

HYa dY`XYf'5fhYa]g. 'Gc``; fc» Vf]hUbb]Yb gY]bY'[Yghc\`YbYb'GW\AhnY ni fØW_[YVYb3

#W. 'gWX]Y`hY 'Ui Z'X]Y '? UfhY 'Ui Z'a Y]bYa '< UbXm'i bX '`Ug'X]Y
k]bn][Yb 'NU\`Yb ']a 'bUWXa]hhÀ[`]WXYb 'GWXY]b 'Y]bYf
i bj YfgÒ\b`]WXYb 'GcbbY" '8 Yf'HYa dY` 'XYf'5fhYa]g'k Uf'XYZ]b]h]j
Ui Z'XYf'? UfhY 'a Uf_]Yfh' 'Bi a a Yf'&' "</pre>

K]f`\UhhYb`XYb`A cf[Yb`]b`9d\Ygi g`j YfVfUW\hž'Hi f_Ymg`]_cb]gW\YUfW\Ac`c[]gW\Y`GhAhhY`i bX`k UfYb`bi b`Ui Z`XYf`Gi W\Y`bUW\`XYaHYa dY``XYf`5fhYa]gž`Y]bYa `XYf`VYfØ\a hYb`g]YVYb`K Y`hk i bXYfXYf`5bh]_Y"

K]f'k UfYb'XfY]'j YfgW\]YXYbY'DZUXY'Ybh`Ub[[Y[Ub[Yb'i bX'Ub'X]Y; fYbnYb'XYg'; Y`ÀbXYg'[Yghc»Ybž'c\bY'XYb'gW\Y]bVUf a mh\]gW\Yb'HYa dY``Ui qZ[bX]['a UW\Yb'ni '_ObbYb"'GW\`]Y»`]W\ `UhgWkhYbik]finia `GØXhcfžïX]Y `5fa Y `]bii bbUhØf`]WkYbiK]b_Y`b Ui g[YghfYW_hžia `@ Zhiia `i bgYfY `gWkk]hnYbXY '< Ui hini ``UggYb" K]fik i fXYbiUa `Hcfij cbiY]bYa `hmd]gWk `[YgY``][YbiHØf_Yb VY[fØ» hžiXYfii bgiZfÒ\`]WkiYfnÀ\`hYžiXUggiXYfiHYa dY``XYfi5fhYa]g ØVYf\Ui dhib]Wkhi]a `?ca d`Ylij cbi9d\Ygi gžigcbXYfbi' `_a YbhZYfbhži]biXYfiBÀ\YiXYfiGhUXhžigY]"

 $C\ Vk\ c\ 'i\ bg'Y]b'''\ _a\ '`Ub[\ Yf':\ i\ *a\ UfgWk'gY`hYb'Y]bgWk \varnothing Wk'hYfhYž\ gdfUWk'X]Y'5i\ gg]Wk'hž']b'XYf'[\ chh`cgYb'<]hnY'ni a ''HYa dY`'ni gWk'YddYbž'_Y]bYb'j cb'i bg'Ubž'U`gc'gdfUb[\ Yb'k]f'ghUhhXYggYb']bYb'HUI]"'NY\b'A]bi hYb'i bX') 'I G!8c``Uf'gdÀhYf'ZUbXYb'k]f'i bg'Ui Z'Y]bYa''_U\`'k YfXYbXYb'< \varnothing[\ Y`'Ui g'gi a dZ][\ Ya''GWk`Ua a 'i bX' j YfXcffhYa'; fUg'k]YXYf''$

"U`h1 :]h'ZØf'Y]bY'; Ohh]b3'8Yf'VYfØ\a hY'HYa dY``XYf'5fhYa]g
h\fcbh'Ui Z'Y]bYa '_U\``k YfXYbXYb'Gi a dZ\Ø[Y` 25h`Ug'/ '6cchg
:]h'ZØf'Y]bY'; Ohh]b3'8Yf'VYfØ\a hY'HYa dY``XYf'5fhYa]g'h\fcbh'Ui Z
Y]bYa '_U\``k YfXYbXYb'Gi a dZ\Ø[Y`

