

?cbghUbn'YbhXYW_Yb.'5`hghUXhž'6cXYbgYY / Ua d/'_i `]bUf]gW\Y'; Y\Y]a h]ddg

9bhXYW_Yb^G]Y^X]Y^WXUfa UbhY^5`hghUXh^j cb^?cbghUbnž [Yb]Y»Yb^G]Y^UhYa VYfUi VYbXY^5i gV`]W_Y^i bX^_i `]bUf]gWXY <][\`][\hg^Ua ^6cXYbgYY"~⇒XYU`^ZØf^BUhi f!^i bX ?i `hi fZfYi bXY^

K]``_ca a Yb']b'?cbghUbnžXYf'a U`Yf]gWXYb'GhUXh'Ua '6cXYbgYYž X]Y b]W\hbi f Xi fW\]\fY VYY]bXfi W_YbXY @U[YžgcbXYfb Ui W\ $Xi fWX^{-1} fY^{-1} VYbX][Y^{-1} YgWX]WXhY^{-1} bX^{-1} hi f^{-1} VYgh]WXh^{-1} CV^{-1} Xi^{-1} b$ BUhi fZfYi bX V]ghi ?cbghUbn`\UhiZØf`YXYb`Yhk Ugʻni V]YhYb" ⇒b $X[YqYa \ '5fh]_Y``bY\a Yb'k]f'X]WX'a]h'Ui Z'Y]bY'9bhXYW_i b[gfY]gY$ Xi fWX X]Y WX Ufa UbhY 5 hqhUXhž ni UhYa VYfUi VYbXYb 5i gg]WX hqdi b_hYb ii b X '_i `]bUf]gWX Y b '? Òqh`]WX _Y]hY b ž 'X]Y 'X]Y FY[]cb'ni 'Y]bYa 'k U\fYb'9f`YVb]g'ZØf'U``Y'G]bbY'a UW\Yb"'@Ugg ibg'[YaY]bgUa'X]Y'VYghYb'5_h]j]hÀhYb'ZØf'BUhif`]YV\UVYf $Yf_i bXYb\check{z}X]Y^{-1}]ghcf]gWXYb^{-1}GY^{-1}bX^{-1}[_Y]hYb^{-1}bX^{-1}a^{-1}gYYb^{-1}bX^{-1}a^{-1}gYYb^{-1}bX^{-1}a^{-1}gYYb^{-1}bX^{-1}a^{-1}gYYb^{-1}bX^{-1}a^{-1}gYYb^{-1}bX^{-1}a^{-1}gYYb^{-1}bX^{-1}a^{-1}gYYb^{-1}a^{-1}gYyb^{$ VYghUi bYb'i bX'ZUa]`]YbZfYi bX`]WXY'5i qZi [gn]Y`Y'i bX ; $Y \setminus Y$]a h]ddg Ybh XYW_Y bžX]Y XY]bYb 5i <math>ZYbh \setminus U`h'i bj Yf[Ygg \setminus]Wa UWXYb k YfXYb "5 `gc 'gWxbUdd 'X]f 'XY]bYb FY]gYZØ\fYf i bX 'a UWX X]WX 'VYfY]hž'?cbghUbn'i bX'gY]bY'l a [YVib[']b'U```]\fYf'DfUWXh'ni Yf`YVYb°

9bhXYW_i b['XYf'WX Ufa UbhYb'5`hghUXh'j cb?cbghUbn

 $8]Y'5`hghUXh'j cb'?cbghUbn']gh'Y]b'k U\fYg' \not\Rightarrow k Y``Ua'`6cXYbgYY'i bX'j Yfgdf]W\h'Y]b'i bj Yf[Ygg`]W\Yg'9f`YVb]g'`ZØf'`YXYb'`6Ygi W\Yf''`A]h]\fYb'gW\`Ab[Y`bXYb'; UggYbž'Vi bhYb': UggUXYb'i bX'\]ghcf]gW\Yb ; YVAi XYb'YbhZØ\fh'g]Y'`YXYb']b'Y]bY'UbXYfY'NY]h'''6YgcbXYfg$

 $VYY]bXfi W_YbX^*g]bX^*X]Y^*fYghUi f]YfhYb^*a]hhY^*U^*hYf^*]WXYb^*< Ai gYfZ X]Y^*XYb^*i bbUWXU\a^*]WXYb^*7 \ Ufa Y^*XYf^*GhUXh^*Ui gghfU\^Yb"$

9]b VYgcbXYfg a Uf_UbhYg K U\fnY]W Yb XYf 5 hghUXh]gh XUg ? cbghUbnYf A ØbghYf" 9g]gh b] W h bi f XUg [f O h h Y ; chh Yg \ Ui g XYf GhUXh z gcb XYfb 'Ui W Y]b A Y]gh Yfk Yf_ XYf [ch]g W Y b 5 f W]h Y _hi f" 8]Y 'V YY]b X fi W_Y b X Y b 'H Øfa Y z X]Y '\ c W ']b 'X Y b <]a a Y `f U[Yb z g]b X Y]b 'V Y `]Y V h Yg : chca ch]j " 6 Y gi W Yf _O b Y b X]Y '%- ' Ghi ZYb '\]b Ui Zgh Y][Yb z i a 'Y]b Yb 'Uh Ya V Y f Ui V Yb X Y b '6 `] W_ Ø V Yf X]Y 'Gh UXh i b X 'X Y b '6 c X Y b g Y Y 'ni '[Yb]Y "Y b"

#D XYf B A\Y 'XYg 'A ØbghYfg 'VYZ]bXYh 'g]W 'XYf 'A Uf_hd `Uhnž XYf
YXYb '8]YbghU['i bX': fY]hU['ni a '@YVYb 'Yfk UW\hž k Ybb 'XYf
K cW\Yba Uf_h 'ghUhhZ]bXYh" <]Yf 'Z]bXYb 'G]Y 'Zf]gW\Y 'fY[]cbU`Y
DfcXi _hYž '6`i a Yb 'i bX'\UbXk Yf_`]W\Y 'K UfYb" '9g ']gh XYf 'dYfZY_hY
Cfhž i a ']b 'XUg '`c_U`Y '@YVYb 'Y]bni hUi W\Yb 'i bX'X]Y '5ha cgd\AfY
XYf 'GhUXh 'ni '[Yb]Y » Yb" 'J Yfg]cbYb 'j cb '`c_U`Yb '8Y`]_UhYggYbž k]Y
VY]gd]Y`gk Y]gY '6cXYbgYYZY`W\Yb 'cXYf'? cbghUbnYf'? AgYž 'g]bX
\]Yf'\Ai Z]['Yf\A`h`]W\"</pre>

8]Y'GWX k YXYbghfU» Y']gh'Y]bY'XYf'VY`]YVhYghYb': `Ub]Yfa Y]`Yb']b?cbghUbn"'<]Yf'Z]bXYb'G]Y'nU\`fY]WXY'_`Y]bY'; YgWXÀZhYž'7UZÅg'i bXFYghUi fUbhgž'k c'G]Y'Y]bY'DUi gY'Y]b`Y[Yb'_ObbYbž'i a 'X]Y'`c_U`Y?@WXY'ni '_cghYb'cXYf'Y]bZUWX'bi f'XUg'@YVYb'i a 'g]WX'\Yfi a 'ni VYcVUWXhYb"'8]Y'5ha cgd\AfY'k]fX'Xi fWX'X]Y'j]Y`YbG]hn[Y`Y[Yb\Y]hYb']a ': fY]Yb'i bX'X]Y'V`@\YbXYb'6`i a YbVYYhYbcWX'jYfghÀf_h"

