

GdUbXUi 'YbhXYW_Yb.'<]ghcf]Yž'; Ybi gg i bX'BUhi f'Yf`YVYb

9bhXYW_Yb^G]Y^X]Y^GW\AhnY^GdUbXUi g.~j cb^\]ghcf]gW\Yb <][\^][\hg^ØVYf^_i \]bUf]gW\Y^; YbØggY^V]g^\]b^ni ^?i bghž ?i `hi f'i bX^BUhi f"^H]ddg^ZØf^ \Rightarrow fYb^6Ygi W\^



K]``_ca a Yb`]b`GdUbXUi žXYa `W\Ufa UbhYb`6Yn]f_`]a `K YghYb
6Yf`]bgžXYfY]bY`dYfZY_hY`A]gW\i b[`Ui g`; YgW\]W\hYž?i`hi fž
B Uhi f`i bX`; Ybi gg`V]YhYh''6Y_Ubbh`ZØf`gY]bY`\]ghcf]gW\Yb
GW\AhnYžX]Y`V]g`]bg`A]hhY`U`hYf`ni fØW_fY]W\Ybž``AXh`GdUbXUi `XUni
Y]bž`]b`X]Y`J Yf[Ub[Yb\Y]h`Y]bni hUi W\Yb`i bX`[`Y]W\nY]h][`XUg
di `g]YfYbXY`@YVYb`XYf`\Yi h][Yb`NY]h`ni `Yf`YVYb''9[U`ž`cV`Xi `Ui Z
XYf`Gi W\Y`bUW\`_i `]bUf]gW\Yb`<][\`][\hgž`]bgd]f]YfYbXYf`?i bgh
cXYf`9f\c`i b[`]b`XYf`BUhi f`V]gh` `GdUbXUi `\Uh`ZØf`YXYb`Yhk Ug`ni
V]YhYb''' ₺`X]YgYa `5fh]_Y``bY\a Yb`k]f`X]W\`a]h`Ui Z`Y]bY
gdUbbYbXY`9f_i bXi b[ghci f`Xi fW\`GdUbXUi `i bX`nY][Yb`X]fž`k Ug
X]YgYb`GhUXhhY]``gc`Y]bn][Ufh][`a UW\h''`@Ugg`i bg`[Ya Y]bgUa `X]Y
; Y\Y]a b]ggYžX]Y`_Ògh`]W\Yb`D`UhnYf`i bX`X]Y`_fYUh]j Y`GY]hY`j cb
GdUbXUi `YbhXYW Yb`

<]ghcf]gWXY'GWXÀhnY']b'GdUbXUi 'YbhXYW_Yb</pre>

GdUbXUi žY]b'6Yn]f_']a 'K YghYb'6Yf`]bgž']gh'b]Wk h'bi f'ZØf'gY]bY a U`Yf]gWk Yb'l ZYf'i bX'`YVYbX][Yb'GhfU» YbWUZÅg'VY_Ubbhž'gcbXYfb Ui Wk'ZØf'gY]bY'fY]Wk Y'; YgWk]Wk hY"' \delta a]hhYb'XYf'a cXYfbYb GhUXh`UbXgWk UZh'Z]bXYh'g]Wk'Y]b'Y]bXfi W_gj c``Yg'9fVYž'XUg 6Ygi WkYf']b'X]Y'JYf[Ub[Yb\Y]h'YbhZØ\fh"'6Y]'Y]bYa 'GhfY]Zni [Xi fWk'GdUbXUi '_Ubb'a Ub'j]Y`Y'\]ghcf]gWk Y'GWk ÀhnY YbhXYW_Ybž'X]Y']\fYb'l fgdfi b['V]g']bg'A]hhY`U`hYf'ni fØW_j YfZc`[Yb`UggYb"

9]b UVgc`i hYgʻA i ggʻZØfʻ; YgWk]Wk hg]b hYfYgg]YfhYʻ]ghʻX]Yʻ Gd Ub XUi YfʻN]hUXY``YžX]YʻUʻgʻY]bYʻXYfʻUa ʻVYghYbʻYf\UʻhYbYb 'Yghi b[Ybʻ9i fcdUgʻ[]`h"' \Rightarrow fYʻI fgdfØb[YʻfY]WkYbʻV]gʻ]bgʻ%*" \\\J\f\i bXYfh'ni fØW_žʻUʻgʻg]Yʻi bhYfʻXYa ʻ6YZY\``XYgʻ?i fZØfghYb \\\\UWk]a '="'YfVUi h'k i fXY"'8]YʻN]hUXY``YʻV]YhYhʻb]Wk h'bi fʻY]bYb UhYa VYfUi VYbXYbʻ6`]W_ʻUi ZʻX]Yʻ<Uj YʻžʻgcbXYfbʻVY\YfVYf[h'Ui Wka Y\fYfYa i gYUʻYʻ9]bf]Wk hi b[Ybž'XUfi bhYfʻXUgʻ N]hUXY``Yba i gYi a žʻXUgʻX]Yʻ; YgWk]Wk hYʻXYfʻ: Yghi b['i bXʻXYf GhUXhʻVY`Yi Wk hYh"'6Y]'Y]bYa ʻFi bX[Ub['Xi fWk'X]YʻUʻhYbʻA Ui Yfb ZØ\`h'a Ubʻg]Wk']bʻY]bY`UbXYfYʻNY]h'j YfgYhnh"

=a '< YfnYb'GdUbXUi g'`]Y[h'X]Y'5`hghUXh'a]h']\fYb'W\Ufa UbhYbž\]ghcf]gW\Yb'; YVÀi XYb"'<]Yf'_Ubb'a Ub'Xi fW\'X]Y'gW\a U`Yb; UggYb'gW\`YbXYfb'i bX'X]Y'U`hY\fk ØfX][Y'5fW\]hY_hi f
VYk i bXYfb"'6YgcbXYfg'gY\Ybgk Yfh']gh'X]Y'Gh"'B]_c`U]'?]fW\Yž
X]Y'ni 'XYb'À`hYghYb'XYf'GhUXh'[Y\Òfh"'≒\f'fca Ub]gW\Yf'6Ui gh]`'i bX
X]Y'_i bghj c``Yb'; `UgZYbghYf'g]bX'NYi [b]ggY'Y]bYf'VYk Y[hYb
J Yf[Ub[Yb\Y]h'i bX'`UXYb'ni f'6Yg]W\h][i b['Y]b"

K Yfig]W ZØfixUg`c_U`Y`< Ubxk Yf_']bhYfYgg]Yfhžigc``hY`XUg`
GdUbXUi Yf GhUXh[YgW]W h`]W Yg`A i gYi a 'VYgi W Yb"' ₺
X]YgYa '_`Y]bYbŽUVYf ZY]bYb A i gYi a 'k YfXYb'j YfgW]YXYbY
5fhYZU_hY`i bX`9I dcbUhY`Ui g`XYf'; YgW]W hY`GdUbXUi g
dfÀgYbh]YfhžiXUfi bhYf`Ui W X]Y`6Yf`]bYf`A Ui YfžiX]Y`\]Yf`Y]bgh
X]Y`GhUXh`hY]`hY"'8Ug`A i gYi a 'V]YhYh`ZUgn]b]YfYbXY`9]bV`]W_Y`]b`X]Y
9bhk]W_`i b['XYf`FY[]cb`gck]Y`X]Y`gcn]U`Yb`i bX`dc`]h]gWXYb
J YfÀbXYfi b[Yb`]a '@Ui ZY`XYf`₺J\f\i bXYfhY"

