

6YghY; fYUh'6Uff]Yf'FYYZ'Hci f'7U]fbg' 8]jY'A UghYf'6`c['FYj]Yk

9]b '6 `c[[Yf!FYj]Yk 'ØVYf'X]Y 'VYghY 'Hci f'ni a '; fYUh'6Uff]Yf FYYZ'UV '7 U]fbg"; fYbnYb 'G]Y 'X]Y '[fYbnYb `cgYb A O[`]W_Y]hYb 'ZØf'Y]bYb 'Yd]gW\Yb 'F]ZZIGW\bcfW\Y`! 'cXYf HUi W\Ui gZi ['j cb '7 U]fbg'Ui g'Y]b 'XYf' < Ui ghØf'XYg'; fYUh 6Uff]Yf'FYYZ''9]bY'j c``ghÀbX][Y'i bX'Y\f']W\Y HUi W\VYk Yfhi b['Xi fW\Y]bYb 'nYfh]Z]n]YfhYb '8]j Y'A UghYf K Ug'[]VhYg'Ub '7 U]fbg'b]W\h'ni '`]YVYb3': Øf 5VYbhYi YffY]gYbXY 'YfZØ``h'7 U]fbg'U``Y'J cfUi ggYhni b[Yb'ZØf Y]b'hfcd]gW\Yg'FY]gYn]Y`'j cb'K Y`h_`UggY"'J cb'XYb' \pgY`b'V]g ni a 'FY[Ybk U`X'[]Vh'Yg'YbX`cgY'A O[`]W_Y]hYb'ZØf 5VYbhYi Yf"'9g'[]Vh'YXcW\Y]b' <][\`][\hz'XUg'a Y\f A YbgW\Yb'bUW\'7 U]fbg'n]Y\h'U`g'U``Y'UbXYfYb' 'XUg'[fO) hY ?cfU``Ybf]ZZI2 _cgmghYa 'XYf'K Y`hz'XUg'; fYUh'6Uff]Yf'FYYZ'' / Ua d\Y``]d/

9]b'6`c[[Yf!FYj]Yk'ØVYf'X]Y'VYghY'Hcifinia'; fYUh'6Uff]Yf'FYYZUV'7U]fbg"; fYbnYb'G]Y'X]Y'[fYbnYb`cgYb'AÒ[`]W_Y]hYb'ZØf'Y]bYbYd]gW\Yb'F]ZZIGW\bcfW\Y`!'cXYf'HUiW\UigZi['jcb'7U]fbg'Uig'Y]b'XYf'<UighØf'XYg'; fYUh'6Uff]Yf'FYYZ''9]bY'jc``ghÀbX][Y'ibXY\f`]W\Y'HUiW\VYkYfhib['XifW\Y]bYb'nYfh]Z]n]YfhYb'8]jY'AUghYf

K Ug'[]Vh'Yg'Ub'7U]fbg'b]Wkh'ni '`]YVYb3': Øf'5VYbhYi YffY]gYbXY YfZØ``h'7U]fbg'U``Y'J cfUi ggYhni b[Yb'ZØf'Y]b'hfcd]gWkYg'FY]gYn]Y` j cb'K Y`h_`UggY"'J cb'XYb'\DgY`b'V]g'ni a 'FY[Ybk U`X'[]Vh'Yg YbX`cqY'A Ò[`]Wk_Y]hYb'ZØf'5VYbhYi Yf"

 $9g`[]Vh`YXcWX`Y]b`<][\ \ `][\ \ hž`XUg`a\ Y\ f`A\ YbgWXYb`bUWX`7U]fbg$ $n]Y\ h`U`g`U``Y`UbXYfYb```XUg`[fÒ»hY`?cfU``Ybf]ZZl^2_cgmghYa``XYf K Y`hž`XUg`; fYUh`6Uff]Yf`FYYZ''$

 $K \land fYbXG]YXUgF]ZZjcbYUbXYfYbFY]gYn]YYbK]YDcfh8ci[Yug$

cXYf'H\Y'K\]hgi bXUmg'Ui g'VYgi W\Yb'_ObbYbž']gh'7U]fbg'a Y]bYf
A Y]bi b['bUW\'X]Y'VYghY'K U\\"=\b'X]YgYa '; i]XY'a UW\Y']W\'X]f'X]Y
Gi W\Y'bUW\'XYf'VYghYb'; fYUh'6Uff]Yf'FYYZ'Hci f'UV'7U]fbg
\[Y]W\hYfž']bXYa ']W\'X]f'Y]bY'Y\f\]W\Y'6Yk Yfhi b['[YVY"'=\W\'\Y\ZY
\[=\bYb'Ui W\ž']bXYa ']W\'\=\bYb'Y]b][Y'H]ddg'[YVYž'k]Y'G]Y'Y]b'[i hYg
\[C_U`Yg'5b[YVch'Yf\U`hYb'i bX'k]Y'G]Y'XUg'6YghY'Ui g'X]YgYf
\[Yd]gW\Yb'9fZU\fi b['a UW\Yb'_ObbYb"

