

# GWXÀZYf\ØbX]b'5`]W]U'gi WXh'Y]b `]YVYj c``Yg'Ni \Ui gY']b'BØfbVYf[

GW.ÀZYf\ØbX]b'5`]W]U'gi W.h'bUW.'Y]bYa 'bYi Yb'Ni \Ui gYž'XU ]\f'6Yg]hnYf'g]W.'b]W.h'a Y\f'i a 'g]Y'\_Øa a Yfb'\_cbbhY''G]Y ]gh'ZfYi bX`]W\ž'`]YV'i bX'a UW.h'[YfbY']a 'K UggYf''

 $= a \cdot B \cdot \emptyset fb \vee Y f[ Y f' H] Y f' Y ] a \cdot [ ] V h' Y g' Y] b Y \cdot Y b [ Y \cdot GWAZY f' \otimes b X] b \\ b Ua \ Y b g' 5 \cdot ] W] U \check{z}' X] Y \cdot g] W \cdot X f] b [ Y b X \cdot Y] b \cdot b Y i \ Y g' N i \ U i \ gY \cdot k \ \otimes b gWA h'' \\ 5 i \ Z[ fi b X \cdot i b [ `\@W_`] W Y f' I a \ ghAb X Y '_cbbhY \cdot] \ f' Z f @\ Y f Y f' 6 Y g] hn Y f \\ b] WA h'a \ Y \ f' Z \@f' g] Y \cdot g c f[ Y b \check{z}' k \ Y g \ U \ V \cdot X] Y \cdot < \@b X] b \cdot ] a \cdot H] Y f \ Y] a \\ i \ bhY f[ Y V f U W h' k \ Y f X Y b \cdot a \ i \ gghY'' \cdot 8 ] Y g Y f' G W f] hh'] gh' b] W h' Y] b Z U W \check{z} \\ X Y b b \cdot 5 \cdot ] W] U \cdot V h' V ] g \ Y f' U i \ Z' X Y f' G h f U \ Y \cdot [ Y \cdot Y V h' i \ b X \cdot a \ i \ gg \cdot g] W \cdot b i \ b U b \cdot Y] b \cdot [ U b n' b Y i \ Y g' @Y V Y b' i \ b X \cdot I \ a \ Z Y \cdot X \cdot [ Y k \ O \ b Y b'']$ 

; YfUXY'Y]ba U``Y]b`\$J\f`U`hž`\Uh'X]Y`Ub\Àb[`]W\Y'< ØbX]b`gW\cb j ]Y``Yf`YVh"`G]Y`k ]fX`j ca `H]Yf\Y]a `U`g`ZfYi bX`]W\ž`[Y`Y\f][ `i bX `]YVYj c```VYgW\f]YVYb"`6YgcbXYfg`k ]W\h][ `]gh`Ui W\ž`XUgg`5`]W]U`[ i h a ]h`UbXYfYb`< i bXYb`ni fYW\h\_ca a h`i bX`gc[ Uf`?]bXYf`]b`]\fYa bYi Yb`Ni \Ui gY`\_Y]b`DfcV`Ya `ZØf`g]Y`XUfghY``Yb`k ØfXYb"`\\fY ZfÒ\`]W\Y`5fh`nY][ h`g]W\`VYgcbXYfg`]b`]\fYa `[ fc\fy Yb`6YXØfZb]g bUW\`K UggYf` \5`]W]U`]gh`Y]bY` YW\hY`K UggYffUhhY \ž`X]Y`\_Y]bY DZØhnY`Ui g`\hagh"

### 5`]W]Ug GhÀf\_Yb i b X 9][ YbgW UZhYb

a ØggYbž'k À\fYbX']\fY'A YbgW\Yb'UfVY]hYb'cXYf'UbXYfY JYfdZ]W\hi b[Yb'\UVYb"

