

8 Yf '6`Ui Y 'Gi dYfa cbX 'Ua '%- " '5i [i gh. 9]b '\]a a `]gW\Yg 'GdY_hU_Y` 'ZØf 'A Yhha Ubb

9f`YVYb`G]Y`\Yi hYž`Ua `%- "`5i [i ghž`]a `?fY]g`A Yhha Ubb`XUg GdY_hU_Y``j cb`Gi dYfa cbX`i bX`V`Ui Ya `Jc``a cbX`Ua BUW\h\]a a Y`"

?fY]g'A Yhha Ubb"'<]a a Y`gVYcVUW\hYf'i bX'A cbX`]YV\UVYf'gc``hYbg]W\'XYb'\Yi h][Yb'%- "'5i [i gh'fch']a '?U`YbXYf'UbghfY]W\Yb'`8YbbUa '5VYbX'Yfk UfhYh'i bg'Y]b'ZUgn]b]YfYbXYg'GdY_hU_Y``Ua BUW\h\]a a Y`ž'XUg'g]W\'gc'gW\bY```b]W\h'k]YXYf\c`Yb'k]fX"'; `Y]W\nk Y]'Ughfcbca]gW\Y'9fY][b]ggY'ZU``Yb'ni gUa a Yb.'8Yf'A cbX YffY]W\h'gY]bY'a Ul]a U`Y'<Y``][_Y]h'i bX'; fO\sYž'k\A\fYbX'Yf [`Y]W\nY]h]['U`g' 6`Ui Yf'A cbX 'VYnY]W\bYh'k]fX"'8]Yg']gh'Y]bUi \sYf[Yk\O\b`]W\Yf'5bV`]W_ž'XYb'gck c\``<cVVmUghfcbca Yb'U`gUi W\'bYi []Yf][Y'Ni gW\Ui Yf'[Yb]Y\sYb'_ObbYb"

8Yf'< Ö\Ydi b_h'X]YgYg'VYgcbXYfYb'A cbXYg'hf]hh'i a '&\$"&*'l \f Y]bž'k Ybb'XYf'A cbX'VYgcbXYfg'bU\'Ub'XYf'9fXY']gh''8]Yg [YgWk]Y\h'Ui Z[fi bX'gY]bYf'Y``]dh]gWkYb'l a `Ui ZVU\bž'X]Y']\b']b X]YgYb'5VYbXghi bXYb']b'X]Y'BÀ\Y'i bgYfYg'D`UbYhYb'Vf]b[h'' 8Yg\U`V'YfgWkY]bh'XYf'A cbX'U`g'Gi dYfa cbXž'k Ug'VYXYi hYhž'XUgg Yf'\Y``Yf'i bX'[fÒ» Yf'U`g'[Yk Ò\b`]Wk'ghfU\`h'''Gc`Wk'Y]b'9fY][b]g']gh Y]b'k U\fYg': Ygh'ZØf'X]Y'5i [Yb'i bX'gY`Vgh'ZØf'gWk`]Wk hY 6YcVUWkhYf'Y]bZUWk'UhYa VYfUi VYbX''

5ghfcbca]gWX Y GY `hYb \ Y]h. 8 Yf 6 `Ui Y A cbX

8cW. k Ugʻ[YbUi 'VYXYi hYh'Ygž'k Ybbʻj cbʻY]bYa '6`Ui YbʻA cbXX]YʻFYXYʻ]gh3·8]YgYgʻD\Àbca YbʻVYnY]W\bYh'X]YʻG]hi Uh]cbž']bʻXYfY]bYʻ\J\fYgnY]hʻa Y\f`U`gʻX]YʻØV`]W\YbʻXfY]'Jc``a cbXYʻUi Zk Y]gh"ʻ\DX]YgYa '\J\f'dUgg]Yfh`X]Ygʻ]a '5i [i ghž'k UgʻghUh]gh]gW\`[YgY\Ybʻbi f

U``Y`nk Y]Y]b\U`V`V]g`XfY]`\J\fY`j cf_ca a h"`8Yf`\Yi h][Y`5VYbX k]fX`gca]h`b]W\h`bi f`j cb`Y]bYa `gi dYf`\Y``Yb`A cbX`[YdfÀ[hž gcbXYfb`Ui W\j cb`Y]bYa `k U\f\UZh][`gY`hYbYb`BUhi fYfY][b]g"

