

FUi V!8fUa U']b'9]`YbVi f[.'\(\forall \) [YbX`]W\Yf\\]a '; Yf]W\\\ h'\k\Y[Yb'<\Ub\Xm\5b[f]\ZZ\'\)

a : U``i a 'FUi V'i bX'? ÒfdYfj Yf`Yhni b[']b'9]`YbVi f['ghY\YbHcV]Ug'?fYghi bX'GUbXm'N]f`U'j cf'; Yf]W\h"'5b[Y_`U[h'k Y[YbY]bYa '<UbXmØVYf[f]ZZ'Ui Z'Y]bYb'%)!À\f][Ybž'XYf']bIbhYfgi W\i b[g\UZh']ghž'k i fXY'XUg'J YfZU\fYb'j cf`Ài Z][Y]b[YghY``h"



9] Yb Vi f[ž'8 Yi hg W `Ub X'! K Ug'[Y\h']b'9] Yb Vi f[3'9]b'J cfZU``ž XYf'ZUgh'nk Y] 'J\ fY'ni fØW_`]Y[hž'gcf[h'bi b'ZØf'5i ZfY[i b['j cf'XYa 5a hg[Yf] W h'XYf'GhUXh'' Hc V] Ug'? fYgh'f &- Ł'i b X'GUb Xm'N]f`Už'X]Y bc W 'b] W h'j c``À\f][']ghž'ghY\Yb'\]Yf'j cf'; Yf] W h'' =\ bYb'k YfXYb F Ui V'i b X'[YZÀ\f'] W Y'? ÒfdYfj Yf'Yhni b['j cf[Yk cfZYb'' @Ui h' 'j n"XY'gc``Yb'g] Y'Y]bYa '%)! \A\f][Ybž'8 Yb]g'6fi [YbXcfZž']b 9] Yb Vi f['Y]b' < Ub Xm']a 'K Yfh'j cb'Yhk U'%\$\$\$'9i fc'[Yk U'hgUa UV[Ybca a Yb'\UVYb'' 8 Yf'J cfZU``ž'XYf'g] W 'b] W h'[i h'UVnY] W bYhž VY]b\U'hYhYž'XUgg'g] Y'XUg'C dZYf'ni '6cXYb'k UfZYb'i bX']\a'XUg < Ub Xm'Ui g'XYf'HUgWXY'nc[Yb"

I a 'X]Y'; YgW\Y\b]ggY'Yhk Ug'Y]bni cfXbYb.'8Yb]gʻghY\hʻgY'Vghʻ]b I bhYfgi W\i b[g\UZh'k Y[Yb'Y]bYgʻUbXYfYb'F Ui VXY`]_hg''8]YgY J Yfghf]W_i b['a UW\h'X]Y'G]hi Uh]cb'bcW\'_ca d`]n]YfhYf''6Y]'XYf J Yf\UbX`i b['k i fXY'_`UfžʻXUggʻ8Yb]gʻi bX'GUbXmʻg]W\'Ui gʻY]bYf K c\b[fi ddY']b'8fYgXYb'_YbbYb''8Yb]gʻ\UhhY'GUbXmʻi a 'Y]b bYi Ygʻ<UbXmʻ[YVYhYbžʻi bX'X]YgY'\UhhY'XUfUi Z\]b'nk Y]'<UbXmg ZØf'Yk Y]'gʻ%\$\$\$'9i fc'VYghY'`hž'Y]bYgʻXUj cb'ZØf']\b''5``YfX]b[g gUb_ʻgY]bY'NU\`i b[gVYfY]hgW\UZh'Ui Zʻa cbUh`]W\'*\$'V]gʻ-\$'9i fcž k Ugʻ`Yhnh`]W\'ni '?cbZ']_hYb'ZØ\fhY''

8 Ug; Yf]W hgi fhY]`

± XYf 'Øb[ghYb' JYf\ Ub X`i b['ZfU[hY'F]W\ hYf Fi VYb': fUbnYbžcV XUg'HY`Y_ca a i b]_Uh]cbgi bhYfbY\a Yb'X]Y' JYfhfÀ[Y'Ub'gc' '\b[Y ⅓ [YbX`]W\Y'\ÀhhY'Ui gghY``Yb' XØfZYb"'8]Y'G]hi Uh]cb' Yg_U`]YfhYž'U`g 8 Yb]g'g]W\ k Y][YfhYž'XUg' < Ub Xm'\YfUi gni [YVYbž'i bX'XUg'K Y]hY gi W\ hY"'9]b'Ui Za Yf_gUa Yg'DUUfž'XUg'ni ZÀ``]['j cfVY][]b[žk i fXY NYi [Y'X]YgYg'J cfZU``g'i bX']bZcfa]YfhY'gcZcfh'X]Y'Dc`]nY]"

8]Y'JYfhY]X][ib['jcb'HcV]Ug'?fYgh'VYfiZh'g]W\'XUfUiZž'XUgg'Yf
8Yb]g'b]W\h'[YhfYhYb'\UVY"'+bhYfYggUbhYfkY]gY'Yf_UbbhY'F]W\hYf
:fUbnYb'_Y]bYb'FUiV'ibX'`]Y» 'X]Y'5b_`U[Y'[Y[Yb'VY]XY'ZU``Yb"
8Ug'JYfZU\fYb'kifXY'jcf`ÀiZ]['Y]b[YghY``hž'kUg'ZØf'HcV]Ug'?fYgh
VYXYihYhž'XUgg'Yf'%\$\$'GhibXYb'[YaY]bbØhn][Y'5fVY]h'`Y]ghYb
aigg"'GUbXm'N]f`U'k]fX'\]b[Y[Yb'kY]hYfY'bYib'AcbUhY']b'XYf
Kc\b[fiddY'V'Y]VYbž'kUg'g]Y'U_nYdh]YfhY"