 $8 ]Y'fi \setminus ][Y'ibX'UiZa Yf_gUa Y'5fh'XYf' < \varnothing bX]b'hfÀ[h'nif'dcg]h]j Yb \\ 9]bgWAhnib['VY]'''G]Y'k]fX'U`g``Y]bYbZØ\f]['VYgWXf]YVYbž'kUg \\ VYXYihYhž'XUgg'g]Y'[ih'Ub'XYf'@Y]bY'[Y\hibX'jcb']\fYb'bYiYb \\ < YffWAYb'cXYf':fUiWAYb'`Y]WAh']b'X]Y'f]WAh][Y'F]WAhib['[Y`Y]hYh k YfXYb'_Ubb'''8]Yg'_ObbhY'Y]bY'9f`Y]WAhYfib['ZØf'j]Y`Y' < U`hYf XUfghY``Ybž'jcf'U``Ya 'ZØf'YbYž'X]Y'j]Y``Y]WAh'b]WAh'j]Y``'9fZU\fib[a]h' < ibXYb'\UVYb''$ 

#### 8 Y hU]`g'ni '5`]W]U

BUa Y	5`]WJU
FUggY	GWAZYf\i bX
; YgW `YW h	k Y]V`]W
; YVi fhghU[	%"`5df]``&\$&'
∍a ˈH]Yf\Y]a ˈgY]h	*"'; `]'&\$&(

### 8YfKY[]bgH]YfY]a

5`]W]U']gh'Y]bY'VYgcbXYfY'<ØbX]bž'X]Y'Xi fWX']\fY'JYf[Ub[Yb\Y]hUi Z'XYf'GhfU»Y'j]Y`Y'<YfUi gZcfXYfi b[Yb'ØVYfk]bXYb'a i gghY"8]YgY'@YVYbgg]hi Uh]cb'Vf]b[h'cZh'j]Y`Y'I bg]WXYf\Y]hYb'a]h'g]WXži bX'Yg'YfZcfXYfh'j]Y`'; YXi `X'i bX'JYfghÀbXb]g'j cb']\fYb'bYi Yb6Yg]hnYfbž'i a 'g]Y']b'XUg'fi\][Y'i bX'g]WXYfY'Ni\Ui gY'ni]bhY[f]YfYbž'XUg'g]Y'j YfX]Ybh'\Uh"8Ug'H]Yf\Y]a 'VYhcbhž'XUgg5`]W]U'g]WX'gWXbY``'Ub'XUg'@YVYb']b'Y]bYa '[YgWXØhnhYfYb'I a ZY`X[Yk\O\bYb'\_Ubb'i bX'X]Y'f]WXh][Yb'A YbgWXYb'\]bhYf'g]WX'VfUi WXhžX]Y']\fG]WXYf\Y]h'i bX'GhUV]`]hÀh'V]YhYb'\_ObbYb"

8 Yf'U\_hi Y``Y'5i Zfi Z'XYg'B ØfbVYf[ Yf'H]Yf\Y]a g``Àggh'j ]Y`Y dchYbn]Y``Y'UXcdh]Yfhg'DYfgcbYb'\cZZYbž'XUgg'g]Y'Y]bYf'< ØbX]b k ]Y'5`]W]U'Y]b'bYi Yg'Ni \Ui gY'V]YhYb'\_ObbYb"'\dot\Y]bYa 'I a ZY`Xž XUg'Y]bZØ\`gUa 'i bX'`]YVYj c```]ghž'\_Ubb'5`]W]U']\fYf': fYi XY'i bX 9bYf[ ]Y'ZfY]Yb'@Ui Z'`UggYb"'8Yf'H]YfgW\i hnj YfY]b'\cZZhž'XUgg'X]Y A YbgW\Yb'ØVYf'5`]WU']\f'<Yfn'OZZbYb'i bX'g]Y']b']\f'bYi Yg'@YVYb VY[ `Y]hYb'a OW\hYb"' K Yf'[ ]Vh'XYf'^\b[ Yb'<ØbX]b'Y]b'Ni \Ui gY'ZØf ]a a Yf3 ž'ZfU[ h'XUg'H]Yf\Y]a 'Ui Z'gY]bYf': UWVVcc\_!GY]hY'i bX'fi Zh

