

$9 cb A i g_{\tilde{z}} UW_8 cfgYm \tilde{z} N fHY]^{\}$

9`cb`Aig_kUf`X]Y`Y]bZiggfY]W\ghY`:][if`]a`?fmdhc!6YfY]W\z\
jca`8c[YZUh\Yf`V]g`ni`HYg`Už`XYf`6H7`]a`K\Yfh`jcb`%\z)
A]``]UfXYb`IG!8c``Uf`_UiZhY`ibX`XUbb`X]Y`6H7!NU\`ib[YbUiggYhnhY"5bXYfY`DYfgÒb`]W_Y]hYbz`X]Y`XYb`AUf_h
VYkY[hYbz`kUfYb`XYf`Y\YaU`][Y`Hk]hhYf!7\Yz`*J\W_`8cfgYm\z\
A]W\UY``GUm`cfz`7\Ub[dYb[`N\Ucz`;Ufm;Ybg`Yf`ibX`aY\f"&\&\k\Uf`gY\f`YfY][b]gfY]W\"`Hfchn`XYf`DUbXYa]Y`\Uh`XUg\J\f`b]Y`YbXYbXY`JYf\AbXYfib[Yb`ibX`K\YbXib[Yb`Yf`YV\z\ibX`?fmdhc`kUf`b]W\h`UbXYfg"`8Yf`GY_hcf`\Uh`Ub`6YXYihib[Yb`ibX`?fmdhc`kUf`b]W\h`UbXYfg"`8Yf`GY_hcf`\Uh`Ub`6YXYihib[Yb`ibX`aUb\XaY\f`U`g`UbXYfYz`XYfYb`6YkY[ib[Yb`ibX`aUb\XaU`gc[Uf`HkYYhg`A]``]UfXYb'jcb`8c``Uf`Ub\AUf_hkYfh`VYkY[hYb"9`cb`Aig_`Z\Z\f\hY`XUg`6UhU]``cb`Ub\z\UV\f`Ui\W\`UbXYfY`k]Y`/Uad\Y``]d/



9`cb`Aig_k Uf`X]Y`Y]bZ`i ggfY]WkghY:][if`]a '?fmdhc!
 6YfY]Wkžij ca '8c[YZUh\Yf`V]g`ni 'HYg`Už`XYf`6H7']a

- K Yfh'j cb'%ž) 'A]``]UfXYb'l G!8c``Uf'_Ui ZhY'i bX'XUbb $X]Y'6H7!NU\$ i b[Yb'Ui ggYhnhY"
- 5bXYfY DYfgÒb`]WX_Y]hYbž'X]Y XYb A Uf_h'VYk Y[hYbž k UfYb XYf'Y\Ya U`][Y'Hk]hhYf!7\YZ'>UW_'8cfgYmž A]WXUY`GUm`cfž'7\Ub[dYb['N\Ucž'; Ufm'; Ybg`Yf i bX'a Y\f"

9 cb A i g_{-}

K Ugʻk ÀfYʻX]YʻK Y`hʻ&\$&%ʻc\bYʻXYbʻW\Uf]ga Uh]gW\YbʻHYg`U!7\YZ 9`cbʻA i g_3ʻ \not hnhʻ\UhʻXYfʻfY]W\ghYʻA UbbʻXYfʻK Y`hʻ]bʻa Y\fZUW\Yf <]bg]W\hʻ9]bZi ggʻ[Y\UVhžʻgcʻgY\fžʻXUggʻXUgʻH]a YʻA U[Un]bYʻ]\b [YbUbbh'\UhʻDYfqcbʻXYgʻ \not U\fYg"

Aig_g'9]bZigg'UiZ'?fmdhc'kifXY'n]Ya`]W\'[fc»ž']b'Y]b][Yb':À``Ybgc[Uf'ni'[fc»"8Yf'AUf_h'`YVhY'ibX'ghUfV'jcb'gY]bYb6YkY[ib[Yb'ibX'YfghfYW_hY'g]W\'gc[Uf'UiZ'gY]bY'HkYYhg"'9]bHkYYh'a]h'XYa'Kcfh'8c[YWc]b'kØfXY'X]Y'AUf_h_Ud]hU`]g]Yfib[XYg'AYaYWc]bg'ia'Yf\YV`]W\Y'DfcnYbhgÀhnYž'aUbW\aU`ia'V]gni'&)'DfcnYbhž'bUW\'cVYb'hfY]VYb"

