

9fZcfgWXYb'G]Y'X]Y'k UWXgYbXY'7mVYfgYW'f]hml6fUbWXY'V]g &\$&).'HfYbXgž'=bj Ygh]h]cbYb'i bX'A Uf_hUbU`mgYb'ni k]WXh][Yb'5bV]YhYfb"



GUb: fUbW]gWc:6Um:5fYUž:I G5:!:\(\psi:\text{XYf\Yi h}\)[Yb:X][]hU`Yb:K Y`hž k c:7mVYfUb[f]ZZY:a Y\f:XYbb:'Y:ni bY\a Ybž:_\(\)bbhYb:\(\psi:\psi)\text{YghcfYb}\) Yfbgh\UZh:]b:X]Y:7mVYfgYW f]hm!6fUbW\Y:]bj Ygh]YfYb":@Ui h 7mVYfgYW f]hm:J Ybhi fYg:\(\text{k}\)]fX:\(\text{XYf'A Uf_h:}\)b:\(\text{XYf'nk Y}\)hYb:\(\cext{A}\)ZhY j cb:\(\psi:\psi.\psi)\)Y]bY:\(\text{VYa Yf_Ybgk YfhY'K UW\\\ghi a gd\UgY:\text{Xi fW\}\)Ui ZYb" 8]Y:\(\ghat{ghY}\)[YbXY:\(\text{5bnU\}\):\(\text{i}\)bX:\(\text{?ca d`YI]h\(\text{h}\)X]YgYf:\(\text{5b}[f]\)ZZY:\(\text{nk}\)b[h\\\\\\\)IbhYbg]j Yf:\(\text{a}\)]h\(\text{h}\)Yb:\(\text{JYf}\)

8]Y'?cghYb'ZØf'7mVYf_f]a]bU`]hÀh'k YfXYb']a '`Ui ZYbXYb'\\J\f j cfUi gg]W\h`]W\'X]Y'YfgW\fYW_YbXY'Gi a a Y'j cb'\%\\Z) '6]``]cbYb'l G! 8c``Uf'ØVYfgW\fY]hYb"'8]Yg'j YfghÀf_h'X]Y'8f]b[`]W_Y]h'ZØf I bhYfbY\a YbZYY_h]j Y'7mVYfgYW'f]hm!@Ògi b[Yb'ni]a d`Ya Ybh]YfYbži bX:a UW\h:7mVYfgYW'f]hm!5_h]Yb:ni :Y]bYa \Y]» Yb:H]dd":5bU`mghYb:j cb:K YXVi g\:\YVYb:\Yfj cfž:XUgg]bgVYgcbXYfY:9bhk]W_`i b[Yb:]b:XYf'?Øbgh`]W\Yb:\\b\Y\`)[Ybn:Y]b Ybcfa Yg:K UW\ghi a gdchYbn]U``]a 'YfghYb'<U`V'U\f'&\$&) i bhYfghØhnYb:k YfXYb"

K UWX ghi a gZU_hcfYb]a 7 mVYfgYW f]hm! A Uf_h

8 UgʻK UWX ghi a ʻ]a ʻ7 mVYfgYWʻf]hm!A Uf_hʻk]fXʻi bhYfʻUbXYfYa Xi fWX ʻX]Yʻni bY\a YbXYʻJ YfVfY]hi b[ʻj cbʻ€H!; YfÀhYbʻ]b 6YfY]WXYbʻk]Yʻ; Ygi bX\Y]hgk YgYbž: Yfh][i b[ʻi bXʻGa Ufhʻ7]h]Yg i bhYfghØhnh" 8]YgYʻ9bhk]W_`i b[ʻYf\Ò\h'b]WXhʻbi fʻX]Y JYfk i bXVUf_Y]hʻj cbʻGmghYa YbžʻgcbXYfbʻYfZcfXYfhʻUi WX ZcfhgWXf]hhʻ]WXYʻ7 mVYfgYWʻf]hm! @Ògi b[Yb"ʻ9]bʻ6Yf]WXhʻj cbʻMU\cc :]bUbWYʻnY][h'Ui ZʻʻXUggʻXYfʻ7`ci X!6YfY]hghY``i b[ga cXi gʻUa gʻWXbY``ghYbʻk UWXgYbʻk]fX'zʻXUʻCf[Ub]gUh]cbYbʻni bY\a YbXʻWci X! bUh]j YʻG]WXYf\Y]hgʻÒgi b[Ybʻ]a d`Ya Ybh]YfYb"ʻ8]Ygʻ]ghʻj cfʻU``Ya Ui ZʻXYbʻ5bgh]Y[ʻj cbʻFYa chY!5fVY]hYbʻi bXʻX]YʻBi hni b[ʻj cbʻGUUG i bXʻ8Yj Cdgʻni fØW_ni ZʻØ\fYb"

8]Y'I G5'k YfXYb'j cfUi gg]Wkh']Wk'XYb'[fÒ» hYb'A Uf_hUbhY]'']b
BcfXUa Yf]_U'\U'hYbž'k Ug'Ui Z']\fY'ZcfhgWkf]hh']WkY'X][]hU'Y

