY`Yj Ubhihc`Wca d`Yh]cb`cZ 5ggYgga Ybh'%`k \]`Y`k YY_g`) !\%cZ`YWi fYg`UbX`hi hcf]U`g`k]```Wcj Yf`WcbhYbhih\Uh]g`X]fYWhmfY`Yj Ubhihc Wca d`Yh]cb`cZ5ggYgga Ybh'&''`$

 $\label{eq:continuity} $$H^[g']g'k \m^UhYbXUbW']g']a\ dcflUbhUbX'UWIj\ Y'dUfljW]dUljcb'UbX'Wca\ a\ i\ b]WUljcb'k\]h\ 'mci\ f''YWi\ fYf'UbX'h' hcfg']g'YggYbljU''''$

; YbYfU``ZYYXVUW_`cb`UggYgga Ybh'Wca d`Yh]cb`k]```VY`dfcj]XYX`]b`K YY_`*`cZHYfa `UbX`XYHJ]`YX`ZYYXVUW_k]```VY`dfcj]XYX`cb`mci f'a Ubi gWf]dhg"`D`YUgY`Ybgi fY`mci `fYUX`U```Wca a Ybhg`UbX`gYY_`\Y`d`YUf`m]Zmci bYYX`]h'`K Y`UfY`\YfY`hc`YbWci fU[Y`UbX`gi ddcfhimci f`XYjY`cda Ybh'Ug`UWh]jY`UbX`fYZYI]jY``YUfbYfg"`

5ggYgga Ybh'HUg_g'

5ggYgga Ybh'hUg_		

("GY`YWhUbX`XYgWf]VY`CB9`h\YcfmZcf`gcW]U`kcf_žci h]b]b[`gYjYfU``_YmWcbWfdhgžaU]b`h\Ycf]ghgž\ck`]h]g`igYX`]b`gcW]U``kcf_"`UbX`Yj]XYbWf`h\Uhgiddcfhg`cf`id\c`Xg`h\Y`h\YcfmfFYZYf`hc7\Ybck]h\`UbX`AWJi``]ZZYž&\$% ž`7\UdhYf`) ž`UbX`Uh`YUghcbY`ch\Yf`gcifWf\E'`f(\$\$`kcfXgE''

 $\begin{tabular}{ll} Gi Va] $gg]cb`bchYg. D`YUgY`Zc``ck 'h\Y`GW\cc``fYZYfYbW]b[`[i]XYžWcbgi``hih\Y`fi Vf]WzUbgk Yf`U```ei Ygh]cbg Ug_YX`UbX`Zcfa Uhmci f`Ugg][ba Ybh'Uddfcdf]UhY`m' \\ \begin{tabular}{ll} Fugh[cbg] Fugh[cbg]$

 $\label{thm:continuous} \begin{tabular}{ll} Hi & fb & fb & gYM &$

5ggYgga Ybh'& 5bU'mg]g cZ7cbhYl h'UbX DfUWjWY fY`Yj Ubh'hc h\ Y Wci fgY

GhUfhXUhY. Bch5dd`]WUV`Y

5 hyb XUb WY F Yei] fYa Ybhg

H\Y`GW\cc``cZGcV]U``GV]YbW\g`YI dYW\g`t\Uhgh XYbhg`k]```UhhYbX`UbX`dUfh]V]dUhY`UW\j Y`m]b`%\$\$\\ `cZ\YUfb]b[`\UbX`hY\U\X]b[`\U\Mj]j\]Yg"`A\UbX\uhght\bXUbb\W`cZ\W\UggYg`Zcf`t\\]g`\\circ fgY`]g`\dfhcZh\Y\\U\\\Y\X]hUh]cb`fYei]fYa\Ybhg`Zcf`t\\Y`6GK\`fk\cbg\cdfc[\fua\"`H\Y`\\circ fgY`]g`XYg][\bYX`hc`dfcj]XY`YggYbh]U`\Y\Ufb]b[`]b`Y\U\X\gYa]bUfz`t\]g`a\Y\Ubg`mci\ai\gina\fua\thYbX`U``\\\$\gYa]\bUfg"