Aig_'k Uf'bcW\'b]Y'Ya UbXž'XYf'g]W\'j cf'5i Za Yf_gUa _Y]h'gW\Yi h i bX'X]YgY'bYi '[YZi bXYbY'_i `hÀ\b`]W\Y'; YZc`[gW\UZh'a Y`_hž'i a gY]bY'5[YbXU'j cfUbni hfY]VYb"'9f'di a dhY'8c[YWc]bž']bXYa 'Yf U``Yf`Y]'@cV'ØVYf'Y]bY'?fmdhck À\fi b['ØVYf\Ài ZhYž'X]Y'U`g'GW\Yfn [YgW\UZZYb'i bX'j cb'nk Y]'\dag{Yb}[Yb]Yi fYb'Ui Z[Y[YVYb'k i fXY" 9f]bbYfb'G]Y'g]W\ž'U`g'Yf'VY]'GUhi fXUm'B][\h'@]j Y'Ui ZhfUh'i bX 8C; 9'dfca chYhY'i bX'g]W\'gc[Uf'8c[YZUh\Yf'bUbbhY3'fPg'`]YZ b]W\h'k]Y'Yfk UfhYhž'UVYf'hfchnXYa Ł

5```XUg`k Ufž'U`g'Yf'U`g'9]bnY`dYfgcb'\UbXY`hY"'9g'[UV'Y]bY'nk Y]hY GY]hYž'U`g'Yf'U`g'HYg`U!7\YZ'X]Y'A Àf_hY'VYY]bZi gghY"'A i g_'\UhhY]a a Yf'X]Y'A Ò[`]W_Y]hž'gY]bY'=XYYb'gY]bYa 9`Y_hfcZU\fnYi [i bhYfbY\a Yb'Ui Zni nk]b[Ybž'i bX'VY]'6]hWc]b'k Uf XUg'b]W\h'UbXYfg"

± X]YgYa ⅓J\f'[UV'Yf'VY_Ubbhž'XUgg'gY]b'I bhYfbY\a Yb'6H7']a

K Yfh'j cb'%ž) 'A]``]UfXYb'I G!8c``Uf'[Y_Ui Zh'\Uh''8]Yg'`]Y» 'XYb'DfY]g
gc'ghUf_']b'X]Y'<Ò\Y'gW\bY``Ybž'XUgg'XUg'I bhYfbY\a Yb']bbYf\U`V

Y]bYg'A cbUhg'%'A]``]UfXY'I G!8c``Uf'Ui g'gY]bYf'±j Ygh]h]cb'j YfX]Ybh
\UhhY''5bU`mghYb'gc[Uf'k]Yg'XUfUi Z'\]b'XUgg'HYg`U'Y]bY'7\UbW\
\UhhYž'a Y\f'a]h'6H7'ni 'j YfX]YbYb'U`g'a]h'XYa 'J Yf_Ui Z'j cb
5i hcgž'k Ug'gY]b'<Ui dh[YgW\ÀZh']gh''

9g'[]b['YXcW\'gW\bY``gUi Yf'i bX'bUW\'?f]h]_'Ua '6H7!
9bYf[]Yj YfVfUi W\'fZØf'XYb'HYg`U'Y]b'7\Ua d]cb']ghŁ'`]Y» 'Yf'X]Y
?fmdhc'ZU``Yb"'9f'\Uh'nk Uf'Y]b][Y'J YfgdfYW\Yb'[Ya UW\hž'Yg']b
Ni _i bZh'k]YXYf'Ubni bY\a Ybž'UVYf'k]f'U``Y'k i gghYbž'XUgg'Yf'bi f
gY]b'; Yg]W\h'k U\fYb'k c``hY'i bX'a]h'gY]bYa 'Gd]Y`nYi ['ZYfh][
k Uf"'I bX'cVk c\``Yg'ZØf']\b'Y]b'Gd]Y`nYi ['[Yk YgYb'gY]b'_ObbhYž
Yf`]hhYb'X]Y'5b`Y[Yf'Xi fW\'XYb'XUfUi ZZc`[YbXYb'DfY]gj YfZU``
J Yf'i ghY']b'<O\Y'j cb'<i bXYfhYb'j cb'A]``]UfXYb'8c``Uf"

