

8 Y f '@c\b'j cb'A UgUmcg\]'Gcb'U`g'HYW\ g]b_h

8]Y'U_hi Y``Y'A Uf_hVYfY]b][ib[']a 'HYW\bc`c[]YgY_hcf'VYXYihYh a Y\f'U`g'bi f'ghUf_Y'?i fgY]bVfØW\Y"'8Yf'Gh]a a ib[gi a gW\kib[k]f_h'g]W\'Ui W\'Ui Z'X]Y'GhUfhZ]bUbn]Yfi b['Ui gž'XU'j cb 5Vk Àfhgfi bXYb'X]Y'FYXY']gh'i bX'I bhYfbY\a Yb'k]Y'6i m'bck ž'dUm`UhYf'@YUXYf'?`UfbU']\fY'\DC!D`\AbY'\ØVYfXYb_Yb"

?`UfbU'k]fX'j cb'G]f'A]WXUY`A cf]hn'[Y`Y]hYhž'DUfhbYf'XYf $F]g]_c_Ud]hU`[YgY``gWXUZh'GYei c]U'7Ud]hU`ž'X]Y'[YfUXY']\fY \\ F UhgWX`A[Y'ZØf'GhUfh!i dg'U_hi U`]g]Yfh'\Uhž'X]Y'Y]bYf'XØghYfYb \\ Ni _i bZh'[Y[YbØVYfghY\Yb''&$$, '\]Y<math>"$ gY]b'@Y]hZUXYb'ni a "VYf`YVYb'XYf':]bUbn_f]gY' F = D'; ccX'H]a Yg "'5bZUb['&\$&\$ j YfgWX]W_hY'g]Y'Y]b'A Ya c'a]h'XYa 'H]hY`' 7cfcbUj]fi g.'H\Y'6`UW_GK Ub'cZ'&\$&\$ "

H\Y' ⇒ Zcfa Uh]cb `\Uh'Y]bY '?cd]Y']\fYg'bYi YghYb'G`]XY!8YW_g'a]h XYa 'k Yb][Yf'Y]bdfÀ[gUa Yb'H]hY` 5XUdh]b['hc'9bXi fY 'Yf\U`hYb" 9g'VYgW\fY]Vh'X]Yg'U`g' 7fi W]V`Y'A ca Ybh 'i bX'gW\`À[h'; fØbXYfb j cfž'gW\bY``ni '\UbXY`bž'i a ']\fY'@UbXYVU\b'ni 'Yfk Y]hYfb'i bX ?cghYb'ni 'gYb_Ybž'i a 'g]W\Yfni ghY``Ybž'XUgg']\bYb'b]W\h'XUg'; Y`X Ui g[Y\h"

K]f'[Y\Yb'XUj cb'Ui gž'XUgg'g]W\'XYf'A Uf_hUVgW\ki b['Ui Z'XUg JYfVfUi W\Yfj Yf\U`hYbž'X]Y'5fVY]hga Àf_hYž'X]Y'@]YZYf_YhhYb'i bX a Y\f'Ui gk]f_Yb'k]fX"'9g'k]fX'Y]bY'`Àb[YfY'; YbYgi b['XUi Yfbž i bX'cVk c\``k]f'b]W\h'j cf\YfgU[Yb'_ObbYbž'k]Y'`Ub[Yž'_ObbYb'k]fG]Y'VYfUhYbž'k]Y'G]Y'g]W\'j cfVYfY]hYb'i bX'Ui Z'X]Y'UbXYfY'GY]hY [Y`Ub[Yb'_ObbYb ž'gU[h'GYei c]U"