"69FGDFIB; NIA 5B; 96CH. →W. \UVY a Y]bY; fYUh 6Uff]Yf FYYZ GW bcfW Y \! i b X HUi W hci f \UV 7U]fbg a]h 8 ck b \! b X Yf 7fi]gY \/ 8]j Y \@VYf \!? \cc_\[YVi W h \" 8]Y gY \FY]gY \]gh \XYfnY]h \Ui Z[fi b X \XYf DUb X Ya]Y \fUV Uhh]Yfh \" K Ybb \G]Y \"U \gc \Y]b \9]b\Y]a]gW \Yf \"Ui g \TU]fbg g]b \X \Z \"XYf \gW \cb \]a a Yf \"Ua \"F]\Z\"hUi W \Yb \"k c \`hY \Z \\ UV Yb \"G]Y \"Yhnh \Y]bY \"VYggYfY \"7\Ub W \"U \"g \"Y \"ni j \cf \"? \cc_\"Wca

K Ug]gh X]Y VYghY Hci f ni a '; fYUh 6Uff]Yf FYYZ UV 7U]fbg3'

K]Y'ni 'Yfk UfhYbž'[]Vh'Yg']b'7U]fbg'Y]bY'J]Y`nU\`'j cb
FY]gYj YfUbghU`hYfb'i bX'6cchYbž'X]Y'Hci fYb'ni a '; fYUh'6Uff]Yf
FYYZ'UbV]YhYb"'HUhgÀW\`]W\'[]Vh'Yg'gc'j]Y`Yž'XUgg'Yg'Y]b'[UbnYg
6cchghYfa]bU`'[]Vhž'XUg'GW\]ZZYb'[Yk]Xa Yh']ghž'X]Y'ni a '; 6F
i bhYfk Y[g'g]bX.'H\Y'FYYZ': `YYh'HYfa]bU`"

K Ybb 'G]Y 'YXcW\ 'a]h'Y]bYa '9]b\Y]a]gW\Yb ']b '7 U]fbg 'gdfYW\Ybž k]fX 'X]YgYf '8 ck b 'I bXYf '7 fi]gY 'UbX '8]j Y 'U`g 'X]Y 'VYghY 'Hci f 'ni a ; fYUh '6Uff]Yf 'F YYZ 'UV '7 U]fbg 'Ya dZY\`Ybž 'i bX 'XUg 'Ui g '[i hYa ; fi bX" 'K À\fYbX ']W\ 'k Y]hYf 'i bhYb ']a 'F YnYbg]cbgUVgW\b]hh X]YgYg 6Y]hfU[g 'XUfUi Z'Y]b[Y\Yb 'k YfXYž 'g]bX '\]Yf 'Y]b][Y '; fØbXYž 'k Ufi a g]Y 'U`g 'X]Y 'VYghYb 'VY_Ubbh 'g]bX"

- \Rightarrow a Yf'bcW 'Y]b'`c_U`Yg': Ua]`]Ybi bhYfbY\a Yb']b'7U]fbg. 6`Y]VYb'G]Y'`c_U`' '[YVYb'G]Y' \Rightarrow f'; Y`X'b]W\h'Ub k c\`\UVYbXY'C \(\mathbb{Z}g\cfY!\) bhYfbY\a Yb
- 8]Y'9j c`i h]cb']gh'VY]'k Y]hYa 'XUg'VYY]bXfi W_YbXghY 6cchqUb[YVch'ZØf'F]ZZhUi WX!'i bX'GWXbcfWXY`Ui qZØ[Y
- 5`g`a]h'XYa '\OW\ghYb'G]W\Yf\Y]hgb]j YUi 'VYk YfhYh

- 9]bYg'XYf'gW\bY``ghYb'6cchYž'XUa]h'G]Y'a Y\f'NY]h'Ua
 fYUh'6Uff]Yf'FYYZ'j YfVf]b[Yb'_ObbYb
- K Y]hYfY'_cghYb`cgY'@Y]ghi b[Yb'k]Y'HYYž'?UZZYYž'GbUW_gž A]hhU[YggYb'i bX'gc[Uf'K Y]b