: Øf?i bgh`]YV\UVYf'V]YhYh'X]Y'5`hghUXh'Y]bY'J]Y`nU\`'j cb'; U`Yf]Yb
i bX'?i bgh\UbXk Yf_g`ÀXYb"'Jcb'hfUX]h]cbY``Yf
<UbXk Yf_g_i bgh'V]g'\]b'ni 'a cXYfbYb'5i gghY``i b[Yb'Z]bXYb</pre>

6Ygi WXYf'\]Yf'Y]bY'VfY]hY'DU`YhhY'Ub'_fYUh]j Yb'5i gXfi W_gZcfa Yb" 9]b'Ghcdd']a 'GhUXha i gYi a 'V]YhYh'ni XYa 'Y]bYb'h]YZYb'9]bV`]W_]b'X]Y'; YgWX]WXhY'i bX'?i `hi f'XYf'GhUXh"

I a 'X]Y'5`hghUXh'ni 'Yf_i bXYbžYa dZ]Y\`h'Yg'g]W\ž'Y]bYb' GhUXhZØ\fYf'ni 'Yb[U[]YfYb'cXYf'Ub'Y]bYf'[YZØ\fhYb'Hcif hY]`ni bY\a Yb"'8]YgY'9I dYfhYb'_ObbYb'=\bYb'X]Y'j YfghYW_hYb; YgW\]W\hYb'i bX'5bY_XchYb'YfnÀ\`Ybž'X]Y'XUg'GhUXhV]`X'dfÀ[YbibX'=\bYb'\Y`ZYbž'X]Y'GhUXh'Ui g'Y]bYa 'UbXYfYb'6`]W_k]b_Y`ni gY\Yb"'5`hYfbUh]j'_ObbYb'G]Y'Ui W\'X]Y'GhUXh'Ui Z'Y][YbY': Ui ghYf_i bXYb'i bX'X]Y'W\Ufa UbhYb'; UggYb'i bX'D`ÀhnY'bUW\'@ gh'i bX'@Ui bY'Xi fW\ghfY]ZYb"

9]bYg'XYf'gWX ObghYb'A Yf_a U'Y'XYf'?cbghUbnYf'5`hghUXh'g]bX'X]Y nU\`fY]WXYb'D`ÀhnY'i bX'6fi bbYbž'X]Y'X]Y'I a [YVi b[VYfY]WXYfb"'G]Y'g]bX'b]WX h'bi f'gWX ObY': chca ch]j Yž'gcbXYfb'Ui WXVY`]YVhY'JYfgUa a `i b[gcfhY'ZØf'9]b\Y]a]gWXY'i bX'Hci f]ghYb"'8Yf' FUh\Ui gd`Uhnž'a]h'gY]bYa '\]ghcf]gWX'VYXYi hgUa Yb'FUh\Ui gž i bX'XYf'<c\Yb'A Uf_hž'k c'XYf' Ni bZhVfi bbYb 'ni 'Z]bXYb']ghž g]bX'VYgcbXYfg'VY_Ubbh"

GcVU`X`X]Y`GcbbY`i bhYf[Y\hžij Yfk UbXY`h`g]W\`X]Y`5`hghUXh`]b`Y]b
a U[]gW\Yg`@]W\hYfa YYf"`J]Y`Y`XYf`\]ghcf]gW\Yb; YVÀi XY`g]bX
UVYbXg`VY`Yi W\hYhž`k Ug`Y]bY`fca Ubh]gW\Y`Gh]a a i b[`nUi VYfh"
6Ufg`i bX`7UZÅg`ZØ``Yb`g]W\`a]h`A YbgW\Ybž`X]Y`XYb`5VYbX`VY]
Y]bYa ; `Ug`6UX]gW\Yb`K Y]b`cXYf`Y]bYa Zf]gW\`[YnUdZhYb`6]Yf
Ui g_`]b[Yb``UggYb"`8Ug`BUW\h`YVYb`]b`XYf`5`hghUXh`\Uh`gY]bYb
Y][YbYb`7\Ufa Y`i bX`V]YhYh`Y]bY`YbhgdUbbhY`5ha cgd\ÀfY`ZØf`XYb
dYfZY_hYb`5VgW\`i gg`Y]bYg`Yf`YVb]gfY]W\Yb`HU[Yg"

8]Y'5`hghUXh'j cb'?cbghUbn']gh'Y]b'Cfhž'XYf'fY]W\'Ub'; YgW\]W\hYž?i `hi f'i bX'5ha cgd\ÀfY']gh''9[U`ž'cV'G]Y'g]W\'ZØf'5fW\]hY_hi fž; YgW\]W\hYž'?i bgh'cXYf'Y]bZUW\'bi f'ZØf'X]Y'`c_U`Y'@YVYbgUfh]bhYfYgg]YfYbž'X]Y'5`hghUXh'j cb'?cbghUbn'\Uh'ZØf'YXYb'Yhk Ug'niV]YhYb''GW\Ui Yb'G]Y'j cfVY]ž'i bX'`UggYb'G]Y'g]W\'j cb'X]YgYaVYqcbXYfYb'Cfh'j YfnUi VYfb''

8]Y UhYa VYfUi VYbXY 5i gg]W\hijca CVYfgYY

8 Yf'C VYfgYYž'Y]b'HY]''XYg'a U`Yf]gWXYb'6cXYbgYYgž'V]YhYh'Y]bY?i`]ggYž'X]Y'g]WX'Xi fWX']\fY'UhYa VYfUi VYbXY'GWXÒb\Y]hUi gnY]WXbYh"'I a [YVYb'j cb'gUbZhYb'< Ø[Y`b'i bX'XYa a U'YghÀh]gWXYb'5`dYbdUbcfUa U']gh'XYf'C VYfgYY'Y]b'k U\fYg DUfUX]Yg'ZØf'BUhi f`]YV\UVYf'i bX': chc[fUZYb"'<]Yf'[]Vh'Yg nU\`fY]WXY'A Ò[`]WX_Y]hYbž'X]Y'ZUgn]b]YfYbXYb'5i gV`]W_Y'Ui Z'XUg K UggYf'i bX'X]Y'@UbXgWXUZh'ni '[Yb]Y»Yb"

8 Yf 'GYY 'YfghfY W_h'g] W. 'nk]gW. Yb 'XYb 'GhÀXhYb'? cbghUbn'i bX
A YYfgVi f['i bX'V]YhYh'Y]bY'J]Y`nU\`'j cb'DYfgdY_h]j Ybž'X]Y'a]h
'YXYa 'GW. f]hh'j Uf]]YfYb"'8 Ug'K UggYf'\Uh'Ub'j YfgW.]YXYbYb'C fhYb
i bhYfgW.]YX`]W. Y': UfVYbž'j cb'h]YZYa '6`Ui 'V]g'\]b'ni '`Yi W. hYbXYb
; fØbhÒbYb"'8]YgY': UfVYbdfUW. h']gh'VYgcbXYfg']b'XYb'ZfØ\Yb
A cf[Ybghi bXYb'i bX'_i fn'j cf'XYa 'GcbbYbi bhYf[Ub['Ui g[YdfÀ[hž
k Ybb'XUg'@]W. h'X]Y'C VYfZÀW. Y'XYg'K UggYfg']b'Y]b'a U[]gW. Yg
GW. Ui gd]Y`'j Yfk UbXY`h"