8 c W 'b ] W hibi f '5 `] W] U 'gi W hiy ] b 'b Yi Yg 'Ni \ Ui gY " '5 i W 'Ub XY fY < i b XY ž k ] Y 'XY f '? Ub [ U ` '5 `Z] 'i b X 'XY f '6 f U W\_Y! A ] I '? `Ui gž \ c ZZY b 'Ui Z Y] b 'V YggY f Yg '@Y V Y b " K À\ f Y b X '5 `Z] 'Ui g 'g W `Y W h Y f '< U `hi b [ [ Yf Y h h Y h 'k i f XY ž '] g h '? `Ui g 'V Y f Y] h g 'ni a 'X f] h h Y b 'A U ` '] a 'H] Y f \ Y] a " 8 ] Y g Y 'G W ] W\_g U `Y 'i b h Y f g h f Y] W Y b 'X] Y '[ f c » Y b ' < Y f Ui g Z c f X Y f i b [ Y b ž a ] h 'X Y b Y b 'j ] Y `Y 'H] Y f Y \_c b Z f c b h] Y f h 'g] b X " '5 `] W] U '] g h 'b i f 'Y] b Y g 'j c b j ] Y `Y b 'H] Y f Y b ž X] Y 'Ui Z Y] b 'b Y i Y g 'Ni \ Ui g Y `\ c Z Z Y b 'i b X 'X Y b A Y b g W Y b 'h f Y i Y ': f Y i b X Y 'Z Ø f g '@Y V Y b 'g W Y b \_O b b Y b "

# 5`]W]UgʻbYi Yʻ7\UbWYʻUi ZʻY]bʻ`]YVYj c``Yg < Y]a

8]Y'G]hi Uh]cb'j cb'5`]W]UžXYf'GW\ÀZYf\ØbX]bž']gh'5i gXfi W\_'Y]bYf
[fÒ»YfYb'DfcV`Ya Uh]\_']a 'I a [Ub['a]h'H]YfYbž'X]Y']\f'Ni\Ui gY
j Yf']YfYb"'8]Y'ghY][YbXY'NU\`'j cb'<Ui gh]YfYbž'X]Y'Ui g
i bhYfgW\]YX`]W\Yb'; fØbXYb']b'H]Yf\Y]a Yb'`UbXYbž'gd]Y[Y`h'Y]bY
VYgcf[b]gYffY[YbXY'FYU`]hÀh'k]XYf"'=bgVYgcbXYfY']b'ghÀXh]gW\Yb
; YV]YhYb'k]Y'BØfbVYf[ž'kc'k]fhgW\UZh`]W\Y'I bg]W\Yf\Y]hYb'i bX
dYfgÒb`]W\Y'Bch`U[Yb'ni bY\aYb'\_ObbYbž'g]bX'j ]Y`Y'H]YfVYg]hnYf
[Ynki b[Ybž'q]W\j'cb']\fYb'H]YfYb'ni 'hfYbbYb"

<i bXY'Ui g'gW\k ]Yf][ Yb'J Yf\\\A`\hb]ggYb

5`]W]Ug'; YgWX]WXhY']gh'\_Y]b'9]bnY`ZU``"'J]Y`Y'<i bXYž'X]Y'Ui g'XYf CV\i h']\fYf'6Yg]hnYf'[Yf]ggYb'k YfXYbž'Yf`YVYb'À\b`]WXY GWX]W\_gU`Y"'GhUh]gh]\_Yb'nY][Ybž'XUgg']a '\*\J\f'&\\$\&' '8Yi hgWX`UbX]bg[YgUa h'Yhk U'' \\$"\\$\\$'<i bXY']b'H]Yf\Y]a Yb'Ui Z'Y]b'bYi Yg

 $8Yf^5$  hu[ ]a H]Yf\Y]a

8 Ug B ØfbVYf[ Yf H]Yf\Y]a ž ]b XYa 5 `]W]U XYfnY]h YVhž \_ Øa a Yfh g]WX i a j ]Y Y H]YfYž X]Y c Zh Ui g dfY \_ ÅfYb @YVYbgg]hi Uh]cbYb \_ ca a Yb " < ]Yf k YfXYb X]Y H]YfY b]WX h bi f j Yfgcf[ hž gcbXYfb Ui WX Ui ZY]b ni \_ ØbZh][ Yg @YVYb ]b Y]bYa bYi Yb Ni \ Ui gY j cfVYfY]hYh" 8 ]Yg VY]b\U`hYhYhK U X]Y Gcn]U`]g]Yfi b[ a ]h Ub XYfYb H]YfYb i b X A YbgWX Yb gck ]Y [ fi bX`Y[ YbXY 9fn]Y\i b[ " 9I dYfhYb ]a 6YfY]WX XYf H]YfgWXi hnUfVY]h VYhcbYb X]Y 6YXYi hi b[ " X]YgYg DfcnYggYg ZØf X]Y + bhY[ fUh]cb XYf H]YfY ]b Y]b bYi Yg I a ZY X " 8 ]Y H]Yf\Y]a a ]hUfVY]hYf UfVY]hYb `\ Ufh XUfUb Z [ YY][ bYhY : Ua ]`]Yb ZØf YXYg H]Yf ni Z]b XYb ii bX XUVY] XYfYb ]bX]j ]Xi Y``Y 6YXØfZb]ggY ni VYfØW\_g]WX h][ Yb "