8 Ugʻ[`Y]W\nY]h][Yʻ5i ZhfYhYbʻX]YgYfʻVY]XYbʻD\Àbca YbYʻ[]Vh
5b`Uggʻni fʻ: fYi XYʻb]W\h'bi fʻi bhYfʻXYbʻ5ghfcbca]Y!9bh\i g]UghYbž
gcbXYfbʻUi W\ʻU``ʻYbYbžʻX]YʻY]bZUW\ʻXYbʻ5bV`]W_ʻY]bYg
ghfU\`YbXYbʻ<]a a Y`gʻ[Yb]Y» Yb"'@YhnhYgʻ\$J\f`\UhhYbʻk]fʻVYfY]hg
Y]bYbʻ gi dYfʻV`i Yʻa ccb žʻUVYfʻgc`W\Yʻ; Y`Y[Yb\Y]hYbʻg]bX
_cghVUf"J]Y`Yʻ\UVYbʻX]YgYgʻGW\Ui gd]Y``a Ò[`]W\Yfk Y]gYʻj YfdUggh
i bXʻ_ÒbbYbʻ\Yi hYʻ5VYbXʻX]Yʻ7\UbWYʻbi hnYbž'a Y\fʻXUfØVYfʻni
`YfbYbʻcXYf´Y]bZUW\`X]YʻGW\Òb\Y]hʻXYgʻBUW\h\]a a Y`gʻni
gW\ÀhnYb"

8]Y: Ugn]bUh]cb: ZØf: XYb: A cbX:]gh: b]W. h: bYi: ":GY]h: *J\f\i:bXYfhYb]bgd]f]Yfh: Yf: A YbgW. Yb: ni: ; YX]W. hYbž:@]YXYfb: i:bX k]ggYbgW. UZh:]W. Yb: 9bhXYW_i:b[Yb": *b_fYa YbhU: Yg: K]ggYb: ØVYf X]Y: <]a a Y:g_OfdYf: k:ifXY: Xi:fW.:6YcVUW. hi:b[Yb:ibX::cfgW.ib[ghYh]['Yfk Y]hYfh":8]Y:\Yi:h][Y:BUW. h:]gh: Y]bY: 9]b: UXi:b[ž:g]W.:a]h XYf: 5ghfcbca]Y: ni: VYgW. AZh][Yb:ibX:j]Y:`Y]W. h:Ui:W.:bYi:Y:UW. hhYb: X]YgYf: U:hYb:8]qn]d:]b:ni: YbhXYW_Yb"

: Øf'U```X]Y Yb][Ybž'X]Y 'X]Y '; Y`Y[Yb\Y]h'b]W\h'gY`Vgh'Yf`YVYb
_\ObbYbž'[]Vh'Yg'a]hh`Yfk Y]`Y'nU\`fY]W\Y'@j Y!GhfYUa g'i bX
6Yf]W\hYfghUhhi b[Ybž'X]Y 'XUg'; YgW\Y\Yb'Ua 'BUW\h\]a a Y`
Xc_i a Ybh]YfYb" 8 Ug'VYXYi hYhž'Ui W\k Ybb'X]Y 'K c`_Yb'g]W\'ØVYf
A Yhha Ubb'ni gUa a Ybn]Y\Ybž'a i gg'XYf'5VYbX'b]W\h'j Yf[Yi XYh
k YfXYb"'9]b'Y]bZUW\Yg'; Yf\h'cXYf'Ni VY\\Of'i bX'X]Y
Ughfcbca]gW\Y'6Y[Y]ghYfi b['_\ObbYb'\YXYa '\Y`ZYbž'XUg
D\\Abca Yb'ni 'j YfghY\Yb'i bX'ni 'k ØfX][Yb"

9]b:YghZØfX]YG]bbYibXX]YK]ggYbgWXUZh

K À\fYbX'X]Y'A YbgW\Yb'U`gc']\fY'HY`Yg_cdY'i bX'? Ua YfUg j cfVYfY]hYbž'i a 'X]YgYg'BY[`][Å'XYf'BUhi f'\cW\ni Ø» Ybž'_ÒbbhY X]Y'\Yi h][Y'BUW\h'Ui W\'Y]bY'+bgd]fUh]cb'ZØf'X]Y': cfgW\i b['gY]b" 5`g'Gi dYfa cbX'i bX'6`Ui Yf'A cbX'ni gUa a YbZU``Ybž'k]fX'b]W\h'bi f XUg'+bhYfYggY'ZØf'XYb'5i [YbV`]W_'[Yk YW_hž'gcbXYfb'Ui W\'XUg'ZØf

ni _ØbZh][Y'Ghi X]Yb']b'6Yni ['Ui Z'd`UbYhUf]gW\Y'6Yk Y[i b[Yb" K]ggYbgW\UZh`Yf'_ÒbbhYb'X]Y'; Y`Y[Yb\Y]h'bi hnYbž'i a '8 UhYb'ni gUa a Y`b'i bX'X]Y'5i gk]f_i b[Yb'gc`W\Yf'D\Àbca YbY'Ui Z'X]Y'9fXY YfbYi h'ni 'i bhYfgi W\Yb"