9]b 'VY`]YVhYf'5i gg]Wk hgdi b_h']gh'X]Y'< Of]ž'Y]bY'< U`V]bgY`ž'X]Y'g]Wk k Ygh`]Wk 'XYg'C VYfgYYg'YfghfYW_h''<]Yf'_Ubb'a Ub'b]Wk h'bi f'X]Y GWk Ob \Y]h'XYg'GYYg'VYk i bXYfbž'gcbXYfb'Ui Wk'X]Y']Xm``]gWk Yb 8 OfZYf'Yf_i bXYbž'X]Y'a]h'Wk Ufa UbhYb'U`hYb'; YVÀi XYb'[YgÀi a h g]bX"'8 Yf'Fi bXk Y['i a 'X]Y'< U`V]bgY``]gh']XYU`'ZØf'[Ya Øh`]Wk Y GdUn]Yf[Àb[Y'cXYf': U\ffUXhci fYbž'VY]'XYbYb'G]Y'X]Y'BUhi f'i bX X]Y'5i gg]Wk h']b'j c``Yb'NØ[Yb'[Yb]Y*Yb'_ObbYb"

 $: \emptyset f`5VYbhYi Yf`i gh][Y`[]Vh`Yg`Ui W\`A Õ[`]W_Y]hYb`ni a\\ K UggYfgdcfhž'k]Y`GY[Y`bž'? U^U_ZU\ fYb`i bX`GhUbX!I d!\\ DUXX`]b["`8]Yg`]gh`Y]bY`[fc»Ufh][Y`A Õ[`]W_Y]hž`X]Y`FY[]cb`Ui g\\ Y]bYf`UbXYfYb`DYfgdY_h]j Y`ni `Yf`YVYb`i bX`X]Y`Zf]gW\Y`@ Zh`XYg GYYg`ni `[Yb]Y»Yb"`9g`[]Vh`nU\`fY]W\Y`JYf`Y]\Y`Ua `CVYfgYYž`X]Y <math>\Rightarrow$ bYb`U``Yg`Bchk YbX][Y`ni f`JYfZ \emptyset [i b[`ghY``Yb"

9]b'k Y]hYfYg'i bj Yf[Ygg`]W\Yg'9f`YVb]g'Ua 'C VYfgYY']gh'Y]bY 6cchgZU\fh"'Jcb'?cbghUbn'Ui g'ZU\fYb'fY[Y`a À»][': À\fYb'i bX ?fYi nZU\fhgW\]ZZYž'X]Y'X]Y'i a `]Y[YbXYb'GhÀXhY'i bX'8 ÒfZYf UbghYi Yfb"'8]YgY': U\fhYb'g]bX'b]W\h'bi f'YbhgdUbbYbXž'gcbXYfb V]YhYb'Ui W\'ZUbhUgh]gW\Y'5i gV`]W_Y'Ui Z'X]Y'I ZYf`UbXgW\UZh'i bX X]Y'5`dYb']a '<]bhYf[fi bX"'G]Y'_ObbYb'_`Y]bY'DUi gYb'Y]b`Y[Ybž

i a 'X]Y'W\Ufa UbhYb'CfhY'k]Y'**A YYfgVi** f['cXYf': f]**YXf]W\g\UZYb** ni 'Yf_i bXYb"

I bhYf'XYb'j]Y`Yb'UhhfU_h]j Yb'K UbXYf!'i bX'FUXk Y[Yb']gh'XYf'
6cXYbgYY!FUXk Y['VYgcbXYfg'VY`]YVh"'8]YgYf'K Y['ZØ\fh
Ybh`Ub['XYg'GYYg'i bX'V]YhYh'b]W\h'bi f'UhYa VYfUi VYbXY
5i gV`]W_Yž'gcbXYfb'Ui W\k]W\h][Y'GY\Ybgk ØfX][_Y]hYbž'k]Y
\]ghcf]gW\Y'Gh\hhYbž'K Y]bVYf[Y'i bX'_`Y]bY'Ghf\hbXYž'X]Y'ni a
JYfk Y]`Yb'Y]b`UXYb"'8]Y'UVk YW\g`i b[gfY]W\Y'@UbXgW\UZh'i bX'X]Y
[i h'Ui g[YgW\]`XYfhYb'Fci hYb'a UW\Yb'Yg'ni 'Y]bYa ']XYU`Yb'N]Y`
ZØf'HU[YgUi gZ'Ø[Y'cXYf'gc[Uf'a Y\fh\h][]Y'Hci fYb"

K Ybb 'G]Y 'bUW 'Y]bYa 'VYgcbXYfg'fY]nj c``Yb 'Gdch'gi W Ybž'gc``hYbG]Y 'g]W 'ni 'XYb 'F cgYb]bgY``Ui Za UW Yb"'8]YgY'_`Y]bY '♣gY``]a C VYfgYY ']gh'VY_Ubbh'ZØf']\fYb 'gW ÒbYb 'F cgYb[UfhYb'i bX'X]Y \]ghcf]gW Yb'; YVÀi XY"'G]Y 'YffY]W Yb'X]Y '♣gY``dYf': À\fY'i bX _ÒbbYb 'Xcfh'YbhgdUbbYbž'X]Y 'j YfgW]YXYbYb 'F cgYbgcfhYb VYk i bXYfb'i bX'X]Y 'UhYa VYfUi VYbXY'5i gg]W h'Ui Z'XYb'6cXYbgYY [Yb]Y» Yb"

B UhØf`]W\ ']gh'XYf'C VYfgYY'Ui W\ 'Y]b'\Yfj cffU[YbXYf'C fh'ZØf'
D]W_b]W_g'cXYf'Y]bZUW\ 'bi f'ni a '9bhgdUbbYb'Ua 'I ZYf"'9g'[]Vh
nU\ `fY]W\ Y'_`Y]bY'GhfÀbXY'i bX'@]Y[Yk]YgYbž'X]Y'ni a 'JYfk Y]`Yb
Y]b`UXYb"'J]Y`Y': Ua]`]Yb'_ca a Yb'\]Yf\Yfž'i a 'Y]bYb'YbhgdUbbhYb
HU[']b'XYf'BUhi f'ni '[Yb]Y» Yb' 'cZh'a]h'Y]bYa '_Ògh`]W\Yb'
6UX]gW\ Yb'K Y]b'cXYf'Y]bYf'`Y]W\ h'ni VYfY]hYhYb'A U\`nY]hž'X]Y'g]Y
a]h[YVfUW\ h'\UVYb"

Ni gUa a Yb ZUggYb X '`Àggh'g]W 'gU[Yb ž XUgg'XYf'C VYfgYY 'Y]b Y 'XYf gW ÒbghYb i b X ']bgd]f]YfYb XghYb 'F Y[]cb Yb 'fi b X 'i a '?cbghUbn']gh" 9[U`ž'c V 'G]Y 'U_h]j 'gY]b 'a ÒW hYb 'c XYf'Y]b ZUW 'bi f'X]Y '5i gg]W h [Yb]Y » Yb 'k c ``Yb ž'\]Yf 'Z]b XYh 'YXYf'XUg'd UggYb XY '9f`YVb]g" '\delta 'XYf ?ca V]b Uh]cb 'Ui g'B Uhi fž'Gdcfhž'?i `hi f'i b X'; Ybi gg'Yb hghY\h i bj Yf[Ygg`]W Y '9f]b b Yfi b[Yb"'6 Ygi W Yb 'G]Y 'XYb 'C VYfgYY'i b X `UgqYb 'G]Y 'g]W 'j cb 'gY]b Yf'A U[]Y 'j YfnUi VYfb'