9]b'[Ubn'VYgcbXYfYg'<][\`][\h']gh'XUg'Gca a Yf_cbnYfh']b'XYf N]hUXY``Yž'XUg'YXYg'\$J\f'nU\`fY]W\Y'Aig]_`]YV\UVYf'Ubn]Y\h''9g]gh'Y]bY'\Yfj cffU[YbXY'; Y`Y[Yb\Y]hž'X]Y'JYfV]bXi b['j cb'?i `hi f i bX'; YgW\]W\hY']b'Y]bYf'XYf'gW\ÒbghYb'?i `]ggYb'6Yf`]bg'ni Yf`YVYb''8]Y'?ca V]bUh]cb'Ui g'_`Ugg]gW\Yf'Aig]_'i bX'XYf VYY]bXfi W_YbXYb'?i `]ggY'XYf'N]hUXY``Y'gW\UZZh'Y]bY'5ha cgd\ÀfYž X]Y'a Ub'g]W\'b]W\h'Ybh[Y\Yb'`UggYb'gc``hY''

GdUbXUi `\Uh'Ui W\ 'ZØf'@]YV\UVYf'XYf' &Xi ghf]Y[YgWX]WXhY'Y]b][Ygni 'V]YhYb"'8]Y'I fUb]U!K Yf_ghÀhhYbž'Y]bgh'Y]b'VYXYi hYbXYf GhUbXcfh'ZØf'X]Y'F Øghi b[g]bXi ghf]Yž'g]bX'\Yi hY'Y]b'Gma Vc``ZØf XYb'K UbXY``i bX'X]Y'9fbYi Yfi b[']b'X]YgYa 'Y\Ya U`][Yb 5fVY]hYfghUXhhY]`": Ø\fi b[Yb'Xi fWX'X]Y'K Yf_ghÀhhYb'nY][Ybž'k]Yg]WX'X]Y']bXi ghf]Y``Y'@UbXgWXUZh'GdUbXUi g']a '@Ui ZY'XYf \$J\fnY\bhY'j YfÀbXYfh'\Uh"

GY\Ybgk ØfX][_Y]h	6YgWxfY]Vib[² ZZbi b[gnY]hYb
N]hUXY``Y`GdUbXUi	6YZYgh][ib[gUb`U[Y	HÀ[`]WX'%\$.\$\$'
	a]hʿAigYYbʻibX	%, .\$\$`I \f
	6`]W_*Ui Z'X]Y < Uj Y`	
Gh"'B]_c`U]'?]fW\Y	9]bY`XYf`À`hYghYb	AcbhU['':fY]hU[

GY\Ybgk ØfX][_Y]h	6YgWkfY]Vib[² ZZbi b[gnY]hYb
	?]fW\Yb`]b`GdUbXUi	%\$.\$\$``%+.\$\$`I\f
GdUbXUi Yf	@c_U`Y`; YgWX]WXhY	8]· 'Gc'%%.\$\$'
GhUXh[YgWX]WXh`]WXYg	i bX ¹ 91 dcbUhY	%+.\$\$`I\f
AigYia		

 $5V[YfibXYhik]fX:XYf'[YgWX]WXhi]WXY:FibX[Ub[:XifWX:X]Y: <]ghcf]gWXY:AY]:Yž:X]Y:YbhiUb[:XYf'<Uj:Yij:Yf`Ai:Zh''<]Yf'_Ubb a Ub:X]Y:U`hYb:K UggYfk Y[Y:YbhXYW_Ybž:X]Y:Y]bY:k]WXh][Y:Fc``Y']b XYf'<UbXY`g[YgWX]WXhY:GdUbXUi:g'[Ygd]Y`h'\UVYb'':9]bY:6cchghcif Ui:Z'XYf'<Uj:Y``V]YhYh'Y]bYb:Y]bn][Ufh][Yb:6`]W_:Ui:Z'X]Y \]ghcf]gWXYb:6Ui:k:Yf_Y:ibX:Yfa <math>O[`]WXhY]bY:YbhgdUbbhY$ 9f_ibXi:b[:XYfIa[YVi:b["

A]h'Y]bYf': \emptyset ``Y'Ub'\]ghcf]gWXYb'GWXÀhnYbž'X]Y'Ui Z'ZUgn]b]YfYbXY K Y]gY'X]Y'; YgWX]WXhY'i bX'?i `hi f'X]YgYf'GhUXh'nY][Ybž']gh GdUbXUi 'XUg'dYfZY_hY'N]Y`'Z \emptyset f'YXYb'; YgWX]WXhg]bhYfYgg]YfhYb i bX'bYi []Yf][Yb'FY]gYbXYb"' \Rightarrow XYg'9W_Yž'YXYg'; YVÀi XY'\Uh gY]bY'Y][YbY'; YgWX]WXhY'ni 'YfnÀ\`Yb'i bX'k UfhYh'XUfUi Zž'j cb \Rightarrow bYb'YbhXYW h'ni 'k YfXYb"

$?i)bUf]gWXY <][\ \][\ \ hg ZØf : Y]bgWXa YW_Yf$

GdUbXUi žY]b'GhUXhhY]`jcb'6Yf`]bžV]YhYh'b]Wkh'bif`\]ghcf]gWkYGY\Ybgk ØfX][_Y]hYbž'gcbXYfb'Ui Wk'Y]bY'Ui ZfY[YbXY'_i`]bUf]gWkYGnYbYž'X]Y':Y]bgWka YW_Yf'Ui g'bU\ibX'ZYfb'Ubn]Y\h''<]Yf'Z]bXYha Ub'Y]bY'J]Y`nU\`'jcb'FYghUi fUbhgž'7UZÅg'i bX'A Àf_hYbž'X]Y'Y]bYA]gWkib['Ui g'hfUX]h]cbY``Yb'i bX']bhYfbUh]cbU`Yb'?Ògh`]Wk_Y]hYbUbV]YhYb''8Yf'; Ughfcbca]YVYfY]Wk']b'GdUbXUi 'gd]Y[Y`h'X]Y_i`hifY``Y'J]Y`ZU`h'XYf'GhUXh'k]XYf'i bX'V]YhYh'ZØf'YXYb; YgWka UW_Yhk Ug"

9]b'6Ygi W\']b'GdUbXUi 'gc``hY'i bVYX]b[h'Y]bYb'Ghcdd']b'Y]bYa XYf'W\Ufa UbhYb'FYghUi fUbhg'Y]bVYn]Y\Yb"'<]Yf'g]bX'Y]b][Y _i`]bUf]gW\Y'<][\`][\hgž'X]Y'Xi 'b]W\h'j YfdUggYb'gc``hYgh

• 5 h G d U b X U i . 18 f Y h U b X Y f N h U X Y Y F Y F Y E Y B Z V f Y h Y h X f Y g Y g F Y g h U i f U b h U i h Y b h g W X Y X Y i h g W Y ? Ø W Y a f h

Zf]gW\Ybž'fY[]cbU`Yb`Ni hUhYb"'8]Y'[Ya Øh`]W\Y'5ha cgd\ÀfY i bX'X]Y'hfUX]h]cbY``Y'; Ya Øh`]W_Y]h'`UXYb'ni a 'JYfk Y]`Yb Y]b"