K]fr[]b[Ybini Y]bYfrj YfrUggYbYbi Dzcfa Uh]cbghUzYii bX

ØVYfVi]W_hYbiX]YiGnYbYiXU\]bhYfriK]fi\UVYbib]Wkhij]Yiij cbiXYa

HYa dYiiYfk UfhYhifV]giUi ZiX]YiDmfUa]XYbij cbi;]nY\iki fXYbiUiiY

Ubh]_YbiK i bXYfinYfghÒfhŁžiUVYfik]fi\UVYbia Y\fi: UbZUfYifi bXii a

X]YiGhÀhhYigYiVghiYfk UfhYhij]YiiY]WkhiY]biGUa hgY]icXYfiY]bYi5fh

; YXYb_hUZYiiiYhk UgžiXUgiUbiX]Yi6YXYi hi b[iYf]bbYfhi8YfiGY]hYii

GhUhhXYggYbiZUbXYbik]fiY]bYiY]bgUa YiGÀi YžiX]Yij cbij YfghfYi hYb

GhY]bYbii a [YVYbik Ufii

 $"U"h1 K Ug"V"Y]Vh"\Yi hY 25h"Ug"/ "6cchg"K Ug"V"Y]Vh"\Yi hY$

9gʻgWXY]bhž'XUggʻXYfʻHYa dY``XYfʻ5fhYa]gž'Y]bYʻ<ca a U[YʻUbʻX]Y [`Y]WXbUa][Yʻ[f]YWX]gWXYʻ; Ohh]bʻXYfʻ*J[XžʻYhnhini fʻj]YfhVYghYb GY\Ybgk ØfX][_Y]hʻXYfʻGhUXhʻbUWXʻ9d\Ygi gžʻXYfʻ6i f[ʻ5mUgc`i_ibX`XYfʻ*gU!6Ym!AcgWXYYʻk i fXY''`K]fʻj YfVfUWXhYbʻ*&\$`A]bi hYb XUa]hži a `X]YʻFi]bYbʻ\Yfi a ni `Ui ZYbʻi bXʻ_cbbhYbʻi bgʻk Y[Yb XYqʻqi a dZ][Ybʻ6YW_Ybqʻb]WXh'ni `bU\Yʻ_ca a Yb''

8 Yf'i a ', \$\$'j "'7\f"'YfVUi hY'HYa dY`'k i fXY'XfY]a U`'bUWXY]bUbXYf

Xi fW., VYfgWk Ya a i b[Ybž'6fUbXgh]Zhi b['i bX'D`ØbXYfi b[YbnYfghÒfh"8]Y'Xf]hhY'=b_UfbUh]cb'ghUbX'* \$\$'\\\fY'\Ub['i bX i a ZUgghY'@VYf'\&+'GÀi \Ybž'j cb'XYbYb'bi f'bcW\'Y]bY'Ua i fgdf@b[`]W\Yb'GhUbXcfh'Yf\U`hYb']gh"

5`g`k]f`j cf`XYf`Y]bgUa Yb`GÀi `Y`ghUbXYbž'j Yfgi W\hYb`k]fž']\fY 6YXYi hi b['Ui Zni bY\a Yb/i a 'g]W\']b`XYb`9W\cg`Y]bYf [`cffY]W\Yb`JYf[Ub[Yb\Y]h`ni 'gcbbYb"

@Y]XYf'k Uf'U``Ygž'k Ug'k]f'ZØ\`hYbž'Y]b'; YZØ\``XYf'I bhYfXfØW_i b[ž [YZÅfVh'a]h'XYa 'GW\i `X[YZØ\`ž'6f]hY'ni 'gY]b"'K]Y'G]Y'gY\Ybž k i fXYb'HY]`Y'XYg'HYa dY`g'Ui g[Y[fUVYb'i bX']b'XYb' 9d\Ygi g Fcca 'XYg'6f]h]g\'A i gYi a 'hfUbgdcfh]Yfhž'bUW\XYa 'X]Y'Vf]h]gW\Yb 5fW\Ac`c[Yb' \approx \b'Hi fh`Y'K ccX']b'XYb' * U\fYb' * , *-!%, +('i bX 8Uj]X'; Ycf[Y'<c[Ufh\']b'XYb' * U\fYb' * -\$'[YUfVY]hYh \UhhYb"