?i`]bUf]gWXY'<][\`][\hg'XYf'FY[]cb''jcb
6UX]gWXYb'KY]bYb'V]g'ni'fY[]cbU`Yb</pre>

GdYn]U`]hÀhYb

8]Y FY[]cb?cbghUbnii bX XYf 6cXYbgYY g]bX b]W hibi f ZØf]\fY UhYa VYfUi VYbXYb @UbXgW UZhYb VY_Ubbhž gcbXYfb Ui W ZØf]\fY j]Y ZÀ`h][Y i bX _Ogh`]W Y; Ughfcbca]Y "8]Y _i `]bUf]gW Yb < O\Ydi b_hY XYf FY[]cb nY]W bYb g]W Xi fW Y]bY A]gW i b[Ui g VUX]gW Yb 5fca Ybž Zf]gW Yb Ni hUhYb i bX hfUX]h]cbY``Yb FYnYdhYb Ui g" <]Yf]ghY]b 9]bV`]W_]b X]Y VYghYb; Yf]W hY i bX; YhfÀb_Yž X]Y G]Y VY]a 6Ygi W X]YgYf W Ufa UbhYb GhUXh i bVYX]b[h'dfcV]YfYb 'gc``hYb"

6UX]gWX Y 'K Y]bY 'g]bX 'Y]b'j c``Yf'; Ybi gg'i bX'j YfX]YbYb
VYgcbXYfY '9fk À\bi b["'8]Y 'K Y]bfY[]cb'6UXYbg'YfghfYW_h'g]WX
Ybh`Ub['XYg'F\Y]bg'i bX'V]YhYh']XYU`Y'6YX]b[i b[Yb'ZØf'XYb
K Y]bUbVUi "'6YgcbXYfg'VY`]YVh'g]bX'X]Y 'F]Yg`]b['i bX'XYf'
; fUi Vi f[i bXYfž'X]Y 'VYgcbXYfg'[i h'ni 'XYb'fY[]cbU`Yb'GdY]gYb
dUggYb"'<]Yf'g]bX'Y]b][Y 'K Y]b[ØhYfž'X]Y'Y]bYb'6Ygi WX 'k Yfh'g]bX.</pre>

- K Y]b[ih'<iVYf''6Y_Ubbh'ZØf'gY]bY'\cWk Yfh][YbHfcdZYb'ibX'kibXYfgW\ObYb'KY]bZYghY"
- K Y]b[i h'Nchn' '6YfØ\a h'ZØf'gY]bY'bUW\\U`h][Y
 K Y]bdfcXi _h]cb'i bX'\Yfj cffU[YbXYb'Fchk Y]bY"
- K Y]b[i h'6`Ub_Yb\cfb' :: Ua]`]Yb[YZØ\fhYg'K Y]b[i h'a]h Y]bYf'`Ub[Yb'HfUX]h]cb'i bX'VYY]bXfi W_YbXYa K Y]bgcfh]a Ybh"

BYVYb'XYb'K Y]bYb'g]bX'Ui W\'X]Y'fY[]cbU`Yb'GdYn]U`]hÀhYb'Y]bUVgc`i hYg'A i gg"'8]Y'hfUX]h]cbY``Y'? \emptyset W\Y'j cb'?cbghUbn'i a ZUggh gck c\`'\Yfn\UZhYb'U`g'Ui W\'g \emptyset » Yb'; Ybi gg.

- Ÿ`d`Yfa U[fcbYb'''9]b'gW\a UW_\UZhYg'; Yf]W\h'Uig HY][k UfYbž'? Ufhc ZZY`bž'? ÀgY'i bX'Nk]YVY`bž'XUg'VYgcbXYfg]b'XYb'_U`hYb'A cbUhYb'VY`]YVh']gh"
- 6cXYbgYY!: Y`W\Yb' '9]b'gW\a UW_\UZhYf':]gW\ž'XYf'Ua 6cXYbgYY'[YZUb[Yb'k]fX'i bX'U`g'8Y`]_UhYggY'[]`h"
- GWX k Ufnk À`XYf'?]fgWX hcfhY' '8]Y'k Y`hVYfØ\a hY'HcfhY XUfZ'VY]'Y]bYa '_i `]bUf]gWXYb'5i gZi [']b'X]Y'FY[]cb'b]WXh ZY\`Yb"

8 Ugʻ5b[YVchʻUbʻFYghUi fUbhgʻi bXʻ7 UZÅgʻ]bʻ?cbghUbnʻ]gh i b[`Ui V`]WXʻj]Y`ZÀ`h][žʻj cbʻZY]bYbʻ; ci fa YhfYghUi fUbhgʻV]gʻ\]bʻni [Ya Øh`]WXYbʻGhfUi » k]fhgWXUZhYb"'9]b][YʻYa dZY\`Ybgk YfhYʻ@c_U`Yq]bX.

- K]fhg\Ui g'ni f'A ØhnY' '9]b'hfUX]h]cbY``Yg'K]fhg\Ui gž XUg'hmd]gW\Y'VUX]gW\Y'? ØW\Y'gYfj]Yfh"
- FYghUi fUbh:F]j U: '9]b:Yfgh_`Ugg][Yg:FYghUi fUbh:Ua 6cXYbgYY:a]h:\Yfj cffU[YbXYa '6`]W_:Ui Zg:K UggYf:i bX Y]bYf:a cXYfbYb:GdY]qY_UfhY"
- 7 UZÅ: YhhY: < YbbY: '9]b: WX Ufa UbhYg: 7 UZÅž:]XYU`: ZØf: Y]b _Ogh`]WX Yg: GhØW_:? i WX Yb: i bX: Zf]gWX Yb: ? UZZYY"

 $: \emptyset f ``U``Y `: Y]bgWXa YW_Yf `V]YhYb `X]Y `nU\`fY]WX Yb `A Åf_hY `]b `XYf GhUXh ``Ui WX `X]Y `A Õ[`]WX_Y]hž ``c_U`Y `DfcXi _hY `X]fY_h `j cb `XYb 9fnYi [Yfb `ni `_Ui ZYb "`8 Yf `K c WX Yba Uf_h `Ua `A ØbghYfd`Uhnž `XYf YXYb ``GUa ghU[``ghUhhZ]b XYhž `]gh `Y]b `k U\fYg ``DUfUX]Yg ``ZØf ``@]YV\UVYf Zf]gWXYf `i b X`fY[]cbU`Yf `DfcXi _hY "` <]Yf `Z[b XYb ``G]Y .$

DfcXi _h	< Yf_i bZh	6YgcbXYf\Y]h
CVghi bX; Ya ØgY	@c_U`Y`6Ui Yfb	⇒ XYfGU]gcb Zf]gW
		i bX'i bVY\UbXY`h
? ÀgY	FY[]cbU`Y`?ÀgYfY]Yb	<ui g[ya="" td="" uwkh'a]h<=""></ui>
		hfUX]h]cbY``Yf
		FYnYdhi f
6fch	6ÀW_YfY]Yb`]b`XYf	CZYbZf]gW\`i bX`bUW\
	la[YVib[U`hYb'FYnYdhYb
		[YVUW_Yb

K Yf'[YfbY'gY`Vgh'_cW\hž'_Ubb'g]W\a]h'Y]bYa '; ci fa Yh!DU_Yh Y]bXYW_Ybž'XUg'nU\`fY]W\Y'fY[]cbU`Y'DfcXi _hY'i a ZUggh"8]YgY DU_YhY'g]bX']XYU`ž'i a 'Y]b'GhØW_W\Yb'?cbghUbn'bUW\'<Ui gY'ni Vf]b[Yb'i bX': fYi bXY'VY]'Y]bYa '[Ya Y]bgUa Yb'5VYbXYggYb'ni VYY]bXfi W_Yb"