8]Y'Fc``Y'jcb'H]YfgWkihncf[Ub]gUh]cbYb

H]YfgWki hncf[ Ub]gUh]cbYb 'gd]Y`Yb 'Y]bY 'YbhgWkY]XYbXY'F c``Y']a

GWki hn'i bX']b'XYf'J Yfa ]hhìi b[ 'j cb'H]YfYb']b'Bch"'G]Y

cf[ Ub]g]YfYb'b]Wkh'bi f'X]Y'DZY[ Yž'gcbXYfb'Ui Wk

5i Z\_`Àfi b[ gUfVY]h'ØVYf'j YfUbhk cfhi b[ gj c``Y'<i bXY\U`hi b[ "'@Ui h
Y]bYf'I a ZfU[ Y'XYg'8 Yi hgWkYb'H]YfgWki hnVi bXYg'g]bX'j ]Y`Y

H]Yf`]YV\UVYf'g]Wk'XYf'ghY][ YbXYb'<YfUi gZcfXYfi b[ Yb'VYk i gghž
X]Y'Y]bY'H]Yf\U`hi b[ 'a ]h'g]Wk'Vf]b[ hž'i bX'k ØbgWkYb'g]Wk'a Y\f
I bhYfghØhni b[ 'Xi fWk'X]Y'; YgY``gWkUZh"'9]b': c\_i g'`]Y[ h'\]YfVY]

XUfUi Zž'dchYbn]Y``Yb'H]YfVYg]hnYfb'ni 'j Yfa ]hhY`bž'XUgg'X]Y

9bhgWkY]Xi b[ 'ZØf'Y]b'<Ui gh]Yf'[ i h'ØVYf`Y[ h'gY]b'gc``hYž'i a

\_ØbZh][ Y'5V[ UVYb'ni 'j Yfa Y]XYb''

8 Ug'K c\``XYf'H]YfY'j cf'5i [Yb

$$\begin{split} &H]Yf\backslash Y]a\ Ybii\ bXiH]YfgWXi\ hncf[\ Ub]gUh]cbYb"'9g']ghik\ ]WXh][\ \check{z}\\ &\grave{O}ZZYbhi]WXY'5i\ Za\ Yf\_gUa\ \_Y]h'Ui\ Z'X]Y'Bch'U[\ Y'j\ cb'H]YfYb']b\\ &H]Yf\backslash Y]a\ Ybini\ 'Yb\_Ybii\ bX'5Xcdh]cbYb'Uig'YfghfYVYbgk\ YfhYb'K\ Y[\ ni\ f'<]`ZY'ni'\ dfcdU[\ ]YfYb"'\#\\ Zcfa\ Uh]cbYb'Uig'XYa\ 'H]Yf\Y]a\\ &B\varnothing fbVYf[\ 'i\ bX'UbXYfYb'\A\\bi\]WXYb'9]bf]WXhi\ b[\ Yb'\_\ObbhYb'XUni\ VY]hfU[\ Ybz'XUg'6Yk\ i\ gghgY]b'k\ Y]hYf'ni\ 'gWX\AfZYb'i\ bX'a\ Y\f\ A\ YbgWXYb'XUni\ 'ni\ 'VYk\ Y[\ Ybz'g]WX'Z\Øf'X]Y'5Xcdh]cb'ghUhh'XYb'?\ Ui\ Z\ Y]bYg'<\Ui\ gh]YfYg'ni\ 'YbhgWX\Y]XYb" \end{align*}$$

8 Y hU1`c

6Ygi WXYb G]Y i bg Ui Z b!U[ "XY