'U'h1 G5LCBG'F99: '5A'; F95H'65FF=9F'F99: '2

Gc 'Yf\ U`hYb 'G]Y 'XUg 'VYghY '5b[YVch 'ZØf 'Y]bY Hci f 'ni a '; fYUh '6Uff]Yf 'F YYZ 'UV '7U]fbg

K Ybb']W\ 'Hci fYbž'5_h]j]hÀhYb'cXYf'9f`YVb]ggY'Vi W\Yž'j Yfk YbXY]W\ ']a a Yf'Y]bY'6i W\ i b[g!5dd'cXYf'K YVg]hY'k]Y'?`cc_"'?`cc_UfVY]hYh'gY`Y_h]j 'bi f'a]h'XYb'VYghYb'i bX'Yh\]gW\ghYb FY]gYUbV]YhYfb'ni gUa a Ybž'a]h'<i bXYfhYb'j cb'5_h]j]hÀhYb']b [Ubn'5i ghfU`]Yb"

8 Ugʻ; i hYʻUbʻXYfʻ6i Wki b[ˈa]hʻY]bYfʻ5ddʻcXYfʻK YVg]hYʻk]Yʻ?`cc_]ghžʻXUggʻG]Yʻ[UbnʻY]bZUWkʻ6Yk Yfhi b[Ybʻni ʻ9f`YVb]ggYbʻi bX 5_h]j]hÀhYbʻUi Zʻ[UbnYfʻ@]b]Yʻj Yf[`Y]WkYbʻ_ObbYb"ʻ8 UfØVYfʻ\]bUi g Yf\U`hYbʻG]Yʻ]a a YfʻXUgʻVYghYʻ5b[YVchžʻXUʻg]Yʻ]a a YfʻX]Y [Øbgh][ghYbʻ5b[YVchYʻUbV]YhYbžʻX]YʻcZhʻgc[Ufʻ[Øbgh][Yfʻg]bXžʻU`g X]fY_h'ni a ʻHYfa]bU``ni ʻ[Y\Yb"

GY\Yb'G]Y'g]W\XUg'U_hi Y``Y'FUVUhhUb[YVch'Ub.'¾hnh']gh'X]Y'VYghY NY]hž'i a 'bUW\'7U]fbg'ni 'fY]gYb"'8U'XYf'FYgh'XYf'K Y`h'hUVi ']ghž dfcZ]h]YfYb'G]Y'j cb'XYb'j YffØW_hYb'`c_U`Yb'HUf]ZYbž'X]Y Ub[YVchYb'k YfXYb"

U`h1 ; F95H'65FF=9F'F99: '?CF5@@9BF=: 'JCF'75=FBG 2

8ck b'l bXYf'7fi]gY'/ '8]j Y' '9]b'FØW_V`]W_'

@UggYb'G]Y'i bg'bi b']b'X]Y'a Y]bYf'A Y]bi b['bUWX'VYghY'Hci f'ni a ; fYUh'6Uff]Yf'FYYZ'UV'7U]fbg'Y]bhUi WXYb"'=\WX'k YfXY'j Yfgi WXYbž X]Yg'gc'i bj cfY]b[Ybca a Yb'k]Y'a Ò[`]WX'ni '\U`hYbž'UVYf'Yg']gh ØVYfk À`h][YbX'dcg]h]j "'=\WX'dYfgÒb`]WX'\UVY'X]YgY'FY]gY'[Ya UWXh i bX'Yg'[UV'gY\f'k Yb][ž'k Ug']WX'XUfUb'VYa Àb[Y`b'_ObbhY"

HUhgàW\`]W\`hY]`Yb`j]Y`Y`X]YgY`5bg]W\hž'k cVY]`X]Y`F]ZZZU\fh`&\$&\$ j cb`Hf]dUXj]gcf`U`g`,) `XYf`VYghYb`HU[Yg_fYi nZU\fhYb`XYf`K Y`h i bX`U`g`, (`XYf`VYghYb`FY]gYYf`YVb]ggY`]b`5i ghfU`]YbUi q[YnY]W\bYh`k i fXY"

, VYfXUg; YgWXÀZh

 $GY]Yb G]Y J Yfg]WXYfhž XUg ; YgWX ÅZh VYZ]bXYh G]WX Ja a Yf bcWX Jb `c_U`Ya GYg]hn i bX k]fX J cb Y]bYf : Ua J`]Y Ui g 7 U]fbg VYhf]YVYb "G]Y VYgWX ÅZh][Yb Ui WX 9]b\Y]a]gWXY Ui g 7 U]fbgž XUa]h G]Y k]ggYbž XUgg <math>\Rightarrow$ f 8 c ``Uf X]fY_h ni fØW_ Jb X]Y ``c_U`Y K]fhgWX UZh Z]Y \Rightarrow h"