 $5i \ W. \ X]Y \ Yb][\ Yb \ ZX]Y \]b \ GhUfh! i \ dg \]bj \ Ygh]YfYb \ ZgW. b \ U`Yb \ XYb \ ; \ \emptyset fhY` Yb[\ Yf" \ Gc \ Zh6 \ Ub_ `\ Uh'X]Y \ @O\ b Y \ gY]b \ Yf \ Hc \ d! : \ \emptyset \ fi \ b[\ g_f A \ ZhY] \ [\ Y_\emptyset fnh \ b \ W \ XYa \ gY]b \ J]g]cb \ : \ i \ b \ X'Y]b \ Yb \ `\]ghc f]gW. Yb \ J \ Yf` i \ gh \ j \ cb \ '\ z) \ '6]``]cb \ Yb \ MYb \ fl&+z* \ 'A \]``]UfXYb \ I \ G!8 \ c``UfL' j \ YfnY]W. b \ Yh \ \ UhhY \ Z'VYf]W. hYh \ '5 b \ hc b] \ 'G`c \ X_ck \ g_]']b \ 'Hc_]c" \ "@Ui \ h'VY\ OfX`]W. Yb \ I \ bhYf`U[\ Yb \ VY]'XYf' \ Hc_mc' \ Ghc \ W_ '9I \ W. Ub[\ Y'j \ YfX]Yb \ Y' \ :]b \ Ub \ j \ cfghUb \ X'Mcg \]a \]hgi \ '; \ chc']a \ 'j \ Yf[\ Ub[\ Yb \ Yb \ YgW. A \ Zhg'U\ fz \ XUg'Ua \ '' \ %" \ A \ Afn \ Yb \ XYhY \ z' \&- ' \ 'A \]c" \ MYb' \ fl&z' \ 'A \]c"' \ MYb']a \ J \ cf'U\ f'Yb \ hgd f]W. h"$

8]Y'6YnU\`i b['XYg'; fØbXYfg'A UgUmcg\]'Gcb'V`Y]Vh'i bj YfÀbXYfh i bX'`Ui h'@Yl'gc``hYb'g]W\'5b`Y[Yf'ZfU[Ybž'cV'Yg'g]W\'`c\bhž'5bhY]`Y Ub'Y]bYa 'l bhYfbY\a Yb'ni '\U`hYbž'XUg': Ø\fi b[g_fÀZhY']a a Yf bcW\'\cW\'VYnU\`hž'i a '\]bhYf'XYa 'A Uf_h'UVni gW\bY]XYb"

8 Ug' = bhYfbYh'XYf'fZØbZL'8]b[Y

%" HYh\Yfg 6U\Ua Ug!JYfV]bXi b[

HYh\Yf`\Uh`Y]bYb`HY]``gY]bYf`FYgYfj Yb`VY]`Y]bYf`_`Y]bYb`6Ub_`Ui Z XYb`6U\Ua Ug`bUa Ybg`7Ud]hU``I b]cb`[Y\U`hYbž`gU[hYb`a]h`XYf 5b[Y`Y[Yb\Y]h`j YfhfUi hY`DYfgcbYb`i bX`[UVYb`k Y]hYfY`5i ZgW\`i gg XUfØVYfž`k]Y`X]Y`; fi ddY`X]Y`+'`A]``]UfXYb`8c``Uf`gW\k YfY GhUV`YWc]b`j Yfk U`hYhž`X]Y`XYb`?fmdhca Uf_h`i bhYfa Ui Yfh"`BUW\ XYa 'Ni gUa a YbVfi WX'j cb'hYffUI G8'gU[h'FYWXhgdfcZYggcf]b <]`Ufm'5``Ybž'XUgg'X]Y'@Yi hY'X]Y'ZU`gWXYb': fU[Yb'ni 'GhUV`YWc]bg ghY``Yb"

$\&"=hU`]Ybg 6fY]hVUbX_cbgc`]X]Yfi b[$

8]Y'j YfgWki `XYhY'HY`YWca '\=hU`]U'\Uh'Y]bY'j cf`Ài Z][Y'JYfY]bVUfi b[a]h'\=bj YghcfYb'i bhYfnY]WkbYhž'i a']\fY': YghbYhnUb`U[Yb'a]h'XYa_`Y]bYfYb'?cb_i ffYbhYb'CdYb':]VYf'ni gUa a Ybni ZØ\fYb'i bXXUa]h'XYb'K Y['ZØf'Y]bYb'Y]bn][Yb']hU`]Yb]gWkYb'6fY]hVUbX!7\Ua d]cb'ni YVbYb"