GWX`]Y»`]WX`[]Vh'Yg`_Ui a 'Y]bYb`VYggYfYb`A ca Ybhži a 'g]WX`a]h UbXYfYb`<]a a Y`gVYcVUWXhYfb`ni 'j YfV]bXYb"'9[U``cV`VY]'Y]bYa 5VYbXgdUn]Yf[Ub[ž'Y]bYf`cf[Ub]g]YfhYb`6YcVUWXhi b[g[fi ddY cXYf`Y]bZUWX`]a 'Y][YbYb'; UfhYb` 'XYf`A cbX`\Uh'X]Y`?fUZhž A YbgWXYb`ni gUa a Ybni Vf]b[Yb`i bX'; YgdfÀWXY`ni 'YbhZUWXYb" 8]Y`?ca V]bUh]cb`Ui g`Y]bYa 'Gi dYfa cbX`i bX`Y]bYa '6`Ui Yb`A cbX V]YhYh'X]Y`dYfZY_hY`?i`]ggYži a 'XYb'6`]W_`]b`XYb`<]a a Y``ni f]WXhYb`i bX`g]WX`j cb`XYf`i bVY[fYbnhYb`K Y]hY`XYg`l b]j Yfgi a g]bgd]f]YfYb`ni ``UggYb"

 $5 \cdot gc \check{z} \cdot]YVY \cdot @YgYf]bbYb \cdot i \cdot bX \cdot @YgYf\check{z} \cdot nØW_Yb \cdot G]Y \cdot \Rightarrow fY \cdot Bch]nV \cdot \grave{O}W_Y \\ i \cdot bX \cdot]bZcfa \]YfYb \cdot G]Y \cdot g]WX \cdot ØVYf \cdot X]Y \cdot VYghYb \cdot 6YcVUWX hi \cdot b[gd `AhnY \cdot]b \\ \Rightarrow fYf \cdot BA \setminus Y'' \cdot J \cdot Yf[YggYb \cdot G]Y \cdot b]WX h\check{z} \Rightarrow fY \cdot : Ua \]`]Y \cdot cXYf \cdot : fYi \cdot bXY \\ Y]bni \cdot `UXYb\check{z} \cdot XYbb \cdot ni \cdot gUa \cdot a \cdot Yb \cdot XUg \cdot K \cdot i \cdot bXYf \cdot XYf \cdot BUhi \cdot f' \cdot ni \cdot [Yb]Y \cdot Yb\check{z} \\]ghY]bYg \cdot XYf \cdot gWX \cdot \grave{O}bghYb \cdot 8]b[Y'' \cdot GWX \cdot Ui \cdot Yb \cdot G]Y \cdot Y]bZUWX \cdot bUWX \cdot cVYb \\ i \cdot bX \cdot `UggYb \cdot G]Y \cdot g]WX \cdot j \cdot cb \cdot XYf \cdot A \cdot U[]Y \cdot XYg \cdot <]a \cdot Y \cdot g \cdot j \cdot YfnUi \cdot VYfb''$

8 Yf 'Gi dYfa cb Xž XYf']b '8 Yi hgW `Ub X 'ni 'VYc VUW hYb']ghž]gh'b]W h bi f'Y]b 'Agh\Yh]gWX Yg 'GdY_hU_Y`ž 'gcb XYfb'\Uh'Ui W k]ggYbgWX UZh`]WX Y FY Yj Ubn" '6 Ygcb XYfg'VY] '5 ghfcbca Yb'g]b X gc`WX Y '9fY][b]ggY'j cb' \$\Delta hYfYggYž'k Y]`'g]Y'k Yfhj c``Y' \$\Delta Zcfa Uh]cbYb \\ \tilde{\Omega}VYf'X]Y'A cb XVYk Y[i b[Yb'i bX'XYfYb'9]b Zi gg'Ui Z'X]Y'9fXY \\ \]YZYfb"'8]Y 'HUhgUWX Yž XUgg 'XYf'A cb X'g]WX']b'Y]bYf'Y``]dh]gWXYb 6U\b'VYk Y[hž'Z\(\Omega\) fh'ni 'XYb'J Uf]Uh]cbYb']b'gY]bYf'; f\(\Omega\) Y'i bX \\ \'Y``][_Y]h"'8]Yg']gh'b]WX h'bi f'Z\(\Omega\) f'XYb'A cb X'gY`Vgh'VYXYi hYbXž gcbXYfb'VYY]bZi ggh'Ui WX'; YnY]hYb'i bX'UbXYfY | a k Y`hVYX]b[i b[Yb'Ui Z'XYf'9fXY''