- 'U`h1 2

B UhØf`]WX ']gh'Yg'b]WX h'XUg'YfghY'A U`ž'XUgg'X]Y'6f]hYb'k Yfhj c``Y

5fhYZU_hY'ZØf'g]WX'VYUbgdfi WXYb"'5bXYfY'i a ghf]hhYbY

; Y[YbghÀbXY'g]bX'XYf'FcgYhhU'GhcbY'Ui g'Ÿ[mdhYb'i bX'X]Y'9`[]b

A UfV`Yg'Ui g'; f]YWXYb`UbX"'8]Y'6Y\ÒfXYb']b'VY]XYb'@ÀbXYfb

\UVYb'g]WX'`Ub[Y'ZØf'X]Y'FØW_[UVY'X]YgYf'CV'Y_hY'Y]b[YgYhnhž

UVYf'XUg'6f]h]g\'A i gYi a '\Uh'g]WX'[YgWX]W_h'[Yk Y][Yfh'i bX

VY\Ui dhYhž'XUgg'X]Y'GWXÀhnY'K Y`h_i `hi fYfVY'i bX'ZØf'6Ygi WXYf']b

@cbXcb'VYggYf'ni [Àb[`]WX'gY]Yb"

 $8 \ Ug`6f]h]g\ `AigYia']gh`k\ U\ fgWkY]b`]Wk`UiWk`VYgcf[h`XUfØVYfž XUgg`ibVYnU\`VUfY`5fhYZU_hY`]b`Uig`AbX]gWkYb`AigYYb`[YZA\fXYhg]bXž`X]Y`kY]hUig`kYb][Yf`A]hhY``\UVYb"`GWk`]Y»`]Wk`kifXY`]a <math display="block"> \ddot{Y} [mdh]gWkYb`AigYia']b`?U]fc`XYf`6Ufh`jcb`?\dot{O}b][`HihUbWkUaiba]h`U``hA[`]WkYa'?`YVYf`k]YXYf`UiZ[Y_`YVh''$

GWX`]Y»`]WX'_ÒbbhY'XUg'6f]h]g\'AigYiaž'kYbb'Yg'Y]bYa'5bgdfiWXbUWX[]Vhž'X]Y'GWX`YigYb'ZØf'8ihnYbXY'UbXYfYf'ÒZZbYb"

5bXYfYfgY]hg`]gh`XUg`Vf]h]gW\Y`9][Ybhi a `Ub`k Yfhj c``Yb`5fhYZU_hYb]a `5``[Ya Y]bYb`XUg`9f[YVb]g`_c`cb]U`Yf`GhfY]h][_Y]hYb`i bX`b]W\h X]d`ca Uh]gW\Yf`JYfY]bVUfi b[Yb"`K Ybb`k]f`Y]bYa `a cXYfbYb JYf\U`hYbg_cXYI `Zc`[Yb`k c``Ybž`XUbb`VYghY\h`X]Y`Y]bn][Y A Ò[`]W_Y]h`XUf]bž`k Yfhj c``Y`5fhYZU_hY`]b`]\f`<Yf_i bZhg`UbX ni fØW_ni [YVYbž'i bUV\Àb[][`XUj cbž'cV`Yg`X]Y`A]hhY``i bX`X]Y A ch]j Uh]cb`\Uhž'g]Y`gc`ni `Yf\U`hYbž'k]Y`k]f`Yg`hi b`k ØfXYb"