Implication of the control of the co

7ci fgY'GWXYXi `Y

J]Yk 'WUgg'ha YHJV'Y

H]a YHJV`Y

8 UhY	l lml V	7 o h b/h h
	Hmd Y	7 cbh/bh
K YY_'%' %+': YVfi Ufm!' &% : YVfi Ufm	Cb`]bY'5Wfjj]m	±blfcXiWh]cb'hc'h\Y'WcifgYžgY`Z'UkUfYbYgg UbX'gY`Z'WUfY
		H\]g`cb`]bY`UWfj]]tmik]```Wcbg]XYf`\ck 'mci 'fg\ck 'i dfz UbX`YgHJV`]g\`\ck 'mci 'k]```]a d`Ya YbhgY`ZWJfY`]b h\Y`Wci fgY"'
		B WSeW`afW fZ[e SUf[h[fk US`TWg`VWfS] W bd[adfa I WW] #IS`V _ gef TWUa_ b WfW Tk fZWW V aX I WW] #ž
	Hi kcf]U`	±blfcXiWfjcbihcih\Y`WtifgY`UbX'Wtbg]XYfUh]cb cZXYZ b]h]cbgicZgcW]U`ik cf_
	; fci d'5Wfj]hm	K Y`Wca Y'hc'GcWJU`K cf_'A cfb]b['HYU
		H\]g`UWMjj]mmZc``ckg`h\Y`@YWMifY`]b`KYY_`%`UbX`U`` ghiXYbhg`UfY`YIdYWMYX`hc`UhMYbX"`
		8 YHU]`g. '? a` VSk #*fZ 8WTcgSckł (Ž) b_ł agfe[VWfZW WUfgdWfZWSfdW[5>4
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K YY_'&.'&(': YVfi Ufm'!'&, : YVfi Ufm	Hi lcf]U`	A Udd]b['h\Y'_bck `YX[Y'VUgY'cZgcW]U`'k cf_ dfUWf]V\Y"	
	@YWhi fY	GcWJU``k cf_'h\Ycfm'5b'cj Yfj]Yk '	
K YY_'' . & A UfWX '! '* A UfWX	Hi lcf]U`	:]Y`Xg`UbX`WcbhYl hg`cZgcWJU``k cf_`dfUWrJWY.`gYWfcfg]b`k \]W\`gcWJU``k cf_Yfg`dfUWrJWYž'UbX`h\Y`hmdYg`UbX `Yj Y`g`cZ]bhYfj YbhJcbg`h\Ymil h]`]gY"	
	@YVVi fY	DfUWfWYZJY`Xgž'WcbHYI hg`UbX`a Yh\cXg	
K YY_'(.'-'A UfWX'!'%' A UfWX	Hi hcf]U`	91 d`cfUhjcb`cZh\Y`Yh\]\W``UbX`j U`i Yg`Zci bXUhjcb`cZ gc\VjU``k cf_`dfU\Wj\\Y"	
	@YWhi fY	J U`i Yg`UbX`Yh\]Wg`]b`dfUW¶W	
	5ggYgga Ybh	5 ggYgga Ybh'%Xi Y': f]XUm'% h\ 'A UfVX	
K YY_") ."%*"A UfWX"!"&\$ A UfWX	Hi læfju`	DfUWjWY`9IUad`Y`%`7UgYkcf_ž7cibgY``jb[ž:Uaj`m Kcf_ž7caaib]miKcf_žFYgYUfW\cf`Dc`jWm	
	@YWi fY	DfUWjWY'9IUadY'%'7UgYkcf_ž7cibgY``]b[ž:Ua]m Kcf_ž7caaib]miKcf_žFYgYUfW\'cf'Dc`]Wm	
	Cb`]bY`5WNjj]hm	GY`YWz``]ghYb`hc`UbX`k f]hY`UVci hU`dcXWUghfY`Yj Ubh hc`gcWjU``k cf_`dfUWjWYz`UbX`Wca a Ybhcb`Uh``YUgh lk c`ch\Yf`gh XYbhfg`V`c[g"`8YhU]`g`k]```VY`dfcj]XYX`]b A ccX`Y"`H\]g`]g`hc`VY`Wca d`YhYX`VYhk YYb`K YY`) UbX`K YY'+`cZHYfa "`	
K YY_'*.'&' 'A UfWX'!'&+ A UfWX	Hi hcf]U`	DfUWNWY91 UadY'&:7UgYkcf_ž7cibgY``]b[ž: Ua]`m Kcf_ž7caaib]miKcf_žFYgYUfW\`cf'Dc`]Wm	
	@YWhifY	DfUWNWY'91 Ua d`Y'&.'7 UgYk cf_ž'7 ci bgY``]b[ž: Ua]`m K cf_ž'7 ca a i b]hmK cf_ž'F YgYUfW\'cf'Dc`]\Mn	
K YY_`+." \$`A UfWX`!" 5df]`	Hi hcf]U`	DfUWNWY'91 Uad'Y''.'7 UgYkcf_ž7cibgY``]b[ž: Ua]`m Kcf_ž7caaib]mKcf_žFYgYUfW\'cf'Dc`]Wh	
	@YWhifY	DfUWNJWY 91 Uad'Y''. 7 UgYkcf_ž7cibgY``]b[ž: Ua]m Kcf_ž7caaib]miKcf_žFYgYUfW\'cf'Dc`]Wn	