8 Ug 6 c c h 8] Y 9 j c i h] c b i

±b 'C fXbi b[ž'j]Y``Y]W\h']gh'XYf'VYghY'; fi bXž'Y]bY'Hci f'ni a '; fYUh 6Uff]Yf'F YYZ'j cb '7U]fbg'Ui g'a]h'8ck b'l bXYf'7fi]gY / '8]j Y'ni Vi W\Ybž']\f'6cchž'H\Y'9j c`i h]cb"

K Ybb 'Yg' \Rightarrow bYb 'Y[U`']ghž'k]Y 'XUg'6cch'Ui ggY\Yb'k]fXž'XUbb '`UggYb G]Y'a]W\' \Rightarrow bYb'j Yfg]W\Yfbž'XUgg'X]Yg'Y]bYf'XYf'k]W\h][ghYb : U_hcfYb'VY]'XYf'K U\`'nk]gW\Yb'XYb'VYghYb'Hci fYb'ni a '; fYUh

6Uff]Yf'FYYZ'UV'7U]fbg']gh"8]YgYf'?UhUa UfUb']gh'gi dYfgWkbY``i bXghUV]`ž'k Ug'VYXYi hYhž'XUgg'G]Y'a Y\f'NY]h'Ui Z'XYa 'F]ZZ'j YfVf]b[YbkYfXYbž'U`g'Ui Z'XYf'8i fWkfY]gY'\Yfi a ni \ØdZYb"'\Dg[YgUa hXUi Yfh'Yg'a]h'XYf'9j c`i h]cb'bi f'Yhk U'%ž) 'Ghi bXYbž'i a 'ni a Ài »YfYb'; fYUh'6Uff]Yf'FYYZ'ni '[Y`Ub[Yb"'G]Y'\UVYb'Ui Wk'Y]bUb[YbY\a YfYg'9f`YVb]g'i bX'Y]b'[Yf]b[YfYg'F]g]_cž'gYY_fUb_'ni k YfXYb''

U`h1 2

K Ugʻ]ghʻ]bʻXYfʻ8ck bʻl bXYfʻ7fi]gYʻUbXʻ8]j YʻFYYZ Hci fʻYbh\U`hYb3

8]Y`FY]gYžX]Y`]W\`U`g`X]Y`VYghY`; 6F!HUi W\!`i bX`GW\bcfW\Y`fY]gY Ya dZc\`Yb`\UVYž`]gh`Y]bY`; UbnhU[YgfY]gY"`K]f`\UVYb`nkY]`F]ZZ! 8Ygh]bUh]cbYb`VYgi W\hž`X]Y``YhnhYbX`]W\`j cb`XYb KYhhYfVYX]b[i b[Yb`i bX`XYf`6Y`YVh\Y]h`Ub`X]YgYa`VYgh]a a hYb HU[`UV\Àb[Yb"

Ni gUa a YbZUggYbX'g]bX'\]Yf'X]Y'j c``ghÀbX][Yb'9]bgW\` \emptyset ggYž'X]Y]W\'VY]'X]YgYf'Yd]gW\Yb'9fZU\fi b['j cb'7U]fbg'[Yb]Y \Rightarrow Yb'Xi fZhY.

- $? cghYb cgYf ? UZZYYž HYY i b X GbUW_g VY]a 9]bghY][Yb$
- Df]j UhY 'G]WX Yf\Y]hgi bhYfk Y]gi b[Ybž'VY]'XYbYb'G]Y'g]WX
 b]WX h'k]Y'J]Y\'ZØ\`Yb
- GWkbi ddYf! cXYf'nYfh]Z]n]YfhYf'HUi Wk[Ub['Ua'; fYUh 6Uff]Yf'FYYZ'fUV\Àb[]['j cb'⇒fYf'9fZU\fi b[Ł
- 5``Y`GW\bcfW\Y`!`i bX`HUi W\Ui gfØghi b[`]b_`i g]j Yž'gck]Y Y]b`Gh]b[Yf!5bni[
- Jc``Yf'A]hhU[gh]gW
- 9]b 6 Ygi W 'Ub 'nk Y] 'HUi W d `Ahn Yb
- ?cghYb`cgYf'K Y]b'Ui Z'XYf'F@W_ZU\fh