: Øf`Y]bY`gØ» Y`J Yfgi W\i b[``gc``hYb`G]Y`Ui Z`^YXYb`: U```X]Y`
GW\c_c`UXYba Ubi ZU_hi fYb`VYgi W\Yb"`8]Y`GW\c_c`UXY`Ui g
?cbghUbn`]gh`VY_Ubbh`ZØf`]\fY`\cW\k Yfh][Yb`Ni hUhYb`i bX`X]Y

_fYUh]j Y`< YfghY``i b["'9]b`UVgc`i hYg`<][\`][\h`g]bX`X]Y \UbX[Ya UW\hYb`DfU`]bYb'j cb` GW\c_c`UXYb`6ci h]ei Y ž'X]Y`\\bYb XUg`K UggYf`]a 'A i bX`ni gUa a Yb`Ui ZYb``UggYb"

 $\label{thm:condition} 5 \ VgWX \ "YbX" \ Aggh"g]WX \ "gU[Ybž"XUgg"X]Y"_i \ "]bUf]gWXYb" <][\ '][\ hg j cb"? cbghUbn"i bX"XYf"FY[]cb"6cXYbgYY"_Y]bY"9fk Ufhi b[Yb YbhhÀi gWXYb""CV"G]Y"Y]b"; \ "Ug"6UX]gWXYb"K Y]b"[Yb]Y" \ Yb"cXYf"g]WX Xi fWX"X]Y \ "c_U"Yb"GdYn]U"]hÀhYb"gWX \ Ya a Ybž"\]Yf k]fX"YXYf ; Ui a Yb"j Yfk <math>O\ bh$ " $O\ bh$ "

8]Y'VYghYb'5_h]j]hÀhYb'ZØf'BUhi f`]YV\UVYf fibX'ia'XYb'6cXYbgYY

8Yf'6cXYbgYYž'a]h'gY]bYf'a U`Yf]gWXYb'@UbXgWXUZh'i bX'XYa _`UfYb'K UggYfž'V]YhYh'Y]bY': Ø``Y'j cb'A Ò[`]WX_Y]hYb'ZØf
BUhi f`]YV\UVYf"'?cbghUbnž'U`g'Y]bYf'XYf'dYfZY_hYb
5i g[Ub[gdi b_hYž'Yfa Ò[`]WXh'Yg'6Ygi WXYfbž'X]Y'j]Y`ZÀ`h][Y': `cfU i bX': Ui bU'XYf'I a [YVi b['ni 'Yf_i bXYb"'9[U`ž'cV'G]Y'Y]b
VY[Y]ghYfhYf'K UbXYfYfž'FUXZU\fYf'cXYf'Y]bZUWX'bi f'Y]b
YbhgdUbbhYf'GdUn]Yf[Àb[Yf'g]bXž'\]Yf'g]bX'Y]b][Y'XYf'VYghYb
5_h]j]hÀhYbž'X]Y'G]Y'b]WXh'j YfdUggYb'gc``hYb"

K UbXYfb Ybh`Ub[XYg 6cXYbgYY!! ZYfk Y[g

8 Yf'6c XYbgYY!I ZYfk Y['YfghfYW_hig]W\ 'ØVYf'&* \$ '?]`ca YhYf'i bX V]YhYhinU\`fY]W\ Yb 'K UbXYfYfb 'Y]bY 'UhYa VYfUi VYbXY '5 i gg]W\ h Ui Z'XUg'K UggYfž'X]Y '6Yf[Y'i bX'X]Y i a `]Y[YbXYb 'K Y]bVYf[Y" 8 Yf K Y[']gh'[fÒ» hYbhY]`g'ZUW\ i bX'`Y]W\ h'VY[Y\VUfž'k Ug']\b']XYU``ZØf : Ua]`]Yb 'i bX'; Ybi ggk UbXYfYf'a UW\ h"'DfcV`Ya `cg'_ÒbbYb'G]Y']b j YfgW\]YXYbYb'9hUddYb'k UbXYfb'i bX'j]Y`Y'W\ Ufa UbhY'8 ÒfZYf i bX'Gh\XhY'Yf_i bXYbž'XUfi bhYf'A YYfgVi f['i bX'K UggYfVi f["

FUXZU\fYb. 9bhXYW_i b[gfY]gY Ui Z'nk Y] F ÀXYfb

8 Yf '6 c XY bgYYfUXk Y[ž'Y]b '[i h'Ui g[YVUi hYg'BYhn'j cb 'F UXk Y[Ybž ZØ\fh'G]Y'i a 'XYb'[YgUa hYb'GYY'i bX']gh'Y]b 'k U\fYg'DUfUX]Yg'ZØf

 $FUXZU\ fYf"8]YgYGhfYW_YV]YhYhb]WAhbi f'gdY_hU_i `AfY 5i gV`]W_Yž'gcbXYfb'Ui WA'nU\`fY]WAY'A O[`]WA_Y]hYbž'`c_U`YGY\Ybgk ØfX][_Y]hYb'ni 'YbhXYW_Yb''$

- <][$\$][$\$ hg XYg 6cXYbgYYfUXk Y[g.
- 6Ygi WX 'XYf'6`i a Yb]bgY``A U]bUi ' 'VYfØ\a h'ZØf']\fY k i bXYfgWX ÒbYb'; ÀfhYb"
- 8]Y`\]ghcf]gW\Y`GhUXh`A YYfgVif[`a]h`]\fYf`U`hYb`6if[`ibX XYa`GhUXhaigYia"
- 8 Ugʻ]Xm``]gWXY`8 cfZ'Gh"; U``Yb`a]h'gY]bYa 'WXUfa UbhYb < UZYb"

6cchghci fYb. 8Yf 6cXYbgYY j ca 'K UggYf Ui g Yf YVYb

9]bY'XYf'VYghYb'A $O[`]WX_Y]hYbŽ'X]Y'GWXObY]h'XYg'6cXYbgYYg'ni [Yb]Y*YbŽ']gh'Y]bY'6cchghci f"'A Y\fYfY'5bV]YhYf'Yfa <math>O[`]WXYb \Rightarrow bYbŽ'X]Y'FY[]cb'Ui g'Y]bYf'UbXYfYb'DYfgdY_h]j Y'ni 'gY\Yb''CV YbhgdUbbhY': U\fhYb'a]h'XYf': <math>A\fY'cXYf'JYf[b\emptyset[i b[ghci fYb'a]h Y]bYa''5i gZi [ggWX]ZZŽ'XUg'[`]hnYfbXY'K UggYf']gh'Y]bZUWX ZUgn]b]YfYbX''$

: À\fY'?cbghUbn'	&\$^A]bihYb	5``Y'' \$'A]bi hYb
A YYfgVi f[
?ifnhf]d ni a A U]bUi	% ⁻ Ghi bXY	GhØbX`]WX
JUb]``U`MUWXhUi gZi [& Ghi bXYb	5i Z [·] 5bZfU[Y