8 Yf '6 Y[f]ZZ' Gi dYfa cbX 'k i fXY'bcW 'b]W h '\ Ub[Y'j Yfk YbXYh i bX ZUbX 'Yfgh']b 'XYb '\YhnhYb '\J\fYb '9]bni [']b 'X]Y 'dcdi '\AfY 5ghfcbca]Y "'8 Yf 'YfghY 'Xc_i a Ybh]YfhY 'Gi dYfa cbX 'ZUbX '%-+-ghUhhž 'UVYf 'Yg']gh 'Yfgh 'gY]h 'XYb '\&\\$\\$\fYb \Z'XUgg 'XUg D\\Abca Yb']b 'XYb '\AYX]Yb 'dcdi '\Af 'k i fXY "'K \A\fYbX'X]Y '\AYbgWXYb

]b`XYf`JYf[Ub[Yb\Y]h`_Y]bY`gdYn]Y``Yb`BUaYb`ZØf`X]YgY 9fY][b]ggY`\UhhYbž`Vf]b[h`X]Y`acXYfbY`?caaib]_Uh]cb`X]Y GW\Ob\Y]h`XYg`Ib]jYfgiag`b\A\Yf`ibX`aUW\h`Ughfcbca]gW\Y D\\AbcaYbY`ZØf`Y]bY`VfY]hYfY`2ZZYbh`]W_Y]h'jYfgh\AbX`]W\`ibX ni[\\Ab[`]W\"

9]b 6`]W_`Ui Z`X]Y``YhnhYb Gi dYfa cbX! 9fY][b]ggY

=a '≯J\f'&\$&&'[UV'Yg'Y]bYb'VYgcbXYfg'a Uf_UbhYb'Gi dYfa cbXž
XYf'j cb'5ghfcbca Yb'U'g' Gi dYf'6'i Y'A ccb 'VYnY]W\bYh'k i fXYž
k cVY]'XYf': c_i g'Ui Z'XYf'gY'hYbYb'?ca V]bUh]cb'Y]bYg
Gi dYfa cbXYg'i bX'Y]bYg'V'Ui Yb'A cbXYg'`U["'8]YgY'9fY][b]ggY
g]bX'Y]b'\Yfj cffU[YbXYg'6Y]gd]Y`'XUZØfž'k]Y'K]ggYbgW\UZh'i bX
ÒZZYbh`]W\Y': UgW]bUh]cb'Ui ZY]bUbXYfhfYZZYb"'8]Y'A Ò[`]W_Y]hž
gc`W\Y'9fY][b]ggY'ni 'VYcVUW\hYbž'a ch]j]Yfh'j]Y`Y'A YbgW\Yb'XUni ž
g]W\'ZØf'5ghfcbca]Y'ni ']bhYfYgg]YfYb"'Ni [Y[`]W\'k]fX'X]Yg'j cb
X]j YfgYb'k]ggYbgW\UZh`]W\Yb' ⊕gh]hi h]cbYb'i bhYfghØhnhž'X]Y
ÒZZYbh`]W\Y'6YcVUW\hi b[gUVYbXY'i bX'6]`Xi b[gdfc[fUa a Y
UbV]YhYb"

8]Y``YhnhYb`\J\fY`\UVYb`Ui W\`[YnY][hž`XUgg`X]Y`G]W\hVUf_Y]h`XYg A cbXYg`j cb`XYf`@]W\hj YfgW\a i hni b[`]b`i fVUbYb`; YV]YhYb VYY]bZi ggh`k]fX"'\D``\AbX`]W\YfYb`FY[]cbYb`_\ObbYb`6YcVUW\hYf X]Y`GW\Ob\Y]h`i bX`8YhU]`g`XYg`A cbXYg`cZh`VYggYf`YfZUggYb`U`g`]b Gh\AXhYbž`k c`XUg`@]W\h`XYf`GhfU\Yb`UhYfbYb`X]Y`G]W\h`Ui Z`XYb <]a a Y``VYY]bhf\AW\h][Yb`_Ubb"'\DhYfYgg]YfhY`_\ObbYb`a]hh`Yfk Y]`Y Ui W\`cb`]bY`Ub`@j Y!\\VYfhfU[i b[Yb'j cb`5ghfcbca]Y!5ghfcbca Yb hY]`bY\a Ybži a `]b`XYb`; Ybi gg`gc`W\Yf`GdY_hU_Y``ni `_ca a Ybž Y[U``k c`g]Y`g]W\`VYZ]bXYb"