9\f`]W\ [YgU[h_cbbhY]W\ j cb Y]bYf F]Zzhci f ZØf X]YgYb DfY]g b]W\ h k]f_`]W\ a Y\fYfk UfhYb "G]Y Yf\U`hYb YXcW\ bi f Y]bYb HUi W\ [Ub[]a ; fi bXdfY]g "K Ybb G]Y a Y\f'HUi W\ [Ab[Y a OW\hYbž a ØggYb G]Y Yhk Ug a Y\f'VYnU\`Yb "I a XUg ni gU[Ybž]W\ k Uf bcW\ b]Y 'Ui ZY]bYf HUi W\ fY]gY]f[YbXk c 'Ui Z'XYf K Y`hž k c a Ub XfY] 'HUi W\ [Ab[Y ZØf X]YgYb DfY]g VY_ca a Yb _Ubbž 'U`gc]gh

Ygʻn]Ya`]WX`j YfbØbZh][ž'bi f`Y]bYb`]b`XUgʻ6Ug]gdU_Yh Ui Zhi bY\a Yb"

6i WXYb G]Y X]Y FY]gY \]Yf

- 'U`h1 H5I 7<9B'5A'G5LCBG'F99: 'I B8'<5GH-B; G'F99: -B'75 ≠ BG'HF -D 2
- 'U`h1 6CCH'5I: '89A'; F95H'65FF=9F'F99: '75∓BG 2

GW bcfW Y`b cXYf HUi W Yb3

8]YFY]gYa]h8ckb1bXYf1]ghY]bYHUiW!ibXGWXbcfWXYfY]gY"8UXUg; fYUh6Uff]YfFYYZY]bn]Ya`]WXZUWXYfibXfi\][YfHUiWXd`Uhn1]ghžV]YhYbg]YGWXbiddYfhUiWX[Àb[Ya]hD58=UbžUiWXkYbbG]YbcWXb]Ynijcf[YhUiWXhg]bX"G]YaØggYbY]bY9]bkY]gib[ibXY]bYG]WXYf\Y]hgY]bZØ\fib[nia'HUiWXYbaUXYbžX]Y'UiZXYaKY[inia'F]ZZXifWX[YZØ\fhk]fX"

K Ybb'G]Y'`]YVYf'b]W\h'hUi W\Yb'a ÒW\hYbž'_ÒbbYb'G]Y'ghUhhXYggYbgW\bcfW\Y`b"'K]Y']W\'VYfY]hg'Yfk À\bh'\UVYž'g]bX'X]Y'a Y]ghYbF]ZZY'n]Ya`]W\'ZUW\ž'k Ug'VYXYi hYhž'XUgg'G]Y'XUg'F]ZZ'VY]aGW\bcfW\Y`b']a a Yf'bcW\'j c``ghÀbX]['Yf`YVYb'_ÒbbYb"

#W `\ UVY `Ui Z`a Y]bYf`FY]gY `bi f`Y]bYb`HUi WX [Ub[`[Ya UWX hži bX
XU`]WX `Y]b`8]j Y`A UghYf!NYfh]Z]_Uh`VYg]hnYž`_cbbhYb`< Um`YU`i bX`]WX
XUg`F]ZZ`U``Y]bY`Yf_i bXYb"`8Yb`FYgh`XYf`NY]hij YfVfUWX hYb`k]f`a]h
: fY]hUi WXYb`i bX`GWXbcfWXY`b`fi bX`i a `XUg`F]ZZ"`CVk c\``XUg
HUi WXYb`VYggYf`k Ufž`\UhhY`]WX`XYZ]b]h]j `b]WXh`XUg`; YZØ\`ž`XYb
FYgh`XYf`FY]gY`Xi fWX`XUg`: fY]hUi WXYb`j YfdUggh`ni `\UVYb"</pre>

 $J9F6 \pm 81B$; .: `i ['ni a '; fYUh'6Uff]Yf'FYYZ'UV'7U]fbg' 'K Ug'G]Y Yfk UfhYh'i bX'k c'G]Y'Vi W\Yb'_ÒbbYb

9]bY hmd]gWXYF]ZZfci hY a Y]bY 9fZU\fi b[

I a 'ni 'j YfUbgW\Ui `]W\Ybž'k Ug'G]Y'Ui Z'XYf'VYghYb'Hci f'ni a '; fYUh 6Uff]Yf'FYYZ']b'7U]fbg'Yfk UfhYb'_\ObbYbž'\]Yf'Y]b'\, VYfV\]W_'\ØVYf a Y]bY'9fZU\fi b[Yb"