\(\delta Zf\Ughfi _hi f'i bX'X]Y''\Ui ZYbXYb'7m\VYf\VYXfc\i b[Yb
ni fØ\W_ni Z\O\fYb']gh''': \(\O\fYbXY'\) bhYfbY\a Yb'k]Y'A]\Wfcgc\(Zh'i bX\)
\(\mathref{Ng\W}\)YfYbhk]\(\warphi Y\)bcj Uh]j Y'7'ci X!G]\WkYf\Y]hg'\(\Og\text{g} b[Yb\text{z}'i a\)
\(\text{XYf'[Ygh]Y[YbYb'BU\WkZfU[Y'[YfY\Wkh'ni k\)YfXYb''\)

A Uf_hYbhk]W_`i b[i bX Dfc[bcgYb

8 Yf'[`cVU`Y'7 mVYfgYW f]hm!A Uf_h'k]fX'j cb'&&+ž) - 'A]``]UfXYb'I G8
]a '\$J\f'&\$&) 'Ui Z'gW\Ahni b[gk Y]gY'') %ž- &'A]``]UfXYb'I G8 'V]g
&\$' \$'k UW\gYbža]h'Y]bYf''À\f`]W\Yb'K UW\ghi a gfUhY'j cb'- ž%i "
8]YgY'Dfc[bcgY'k]fX'Xi fW\'X]Y'ni bY\a YbXY'♣bhY[fUh]cb'j cb'€H!
; YfAhYb'i bX'X]Y'Bchk YbX][_Y]h']bhY``][YbhYf
6YXfc\i b[gYf_Ybbi b['i bX', VYfk UW\i b['[YghØhnh"'@Ui h'A cfXcf'♣bhY``][YbW'k]fX'XYf'A Uf_h'nk]gW\Yb'&\$&('i bX'&\$&- 'Y]bY
75; F'j cb'%%ž((i 'YffY]W\Ybžk Ug'Ui Z'Y]bYb'Vcca YbXYb'GY_hcf\
\]bk Y]ghž'XYf'j cf'U``Ya ']b'XYf'5g]Yb!DUn]Z]_!FY[]cb'gW\bY``

5_hi Y``Y`< YfUi gZcfXYfi b[Yb`ghY``Yb`YXcW\`X]Y`\a d`Ya Ybh]Yfi b[j cb`7 m\YfgY\\iff f]hm\@\Ogi b[Yb`i bX`X]Y`? ca d`Yl]h\Ah`XYf 6YXfc\i b[Yb`XUf"`Ni XYa `a \ØggYb`l bhYfbY\a Yb`X]Y`J]Y`nU\``Ub HY\\bc`c[]Yb`i bX`5bV]Yh\Yfb`]b`6YhfU\\h`n]Y\Yb": U``ghi X]Yb nY][Yb\Z`XUgg`:]fa Yb`k]Y`\Left A\Z`:) `i bX`\Ng\\U`\Yf`V\Yf\]hg`YfZc`[fY]\\\7 m\YfgY\\forall f]hm\@\Ogi b[Yb`]a d`Ya Ybh]\Yfh`\U\Yb\Z`i a `X]\Yg\b < YfUi g\ZcfX\Yfi b[Yb`Ybh[Y[Ybni k]f_Yb"

9g'k]fX'XYi h`]WX ž'XUgg'X]Y'7mVYfg]WXYf\Y]hgVfUbWXY'[ihdcg]h]cb]Yfh']ghžia ']b'XYf'g]WX'ghÀbX]['j YfÀbXYfbXYb'X][]hU`Yb@UbXgWXUZh'j cb'XYf'5bk YbXi b['[YbYfUh]j Yf'?=ni 'dfcZ]h]YfYb"'A]hY]bYa': c_i g'Ui Z'G]WXYf\Y]h'i bX'7ca d`]UbWY'_ObbYbIbhYfbY\a Yb'b]WXh'bi f']\fY'K YfhY'gWXØhnYbž'gcbXYfb'Ui WXg]WXYfghY``Ybž'XUgg'g]Y'XYb'5bZcfXYfi b[Yb'[YgYhn`]WXYfJcfgWXf]ZhYb'YbhgdfYWXYb"

Ni gUa a YbZUggYbX``Àggh'g]W\`gU[Ybž'XUgg'X]Y'7mVYfgYW\f]hm!
6fUbW\Y'gckc\``ZØf'I bhYfbY\a Yb'U`g'Ui W\`ZØf'\bj YghcfYb'Y]b
i bgW\`U[VUfYg'DchYbn]U``V]f[h"'A]h'XYf'f]W\h][Yb'GhfUhY[]Yž'XYa
9]bgUhn'ZcfhgW\f]hh`]W\Yf'HYW\bc`c[]Yb'i bX'XYf'6YfØW_g]W\h][i b[U_hi Y``Yf'<YfUi gZcfXYfi b[Yb'_Ubb'X]YgYf'AUf_h']b'Ni _i bZh'Y]bY
hfU[YbXY'Fc``Y'gd]Y`Yb"

8 Y hU]`g	
Cfh	GUb: fUbW]gWc:6Um:5fYUžI G5
EiY``Yb	WmVYfgYWif]hmjYbhifYg"Wca
	Z]bUbWY"mU\cc"Wca
	k k k "a cfXcf]bhY``][YbWY "Wca

6 Ygi W Yb G]Y i bg Ui Z k ca , + "XY