- FYghUi fUbh'? fUb]WX. '8]YgYg'@c_U``X]fY_h'Ua 'K UggYf VYgh]WXh'Xi fWX 'gY]bY'\Yfj cffU[YbXY':]gWX_@WXY'i bX'Y]bY hc``Y'5i gk U\``Ub'fY[]cbU`Yb'K Y]bYb"'8]Y'5i gg]WXh'a UWXh XUg'9ggYb'ni 'Y]bYa 'VYgcbXYfYb'9f`YVb]g"
- @U'; UfY. '9]b'_`Y]bYgž'ZY]bYg']hU`]Yb]gWXYg'FYghUi fUbhž'XUg
 ZØf'gY]bY'Ui h\Ybh]gWXYbž'\UbX[Ya UWXhYb'DUghU'i bX
 `YW_YfYb'D]nnYb'VY_Ubbh']gh"'<]Yf'k]fgh'Xi 'a]h'Y]bYa
 \Yfn`]WXYb'GYfj]WY'Ya dZUb[Yb"

: Øf'U```X]Y Yb][Ybž'X]Y Yhk Ug'9I ch]gWX Yg'gi WX Ybž'[]Vh'Yg']b
GdUbXUi 'YVYbZU``g'j]Y`Y']bhYfbUh]cbU`Y'Cdh]cbYb"'8]Y
_i `]bUf]gWX Y'J]Y`ZU`h'n]Y\h'g]WX 'Xi fWX'X]Y'GhfU» Ybž']b'XYbYb'a Ub
_`Y]bYž'ZUa]`]Yb[YZØ\fhY'F YghUi fUbhg'YbhXYW_Yb'_Ubbž'X]Y
; Yf]WX hY'Ui g'U``Yf'K Y`h'UbV]YhYb"' <]Yf'Y]b'dUUf'6Y]qd]Y`Y.</pre>

- ; \cg\.'9]b']bX]gWXYg'FYghUi fUbhž'XUg'a]h'Ufca Uh]gWXYb 7i ffmg'i bX'Y]bYf'YbhgdUbbhYb'5ha cgd\ÀfY'ØVYfnYi [h" 8]Y'5i gk U\`'Ub'j Y[YhUf]gWXYb'i bX'j Y[UbYb'; Yf]WXhYb']gh VYqcbXYfg'\Yfj cfni \YVYb"
- 5g]U'; ci fa Yh.'<]Yf'_Ubbgh'Xi 'X]W\'Ui Z'Y]bY'FY]gY'Xi fW\
 X]Y'Ug]Uh]gW\Y'?ØW\Y'VY[YVYb"'Jcb'Gi g\]'V]g'H\U]!7i ffmž
 Yg'[]Vh'ZØf'YXYb'Yhk Ug"'8]Y'Zf]gW\Yb'Ni hUhYb'i bX'X]Y
 _i bghj c``Y'Ni VYfY]hi b['a UW\Yb'YXYg'; Yf]W\h'ni 'Y]bYa
 ; Ybi gg"

: Øf'X]Y'@]YV\UVYf'gØ» Yf'J Yfgi W\i b[Yb']gh'GdUbXUi 'YVYbZU``g'Y]b A Y__U"'8]Y'Òfh`]W\Yb'6ÀW_YfY]Yb'i bX'?cbX]hcfY]Yb'V]YhYb'Y]bY J]Y`nU\``Ub'[YVUW_YbYb'?Ògh`]W_Y]hYb"'9]b'dUUf'`c_U`Y 9a dZY\`i b[Yb.

- 6ÀW_YfY]'6ÀW_Yf'6`i a Y. '6Y_Ubbh'ZØf']\fY'Zf]gW\
 [YVUW_YbYb'6fÖhW\Yb'i bX'_Ògh`]W\Yb'?i W\Yb"'8]Y
 ?UZZYY_i `hi f'k]fX'\]Yf'[fc»[YgW\f]YVYb'']XYU`'ZØf'Y]bY
 5i gnY]h'Ua 'BUW\a]hhU["
- $\bullet ? cbX]hcfY] `6cW_. `8]YgY `hfUX]h]cbY``Y `?cbX]hcfY] `V]YhYh$

Y]bY'Ylei]g]hY'5igkU\`'Ub'HcfhYb'ibX'GØ»][_Y]hYbždYfZY_h'ZØf':Y]bgW\aYW_Yfž'X]Y'g]W\'YhkUg'6YgcbXYfYg[ObbYb'aOW\hYb"

8]Y'K cW\Yba Àf_hY']b'GdUbXUi 'g]bX'Y]b'k Y]hYfYf'< O\Ydi b_h'ZØf: Y]bgW\a YW_Yf'''<]Yf'_Ubbgh'Xi 'Zf]gW\Y'`c_U`Y'DfcXi _hY'_Ui ZYbibX'X]fY_h'j cb'6Ui Yfb'i bX'< YfghY``Yfb'YfZU\fYbž'k c\Yf'X]Y @YVYbga]hhY``ghUa a Yb'''5i Z'XYa 'À`hYghYb'K cW\Yba Uf_h'6Yf`]bgžXYa 'GdUbXUi Yf'K cW\Yba Uf_hž'[]Vh'Yg'fY[Y`a À»]['GhÀbXY'a]hfY[]cbU`Yb'GdYn]U`]hÀhYb'i bX'\UbXk Yf_`]W\'\Yf[YghY``hYb

K cWYba Uf_h	² ZZbi b[gnY]hYb	6YgcbXYf\Y]hYb
GdUbXUi Yf	: fY]hU['/ 'GUa ghU[ž	: f]gWXY DfcXi _hY /
K cWXYba Uf_h		fY[]cbU`Y
		GdYn]U`]hÀhYb
<uj td="" uf_h\u``y<="" y`a=""><td>GcbbhU[ž-!%) 1 \f</td><td>≢bhYfbUh]cbU`Y</td></uj>	GcbbhU[ž-!%) 1 \f	≢bhYfbUh]cbU`Y
		; Ughfcbca]Y

GdUbXUi `\Uh'Ui W\ 'Y]b][Y'[Ya Øh`]W\ Y'7 UZÅgž'X]Y'g]W\ 'dYfZY_h
Y][bYbž'i a 'Y]bYb YbhgdUbbhYb 'BUW\ a]hhU['a]h': fYi bXYb cXYf
XYf': Ua]`]Y'ni 'j YfVf]b[Yb"'8]YgY 'C fhY'g]bX']XYU`ž'i a 'X]Y
5ha cgd\ÀfY 'XYf'GhUXh'ni '[Yb]Y» Yb'i bX'j]Y``Y]W\h'Y]b'GhØW_
\Ui g[Ya UW\hYb'?i W\Yb'cXYf'Y]bYb'Ufca Uh]gW\Yb'? UZZYY'ni
dfcV]YfYb"

8 Yf 'GhUXhhY]``\ Uh'ni XYa 'Y]b][Y 'Ui g[YnY]W\bYhY'K Y]bZYgh]j U`g i bX'_i `]bUf]gW\Y'9j Ybhg']a '@Ui ZY'XYg'\U\fYgž'VY]'XYbYb'Xi '`c_U`Y K]bnYf'i bX'6fUi Yf'hfYZZYb'i bX']\fY'DfcXi _hY'dfcV]YfYb'_Ubbgh" 8]YgY'J YfUbghU`hi b[Yb'g]bX'Y]bY'\Yfj cffU[YbXY'A Ò[`]W_Y]hž']b X]Y'_i `]bUf]gW\Y'?i `hi f'GdUbXUi g'Y]bni hUi W\Yb'i bX'bYi Y; YgW\a UW_gYf`YVb]ggY'ni 'YbhXYW_Yb"

CV:Xi: bUWX:hfUX]h]cbY``Yf:XYi: hgWXYf:?ØWXYž:]bhYfbUh]cbU`YbGdYn]U`]hÀhYb:cXYf:gØ» Yb:JYfZØ\fi:b[Yb:gi:W\gh::'GdUbXUi:'\Uh:ZØfYXYb::Y]bgWXa:YW_Yf:Yhk:Ug:ni:'V]YhYb":A:UWX:X]WX:VYfY]h:ZØfY]bY_i:`]bUf]gWXY:9bhXYW_i:b[gfY]gY:Xi:fWX:X]YgYb:ZUWYhhYbfY]WXYbGhUXhhY]`°