+.%) 'I \f' '7\YW_!]b

BUWXXYa 'k]f'Ua 'FYYZ': `YYh'HYfa]bU``]b'XYf'BÀ\Y'XYf'7U]fbg
A Uf]bU'Y]b[YWXYW_h'\UhhYbž'[]b[Yb'k]f'[Y[Yb'+.' \$'I \f'Ub'6cfX
XYf'9j c`i h]cb"'6Y]a '9]bghY][Yb'k i fXYb'k]f']b'XYb'_`]a Uh]g]YfhYb
GU`cb']a 'CVYf[YgWXcgg'[YVfUWXhži a 'X]Y'HUi WXi bhYf`U[Yb
Ui gni ZØ``Yb'i bX'i bg'ØVYf'X]Y'G]WXYf\Y]h'XYg'GWX]ZZYg'i bX'X]Y
VYj cfghY\YbXYb'HUi WX[Àb[Y']bZcfa]YfYb'ni '`UggYb"

?ifn'XUfUi Z'[]b[Yb'k]f'\]bi bhYf'ni a 'FYghUi fUbhž'k c'k]f'Y]bYb ?UZZYY'i bX'GWcbYg'[YbcggYbž'kÀ\fYbX'k]f'ni a 'YfghYb F]ZZghUbXcfh'XUa dZhYb.'GUI cbg'FYYZ'' U`h1 85G'9JC@ H€B'75 ₽BG'; F95H'65FF →9F'F99: 'HCIF 6CCH 2

 $< Yfj \ cf[\ Y\cVYb\]b.\ '8\]Y\ '\%\ 'VYghYb\ 'Hci \ fYb\ 'i \ bX\ '9f\ YVb\]ggY\ ']b \ 7\ U]fbg$

- \$\$ I \f 9fghYf HUi WX [Ub[

8 U'k]f'9fZU\fi b['U'g'HUi W\ZØ\fYf'\UhhYbž'[UV'i bg'XYf'8]j Y
A UghYf'X]Y'A Ò[`]W_Y]hž'Y]bYa ': Ø\fYf'ni 'Zc`[Yb'cXYf'i bg'gY`Vgh
ni 'Yf_i bXYb"'K Ybb']W\bcW\b]Y'Ub'Y]bYa 'Cfh'[YhUi W\h'V]bž
k ØfXY']W\bcfa U'Yfk Y]gY'Y]bYa ': Ø\fYf'Zc`[Ybž'XU'g]Y
bcfa U`Yfk Y]gY'Y]bY'n]Ya `]W\[i hY'J cfghY``i b['XUj cb'\UVYbž'k c
Yg'Xcfh'i bhYb'X]Y'Wcc`ghYb'GUW\Yb'[]Vh"8 Ug'GUI cbg'FYYZ']gh
YXcW\'Y]b'n]Ya `]W\'Y]bZUW\Yf'HUi W\[Ub['Z'XU'G]Y'Y]bYf'F]ZZk UbX
Zc`[Yb"'6]g'\Yi hY'k Uf'XYf'HUi W\[Ub['Ua 'GUI cbg'FYYZ'XYf
VYY]bXfi W_YbXghYž'XYb']W\'V]g\Yf'Ua'; fYUh'6Uff]Yf'FYYZ'Yf'YVh
\UVY"'8]Y'G]W\hk Y]hY'VYhfi ['ØVYf'&\$'A YhYf'i bX'k]f'YbhXYW_hYb
k Y]» Y'Gd]hnYbž'f]Yg][Y'A Ucf]!@]ddZ]gW\Yž'i b[`Ui V`]W\Y
: Ufb_cfU``Yb'i bX'Y]bY'FY]\Y'UbXYfYf'Vi bhYf':]gW\qW\k Àfa Y"

BUWXXYa 'k]f'j cb'XYb'HUi WXVYX]b[i b[Yb'ØVYfk À`h][h'k UfYbž [YbcggYb'k]f'Y]b': Ygha U\``Ui Z'XYa '8YW_'a]h'6`]W_'Ui Z'XUg i b[`Ui V`]WXY'?cfU``Ybk UggYf'XYg'; fYUh'6Uff]Yf'FYYZ'' U`h1 $6 \neq A$ 5CF=K F5GG9'5A'; F95H'65FF=9F'F99: 'B'75FBG 2