K]ggYbgWX UZh`]WX Y '9f_Ybbhb]ggY 'ni A cbXnm_`Yb i bX XYfYb '5i gk]f_i b[Yb

8]Y'AcbXnm_`Yb'i bX'XYfYb'A]h\]`ZY'VY]'j YfgW\]YXYbYb'5gdY_hYb XYg'@YVYbg'Ui Z'XYf'9fXY'ghY\Yb']a 'A]hhY`di b_h'nU\`fY]W\Yf k]ggYbgW\UZh`]W\Yf'I bhYfgi W\i b[Yb"'9]bY'Ghi X]Y'XYg'5a Yf]WUb £i fbU``cZ'5ghfcbca minY][hž'XUgg'XYf'A cbX'Y]bYb'X]fY_hYb
9]bZi gg'Ui Z'XYb'a YbgW\`]W\Yb'GW\`UZ\UVYb'_Ubbž'k cVY]'Y]b][Y
A YbgW\Yb'ØVYf'i bfi \][Y'BÀW\hY'k À\fYbX'Y]bYg'J c``a cbXg
VYf]W\hYb"'8UfØVYf'\]bUi g'[]Vh'Yg': cfgW\i b[Yb'ØVYf'X]Y
5i gk]f_i b[Yb'j cb'A cbXd\UgYb'Ui Z'X]Y'H]Yfk Y`h"'Ni a '6Y]gd]Y`\UVYb'Y]b][Y':]gW\UfhYb']\fY'6fi h!'i bX': cfhdZUbni b[gnm_`Yb'Ub
XYb'A cbXd\UgYb'Ui g[Yf]W\hYhz'k Ug'ZØf'X]Y':]gW\YfY]k]fhgW\UZh
j cb'6YXYi hi b[']gh"

I a 'Y]bY'VfY]hYfY'DYfgdY_h]j Y'ni '[Yk]bbYbža ØggYb'k]f'Ui W\kY`hkY]h'X]Y'_i `hi fY``Yb'6YXYi hi b[Yb'XYg'AcbXYg'VYhfUW\hYb"'=bj]Y`Yb'?i `hi fYb'\Uh'XYf'AcbX'Y]bY'gmaVc`]gW\Y'6YXYi hi b['i bXgd]Y`h'Y]bY'nYbhfU`Y'Fc``Y']b'HfUX]h]cbYb'i bX'Amh\Yb"'8]YgY_i `hi fY``Yb'=bhYfdfYhUh]cbYb'nY][Ybž'k]Y'Yb['XUg'aYbgW\`]W\Y@YVYb'a]h'XYb'bUhØf`]W\Yb'Nm_`Yb'XYf'<]aaY`g_OfdYf'jYfVi bXYb]gh"

8 i fWX 'X]Y '6YcVUWX hi b[Yb 'XYf'A cbXd\Àbca YbY'i bX']\fYf
5 i gk]f_i b[Yb 'k]fX 'XYi h`]WX ž'XUgg 'X]Y : Ugn]bUh]cb 'ZØf'XYb 'A cbX
b]WX h'bi f'Ui Z'Y]bYa 'Àgh\Yh]gWX Yb '9f`YVb]g 'VUg]Yfhž'gcbXYfb 'Ui WX
h]YZ']b 'XYf'BUhi fk]ggYbgWX UZhi bX 'XYf'a YbgWX`]WX Yb '?i `hi f
j Yfk i fnY`h']gh" '8 Yf'A cbX 'V`Y]Vh'Y]b 'ZUgn]b]YfYbXYg
: cfgWX i b[gZY`Xž'XUg'gck c\`'_Øbgh`Yf]gWX Y'U`g'Ui WX
k]qqYbqWX UZh`]WX Y'5qdY_hY'a]hY]bUbXYf'j YfV]bXYh"

8 Y hU1`a

6 Y gi W Y b 'G] Y 'i b g 'U i Z 'b ! U ["X Y