8Yf?cbhYlh'XYf'i [YbX f]a]bU`]hÀh

9]b'6`]W_'Ui Z'X]Y'\$ [YbX_f]a]bU`]hÀh']b'8Yi hgW\`UbX'nY][hž'XUgg gc`W\Y'JcfZÀ``Y'`Y]XYf'_Y]bY'9]bnY`ZÀ``Y'g]bX"'&\$&('YffY]W\hY'X]Y\$ \$\forall [YbX[Yk U`h'a]h'fi bX'%' ", \$\$': À``Yb'Y]bYb'< OW\ghghUbXž'a Y\fU`g'XcddY`h'gc'\cW\'k]Y'&\$\%* ž'k]Y'GhUh]ghU'VYf]W\hYh'''6YgcbXYfg VY]'\$\forall [YbX`]W\Yb'nk]gW\Yb'\%('i bX'\%+ '\nny\fYb'gck]Y\$ < YfUbk UW\gYbXYb'nk]gW\Yb'\%, 'i bX'\&\$'\nny\fYb'k i fXY'Y]b'5bgh]Y['jYfnY]W\bYh'''8]Y'; fØbXY'\]YfZØf'g]bX'j]Y`ZÀ`h]['z'Y]bgW\`]Y\named `]W\\dgmW\]gW\Yf'6Y`Ughi b['Yb'Xi fW\'X]Y'7cfcbU!A U\named bU\a Yb'i bX'\dfcV`Ya Uh]gW\Yb'@YVYbgi a ghÀbXYb'\1\b[Yf'GW\i hngi W\YbXYf''

8]Y'[YgY``gW\UZh`]W\Y'8YVUhhY'XfY\h`g]W\cZh`ia X]Y': fU[Yž'k]Ya]h'f\[YbX`]W\Yb'GhfUZh\hYfb'ia[Y[Ub[Yb'kYfXYb'gc``hY"K\h\fYbX'Y]b][Y'ZØf'\\hYfY'GUb_h]cbYb'd`\hX]YfYbž'VYhcbh'Y]b[f\overline{O}\rangle YfYf'HY]``X]Y'BchkYbX][_Y]hž'df\hajYbh]jY'AU\rangle bU\aYb'nijYfgh\h_Yb''Ia'__f]a]bY``Y'@YVYbgkY[Y'nijYf\]bXYfbž'k]fX\\haiZ]['UiZ'X]Y'Fc``Y'XYf'?]bXYf!ibX'\si[YbX\]`ZY'\]b[Yk]YgYb"

8]Y fYWkh]WkYb F U\a YbVYX]b[i b[YbžX]Y]b Y]bYa 'À\b`]WkYb?cbhYl h']a ': U``'Y]bYg F Ui VYg X]g_i h]Yfh'k i fXYbž'nY][YbYVYbZU``gž'XUgg'XUg'¾ [YbXghfUZfYWkh'\Ài Z]['ni f'5bk YbXi b[_ca a hž'Ui Wk'k Ybb']b'VYgh]a a hYb'G]hi Uh]cbYb'XUg'U``[Ya Y]bYGhfUZfYWkh'Y]bY', VYf`Y[i b['k Yfh'k ÀfYž'k]Y']b'Y]bYa ']b''ghfUZfYWkhg]Y[Yb"XY'Xc_i a Ybh]YfhYb': U``"'<]Yf'k i fXY'X]Y5bk YbXVUf_Y]h'XYg'¾ [YbXghfUZfYWkhg'ZØf'<YfUbk UWkgYbXYVY'U\hž'XU'X]Y'dYfgÒb`]WkY'G]hi Uh]cb'i bX'X]Y'9bhk]W_`i b['XYf5b[Y_`U[hYb']b'XYb'JcfXYf[fi bX'[YfØW_h'k i fXY'"

Ni gUa a Yb[YZUggh'V`Y]Vh'X]Y: fU[Yž'k]Y'9]`YbVi f['i bX'UbXYfY GhÀXhY'a]h'XYf'k UWXgYbXYb'\$\frac{1}{3} [YbX_f]a]bU`]hÀh'i a [Y\Yb'k YfXYb i bX'k Ug'XUg'ZØf'X]Y'6YhfcZZYbYb'VYXYi hYh''8Yf'; fi bXgUhnž'XUgg b]Ya UbX'i bhYf'%('\$U\fYb'ZØf'GhfUZhUhYb'VYghfUZh'k]fXž'k]fZh gdUbbYbXY': fU[Yb'Ui Zž']bgVYgcbXYfY'k Ybb'a Ub'VYXYb_hž'XUgg j]Y`Y'\$\frac{1}{3} [YbX`]WXY'hUhgÀWX`]WX']b'gWXk]Yf][Yb'UYf\A`hb]ggYb'`YVYb''

8 YhU]`g	
Cfh	9]`YbVif[ž'8YihgWX`UbX
EiY``Yb	• k k k "`j n"XY
	k k k "ghfUZfYVX hg]Y[Yb"XY
	XY"ghUh]ghU"Wca

6 Ygi W Yb G Y i bg Ui Z b! U ["b Yh