: Øf`a Y\f`±oZcfa Uh]cbYb`ØVYf`X]Y`[Ughfcbca]gWkYb`5b[YVchY`]b GdUbXUi `_Ubbgh`Xi `X]Y`cZZ]n]Y``Y`K YVgY]hY`j cb`GdUbXUi VYqi WkYb. `GdUbXUi "XY"

BUhi f'i bX'9f\c`i b[']a'; fØbYb

GdUbXUi ž'VY_Ubbh'ZØf'gY]bY'fY]WXY'; YgWX]WXhYž'\Uh'Ui WX 'Y]bY VYY]bXfi W_YbXY'BUhi f!'i bX'9f\c`i b[g`UbXgWXUZh'ni 'V]YhYb" 9]b[YfU\a h'j cb'K UggYf'i bX'K À`XYfbž'Z]bXYh'XYf'6Ygi WXYf']b'i bX i a 'GdUbXUi 'nU\`fY]WXY'A Ò[`]WX_Y]hYbž'X]Y'Zf]gWXY'@i Zh'i bX'X]Y bUhØf`]WXY'GWX Òb\Y]h'XYf'I a [YVi b['ni '[Yb]Y»Yb"

 $9]b`<][\ \ `][\ \ `][\ \ ']b`X]YgYa ``6YfY]WX`]gh`XYf`GdUbXUi Yf`: cfghž`Y]b k Y]h`Ài Z][Yg`K U`X[YV]Yhž`XUg`g]WX`\Yfj cffU[YbX`ZØf GdUn]Yf[Åb[Yž`<math>\approx$ [[]b[`cXYf`: U\ffUXhci fYb`Y][bYh"`A]h`gY]bYb X]WX hYb`6Ài a Ybž`gWX Uhh][Yb`K Y[Yb`i bX`XYf`A \circ [`]WX_Y]hž K]`Xh]YfY`ni `VYcVUWX hYbž`V]YhYh`XYf`: cfgh`Y]bYb`F \circ W_ni [gcfh`j ca \Y_h]gWXYb`GhUXh`YVYb"

8 Ugʻ9Ui 'XYʻ7c`c[bYʻXYgʻK U`XYgʻK]fXʻj cbʻgØXk Ygh`]W\YbʻK]bXYb
[YhfU[Ybž'k À\fYbXʻX]YʻJ Ò[Y``]bʻXYbʻ6Ui a _fcbYbʻY]bʻ`YV\UZhYg
?cbnYfh`[YVYb"`8Yf`GdUbXUi Yfʻ: cfghʻ]ghʻb]W\hibi fʻY]bYʻC UgY
ZØfʻB Uhi fZfYi bXYžʻgcbXYfbʻUi W\Y]bʻVY`]YVhYfʻC fhʻZØfʻ: Ua]`]Ybž
X]Yʻ\]YfʻUbʻK cW\YbYbXYbʻd]W_b]W_YbʻcXYfʻX]YʻB Uhi fʻYf_i bXYb"

9]b k Y]hYfYg gWX ObYg B Uhi fn]Y``]gh XYf GWX `Yi gYbd Uf_ž XYf g]WX Ybh`Ub[XYg Gd Ub XUi Yf GWX]ZZZU\fhg_Ub U`g YfghfY W_h" <]Yf _ObbYb Gd Un]Yf[Àb[Yfž F UX ZU\fYf i b X '6 c c hg Zf Yi b XY 'ni gUa a YbhfY ZZYb" 8]Y k Y]h`Ài Z][Yb ; fØb Z À WX Yb 'g]b X 'd Yf ZY _h 'ZØf 'Ybhgd Ub bhY B UWX a]hhU[Y 'Ua 'K UggYf ž i b X 'X]Y 'n U\`fY]WX Yb '6 Àb_Y '`UX Yb 'ni a J Yfk Y]`Yb 'Y]b "'A Ub WX a U``_Ubb 'a Ub 'gc [Uf 'X]Y 'GWX]ZZY VYc V UWX hYb ž X]Y 'X]Y 'GWX 'Yi gY 'd Ugg]YfYb ž k Ug 'ZØf'; fc » 'i b X '? `Y]b Y]b 'hc``Yg 'GdY_hU_Y``]gh"

: Øf'K UggYfgdcfh`Yf'V]YhYh'XYf'GdUbXUi Yf'GWX]ZZZU\fhg_UbU` Y]bY'J]Y`nU\`'j cb'5_h]j]hÀhYbž'XUfi bhYf'? Ubi!'i bX Fi XYfZU\fhYb"'9g'[]Vh'nU\`fY]WXY'6cchgj Yf`Y]\Yž'X]Y ghi bXYbk Y]gY'cXYf'ZØf'XYb'[UbnYb'HU['Ui g[YghUhhYh'g]bXž'gcXUgg YXYf'X]Y'GW\Ob\Y]h'XYg'K UggYfg'\Ui hbU\'Yf`YVYb'_Ubb"'CV'a Ub U``Y]b'dUXXY`h'cXYf'a]h': fYi bXYbž'XUg'9f`YVb]g']gh']a a Yf i bj Yf[Ygg`]W\"

9]b; Y\Y]a h]dd; ZØf; BUhi fVY[Y]ghYfhY;]gh; XYf; Fi\k U; XdUf_ž; Y]b _; Y]bYfž; UVYf; kibXYfgWX; ObYf; DUf_ž; XYf;]XYU; ZØf; YbhgdUbbhY GdUn]Yf[Ab[Y;]gh; 8]YgYf; DUf_; k]fX; jcb; j]Y; Yb; 9]b\Y]a]gWXYb [YgWX; Ahnhž; X]Y;\]Yf; cZh; a]h;]\fYb; <ibXYb; ibXYb; ibhYfk; Y[g;g]bX; cXYf Y]bZUWX; X]Y; BUhi f; [Yb]Y»Yb; 8]Y; Gh]; Yi bX; 5V[YgWX]YXYb\Y]h; XYg DUf_g; V]YhYb; Y]bYb; dYfZY_hYb; Cfh; ZØf; Y]b; [ihYg; 6iWX; cXYf; Y]bY 5ignY]h; cb; XYf; HYWX; bc; c[]Y"

9f[ÀbnYbX'\]Yfni 'V]YhYb'X]Y'HYa dY`\cZYf': Y`X']b'XYf'BÀ\Y
Y]bY'k Y]h'Ài Z][Y': `ÀWXYŽ'X]Y'Y\Ya U`][Yb': `i [\UZYb'V]YhYh'a Y\f
U`g'bi f'; YgWX]W\hY' 'Yg']gh'Ui W\'Y]b'[fc»Ufh][Yf'Cfh'ZØf'D]W_b]W_gŽ
FUXZU\fYb'i bX'Gdcfh": Øf'YXYb'[]Vh'Yg'\]Yf'Yhk Ug"'8Ug': Y`X
n]Y\h'VYgcbXYfg'Ub'gcbb][Yb'K cWXYbYbXYb'nU\`fY]WXY'6Ygi WXYf
Ubž'X]Y'Ui g'U``Yb'9W_Yb'6Yf`]bg'_ca a Ybži a 'XUg'Zf]gWXY'; fUg'ni
[Yb]Y»Yb'i bX'g]W\'ni 'YbhgdUbbYb"