F Ygci fWYg

DfYgWf]VYX F Ygci fWYg

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

Hi fb]h]b Gi Va]gg]cb

#mci YbWci bhYf'U'dfcV'Ya 'k \Yb'UthYa dr]b['rc'gi Va]hmci f'Ugg][ba Ybht\fci [\'Hi fb]r]bž'd'YUgY
hY'Yd\cbY'9I hYfbU''Gi ddcfhcb'-',) '''' %cf'Ya U]''h\Ya 'cb'YI hYfbU'hY'hgi ddcfh4 i bgk "YXi "Ui '"'Gi ddcfh
\ci fg'UfY', .\$\$Ua '-'%\$.\$\$da 'cb'k YY_XUmg'UbX'-.\$\$Ua '-').\$\$da 'cb'k YY_YbXg'fl *) 'XUmg'U'mYUft\"'=\maintention
UfY'i bUV'Y 'rc'gi Va]hmci f'Ugg][ba YbhXi Y'rc'U'ZJi 'hk]h\'Hi fb]r]b'mci 'a Um'Udd'm\Zcf'Ub'YI hYbg]cb\ZVi hmci
a i ghfYhJ]b'mci f'r]\W_Yhbi a VYf'\Zfca '9I hYfbU''Gi ddcfhfU'cb['k]h\'Ubmch\Yf'fY'Yj UbhXcW a Ybfg\L'rc
]bWi XY'Ug'Yj]XYbW' 'rc'gi ddcfhmci f'YI hYbg]cb'Udd']\WJh]cb'''=\maintention
UfY'' bUYY''mfYWY']j Y'U'r]\W_Yhbi a VYf\Zfvi h]Zmci 'hY'Yd\cbY'mci 'k]'''bYYX'rc'gdYW]\ZfwJ''mUg_'Zcf'cbY''
Hi fb]h]b'U'gc'dfcj]XYg'i dXUhYg'cb'h\Y]f'gmghYa 'gfUh' g'cb'Hk]hYf"

; YbYfU``mž'UggYgga YbhiHug_g'a i ghVY'gi Va]hhYX'Y`YVWfcb]\W)``mj]U'Y]h\Yf'Hi fb]hjb'cf'U'A ccX`Y Ugg][ba Ybh'' =b']bgHJb\W'g'k \YfY'h\]g']g'bchdcgg]V`Yž']hk]``'VY'gHJhYX'cb'mci f'\\circ i fgY'g'A ccX`Y'g]hY'k]h\ U`hYfbUhj Y'gi Va]gg]cb'XYHJ]`g''

cfi]bZcfa Uh]cbicbi\ckihcigi Va]hUgg][ba Ybhgicbi]bYij]UiA ccXiY.i\hdg.#gh XYbh'i bgk "YXi "Ui #\ck! qi Va]hUgq][ba Ybha ccXiY

5 WUXYa]W<cbYghmUbX D`U[]Uf]ga

D`U[]Uf]ga `]g`i g]b['h\Y`k cfXg`cf`]XYUg`cZch\Yfg`UbX`dfYgYbh]b['h\Ya `Ug`mci f`ck b"'=hWJb'hU_Y`a Ubm Zcfa gžZfca `XY`]VYfUhY`W\YUh]b['hc`UWW]XYbhU`mWcdm]b['Zfca `U`gci fWY'k]h\ci hUW_bck `YX[Ya Ybh'

IBGK [fcidg'd'U[]Uf]ga]bhc'h\Y'Zc``ck]b[WUhY[cf]Yg.