9]bY'GUWXYžX]Y'i bg'VY]'5h'Ug'/ '6cchg']a a Yf'k]YXYf'YfghUi bh \Uhž']gh'XYf'i bZUggVUf'\Yfn']WXY'9a dZUb[ž'XYb'k]f'U`g'6f]hYb'Ui Z XYf'[UbnYb'K Y`h'YfZU\fYb"'\#bXYf'\UVYb'i bg'@UbXg`Yi hY'[YbUbbhžY]b':]XgWX]UbYf'\Uh'; fc»Vf]hUbb]Yb'XUg' A i hhYf`UbX '[YbUbbh i bX'?Yb]UbYf'\UVYb'i bg'ghc`n'YfnÀ\`hž'XUgg'g]Y']a a Yf'bcWX'XYb GWX]``]b['VYbi hnYb"'9g'gWXY]bhž'XUgg'X]Y'_c`cb]U`Y'JYf[Ub[Yb\Y]h; fc»Vf]hUbb]Ybg'gc'_fUZhj c``ž'gc'j c``ghÀbX]['k Ufž'XUgg'Yg']\a [Y`Ub[ž'b]WXh'bi f'ZYfbY'@ÀbXYf'ni 'VY\YffgWXYbž'gcbXYfb'g]WX Ui WX'gY`Vgh'VY`]YVh'ni 'a UWXYb"

6Ygi WX 'XYg'HYa dY`g'XYf'5fhYa]g. 'XUg K YgYbh`]WXY

K Ug. '6Ygi W $^{'}$ XYg'HYa dY $^{'}$ g'XYf'5fhYa]g']b'GY $^{'}$ Ãi _ $^{z'}$ Hi f_Ym''

K c. K]f YbhgW]YXYb i bg ZØf XUg 5_Um < chY ž XUg dYfZY_h [Y Y [Yb]ghži a '9d Ygi g gck]Y X]Y UbXYfYb GY Ybgk ØfX][_Y]hYb fi bX i a GY Ãi _ 'ni 'VYgi W Yb "'9g '`]Y [h]b XYf BÀ Y XYg HYa dY `g XYf 5fhYa]gž XYf 6i f['5mUgc `i _ž XYf 6Ug]`]_U Gh" * \&\ b i bX XYf * \gu! 6Ym! A cgW YY i bX bi f '%\$; Y\a]bi hYb j ca 'GhUXhnYbhfi a 'i bX XYa 6U\b\cZYbhZYfbh"

 $8 \ Ug' < chY `'j \ YfZØ[h'ØVYf'Y]bYb'Y]b`UXYbXYb'Gk]a a]b[dcc`ž'Y]bY _ `Y]bY'6Uf'a]h'_U`hYb'; YhfÀb_Ybž'GbUW_g'i bX'6]Yf'i bX'gc[Uf'Y]b DUUf'GW\]`X_fÒhYbž'X]Y'Xi fW\'XYb'; UfhYb'ghfY]ZYb'''8Yf'Y][Ybh`]W\Y 5bn]Y\i b[gdi b_h']gh'YXcW\'XYf'k Y]hY'6`]W_'Ui Z'X]Y'i a `]Y[YbXY GhUXh'i bX'@UbXgW\UZh'''8 Ug': fØ\ghØW_'k]fX'Ui <math>\ Yf\U`V' = Yf$ N]a a Yfg'a]h'6`]W_'Ui Z'X]Y'5i gg]W\h'gYfj]Yfhž'ZfU[Yb'G]Y'U`gc'bUW\Y]bYa'N]a a Yf']a 'C VYf[YgW\cgg''

8 UgʻDYfgcbU``\Uhʻbi fʻVY[fYbnhYʻ9b[`]gW_Ybbhb]ggYžk]fX`g]W\UVYf`gY\f`VYa Ø\Ybž'\bYb`VY]`U``Ya ž'k UgʻG]Y`VfUi W\Ybž'ni\Y`ZYb"` Ø_fUb`\UhhY`Y]b`K ÒfhYfVi W\`]b`XYf`BÀ\Y`i bX`gW\f]YVZY]»][`GÀhnY`Ui Zži a `g]W\Yfni ghY``Ybž'XUgg`k]f`i bg`f]W\h][j YfghUbXYb"