Ni gàhn`]WX '`àggh'g]WX 'X]Y 'B Uhi f`UbXgWX UZh'a]h'Y]bYa '6Ygi WX ']b XYb 'K UggYf[ÀfhYb 'GdUbXUi ž'Y]bYf'_`Y]bYb 'C UgYž'X]Y '6`i a Ybž HY]WX Y 'i bX 'Y]bY 'J]Y`nU\`'j cb 'DZ'UbnYbUfhYb'_ca V]b]Yfh" '9g']gh'Y]b]XYU`Yf'C fh'ZØf': Ua]`]Yb'a]h'?]bXYfbž'i a 'X]Y 'bUhØf`]WX Y 'GWX Òb\Y]h ni 'Yf_i bXYb'i bX'Yhk Ug'ØVYf'X]Y '\Y]a]gWX Y : `cfU'ni '`YfbYb" '8]Y Ub[YVchYbYb': Ø\fi b[Yb'g]bX']bZcfa Uh]j 'i bX'a UWXYb'XUg 9f`YVb]g'bcWX i bj Yf[Ygq`]WXYf"

8]Y'5i Z]ghi b['j cb'A Ò[`]WX_Y]hYb'ni f'9f\c`i b[']b'XYf'BUhi f']b GdUbXUi 'k ÀfY'i bj c``ghÀbX][ž'c\bY'X]Y'j]Y`ZÀ`h][Yb' JYfUbghU`hi b[Ybž'X]Y'fY[Y`a À»][']a': fY]Yb'ghUhhZ]bXYbž Ubni gdfYWXYb"'Jcb'CdYb!5]f!?cbnYfhYb'V]g'\]b'ni':

: Ua]`]YbZYghYb'[]Vh'Yg']a a Yf'Yhk Ug'Ui Z'XYf'5[YbXUž'XUg'XUni
Y]b`ÀXhž'X]Y'Zf]gWXY'@i Zh'ni '[Yb]Y»Yb'i bX'[`Y]WXnY]h]['gcn]U`Y
?cbhU_hY'ni 'dZY[Yb"

9]b '6Ygi WX ']b 'GdUbXUi ']gh'b]WX h'bi f'Y]bY 'FY]gY 'Xi fWX 'X]Y
; YgWX]WX hY Z'gcbXYfb 'Ui WX 'Y]bY '; Y'Y[Yb\Y]hZ'X]Y 'fY]WX Y 'B Uhi f
i bX 'X]Y '9f\c`i b[ga Ò[`]WX_Y]hYb ']b 'X]YgYf 'GhUXh'ni 'YbhXYW_Yb"
9[U`Z'cV 'a Ub 'X]Y 'Fi\Y 'XYg'K U`XYgZ'X]Y 'I ZYf'XYg'? UbU`g'cXYf'X]Y
WX Ufa UbhYb 'DUf_g'VYj cfni [hZ'X]Y 'B Uhi f']b 'GdUbXUi '\Uh'ZØf'YXYb
Yhk Ug'ni 'V]YhYb"

?i bgh'i bX'?i `hi f. 'GdUbXUi g'_fYUh]j Y 'GY]hY

GdUbXUi žY]b'GhUXhhY]`'j cb'6Yf`]bžnY]W\bYh'g]W\b'b]W\h'bi f'Xi fW\gY]bY'fY]W\Y'; YgW\]W\hY'Ui gž'gcbXYfb'Ui W\'Xi fW\'Y]bY di `g]YfYbXY'?i bghl'i bX'?i `hi fgnYbYž'X]Y'gck c\`'9]b\Y]a]gW\Y'U`g Ui W\'6Ygi W\Yf'VY[Y]ghYfh"'CV']b'XYb'nU\`fY]W\Yb'; U`Yf]Ybž H\YUhYfb'cXYf'VY]': Ygh]j U`g' 'GdUbXUi '\Uh'ZØf'?i bgh`]YV\UVYf Y]bY'A Yb[Y'ni 'V]YhYb"

9]b 'nYbhfu`Yf 'Di b_h']b 'GdUbXUi g'_i `hi fY``Ya '@YVYb']gh'X]Y' 5 `hghUXh'GdUbXUi ž'X]Y'a]h']\fYb'\]ghcf]gW\Yb'; YVÀi XYb'i bX a U`Yf]gW\Yb'; UggYb'Y]b']XYU`Yg'5a V]YbhY'ZØf'_fYUh]j Y JYfUbghU`hi b[Yb'V]YhYh''<]Yf'Z]bXYb'fY[Y`a À»]['?i bgha Àf_hY'i bX 5i gghY``i b[Yb'ghUhhž'X]Y'`c_U`Y'? Øbgh`Yf'dfÀgYbh]YfYb'i bX'X]Y; Ya Y]bgW\UZh'ni gUa a YbVf]b[Yb''8]Y'XYb_a U`[YgW\ØhnhYb : UggUXYb'XYf'5`hghUXh'gW\UZZYb'XYb'dYfZY_hYb'FU\a Yb'ZØf'?i bgh i bX'?i `hi f"

9]b'k Y]hYfYf'_i `hi fY``Yf' < chgdch']b'GdUbXUi ']gh'XUg'GdUbXUi Yf J c`_gdUf_ž'Y]b'k Y]h`Ài Z][Yf'DUf_ž'XYf'U`g'J YfUbghU`hi b[gcfh'ZØf j]Y`Y': Ygh]j U`gž'CdYb!5]f!?]bcg'i bX'?cbnYfhY'X]Ybh'' =a 'Gca a Yf k]fX'XYf'DUf_'cZh'ni a 'GW\Ui d`Uhn'j cb'A i g]_!'i bX
H\YUhYfUi ZZØ\fi b[Ybž'k c'hU`Ybh]YfhY'? Øbgh`Yf'i bX'9bgYa V`Yg Ui ZhfYhYb"'8]Yg']gh'Y]bY'[fc» Ufh][Y'; Y`Y[Yb\Y]hž'g]W\'i bhYf'X]Y `c_U`Y'6Yj Ò`_Yfi b['ni 'a]gW\Yb'i bX'X]Y'_fYUh]j Y'9bYf[]Y'XYf GhUXh'ni 'gdØfYb"

8]Y'K U`XVØ\bY'GdUbXUi ']gh'Y]b'VY`]YVhYg': fY]`i Zhh\YUhYfž'XUg
Y]b'VfY]hYg'GdY_hfi a 'Ub'JYfUbghU`hi b[Yb'V]YhYh'''Jcb'_`Ugg]gW\Yb

\dipgnYb]Yfi b[Yb'ØVYf'A i g]WU`g'V]g'\]b'ni 'a cXYfbYb'5i ZZØ\fi b[Yb
n]Y\h'X]Y'K U`XVØ\bY'nU\`fY]W\Y'Ni gW\Ui Yf'Ub'i bX'j Yfa]hhY`h'Y]b
i bj Yf[Ygg`]W\Yg'9f`YVb]g'i bhYf'ZfY]Ya '<]a a Y`"'8]Y'YbhgdUbbhY
5ha cgd\AfY'i bX'XUg'UbgdfYW\YbXY'Dfc[fUa a 'a UW\Yb'Y]bYb
6Yqi W\'ni f'dYfZY_hYb'K U\``ZØf'Y]bYb'5VYbX'j c``Yf'?i `hi f"

