

BUW >U\fYb XYf Gh]``Y. < c ZZbi b['Ui Z J c``UbgW `i gg XYf 6cbbghfU» Y

8 UgʻA]b]ghYf]i a ʻYbhhÀi gW\hʻ: fYW\YbYfʻI bhYfbY\a Yf. JYfnÒ[Yfi b[YbʻVY]a ˈJc``UbgW\`i ggʻXYfʻ6cbbghfU»YʻUbʻX]Y 5 (ʻgcf[YbʻZØfʻI ba i h"

8]Y'U_hi Y``Y'G]hi Uh]cb'fi bX'i a 'XYb'Jc``UbgW\`i gg'XYf'6cbbghfU» Y fle%, ' L'Ub'X]Y'5i hcVU\b'5('k]fZh'Yf\YV`]W\Y': fU[Yb'ni f JYf_Y\fg]bZfUghfi _hi f']b'XYf'FY[]cb': fYW\Yb'Ui Z''8Yf JYfnÒ[Yfi b[Yb'i bX'Ui gV'Y]VYbXYb'A U» bU\a Yb'bUW\'XYa '6Ui XYg'HY]`UbgW\`i ggYg'ni f': i » VU``k Y`ha Y]ghYfgW\UZh'&\$\$*'VY`UghYb]bgVYgcbXYfY'X]Y'UbgAgg][Yb'I bhYfbY\a Yb''@Ui h'DfcZ''8f'''>Øf[Yb<OgYfz'Jcfg]hnYbXYf'XYf'\DhYfYggYbj YfY]b][i b[': fYW\YbYf I bhYfbY\a Yb'f'\DhYfY\a Yb'f'\DhYfY\a Yb'f'\DhYfY\a Yb'f'\DhYfY\a Yb'f'\DhYfY\a Yb'f'\DhYfY\a Yb'f'\DhYfY\a Yb'f'\DhYfY\a Yb'f'\OgYY\DhY\h'Y]b'Xf]b[YbXYf'\UbX`i b[gVYXUfZz']bgVYgcbXYfY'Ui Z[fi bX'XYf'ghUf_'[Ygh]Y[YbYb'JYf_Y\fgVY`Ughi b[]b'XYf'; Y[YbX"

9bhhài gWX Yb XY 5bhk cfh XYg A]b]ghYf]i a g

8]Y'5bhk cfh'XYg'BFK !JYf_Y\fga]b]ghYf]i a gž'Ui Z'X]Y'j]Y`Y I bhYfbY\a Yb'Ui g'XYa '\ddot Xi ghf]Y[YV]Yh'9i fcdUU``YY'[Y\cZh\UhhYbž'YbhhÀi gW\hY'[Yk U`h]["'\ddot XYf'A]hhY]`i b['XYg'A]b]ghYf]i a g k]fX'nk Uf'X]Y'Bchk YbX][_Y]h'XYg'5i gVUi g'VYghÀh][hž'Yg'k]fX YXcW\VYhcbhž'XUgg'j YfgW\]YXYbY'5Vgh]a a i b[Yb'i bX Jcfd`Ubi b[Yb'bcW\'Ui gghY\Yb"'9g'_ÒbbY'XYa bUW\'bcW\'\d\]YfY XUi Yfbž'V]g'XYf'6Ui 'hUhgÀW\`]W\'VY[]bbYb'_Ubb"

; Ya Y]bgUa Y 5_h cb XYf = I i bX

$?fY]g\UbXk\Yf_YfgWUZh$

I a '8 fi W_'Ui Z'XUg'A]b]ghYf]i a 'Ui gni ØVYbž\UhhYb'X]Y' \Rightarrow I 'i bX'X]Y ?fY]g\UbXk Yf_YfgW\UZh'Y]bY'[Ya Y]bgUa Y' \Rightarrow]h]Uh]j Y'[YghUfhYh'' 8 UVY]'k i fXYb'A i ghYf!6f]YZY'Ub'XUg'A]b]ghYf]i a 'gck]Y'Ub 5V[YcfXbYhY'Ui Z'@UbXYg!'i bX'6i bXYgYVYbY'j YfgYbXYh''8]Y 6f]YZY'h\Ya Uh]g]YfhYb'X]Y' i bni a i hVUfY'J Yf_Y\fgg]hi Uh]cb ž'X]Y b]W\h'bi f'Z\Øf'X]Y'I bhYfbY\a Yfž'gcbXYfb'Ui W\'Z\Øf'X]Y 5bk c\bYbXYb'Y]bY'Ybcfa Y'6Y`Ughi b['XUfghY``h''