7 cdm]b[.'i g]b['h\Y'gUa Y'cf'j Yfmg]a]`Uf'k cfXg'hc'h\Y'cf][]bU`hYl h'cf']XYU'k]h\ci h'UW_bck `YX[]b['h\Y gci fW'cf'i g]b['ei chUh]cb'a Uf_g"'H\]g'U`gc'Udd`]Yg'hc']a U[Ygž'Ufh'UbX'XYg][b'dfcYWhgž'Ug'k Y``'Ug dfYgYbhUh]cbg'k \YfY'gca YcbY'dfYgYbhg'Ubch\Yf'g']XYUg'cf'k cfXg'k]h\ci h'WfYX]h'

⇒ Uddfcdf]UhY 'dUfUd\fUg]b[...7\Ub[]b['U'ZYk 'k cfXg'UbX'd\fUgYg'k \]'Y 'a cghmfYhJ]b]b['h\Y'cf][]bU` ghfi Wh fY 'UbX#cf'dfc[fYgg]cb'cZ]XYUg'cZh\Y'cf][]bU'žUbX']bZcfa Uh]cb'k]h\ci hUW_bck `YX[Ya Ybh'H\]g'U`gc Udd`]Yg']b'dfYgYbhUh]cbg'k \YfY'gca YcbY'dUfUd\fUgYg'Ubch\Yf'g']XYUg'cf'k cfXg'k]h\ci hWfYX]hUbX'hc d]YW]b['hc[Yh\Yf'ei chYg'UbX'dUfUd\fUgYg']bhc'U'bYk 'k \c`Yžk]h\ci hUddfcdf]UhY'fYZYfYbW]b["

7 c``i g]cb.'k cf_jb['k]h\ch\Yfg'Vi hdUgg]b['cZZh\Y'k cf_'Ug'U'dYfgcb'g']bX]j]Xi U``k cf_"'7 c``i g]cb'U`gc]bWi XYg'dfcj]X]b['mci f'k cf_'hc'Ubch\Yf'ghi XYbhVYZcfY'h\Y'Xi Y'XUhYžcf'Zcf'h\Y'di fdcgY'cZh\Ya d`U[]Uf]g]b['UhiUbmh]a Yž'dUm]b['Ubch\Yf'dYfgcb'hc'dYfZcfa 'Ub'UWUXYa]WhUg_ž'ghYU']b['cf'UWei]f]b[Ubch\Yf'dYfgcb'g'UWUXYa]Wk cf_'UbX'Wcdm]b[']hz'cZYf]b['hc'Wca d'YhY'Ubch\Yf'dYfgcb'g'k cf_'cf'gYY_]b[dUma YbhZcf'Wca d'Yh]b['UWUXYa]Wk cf_"

±bUddfcdf]UhY`W]hUh]cb.`7]h]b[ˈgci fWYg'k\]WX`\Uj Y`bchVYYb`fYUXžk]h\ci hUW_bck`YX[]b[`h\Y`″gYWcbXUfm″gci fWY`Zfca 'k\]WX`_bck`YX[Y`cZh\Ya`\Ug'VYYb`cVhU]bYX"

8 i d`]\WUh]cb`ffgY`Zd`U[]\Uf]ga "Ł gi Va]\h]b[`mci f`ck b`k cf_ž]b`k \c`Y`cf`]b`dUfhžk \YfY`]h\Ug`dfYj]ci g`m VYYb`dfYdUfYX`cf`gi Va]\hYX`Zcf`Ubch\Yf`UggYgga Ybhcf\Wci fgY`UhI BGK `cf`Ubch\Yf`i b]j Yfg]\m'

7 cffYWnfYZYfYbWlb['dfUWnWyg.

- DUfUd\fug]b[ž'gi a a Uf]g]b[ž'YggUmk f]h]b["UbX"h]a Y a UbU[Ya Ybh
- 5ddfcdf]UhY'i gY'cZUbX'Uhf]Vi h]cb'Zcf'U'fUb[Y'cZa UhYf]U`g']b\$

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5 WUXYa]W = b Zcfa Uh cb.

: cf`YggYbhJU``gh XYbh`]bZcfa UhJcb`fY`UhJb['hc.

- fYei YghgʻZcfʻYl hYbg]cb/
- `UhY`gi Va]gg]cbg`[i]XY`]bYg/
- fYj]Yk 'cZa Uf_g/
- I BGK '< YU`h\ 'UbX'GUZYhm'dc`]W[Yg/
- YI Ua]bUhcb dfcWXi fYg/
- gdYWJU``Wcbg]XYfUHjcb`]b`H\Y`Yj YbhcZ]``bYgg`cf`a]gUXj Ybhi fY/
- gh XYbhYei]lmUbX X]gUV]`]lm/
- UbX'ch\Yf'YggYbhJU`'UWUXYa]W]bZcfa UhJcbž'gYY

\hdg.#k k k "Uffg"i bgk "YXi "Ui #W ffYbhgh XYbhg#UWJXYa]W]bZcfa Uf]cb#dfchcWc`g![i]XY`]bYg#

a U[Y'7fYX]h

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7F = 7CG

7F = 7CG Dfcj]XYf 7cXY. \$\$\$-,;