 $: \emptyset f? i bgh]bhYfYgg]YfhY`V]YhYhGdUbXUi `ni XYa `Y]bY`J]Y`nU\``j cb`; U``Yf]Ybž`X]Y`gck c\``YhUV`]YfhY`U`g`Ui W\`Ui ZghfYVYbXY`? \emptysetbgh`YfdfAgYbh]YfYb"`8]Y`; U`Yf]Y`HYa d`]b`VY]gd]Y`gk Y]gY`]gh`VY_Ubbh Z\%f']\fY`k YW\\gY`bXYb`5i gghY``i b[Yb`i bX`Z\%fXYfh`_fYUh]j Y`HU`YbhYUi g`XYf`FY[]cb"`<]Yf`_\%bbYb`6Ygi W\\Yf`cZh`Ui W\`a]h`XYb? \%bgh`Yfb`]bg`; Ygdf\\W\`_ca a Ybž`k Ug`X]Y`9fZU\fi b[`bcW\\dYfg\%b`]W\\Yf`a UW\h"$

9]b <][\`][\h']b GdUbXUi ']gh'Ui W 'XUg'GhUXhh\YUhYf'GdUbXUi ž Y]b Cfh'j c ``Yf'_i `hi fY ``Yf'J]Y ZU`h" 8 Ug'H\YUhYf'V]YhYh'Y]bY Ui g[Yk c[YbY'A]gWXi b['Ui g'_`Ugg]gWXYb'i bX'a cXYfbYb 5i ZZØ\fi b[Ybž'X]Y'i bhYfgWX]YX`]WXghY'H\Ya Yb'UbgdfYWXYb" 8 Ug Dfc[fUa a 'j Yfgdf]WXh'ZØf'YXYb'; YgWXa UW_'Yhk Ug'i bX'hfÀ[h'ni f _i `hi fY``Yb'6]`Xi b['i bX'l bhYf\U`hi b['XYf'GdUbXUi Yf 6Yj Ò`_Yfi b['VY]"

6YgcbXYfg`\Yfjcfni\YVYb`g]bX`X]Y`nU\`fY]WXYb`?ibgh!'ibX
?i`hifZYgh]jU`gž`X]Y`]b`GdUbXUi`ghUhhZ]bXYb"`9]bYg`XYf

VY_UbbhYghYb`]gh`XUg`GdUbXUi Yf`: Yghž`XUg`]b`YXYa`\\\f
<ibXYfhhUigYbXY`jcb`6Ygi W\Yfb`Ubn]Y\h"`8Ug`: Ygh]jU``V]YhYh
Y]bY`A]gW\ib[`Uig`@]jY!Aig]_ž`HUbnUiZZØ\fib[Ybž
?ibgh\UbXkYf_`ibX`_i`]bUf]gW\Yb`?Ògh`]W_Y]hYb`ibX`jYfkUbXY`h
GdUbXUi`]b`Y]b``YVYbX][Yg`: fY]`iZhaigYia"

8]Y?i`hi f']b'GdUbXUi ']gh'b]Wkh'bi f'Ui Z'X]Y'[fc»Yb

J YfUbghU`hi b[gcfhY'VYgWkfÀb_h/'Ui Wk'X]Y'_`Y]bYbž'i bUV\Àb[][Yb
6i Wk\UbX`i b[Yb'i bX'7UZÅg'g]bX'cZh'GWkUi d`ÀhnY'ZØf'@Ygi b[Ybž
?i bghUi gghY``i b[Yb'i bX'a i g]_U`]gWkY'8UfV]Yhi b[Yb"'8]YgY'CfhY
g]bX'XYf'dYfZY_hY'FU\a Yb'ZØf'Y]bYb'YbhgdUbbhYb'5VYbXž'Ub'XYa
a Ub'`c_U`Y'HU`YbhY'i bhYfghØhnYb'i bX'[`Y]WknY]h]['X]Y'_fYUh]j Y

9]b ZUgn]b]YfYbXYf 5gdY_h XYf GdUbXUi Yf?i bghgnYbY]gh X]Y =bhY[fUh]cb j cb a cXYfbYb i bX hfUX]h]cbY ``Yb?i bghZcfa Yb" =b]h]Uh]j Ybž X]Y g]W a]h a cXYfbYf GhfU» Yb_i bgh i bX ; fUZZ]h] VYgW AZh][Ybž hfU[Yb ni f I fVUb]g]Yfi b[i bX 5i Zk Yfhi b[XYg GhUXhV] XYg VY] " GhfYYh 5fh! 9j Ybhg i bX K cf_g\cdg V]YhYb ? Øbgh Yfb X]Y A O[`]W _Y]hž g]W Ui gni XfØW_Yb i bX]\fY K Yf_Y a]h XYf 2 ZZYbh]W _Y hni hY] Yb"

JYfUbghU`hib[6YgWxfY]Vib[Cfh	8 Uhi a
GdUbXUi Yf	: Ygh'a]h	5`hghUXh	; `]
: Ygh	9bhYfhU]ba Ybhž	GdUbXUi	
	9ggYb'i bX		
	?i bgh		
?i `hi f: Ygh	9]bY::Y]Yf	Jc`_gdUf_	GYdhYa VYf
	`c_U`Yf	GdUbXUi	
	?i`hifYb'ibX		
	HfUX]h]cbYb		
CdYb!5]f!?]bc	:]`a Y'i bhYf	Jc`_gdUf_	⅓ b] V]g 5i [igh
	ZfY]Ya '<]a a Y`	GdUbXUi	

CV:Xi:Y]b:?ibgh`]YV\UVYfžY]b:Aig]_ZUb:cXYfY]bZUWX:bif
bYi[]Yf][:UiZ:X]Y:_fYUh]jY:GY]hY:jcb:GdUbXUi:V]ghž:Yg:[]Vh:]aaYf
Yhk Ug:ni:YbhXYW_Yb:ibX:ni:Yf`YVYb":8]Y:J]Y`ZU`h:XYf:?ibgh!:ibX
?i`hifUb[YVchY:]b:GdUbXUi:nY][hž:XUgg:X]YgYf:GhUXhhY]`:j]Y`Yg:ni
V]YhYb:\Uh:ibX:g]WX:ghÀbX][:kY]hYfYbhk]W_Y`h":Jcb:XYf:5`hghUXh
V]g:ni:XYb:acXYfbghYb:JYfUbghU`hib[gcfhYb:]gh:GdUbXUi:Y]b:Cfhž
XYf:X]Y:?fYUh]j]hÀh:nY`YVf]Yfh:ibX:]bgd]f]Yfh"

5_h]j Y :: fY]nY]h[YghU`hi b[']b 'i b X 'i a GdUb X Ui

± GdUbXUi []VhYgY]bYJ]Y`nU\`jcb'A Ò[`]WX_Y]hYbž'U_h]j nik YfXYb'ibX'X]Y'la[YVib['ni'Yf_ibXYb"'CV'8i'Y]b'GdcfhZUbž BUhif`]YV\UVYf'cXYf'Y]bZUWX'bif'UiZ'XYf'GiWXY'bUWX'Y]bYa'Cfh nia '9bhgdUbbYb'V]ghž'X]YgY'GhUXh'\Uh'Z∅f'YXYb'Yhk Ug'ni'V]YhYb"

9]b'k Y]hYfYg'<][\`][\h']gh'XYf'GdUbXUi Yf'GhUXhgW\`cggdUf_ž XYf'b]W\h'bi f'ZØf'gY]bY'GW\Òb\Y]h'VY_Ubbh']ghz'gcbXYfb'Ui W\'ZØf gY]bY'gdcfh`]W\Yb'5b[YVchY"'<]Yf'_Ubbgh'8i 'HfYhVcch'ZU\fYbz FUXZU\fYb'cXYf'Y]bZUW\'X]Y'j YfgW\]YXYbYb'K Y[Y'Yf_i bXYbž'X]Y Xi fW\'XYb'DUf_'ZØ\fYb"'8]Y'\Yff`]W\Y'?i `]ggY'XYg'GW\`cggYg a UW\h'YXYb'5i ZYbh\U`h'i bj Yf[Ygg`]W\"