$9]bY'_f]h]gWXY'=bZfUghfi_hifZØfX]YFY[]cb$

 $8]Y `B chk Yb X][_Y]h `Y]b Yg `j]Y fgdi f][Yb `5i g V Ui g `XYf `6cbbghfU "Y]gh `i b V Yghf]hh Yb ži a `X]Y `F U \a Yb V Y X]b[i b [Yb `ZØf `Y]b Yb K]fhg W U Zhggh Ub Xc fh `a]h `[i h `V Yn U \`h Yb `5f V Y]hgd `Ahn Yb `n i [Uf Ub h] Yf Yb " `8]Y `\div I \ V Yhc b hž `X Ugg `Y]b `Yf Zc `[f Y] W Xf `K Uf Yb j Yf _Y \ f ZØf `X]Y `Gh U V] `]h Ah `XYf `F Y[]cb `j cb `Yb hg W XY] XYb XYf `6Y XYi hi b [`gY]" 5 i W `k Ybb `X]Y `J Yf _Y \ fgdc `]h] _ `Yg `V]g` Ub [`j Yfg Ai a h`\ Uh ž bchk Yb X][Y `G W f]h Y `n i `i b Yfb Y \a Yb ž `]gh `Yg `k] W h][ž `X Ugg `X] Yg Y : f U[Y `b] W h `` Ab [Yf `][b c f] Yfh `k]f X "$

6`]W ']b 'X]Y 'Ni i b Zh

 $\pm 0.5 \, \text{bVYhfUWk hiXYf'} [YgUa hk] fhgWk UZh)] Wk Yb 6 YXYi hi b ['ZØf': fYWk Yb V'Y] Vh' & \emptyset f [Yb' < OgYf'cdh]a] gh]gWk . `8] Y' \Rightarrow I' k] fX' b] Wk hi Ui Z [YVYb Z XYb' J c'`UbgWk'i gg'Y] bni ZcfXYfb Z'Ui Wk' k Ybb'X] Yg'bc Wk' \Rightarrow V Yb' XUi Yfb'_ObbhY'' '9] b '`Ub [gUa Yf': cfhgWk f] hh'] b 'XYf'D`Ubi b ['XUfZ X] Y'8 f] b ['] Wk_Y] h'XYg' H\ Ya Ug' YXc Wk' b] Wk h'gWk a À 'Yfb'' 'Gc`Ub [Y_Y] b Y'j Yf' Àgg`] Wk Yb'5 i ggU [Yb'ni 'Y] b Ya '6 Ui nY] hdi b_h' [Ya UWk h k YfXYb'_ObbYb Z'V'Y] Vh'X] Y'I b [Yk]gg\Y] h'ZØf'X] Y'VYhfc ZZYbYb I bhYfbY\a Yb'i b X'6 Øf [Yf'k Y] hYf'VYghY\Yb''$

GWX i ggZc `[Yfib[

8]Y'9bhk]W_`i b['fi bX'i a 'XYb'Jc``UbgW\`i gg'XYf'6cbbghfU\\varphi\' a i gg'Xf]b[YbX'VYcVUW\hYh'k YfXYb"8]Y'JYfk Y][Yfi b['cXYf JYfnÒ[Yfi b['OZZYbh`]W\Yf'6Ui j cf\UVYb'_Ubb'`Ub[Zf]gh]['bY[Uh]j Y 5i gk]f_i b[Yb'Ui Z'X]Y'K]fhgW\UZh'i bX'@YVYbgei U`]hÀh']b'XYf FY[]cb'\UVYb"'9]b'gW\bY``Yf'<UbX`i b[gVYXUfZ']gh'[YZfU[hž'i a : fYW\Yb'U`g'UhhfU_h]j Yb'GhUbXcfh'ZØf'I bhYfbY\a Yb'ni 'Yf\U`hYb"

8 YhU1`a

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