' "'>JJdUbg'YfgWXfYW_YbXY'A Yb[Y'Ub'8UhYbZÀ`gWXi b[Yb']gh YVYbZU``g'Yfa i h][YbX

 $\label{thm:hu} HcmchUž'*JdUb `GhYY``K cf_g`i bX`A]hgi V]g\]``9`YWhf]W[Y\OfYb`ni XYbYbž'X]Y`_Øfn`]W\``U\fY`Ub[Y`8 UhYbZ\`gW\i b[`Y]b[Yf\aa h \UVYb\"`K \A\fYbX`X]Y``Gi W\Y`bUW\`Y]bYf``9f_`\Afi b[`]a a Yf]bhYbg]j Yf`k]fXž'VYghY\h`Y]bY`; Ya Y]bgUa _Y]h`nk]gW\Yb`XYb G_UbXU`Yb`XUf]bž'XUgg`XYb`K \]gh`YV`ck Yfb`Xi fW\`X]Y``9G; ! JYfdZ`]W\hi b[Yb`XYf`I bhYfbY\a Yb`Y]bY``Gh]a a Y`[Y[YVYb`k i fXYž gW\fY]Vh`@Yc`@Yk]g\"` 8 UhYb `[]Vh`Yg`b]W\hž'g]Y`g]bX`b]W\hg`k Yfh i bX`g]Y`[Y\OfYb`gck]Ygc`b]W\h`=\bYbž'gU[h`6YbYX]Wh`9j Ubg\"$

("' Hcd'; i b. 'A Uj Yf]W_ 'a UWX h'<cZZbi b[Yb'Ui Z'Y]b'?]bc! FYj]j U`']a 'Gca a Yf

8]Y:cfhgYhni b['XYg':]`a g'j cb'%-, *ž'XYf'Hca '7fi]gY'ni 'Y]bYa XYf'[fÒ» hYb'GhUfg'<c``mk ccXg'a UW\hYž'VfUW\hY'Ua 9fÒZZbi b[gk cW\YbYbXY'k Y`hk Y]h'&(, 'A]``]cbYb'l G!8c``Uf'Y]b'i bX [UV'XYb'_A`a dZYbXYb'?]bcVYg]hnYfb'<cZZbi b['Ui Z'Y]bY K]YXYfVY`YVi b['XYf'Gca a Yf_UggYb'bUW\'nk Y]'a U[YfYb'\\J\fYbž X]Y'Xi fW\'X]Y'DUbXYa]Y'i bX'X]Y'J YfVfY]hi b['XYg'GhfYUa]b[gj Yfi fgUW\h'k i fXYb'8]Ybgh`Y]ghi b[Yb"

) "; Ua]b['U`g`Hcf`ni a 'A YhUj Yfgi a ' : H':]`a
8]Y`%, \$!A]``]UfXYb!8c``Uf!; Ua]b[!\DXi ghf]Y\ZX]Y`XcddY`h`gc`[fc»
]gh`k]Y`XUg`:]`a [YgW\A\Zh\Zn\Zn]Y\h`VYfY]hg`<i bXYfhY`A]``]cbYb`Gd]Y`Yf
Ub"'5VYf`k\A\fYbX`HYW\bc`c[]Y\Z\O\fYf`XUfi a 'f]b[Yb\Z\X]Y`b\AW\ghY
\DX\fUh]cb`XYg`\DhYfbYhg`ni 'gW\U\ZZYb\Z']gh; Ua]b['ni 'Y]bYa
GW\`UW\h\ZY`X`[Yk\cfXYb"'8]YqYf': H!:]`a 'i bhYfgi W\h\Z`k]Y'; Ua]b[

gc [fc » 'k i fXY 'i bX 'cV 'Yg 'k]f_`]W\ 'XUg 'Hcf 'ni 'X]YgYf 'bYi Yb 'K Y `h gY]b '_Ubb " 'C XYf 'k YfXYb 'F Y[i `]Yfi b[\check{z} *\b\Y[fUh]cb 'i bX 'X]Y Y]b\ZUW\ Y 'U`\hY 'F YU`]h\h\nabla h']a 'K Y['ghY\Yb3

HYW !Hcc`g` L]Uca] HJ : &!GYf]Y

8]Y`L]Uca]`HJ`: &!GYf]Y`\Uh`5a Uncbg`:]fY`HJ`i bX`5dd`Yg`5]fd`Um]bhY[f]Yfh`i bX`]gh`]b`XfY]`; fÒ» Yb`Yf\À`h`]W\.`('`Nc``ž')\$`Nc```i bX))`Nc``

EiY``Y.::]bUbW]U``H]a Yg

8 YhU]`g

6Ygi WXYb G]Y i bg Ui Z _fmdhc!bYk g"Uh