BUhifgWXihn[YV]YhYibXKUbXYfib[Yb

±b 'XYf'BÀ\Y'j cb'?cbghUbn'[]Vh'Yg'Y]b][Y'k i bXYfgW\ÒbY BUhi fgW\i hn[YV]YhYž'X]Y'Yg'k Yfh'g]bXž'Yf_i bXYh'ni 'k YfXYb"'9]bYg XYf'VY_UbbhYghYb']gh'XUg'B Uhi fgW\i hn[YV]Yh'I bhYfgYYž'XUg Y]bY'J]Y`nU\`'j cb'K UggYf!'i bX'Ni [j Ò[Y`b'VY\YfVYf[h"'<]Yf _ÒbbYb'6YcVUW\hYf'a]h'Yhk Ug'; `ØW_'X]Y'gY`hYbYb'?cfa cfUbY cXYf'gc[Uf'GYYUX`Yf'g]W\hYb"

9]b'k Y]hYfYf'[fc» Ufh][Yf'C fh']gh'XUg'GW k ÀV]gW Y'6cXYbgYYž k Y`W\Yg'ZØf'gY]bY'K UbXYf!'i bX'F UXk Y[Y'VY_Ubbh']gh"'8]Y UVk YW\g`i b[gfY]W\Y'@UbXgW\UZh'a]h'gUbZhYb'< Ø[Y`bž'X]W\hYb K À`XYfb'i bX'gdY_hU_i `ÀfYb'5i gq]W\hYb'a UW\h'YXYb'GW\f]hh'k Yfh"

K UggYfgdcfha O[`]WX_Y]hYb

: Øf'U_h]j Y'BUhi f`]YV\UVYf'V]YhYh'XYf'6cXYbgYY'Y]bY'VfY]hY
DU`YhhY'j cb'K UggYfgdcfhU_h]j]hÀhYb"'K]bXgi fZYbž'GY[Y`b'i bX
GhUbX!I d!DUXX`]b['g]bX'bi f'Y]b][Y'XYf'A Ò[`]WX_Y]hYbž'X]Y'G]Y'Ua
6cXYbgYY'Ui gdfcV]YfYb'_ÒbbYb"'K UggYfgdcfhgWXi `Yb'V]YhYb
U``Ygž'j cb'5bZÀb[Yf_i fgYb'V]g'\]b'ni 'Zcfh[YgWXf]hhYbYb'HfU]b]b[gž
i a 'X]Y'VYghYb'HYWXb]_Yb'ni 'Yf`YfbYb"

8]Y K Y]bfY[]cb 6cXYbgYY

8]Y'l a [YVi b['j cb'?cbghUbn']gh'Ui WX'VYfØ\a h'ZØf']\fY' K Y]bdfcXi _h]cb"'6Y]'Y]bYa '6Ygi WX'gc``hYb'G]Y'i bVYX]b[h'Y]bY XYf'j]Y`Yb'K Y]bghUh]cbYb'cXYf'K Y]b[ØhYf'UbghYi Yfbž'i a '`c_U`Y K Y]bY'ni 'dfcV]YfYb'i bX'X]Y'K Y]bVYf[Y'ni 'Yf_i bXYb"'8]Y ?ca V]bUh]cb'Ui g'K Y]bj Yf_cghi b['i bX'XYf'a U`Yf]gWXYb @UbXgWXUZh']gh'Y]b'k U\fYf'; Ybi gg"

Jc[Y`VYcVUW hi b[i bX B Uhi fZchc[fUZ]Y

8]Y`FY[]cb`6cXYbgYY`V]YhYh`U`gc`Y]bY`J]Y`nU\``j cb`5_h]j]hÀhYb`ZØfBUhi f`]YV\UVYfži bX`X]Y`?ca V]bUh]cb`Ui g`a U`Yf]gW\Yb@UbXgW\UZhYb`i bX`_i `hi fY``Yb`9f`YVb]ggYb`a UW\h`Y]bYb`6Ygi W\`]bX]YgYa `HY]``8Yi hgW\`UbXg`i bj Yf[Ygg`]W\"K Ybb`G]Y`a Y\f`ØVYfX]Y`j YfgW\]YXYbYb`A Ò[`]W_Y]hYb`YfZU\fYb`a ÒW\hYbž`VYgi W\YbG]Y`X]Y`cZZ]n]Y``Y`K YVgY]hY`6cXYbgYY`Hci f]ga i g"

9]b'6`] $W_$ ']b'X]Y'; YgWX]WX hY' GY\Ybgk ØfX][$_$ Y]hYb'i bX'A i gYYb']b ? cbghUbn

8]Y'GhUXh'?cbghUbnž'[Y'Y[Yb'Ua'6cXYbgYYž']gh'b]W\h'bi f'ZØf']\fY a U'Yf]gW\Y'5`hghUXh'i bX'UhYa VYfUi VYbXYb'@UbXgW\UZhYb VY_Ubbhž'gcbXYfb'Ui W\'ZØf']\fY'fY]W\Y'; YgW\]W\hY''Gdi fYb j Yf[Ub[YbYf'9dcW\Yb'`UggYb'g]W\']b'XYf'[YgUa hYb'GhUXh YbhXYW_Ybž'i bX'Yg'[]Vh'nU\`fY]W\Y'GY\Ybgk ØfX][_Y]hYb'i bX A i gYYbž'X]Y'Y]bYb'h]YZYb'9]bV`]W_']b'X]Y'_i `hi fY``Y'9bhk]W_`i b[X]YgYf'FY[]cb'V]YhYb''

9]b 'UVgc`i hYg'A i gg'ZØf'; YgW\]W\hg]bhYfYgg]YfhY']gh'XUg'
?cbghUbnYf'A ØbghYf"'8]YgY'VYY]bXfi W_YbXY'?Uh\YXfU`Yž'X]Y
]a '%%"'\J\f\i bXYfh'YfVUi h'k i fXYž']gh'Y]b'A Y]ghYfk Yf_'XYf
[ch]gW\Yb'5fW\]hY_hi f"'6YgcbXYfg'VYa Yf_Ybgk Yfh'g]bX'X]Y'nk Y]
HØfa Yž'X]Y'g]W\'a U'Ygh\Ah]gW\'ØVYf'X]Y'GhUXh'Yf\YVYb"'\=a '\DYfYb
Z]bXYb'6Ygi W\Yf'k i bXYfgW\\ObY'; `UgZYbghYfž'a]hhY`U`hYf`]W\Y
5`h\AfY'i bX'Y]bYb'df\AW\h][Yb'7\cf"'Ni XYa 'k]fX'\]Yf'X]Y
; YgW\]W\hY'XYg'A ØbghYfg'`YVYbX][ž'X]Y'Yb['a]h'XYf
GhUXh[YgW\]W\hY'j cb'?cbghUbn'j YfVi bXYb']gh"

9]b'k Y]hYfYg'\]ghcf]gW\Yg'<][\`][\hi]gh'XUg'Fcg[UfhYbaigYiažXUg'g]W\']a'< YfnYb'XYf'5`hghUXh'VYZ]bXYh'' \div X]YgYa'AigYia __ObbYb'6Ygi W\Yf'a Y\f'ØVYf'XUg'@YVYb'XYf'?cbghUbnYf']a
A]hhY`U`hYf'YfZU\fYb''5i gghY``i b[ggW\k Yfdi b_hY'g]bX'X]Y
GhUXh[YgW\]W\hYž'X]Y'5``hU[g_i `hi f'i bX'X]Y'6YXYi hi b['XYg<cW\gh]Zhg'?cbghUbn'''GdYn]Y``Y'JYfUbghU`hi b[Ybž'k]Y'\]ghcf]gW\Y
GhUXhZØ\fi b[Ybž'V]YhYb'ni g\han`]W\'X]Y'A\O[`]W_Y]hz'h]YZYf']b'X]Y
ZUgn]b]YfYbXY'; YgW\]W\hY'Y]bni hUi W\Yb''