- 'U`h1 2

K Ubb. '8]Y 'VYghY 'FY]gYnY]h 'ZØf' 9d\Ygi g']gh'XYf': fØ\`]b['fA Àfn'V]g A]hhY '\$\id b]\Ezk Ybb'XUg' K YhhYf' [Ya À»][hii bX'X]Y 'HU[Y '`Ub['g]bX" 6YUW hYb' G]Y z'XUgg' Yg' j cf'U``Ya ']a '5df]`'Y]b'cXYf'nk Y]'HU[Y fY[bYb'_Ubb"'5i W 'k Ybb'Yg'a]`XYf'U`g']a 'Gca a Yf']ghz i bhYfgW AhnYb'G]Y'X]Y'GcbbY'b]W h"'8Yf'Gca a Yf'k]fX'XYZ]b]h]j\Y]» 'i bX'k U\fgW Y]b`]W 'ØVYfZØ``h'gY]bz'k A\fYbX'XYf' K]bhYf'_U`h i bX'fY[bYf]gW 'gY]b'_Ubb"

K]Y. 'G]Y '_ObbYb'j ca '5_Um'< chY`ni a 'HYa dY`'XYf'5fhYa]g
`Ui ZYbž'XU'Yf'bi f'%'_a 'YbhZYfbh']gh"'8Yf'9]bhf]hh']gh'ZfY]"
HUhgÀW\`]W\ '[]Vh'Yg'_Y]bYb'9]b[Ub[/'G]Y'_ObbYb'Y]bZUW\ 'XUfUi Z
ni [Y\Yb°

K]f 'g]b X 'Ub [Y_ca a Yb 'Hi f_Ym'Ua ']b hYfb Uh]c b U 'Yb': 'i [\ UZYb 5 hUhØf_']b '=ghUbVi ''i b X'j YfVfUW\hY'Y]b][Y 'HU[Y']b '=ghUbVi 'ž'VYj cf

YgʻbUW. GY`Ãi _'k Y]hYf[]b["'K]fʻbU\a YbʻY]bYbʻ±b`UbXgZi ['bUW. ana]fʻf‰Ghi bXYŁ'i bXʻgh]Y[YbʻXUbbʻ]bʻY]bYbʻNi ['bUW. GY`Ãi _'f‰Ghi bXY`&\$`A]bi hYbŁ"

8 Yf': `i [\UZYb']gh']bhYfbUh]cbU``i bX'\Uh'ØVYfU```JYfV]bXi b[Yb'ni Y]bYf'FY]\Y'j cb'\delta`UbXgn]Y`Yb'Hi f_Ym"'6i W\Yb'G]Y'ØVYf G_mgWUbbYf'ni 'XYb'VYghYb'DfY]gYb"

8]Y'NØ[Y'Yfk]YgYb'g]W\'U`g'gY\f'nijYf`Àgg]['ibX'Y]bZUW\'ni VYX]YbYb"'KY]hYfY'\DZcfaUh]cbYb'ibX'6iW\ib[gaÒ[`]W_Y]hYb Z]bXYb'G]Y'UiZ'XYf'KYVg]hY'XYf'HØf_]gW\Yb'GhUUhgVU\b"'K]f bihnhYb'UiW\'XYb'Ni[ž'ia'bUW\'8Yb]n`]'kY]hYfniZU\fYbž'ia DUai__U`Y'ni'VYgiW\Yb"

9]bgUa Yf'D`UbYh'Hi f_Ym']gh'Y]b'i a ZUggYbXYf'FY]gYZØ\fYf'ZØf'XUg @UbXž']XYU`'ZØf'X]Y'Yb][Ybž'X]Y'gckc\`'X]Y'k]W\h][ghYb GY\Ybgk ØfX][_Y]hYb'Yf_i bXYb'U`g'Ui W\'kYb][Yf'VYZU\fYbY GhfU»Yb'bY\aYb'a ÒW\hYb"

@Y]hV]`X.~5h`Ug~/~6cchg

.

8YhU]`q

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