Aig_`\Uh'j]Y``aY\f`ZØf`XYb`FUia`[YhUbžY]bgW\`]Y»`]W\`XYf:cfXYfib[ž'XUgg`8C; 9'g_U`]Yfh'ibX`U`g`NU\`ib[gaYh\cXY`X]Ybhfk Ug`ØVf][Ybg`b]W\h'gc`_cbn]d]Yfh']gh\''IbX`cVkc\``Yg`\UfhYNY]hYb`[UVž\Uh'Yf`a]h`G]W\Yf\Y]h`XUni`VY][YhfU[Ybž'XUgg`?fmdhcUiZ'XYf`[UbnYb`KY`h'dcdi`ÀfYf`kifXY"

XVW_8cfqYm

 $\pm JW_{j}=0$]gh'b]W\h'[Ubn'gc'i a ghf]hhYb'k]Y'gY]b'?i a dY``A i g_"'9f'k Uf

YXcWX`Ui WX`n]Ya`]WX`Y]bZi ggfY]WX"`5`g`Hk]hhYf!7\YZ`flYf`hfUh YXcWX`]a`Bcj Ya VYf`ni fØW_Łi bX`Hk]hhYf`U`g'; fci bX`NYfc`ZØf XYb`?fmdhc!FUi a`k Uf`gY]b`9]bZi gg`a Ugg]j "`K]Y`VY]`A i g_`\Uh`Yf gY]bY`I bhYfbY\a Yb`[Ybi hnhži a`Ui Z`gY]bY`@]YV`]b[g!?fmdhc`ni XfÀb[Ybž`X]Y`ZØf`]\b`6]hWc]b`i bX`b]WXhg`UbXYfYg`U`g`6]hWc]b`]gh"

A]hˈgY]bYfʻUbXYfYb :]fa UʻGei UfYʻ\UhʻzUW_ʻbcWk a Y\fʻ[YhUb'': Øf XYbʻ5bZUb['\UhʻYfʻgc[UfʻXYbʻB Ua Ybʻj cbʻGei UfYʻ]bʻ6`cW_ [YÀbXYfhˈfcVk c\``Yfʻ]b 'A Uf_YbgWk `UWk hYbʻXUZØft'' 8]Yʻ5Vg]Wk h k Ufžʻh]YZYfʻ]b 'Y]bYʻ6`cW_Wk U]b 'Y]bni hUi WkYbžʻcXYfʻYgʻ_ÒbbhY VYXYi hYb. B UWk VUfgWk UZhgVʻÒW_Yžʻ]b 'XYbYbʻk]fʻi bgYfYʻJ Yf_Ài ZYf Z]bXYbžʻ6`cW_dUfhmgʻj c``YfʻA i g]_

8]Y '7 Ug\ '5 dd'j cb 'Gei UfY ']gh'bUW\ 'k]Y 'j cf'Y]bY 'XYf'VYei Ya ghYb A Ò[`]W_Y]hYb 'ZØf'XYb '? Ui Z'j cb '6]hWc]bž'a]h'Y]bYa 'I a gUhn'j cb ØVYf'&ž) 'A]``]UfXYb 'I G!8 c``Uf'dfc 'E i UfhU`" '*\U\W_'VUi h'a]h'Gei UfY Ui W\ 'Y]bY 'XYnYbhfU`Y '6ÒfqY 'ZØf'6]hWc]b 'Ui Z'

ØVYf`gY\f`XYi h`]W\`[Ya UW\hži bhYf`UbXYfYa `Xi fW\`<U`gYb`VY] 9h\YfYi a `i bX`gc[Uf`Y]bYb`5i ghUi gW\`a]h'J]hU`]_`6i hYf]b"

5 Wk hYb 'G]Y 'Ui Z'HY]` '& 'a]h'A]Wk UY` 'GUm`cfž'7Nž'; Ufm'; Ybg`Yf i bX 'a Y\f"

EiY``Y. 7fmdhc!BYkg!: `Ug\"Wca

8 YhU]`g

6Ygi WXYb G]Y i bg Ui Z b!U["XY