: Øf'?i bgh`]YV\UVYf`]gh`XUg`GhÀXh]gWXY`K YggYbVYf['A i gYi a
Y]b`YWXhYf'; Y\Y]a h]dd"'9g`nY][h`Y]bY`VfY]hY`GUa a `i b['Ub
nY]h[YbÒgg]gWXYf`i bX'_`Ugg]gWXYf`?i bghž`XUfi bhYf`K Yf_Y``c_U`Yf
? Øbgh`Yf"'6YgcbXYfg`\Yfj cfni \YVYb`g]bX`X]Y`5i gghY``i b[Ybž`X]Y
g]WX`a]h`XYf`?i bghgnYbY`Ua '6cXYbgYY`i bX`XYfYb`9bhk]W_`i b[
ØVYf`X]Y`\$J\f\i bXYfhY`VYZUggYb"

9]b '6Ygi W\ 'XYg' <]ghc f]gW\ Yb 'GhUXhUfW\]j g']gh'YVYbZU``g fUhgUa ž'VYgcbXYfg'ZØf'YbYž'X]Y'g]W\ 'ZØf'8c_i a YbhY'i bX A Ubi g_f]dhY'Ui g'XYf'; YgW\]W\ hY'?cbghUbn ']bhYfYgg]YfYb"' <]Yf g]bX'nU\ `fY]W\ Y'\]ghcf]gW\ Y'8c_i a YbhY'Ui g'XYa 'U`hYb'?cbghUbn UfW\]j]Yfhž'X]Y'5i ZgW\ i gg'ØVYf'X]Y'dc`]h]gW\ Y'i bX [YqY``qW\ UZh`]W\ Y'9bhk]W_`i b['XYf'GhUXh'[YVYb"'

$GY \setminus Ybgk \emptyset fX][_Y]hYb]a , VYfV]W_$

GY\Ybgk ØfX][_Y]h	6YgWxfY]Vib[6YgcbXYf\Y]hYb
?cbghUbnYf'A ØbghYf	adcgUbhY [ch]gWXY	6YY]bXfi W_YbXY
	?Uh\YXfU`Y	HØfa Yž; `UgZYbghYf
Fcg[UfhYbaigYia	GhUXh[YgWX]WXhYibX	∌hYfU_h]jY
	5``hU[g_i `hi f	5i gghY``i b[Yb
K YggYbVYf[?ibghgUaa`ib[ˈjcb	: c_i gʻUi Zʻ6cXYbgYY!
AigYia	_`Ugg]gW\`V]g`a cXYfb	?i bgh
<]ghc f]gW\ Y g	GUa a `i b[9]bV`]W <u>Y</u> ']b'X]Y
GhUXhUfWX]j	\]ghcf]gW\Yf	GhUXh[YgWX]WXhY
	8c_i a YbhY	

8]Y; YXYb_ghÀhhY ZØf X]Y ? cbn]`[YgWk]Wk hY ž X]Y g]Wk]b XYf BÀ\Y XYg A ØbghYfg VYZ]b XYhž Xc_i a Ybh]Yfh XUg VYfØ\a hY ? cbn]`j cb ? cbghUbnž XUg jj cb %(%("V]g "%(%, "ghUhhZUbX" "8]YgYg "HfYZZYb k Uf 'b]Wk h bi f 'Y]b 'dc`]h]gWk Ygž gcb XYfb 'Ui Wk 'Y]b 'fY`][]ÒgYg 9fY][b]g a]h k Y]hfY]Wk Yb XYb ? cbgYei YbnYb 'ZØf X]Y '?]fWk Y" '8]Y 5i gghY``i b[']b Zcfa]Yfh ØVYf X]Y 'nYbhfU`Yb 'H\Ya Yb 'XYg '? cbn]`g gck]Y 'ØVYf X]Y 'VYXYi hYbXYb 'DYfgÒb`]Wk_Y]hYbž X]Y '\]Yf ni gUa a Yb_Ua Ybž k]Y '&\UbbYg' < i g`i bX 'A Ufh]b 'J "

5V[YfibXYhik]fX:XUgi_i `hi fY``Y:9f`YVb]g'Xi fWX:XUgi 5fWX Ac`c[]gWX Y:@UbXYga i gYi a '6UXYb!K ØfhhYa VYf[ž k Y`WXYg'g]WX:[Ubn:XYf'; YgWX]WX.hY:i bX:5fWX.Ac`c[]Y:XYf'FY[]cb k]Xa Yh":<]Yf'Z]bXYb'g]WX:VYY]bXfi W_YbXY:i bXY:Ui g:XYf dfA\]ghcf]gWX.Yb'V]g'ni f'fÒa]gWX.Yb'NY]hž'X]Y'b]WX.h'bi f'X]Y 9bhk]W_`i b['XYg'@YVYbg'Ua'6cXYbgYY'Xc_i a Ybh]YfYbž'gcbXYfb Ui WX:X]Y'9]bZØggYž'X]Y'j YfgWX]YXYbY'?i `hi fYb'Ui Z'X]Y'FY[]cb Ui gØVhYb" Ni gÀhn`]WX 'V]YhYb'j]Y`Y'Y]b\Y]a]gWXY: Ø\fi b[Yb
A Ò[`]WX_Y]hYbžX]Y'; YgWX]WXhY'?cbghUbn '\Ui hbU\'ni 'Yf`YVYb"
J cb 'gdUbbYbXYb'GhUXhZØ\fi b[YbžX]Y'X]Y'k]WXh][ghYb
\]ghcf]gWXYb'GhÀhhYb'UVXYW_Ybž'V]g'\]b'ni 'gdYn]Y``Yb
H\Ya YbZØ\fi b[Yb'k]Y'XYf' ?cbghUbnYf'BUWXhk ÀWXhYf!Hci fž'VY]
XYf'a Ub'X]Y'GhUXh'VY]'Y]bYa 'UVYbX`]WXYb'Fi bX[Ub['Yf_i bXYb
Ubbž'[]Vh'Yg'ZØf'YXYb'; YgWXa UW'Yhk Ug'ni 'YbhXYW_Yb"

: Ua]`]YbZfYi bX`]WXY'5i gZ`i [gn]Y`Y'i bX
; Y\Y]a h]ddg']b'XYf'l a [YVi b[

?cbghUbn'i bX'X]Y'6cXYbgYYfY[]cb'g]bX'dYfZY_hY'FY]gYn]Y'Y'ZØf: Ua]`]Yb"'A]h'Y]bYf'J]Y`nU\`'j cb'5_h]j]hÀhYbž'X]Y'gck c\`''Y\ffY]W\U`g'Ui W\'i bhYf\U`hgUa 'g]bXž'k]fX' \Rightarrow f'5i ZYbh\U`h']b'X]YgYf a U`Yf]gW\Yb'GhUXh'U``Yg'V]YhYbž'k Ug'XUg'<Yfn'VY[Y\fh"'<]Yf'g]bXY]b][Y'ZUa]`]YbZfYi bX`]W\Y'5i gZi [gn]Y`Y'i bX'; Y\Y]a h]ddgž'X]Y G]Y'b]W\h'j YfdUggYb'gc``hYb.