 $: \emptyset f^*X]Y^*K UggYfgdcfhVY[Y]ghYfhYb^*i bhYf^9i W^*]gh^*X]Y^*< Uj Y^*^]XYU^*" C V^*? Ubi ZU\fYbž^GhUbX!! d!DUXX^*]b[^*cXYf^*Y]bZUW^*bi f^*Y]b YbhgdUbbhYf^*HU[^*Ua ^*K UggYf^*^*\]Yf^*Z]bXYgh^*Xi ^*Ui gfY]W^*YbX A Õ[^*]W^*_Y]hYbž^*X]Y^*< Uj Y^*^j cb^*Y]bYf^*UbXYfYb^*GY]hY^ni ^*Yf^*YVYb^*^9g []Vh^*gdYn]Y^*^Y^J Yf^*Y]\ghUh]cbYb^*Z\@f^*6cchY^*i bX^*6cUfXgž^*X]Y^*X]f^*XYb Ni [Ub[^*ni a ^*K UggYf^*Yf^*Y]W^*hYfb''$

K Yf Yg ``]YVYf Yhk Ug Yb hgd Ub b hYf a U[ž gc ``hY 'X]Y F UX k Y[Y 'fi b X i a 'Gd Ub X Ui 'Ui gd fc V]Yf Yb "'8]Yg Y '[i h 'Ui g[Y V Ui hYb 'K Y[Y ZØ\ fYb 'X]W\ 'Xi fW\ 'k i b X Y fg W\ Ob Y '@Ub X g W\ UZhY b ž 'j c f V Y] 'Ub : Y`XYf b ž 'K À`XYf b 'i b X 'a U`Yf]g W\ Yb '8 Of Z Y fb "'5 i W\ 'XYf 'Gd f Y Y! F UX k Y[ž 'XYf 'Xi f W\ 'Gd Ub X Ui 'ZØ\ f hž ']gh 'Y]b Y 'hc ``Y 'A O[`]W\ _Y]hž 'X]Y F Y[]cb 'ni 'Yf_i b X Y b "'5 W\ hY 'Ui Z 'X]Y 'n U\ `fY]W\ Y b 'F UX j Y f `Y]\ Y ž X]Y X]f 'X]Y : U\ ff A XYf 'ZØf 'XY]b Y b 'HU['ni f 'J Y f ZØ[i b ['ghY ``Y b "

: Øf:: Ua]`]Yb'[]Vh'Yg'gdYn]Y``Y'5b[YVchY'k]Y': fY]nY]hdUf_g'i bX'
Nccž'X]Y'i b_ca d`]n]YfhY'i bX'gdU»][Y'5_h]j]hÀhYb'ZØf'U``Y
5`hYfg[fi ddYb'V]YhYb"8Yf'H]YfdUf_'; Yfa YbXcfZž'Yhk Ug
Ui »Yf\U`V'j cb'GdUbXUi ž']gh'Y]bY'k i bXYfVUfY'; Y`Y[Yb\Y]hž'H]YfY
\Ui hbU\'ni 'Yf`YVYb'i bX'\Uh'j]Y`Y'Gd]Y`a Ò[`]WX_Y]hYb'ZØf'X]Y
?`Y]bYb"'

$Gdcfh^{3}WXY^{5}h]j]hAhYb^{3}a^{3}VYfV^{3}W_{-}$

5_h]j]hÀh	Cfh	6YgcbXYf\Y]hYb
∞[[Yb7/	J c`_gdUf_'GdUbXUi	KY]h`ÀiZ][Y'5b`U[Ybž
GdUn]Yf[Àb[Y		Gd]Y`d`ÀhnY
HfYhVcchZU\fYb	GhUXhgWX`cggdUf_	GnYb]gW\Y'?i`]ggY
9]bY ⁻ FibXY	FUXk Y[Yia	; i h'Ui g[YVUi hY
FUXZU\fYb	GdUbXUi	GhfYW_Yb
K UggYfgdcfh	< Uj Y`	JYf`Y]\Y'ZØf'6cchY
		i bX ⁻ 6cUfXg
< U``YbVUX'/	Gd c fhghÀ hhY b	J]Y`ZÀ`h][Y'5b[YVchY
GWk]a a Yb	GdUbXUi	ZØf'U``Y
Ncc VYgi WXYb	H]YfdUf_	: Ua]`]YbZfYi bX`]WXY
	; Yfa YbXcfZ	5_h]j]hÀhYb

5VgWX`]Y» YbX``Àggh`g]WX`gU[Ybž`XUgg`GdUbXUi `nU\`fY]WXY
A Ò[`]WX_Y]hYb`ni f`U_h]j Yb`: fY]nY]h[YghU`hi b[`V]YhYh"'9[U`ž`cV`Xi
U``Y]bYža]h`: fYi bXYb`cXYf`XYf`: Ua]`]Y`i bhYfk Y[g`V]gh` `X]Y`GhUXh\Uh`ZØf`YXYb`Yhk Ug`]a `5b[YVch"`A UWX`X]WX`Ui Z`XYb`K Y[`i bXYbhXYW_Y`X]Y`U_h]j Yb`GY]hYb`j cb`GdUbXUi °

DfU_h]gWXY'H]ddg'ZØf'XY]bYb'6Ygi WX']b GdUbXUi

K Ybb`Xi `GdUbXUi `VYgi W\ghž`[]Vh`Yg`Y]b][Y`dfU_h]gW\Y`H]ddgž'X]Y X]f`\Y`ZYb`_ÒbbYbž'XUg`6YghY`Ui g`XY]bYa `5i ZYbh\U`h\YfUi gni \c`Yb"`9[U`ž'cV`Xi `bi f`Y]bYb`HU[`]b`X]YgYf`W\Ufa UbhYb GhUXh'j YfVf]b[Yb'a ÒW\hYgh'cXYf'Y]bYb``Àb[YfYb`5i ZYbh\U`hd`Ubghž`\]Yf`g]bX`Y]b][Y`k Yfhj c``Y`<]bk Y]gY"

5bfY]gY bUW GdUbXUi

GdUbXUi ']gh'\Yfj cffU[YbX'a]h'ÒZZYbh']WXYb'JYf_Y\fga]hhY`b
YffY]WXVUfž'VYgcbXYfg'j cb'6Yf`]b'Ui g"'8]Y'G!6U\b!@]b]Yb'G' ž'G) ž
G+'i bX'G-'\U`hYb'Ua 'G!6U\b\cZ'GdUbXUi ž'XYf'nYbhfU`']a
GhUXhhY]`'`]Y[h"'5i WX'X]Y'I !6U\b!@]b]Y'I +'Vf]b[h'X]WX'X]fY_h']bg
NYbhfi a "'K Ybb'Xi 'a]h'XYa '5i hc'UbfY]ghž'VYUWXhYž'XUgg
DUf_a Ò[`]WX_Y]hYb'cZh']b'XYb'GhUXhhY]`Yb'i bhYfgWX]YX`]WX'g]bX"'+b
XYb'a Y]ghYb'HY]`Yb'j cb'GdUbXUi '[]Vh'Yg'DUf_d`ÀhnYž'UVYf'UWXhY
XUfUi Zž'cV'Y]bY'DUf_[YVØ\f'UbZÀ``h"