$%%' $ I \setminus f A]hhU[YggYb]$

%'.'\$I\f GhUbXcfhXYgbÀWXghYbF]ZZg

 $8 \ Yf'nk \ Y]hY'HUi \ Wk \ d`Uhn`ZØf'i \ bgYfYb`F]ZZUi \ gZi \ [`k Uf'Bcfhk < Ugh]b [g`FYYZ'' < Ugh]b [g`]gh'Y]bYf'XYf' [fÒ» hYb'i bX'VY`]YVhYghYb ? cfU``Ybf]ZZY'Ua ; fYUh'6Uff]Yf'FYYZ''Bcfa U`Yfk Y]gY'g]bX \\ 8 i hnYbXY'j cb'6cchYb'Ua `FUbX'ZYgh[Ya UWkhž'UVYf'G]Y'k]ggYb gWkcbž'7cj]X'''=\Wk'\UVY'a]Wk'g]WkYf`]Wk'b]WkhVYgWkk Yfh'i bX XUfØVYf'bUWk [YXUWkhž'k]Y' [`ØW_`]Wk'k]f'g]bXž'X]YgYg'i b[`Ui V`]WkY ? cfU``YbÒ_cgmghYa `ZØf'i bg'gY`Vgh'Yf`YVYb'ni '_ÒbbYb'' U`h1 ? CF5@9BF \(\div : \div = \$

%).'\$I\f`JYf`UggYb`G]Y`XUg`F]ZZibX`_Y\fYb`G]Y ia`%+.\$\$I\f`bUW\7U]fbg`nifØW_

 $8 \ Yb \ F \ Ygh'X \ Yg' \ HU[\ Yg' \ J \ YfV \ fUW \ hYb' \ k \]f']a \ 'K \ Ugg \ Yf' \ b X \ 'Ub' \ 8 \ YW \ 'XYf$ $9 \ j \ c \ i \ h]cb'' \ '5 \ 'g' \ Yg' \ NY]h' \ k \ Uf \ 'z'b \ UW \ '7 \ U]fbg' ni \ f \emptyset W_ni \ _Y \ f \ Yb \ z'k \ i \ f XY$ $i \ bg' \ Y]b'' \ Jb'' \ Ug' \ Y]g[\ Y_\emptyset \ 'hYf' \ K \ Y]b'' \ Ub[\ YVch \ bz' \ U \ 'g' \ k \]f' ni \ f \emptyset W_']b'' \ XYb$ $< UZYb'' \ gY[\ Y \ 'hYb''$

 $\begin{tabular}{ll} K & $[Y[Yb'''', X'] \cap Y'' \cap Y''' \cap Y''' \cap Y''' \cap Y''' \cap Y'' \cap$

<Ugh'8i '[Ykiggh3'8Ug'; fYUh'6Uff]Yf'FYYZ']gh'XYf'[fÒ» hY 'YVYbXY
Cf[Ub]ga i gž'XYf'Y'Yl]gh]Yfh'\Uh"'8]YgYg'?cfU``YbÒ_cgmghYa
YfghfYW_h'g]WX 'Ybh`Ub['XYf'?ØghY'j cb'EiYYbg`UbX'ØVYf'ZUgh
')\$"\$\$\$'EiUXfUh_]`caYhYf"'9g']gh'UiW\'VYXfc\hž'ZØf']aaYf
jYf`cfYb'ni'[Y\Yb"'@YgYb'G]Y'X]YgYb'5fh]_Y`ž'ia'ni'YfZU\fYbž'k]Y</pre>

G]Y`\Y`ZYb`_ÒbbYbž'cXYf`gdYbXYb`G]Y`Ub`X]Y`; fYUh'6Uff]Yf`FYYZ Cf[Ub]nUh]cb"

K]ggYbgk YfhYg'VY]'XYf'D`Ubi b['Y]bYf'Hci f ni a '; fYUh'6Uff]Yf'FYYZ'UV'7U]fbg

6i W i b [

 $K Ybb G]Y X]Y FY]gY a]h?`cc_'Vi WXYbžYf\U`hYb G]Y Y]bYb \\ X][]hU`Yb DUgg]b XYf 5dd i bX Ub <math>\Rightarrow$ fY 9!A U]`!5XfYggY [YgYbXYh" G]Y a ØggYb _Y]bY D8: !? cd]Y Ui gXfi W_YbžVf]b[Yb G]Y Y]bZUWX \Rightarrow f HY`YZcb a]h":5``Y 7\YW_!]b!5bk Y]gi b[Yb g]bX Ybh\U`hYb"