- FYdh]`]Ybncc'i bX'HYffUf]gh]_'GcbbYbVØ\`.'9]b
 kU\f\UZh'ZUgn]b]YfYbXYf'Cfh'ZØf'H]Yf`]YV\UVYf"'<]Yf
 _ObbYb'?]bXYf'gckc\`'YIch]gW\Y'FYdh]`]Yb'U`g'UiW\
 Y]b\Y]a]gW\Y'5fhYb'VYghUibYb'ibX'aY\f'ØVYf'XYfYb
 @YVYbgfUia'YfZU\fYb"
- DZU\`VUi a i gYi a `I bhYfi \`X]b[Yb. '9]b'Y]bn][Ufh][Yf6`]W_']b'X]Y'I f[YgWX]WXhY"' ≠ X]YgYa ': fY]`]WXha i gYi a Yf`YVYb'X]Y'6Ygi WXYf'cf][]bU`[YhfYi Y'BUWXVUi hYb

dfÀ\]ghcf]gW\Yf`DZU\`VUi hYb`Ua `6cXYbgYY"`K cf_g\cdg`ZØf ?]bXYf`g]bX`YVYbZU``g`j YfZØ[VUf"

- A Yfn][Yb': fY]nY]hdUf_.'9]b'_`Y]bYfž
 ZUa]`]YbZfYi bX`]W\Yf'DUf_ž']XYU`'ZØf'Y]bYb'HU['j c``Yf'GdU»"
 A]h': U\f[YgW\AZhYbž'Gd]Y`d`AhnYb'i bX'Gd]Y`VYfY]W\Yb']gh
 Yf'dYfZY_h'ZØf'X]Y'?`Y]bghYb"
- 5 V Y b hY i Y f d U f_ '=a a Y b g hU U X. '< c W. '\]b U i g '[Y \ h ' Y g '] a 5 V Y b hY i Y f d U f_ ' <]Y f '_ O b b Y b ' X]Y '?]b X Y f '_ `Y h hY f b ž g W k]b [Y b ' i b X 'g] W ']b ' X Y b ' j Y f g W \]Y X Y b Y b ' D U f W c i f g U i g h c V Y b ž k À \ f Y b X ' X]Y '9 ' h Y f b ' X]Y '@U b X g W U Z h '[Y b]Y » Y b "</p>
- I ZYfdfca YbUXY ?cbghUbn. → XYU`ZØfY]bYb
 YbhgdUbbhYb: Ua]`]YbUi gZi ["'J Yf[YggYb'G]Y'b]WkhžY]bY
 D]W_b]W_XYW_Y'Y]bni dUW_Ybži a 'X]Y'UhYa VYfUi VYbXY
 5i gg]Wkh'Ui Z'XYb'6cXYbgYY'ni '[Yb]Y» Ybž'k À\fYbX'X]Y
 ?[bXYf'Ua 'K UggYf'gd]Y`Yb"

Ni gÀhn`]W\`ni `X]YgYb`N]Y`Yb`V]YhYb`g]W\`Ui W\`Y]b][Y'; Y\Y]a h]ddg Ubž'X]Y`cZh`k Yb][Yf`VY_Ubbh`g]bXž`UVYf`VYgcbXYfg`GdU» `a UW\Yb.

- B Uhi f!9f`YVb]gk Y[...9]b`Y]bY]b\U`VghØbX][Yf'FibXkY[ž XYf'K UbXYfYf'Xi fWX'j YfgWX]YXYbY'B Uhi fUfhYb'ZØ\fh'i bX]bhYfU_h]j Y'GhUh]cbYb'ZØf'?]bXYf'V]YhYhž'i a 'a Y\f'ØVYf :`cfU'i bX': Ui bU'ni '`YfbYb"
- ?]bXYfZØ\fi b[']a 'Fcg[UfhYba i gYi a .'?]bXYf'`]YVYb Ygž']b'X]Y'JYf[Ub[Yb\Y]h'Y]bni hUi WXYb"'8Ug Fcg[UfhYba i gYi a 'V]YhYh'gdYn]Y``Y': Ø\fi b[Yb'Ubž'X]Y'a]h gdUbbYbXYb'; YgWX]WXhYb'i bX'5_h]j]hÀhYb'[YghU`hYh'g]bX"
- a]b]? I B GH. '9]b 'ÒZZYbh`]Wk Yg'?i bghdfc 'Y_h`gdYn]Y```ZØf
 ?]bXYfž'k c '1 b[Y '? Øbgh`Yf']\fY 'K Yf_Y`dfÀgYbh]YfYb
 _`ÒbbYb"'GWk Ui Yb 'G]Y 'j cfVY]'i bX ``UggYb 'G]Y '⇒ fY '?]bXYf
 _fYUh]j 'k YfXYb"

9]b'k Y]hYfYf'gdUbbYbXYf'5i gZi [gcfh']gh'X]Y' ⊕gY``A U]bUi ž'X]Y VY_Ubbh'ZØf']\fY'6`i a YbdfUW\h'i bX'; ÀfhYb']gh'' <]Yf'_ÒbbYb : Ua]`]Yb.

• 8]Y'k i bXYfgW\ObY': `cfU'VYk i bXYfb'i bX'XUVY]'j]Y``ØVYf DZUbnYb'`YfbYb"

- 8]Y'GW\a YhhYf\]b[g\Ui g'VYgi W\Ybž'k c'?]bXYf'X]Y'Vi bhYb GW\a YhhYf\]b[Y'Ui g'b\AW\ghYf'B\A\Y'Yf\YVYb'_\ObbYb"
- 5i Z'XYb'[fc» Yb'Gd]Y`d`ÀhnYb'hcVYb'i bX'g]W\']a
 K UggYfdUf_'UV_Ø\`Yb"

K Ybb'G]Y'Ui Z'XYf'Gi W\Y'bUW\'5_h]j]h\hYb'g]bX\z\'X]Y'gck c\``GdU\\alpha UW\Yb'U\`g'Ui W\'`Y\ffY]W\'g]bX\z\']gh'XYf'\6cXY\bg\Y!\ncc']b
: f]YXf]W\\g\UZ\Yb'Y]b'\Yfj cffU[YbXYg'\N]Y\'''\8\Yf\\ncc'\V]Y\\h.

H]YfUfhYb	6YgcbXYf\Y]hYb
D]b[i]bY	: ØhhYfb'i bX'6YcVUW\hYb'XYf
	A U\`nY]hYb'hÀ[`]W\"
;]fUZZYb	G]Wkh'Ui g'Y]bYf'gdYn]Y``Yb
	;]fUZZYb!D`UhhZcfa "
FUi Vh]YfY	@Y\ffY]WXY`JcfZØ\fib[Yb`ibX
	⇒Zcfa Uh]cbYbʻØVYfʻXUgʻ@YVYb
]b XYf K] Xb]g"

?ifn'[YgU[hž'?cbghUbn'ibX'gY]bY'la [YVib['g]bX'jc``Yf A Ò[`]W_Y]hYb'ZØf'Y]bYb'ibj Yf[Ygg`]W\Yb': Ua]`]YbUigZi ["'BihnYbG]Y'X]Y'J]Y'ZU'h'X]YgYf'FY[]cbžia 'Y]bY'dYfZY_hY'6U`UbW\nk]gW\Yb'6]`Xib['ibX':fY]nY]h'ni 'gW\UZZYb"'CV'G]Y'9bhgdUbbib[Ub'XYf'lZYfdfca YbUXY'gi W\Yb'cXYf'BYfj Yb_]hnY`']a 5VYbhYi YfdUf_'Yf`YVYb'k c``Ybž'\]Yf']gh'g]W\Yf'ZØf'YXYb'Yhk Ug XUVY]'

8 Y hU]`a

6Ygi WXYb G]Y i bg Ui Z Y]bY!fY]gY "XY