6 YghY F Y]gYnY]h

 $8]Y]XYU Y FY]gYnY]h ZØf GdUbXUi]gh nk]gWXYb A U] i bX GYdhYa VYf Zik Ybb XUg K YhhYf a]X]gh i bX nu\ fY]WXY JYfUbghU hi b[Yb ghUhhZ]bXYb "8]Y `Ub[Yb Gca a YfhU[Y `UXYb XUni Y]b Z X]Y j]Y Yb : fY] i ZhUb[YVchY ni [Yb]Y » Yb Z i bX Yg []Vh nu\ fY]WXY : Ygh]j U g i bX A Åf_hY "= K]bhYf V]YhYh GdUbXUi gY]bYb hfUX]h]cbY `Yb K Y]\ bUWX hga Uf_h Z XYf YVYb ZU `g Y]bYb 6Ygi WX k Yfh]gh"$

, VYfbUW\hi b[ga Ò[`]W_Y]hYb

 $\label{eq:continuity} GdUbXUi ~V]YhYhY]bY~J~]Y`nU\``j~cb~l~bhYf_ØbZhYbž`X]Y~YXYa~6i~X[~Yh'[~YfYWh'k~YfXYb"'<]Yf`g]bX~Y]b][~Y~C~d~h]c~bYb~.$

- : Yf]Ybk c\bi b[Yb. K Ybb Xi 'a Y\f'D`Uhn'i bX': `Yl]V]`]hÀh a ÒW hYghž'g]bX': Yf]Ybk c\bi b[Yb Y]bY \Yfj cffU[YbXY K U\`ž'VYgcbXYfg'ZØf': Ua]`]Yb cXYf'; fi ddYb"
- $< cghY`g. : Øf`6UW_dUW_Yf`[]Vh`Yg`Ui W.`dfY]g[Øbgh][Y$ $< cghY`gž`X]Y`Y]bY`[i hY`A Ò[`]W_Y]h`g]bXž`UbXYfY`FY]gYbXY$ $_YbbYbni `YfbYb"$

$?i \buildrel{local}{local} i \buf]gWX Y H]ddg$

GdUbXUi '\Uh'Y]bY'j]Y`ZÀ`h][Y'; Ughfcbca]YgnYbYž'X]Y'j cb hfUX]h]cbY``Yb'XYi hgW\Yb'; Yf]W\hYb'V]g'\]b'ni ']bhYfbUh]cbU`Yf ?ØWXY'fY]WXh"'6Y]a '6Ygi WX'gc``hYgh'Xi 'i bVYX]b[h': c`[YbXYg dfcV]YfYb.

- 6]YfgdYn]U`]hÀhYb. GdUbXUi ']gh'VY_Ubbh'ZØf'gY]bY
 6fUi \Ai gYf"'DfcV]YfY'`c_U`Y'6]YfY']b'Y]bYa 'XYf'j]Y`Yb
 [Ya Øh`]WXYb'@c_U`Y"
- 6Yf`]bYf'7i ffmk i fgh. '9]b'A i gg'ZØf'YXYb'6Ygi WXYf'XYf
 FY[]cb' '[Yb]Y»Y'X]Y'`c_U`Y'7i ffmk i fgh'Ub'Y]bYa 'XYf
 =a V]ggghÀbXY"
- =bhYfbUh]cbU`Y`?ØWXY.`Jcb`]hU`]Yb]gWXYf`V]g`Ug]Uh]gWXYf
 ?ØWXY`Z]bXYgh`Xi`]b`GdUbXUi`ZØf`YXYb`; YgWXa UW_
 Yhk Ug"

GY\Ybgk ØfX][_Y]hYb 'd`UbYb

I a 'XUg'6YghY'Ui g'XY]bYa '6Ygi W\'ni 'a UW\Ybž'gc``hYgh'Xi 'Y]bY @]ghY'j cb'GY\Ybgk ØfX][_Y]hYb'ni gUa a YbghY``Yb"'Ni 'XYb < Ui dhUhhfU_h]cbYb']b'GdUbXUi 'nÀ\`Yb.

GY\Ybgk ØfX][_Y]h	6YgWkfY]Vib[
N]hUXY``Y`GdUbXUi	9]bY`XYf`VYghYf\U`hYbYb
	: Yghi b[Yb'XYf'FYbU]ggUbW']b
	8 Yi hgWX`UbX"
5`hghUXh'GdUbXUi	7\Ufa UbhY GhfU» Yb a]h'_`Y]bYb
	@AXYbž7UZÅgibX^\]ghcf]gW\Yb
	; YVÀi XYb"
Gh" B]_c `U] ?]fWX Y	9]bY`XYf`À`hYghYb`?]fWXYb
	6Yf`]bg'a]h'VYY]bXfi W_YbXYf
	5fWX]hY_hif"

$K c \]b a]h?]b X Y fb 3$

K Ybb Xi 'a]h'?]bXYfb fY]ghž []Vh Yg]b GdUbXUi 'a Y\fYfY_]bXYfZfYi bX`]WXY 5_h]j]hÀhYb.

- ?]bXYfV]V`]ch\Y_.'8]Y'6]V`]ch\Y_'V]YhYh'gdYn]Y``Y Dfc[fUa a Y'i bX'JYfUbghU`hi b[Yb'ZØf'?]bXYf"
- GWN k]a a VÀXYf. 6Ygi WNY Y]bYg XYf ÔZZYbh`]WNYb

GWXk]a a VAXYf'ZØf'Y]bYb'qcbb][Yb'HU['jc''Yf'GdU»"

• GdUbXUi Yf': cfgh.'⇒XYU`'ZØf'GdUn]Yf[Àb[Yž'D]W_b]W_g'i bX BUhi fYf_i bXi b[Yb"

GdfUWXYibX?caaib]_Uh]cb

8]YaY]ghYbAYbgWXYb]bGdUbXUigdfYWXYbY]b[ihYg9b[`]gWXž]bgVYgcbXYfY]bhcif]gh]gWXYb6YfY]WXYb"9g_Ubb^YXcWX\]`ZfY]WXgY]bžY]b][Y[fibX`Y[YbXYXYihgWXYD\fUgYbni``YfbYbžiaX]Y9]b\Y]a]gWXYbni`Yfaih][YbibXXX]Y?ihifVYggYfni`Yf`YVYb"

² ZZbi b[gnY]hYb i bX J YfUbghU`hi b[Yb

DZcfa]YfY X]WX]a "J cfUi g'ØVYf'X]Y 2 ZZbi b[gnY]hYb XYf

GY\Ybgk ØfX][_Y]hYb "i bX "F YghUi fUb hgž"X]Y "Xi "VYgi WX Yb

a ÒWX hYghž"XU "X]YgY "j Uf]]YfYb "_ÒbbYb" "5i » YfXYa "[]Vh 'Yg "XUg

[UbnY "₺\\f'ØVYf"nU\`fY]WX Y "J YfUbghU`hi b[Ybž"j cb 'A Àf_hYb 'V]g'\]b

ni ": Ygh]j U`g" "8 Yf"J YfUbghU`hi b[g_U`YbXYf"]b "GdUbXUi "_Ubb 'Ui Z

XYf"c ZZ|n]Y``Yb "K YVg]hY 'Y]b[YgY\Yb "k YfXYb"

8]YgY'dfU_h]gWXYb'H]ddg'k YfXYb'X]f'\Y`ZYbž'XY]bYb'5i ZYbh\U`h']bGdUbXUi 'cdh]aU`'ni '[YghU`hYb'i bX'X]Y'GhUXh']b'j c``Yb'NØ[Yb'ni [Yb]Y»Yb°

8 Y hU1`a

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