$9]bWXYW_Yb^ibX^iDUf_a O[^]WX_Y]hYb$

7\YW_Yb^G]Y^\]Yf^Y]b^i bX^Y]bY^XYf^VYghYb^Hci fYb^ni a '; fYUh 6Uff]Yf^FYYZ]b^7U]fbg^Z]bXYh^Ua ^FYYZ^HYfa]bU^bYVYb^XYf^A Uf]bU ghUhh'' \ddot XYf^9!A U]^ghY\hz^XUgg^G]Y^%) ^A]bi hYb^j cf^XYf^7\YW_!]b! NY]h^Xcfh^gY]b^a \@ggYb''\Ni a ^DUf_Yb^i []Vh^Yg^Y]bYb^Y][YbYb DUf_d^Uhn^X]fY_h^]b^XYf^BA\Y^XYg^HYfa]bU^gz^XYf^%, ^^dfc^HU[_cghYh''G]Y^a \@ggYb^a]bXYghYbg^V]g^%+1 \f^Vi WXYb''K Ybb^G]Y^YXcWX^Ub^Y]bYa ^GcbbhU[^Ui Z^X]Y^F]ZZVcchgZU\fh^[Y\Ybz^_ObbYb G]Y^g]WX^Y]bYb^cgYb^DUf_d^Uhn^Ui Z^Y]bYa ^XYf^a]hh^YfYb \ddot gY^dUf_d^AhnY^]b^XYf^GhUXh^g]WXYfb''^5bgcbghYb^dUf_Yb^g]Y^Ub UbXYfYb^HU[Yb^bi f^XfY]^Ghi bXYb^`Ub[^_cghYb^cg''

K Ugʻni Vf]b[Yb

5i Z'X]YgYf'F]ZZZU\fh']gh'gc'n]Ya `]W\'U``Yg'Ybh\U`hYbž'k Ug'G]Y VfUi W\Yb"'=\W\'k ØfXY'bi f'Ya dZY\`Yb'a]hni Vf]b[Yb.

• ?Ua YfU'#[c'dfc

- 9][YbY'A Ug_Y'#GW\bcfW\Y`'fk Ybb'G]Y'X]Y'VYfY]h[YghY``hYbb'b]W\h'j Yfk YbXYb'a ÒW\hYbŁ
- F |ZZq]WX Y f Y f 'Gcbb Y b q WX i hn
- HUI W\nYfh]Z]n]Yfi b[g_UfhY`fk Ybb`G]Y`VY]`D58=g]bXž__\ObbYb`g]Y`G]Y`Y]bZUW\`bUW\gW\`U[Yb\!
- 9]b'BYcdfYbUbni [žk Ybb'X]f'_U`h'k]fXž'UVYf bcfa U`Yfk Y]gY'VfUi Wkgh'Xi '_Y]bYb'fbcfa U`Yfk Y]gY'%\$'` YI hfUŁ

5``Y'@YVYbga]hhY`ž'K UggYfž'GhUW\Y`gW\i hn'i bX HUi W\!#GW\bcfW\Y`Ui qf@qhi b['q]bX'Ub'6cfX'Ybh\U`hYb"

$K Y]hYfY 5_h]j]hAhYb]b 7U]fbg$

8 Ua]h']gh'X]YgYf'Ui gZØ\f`]W\Y'6Yf]W\h'ZØf'X]Y'VYghY'Hci f'ni a
; fYUh'6Uff]Yf'FYYZ']b'7U]fbg'UV[YgW\`cggYb"'K Ybb'G]Y': fU[Yb'ni f
FY]gY'\UVYb'cXYf'=\fY'9fZU\fi b[Yb'hY]`Yb'a ÒW\hYbž'gW\Yi Yb'G]Y
g]W\'b]W\hž'i bg']b'XYb'?ca a YbhUfYb'i bhYb'ni '_cbhU_h]YfYb"
5bgcbghYbž'k Ybb'G]Y'k Y]hYfY'Yd]gW\Y'7U]fbg!5VYbhYi Yf'd`UbYbž
gW\Ui Yb'G]Y'g]W\'Y]b][Y'a Y]bYf'UbXYfYb'FY]gYZØ\fYf'i bX'6`c[g
Ubž'k]Y'X]YgY'@]ghY'a]h'Yd]gW\Yb'5_h]j]h\hYb']b'7U]fbg'cXYf'X]Y
i a ZUggYbXY'@]ghY'XYf'VYghYb'K UggYfZ\`Y'i bX'K UbXYfk Y[Y']b
7U]fbg°

п

8 YhU1`a

6 Ygi WX Yb 'G]Y 'i bg 'Ui Z 'Y]bY!fY]gY "XY