

?iddYb\Y]a .; Yk U`hXY`]_h']a '@]b]YbVi g 'Dc`]nY]'gi W\h'NYi [Yb

?iddYb\Y]a ž&&"\$, "&\$&(ž&%&) 'I\f' '9]b'JcfZU```]b'Y]bYa@|b]YbVig'\Uh'Ua 'A]hhk cW\']b'?iddYb\Y]a 'ZØf'5i ZfY[ib[[Ygcf[h"5a '6U\b\cZ'gh]Y['Y]b'ibVY_UbbhYf'A Ubb']b'XYb6ig']b'F]W\hib['<UiYbYVYfghY]b'Y]b'ibX'ZØ\fhY'_ifn'XUfUiZY]bYb'VfihU`Yb'5b[f]ZZ'UiZ'X]Y'6iga]hUfVY]hYf'ibX'Y]b][YA]hZU\fYf'Uig":8Yf'JcfZU``YfY][bYhY'g]W\'[Y[Yb'%+.'\$'I\fk\A\fYbX'Y]bYf'fY[i`AfYb'

?iddYb\Y]a ž'&&"\$, "&\$&(ž'&%.&) 'I\f' '9]b'JcfZU``']b'Y]bYa @|b]YbVig'\Uh'Ua 'A]hhk cW\']b'?iddYb\Y]a 'ZØf'5i ZfY[ib[[Ygcf[h"'5a '6U\b\cZ'gh]Y['Y]b'ibVY_UbbhYf'A Ubb']b'XYb'6ig']b F]W\hib['<UiYbYVYfghY]b'Y]b'ibX'ZØ\fhY'_ifn'XUfUiZ'Y]bYb VfihU`Yb'5b[f]ZZ'UiZ'X]Y'6iga]hUfVY]hYf'ibX'Y]b][Y'A]hZU\fYf'Uig"

8 Y f J c f Z J `` Y f Y] [b Y h Y 'g] W ` [Y [Y b '% + .' \$ ` I \ f ` k À \ f Y b X ` Y] b Y f f Y [i ` À f Y b ` : U \ f _ U f h Y b _ c b h f c `` Y `] b ` X Y f : f] Y X f] W g h f U » Y " K] Y ` X] Y D c `] n Y] ` V Y f] W h Y h ž k i f X Y ` X] Y `? c b h f c `` Y ` d ` Ò h n `] W ` j c b ` a Ugg] j Y b _ O f d Y f `] W X Y b ` 5 b [f] Z Z Y b ` [Y [Y b ` n k Y] ` ? c b h f c `` Y i f Y ž Y] b Y b ` 6 i g Z U \ f Y f i b X ` a] b X Y g h Y b g ` n k Y] ` \] ` Z Y ` Y] g h Y b X Y : U \ f [À g h Y ` V Y [` Y] h Y h ' ' 8] Y (- ! ' À \ f] [Y `? c b h f c `` Y i f] b ` Y f `] h n] b Z c ` [Y ` X Y f ` G W ` À [Y ` Y] b Y ` g W k Y f Y ; Y g] W h h j Y f ` Y h n i b [` i b X ` a i g g h Y ` a] h Y] b Y a ` F Y h h i b [g X] Y b g h `] b ` Y] b ? f U b _ Y b \ U i g ` [Y V f U W h k Y f X Y b " 5 i W ` X Y f `) + ! ' À \ f] [Y ` 6 i g Z U \ f Y f g c k] Y ` Y] b ` & \$! ' Â \ f] [Y f : U \ f [Ugh ` Y f `] h Y b ` X i f W ` X Y b ` 5 b [f Y] Z Y f 6] g j Y f ` Y h n i b [Y b " ` 9] b ` k Y] h Y f Y f ` \] ` Z Y ` Y] g h Y b X Y f ` : U \ f [Ugh `] a ` 5 ` h Y f j c b ` (* ` \ X \) f Y b ` k i f X Y ` X i f W ` H f] h Y ` X Y g ` 5 b [f Y] Z Y f g j Y f ` Y h n h "

5b[fY]ZYf'Ui Z'XYf': `i W\h

BUWW XYa 'JcfZU```[Y`Ub['Yg'XYa 'HÀhYfž'ni 'Z]Y\Yb"'8]Y'Dc`]nY]
`Y]hYhY'i a [Y\YbX'Y]bY': U\bXi b['Y]bž'X]Y'YXcWW 'ni bÀWW.gh

YfZc`[`cg'V`]YV"'I a 'a Y\f' ⊕ Zcfa Uh]cbYb'ØVYf'XYb'5b[fY]ZYf'ni
Yf\U`hYbž'\cZZYb'X]Y'9fa]hh`Yf'bi b'Ui Z'[Yg]W\YfhYg'J]XYca UhYf]U`"
8 Yf'A Ubb'k]fX'U`g'nk]gW\Yb'&) 'i bX'' \$'\\J\fY'U`h'a]h'gY\f'Xi b_`Yf
<Ui h'VYgW\f]YVYb'i bX'hfi ['ni f'HUhnY]h'Y]b'[fUi Yg'H!G\]fh'gck]Y
Y]bY'\Y``V`Ui Yž'a cX]gW\'nYff]ggYbY'\\J\Ubg"'BUW\'XYf'; Yk U`hhUh
ZØW\hYhY'Yf'ØVYf'XUg'; Y`\AbXY'Y]bYf'HUb_ghY``Yž'k cVY]'Yf'Y]b
[YdUf_hYg'5i hc'VYgW\\AX][hYž'i bX'`]YZ']b'F]W\hi b['?c`d]b[ghfU\)Y
k Y]hYf"

8]Y'Vfi hU`Y'5hhUW_Y'\Uh'b]W\h'bi f'ni 'JYf`Yhni b[Yb'[YZØ\fhž gcbXYfb'ghY\h'Ui W\']a ': c_i g'XYf'9fa]hh`i b[Yb'Xi fW\'XUg Dc`]nY]fYj]Yf'; U[[YbUi "'8]Y'Dc`]nY]'V]hhYh'i a '<]bk Y]gY'Ui g'XYf 6Yj Ò`_Yfi b[ž'i a 'XYb'Ub[fY]ZYbXYb'HÀhYf'ni ']XYbh]Z]n]YfYb" NYi [Yb'cXYf'DYfgcbYbž'X]Y'a Ò[`]W\Yfk Y]gY' \$\DZcfa Uh]cbYb\UVYbž'_ObbYb'g]W\'i bhYf'XYf'Fi Zbi a a Yf'\$+&&)'-,, +!\$ a Y`XYb"

c`[YbiibXFYU_h]cbYb

 $8]Y \cup cfZA``Y']b \cdot OZZYbh`]WXYb \cup Yf_Y \setminus fga]hhY`b \cdot g]bX \cdot U`Ufa]Y fYbX \cdot i bX k Y fZYb : fU[Yb 'ni f'G]WXYf \ Y]h']b \cdot 6i ggYb \cdot i bX \cdot 6U \ bYb \cdot Ui Z'' 8]Y GWX k Y fY \ XYf \ J Yf`Yhni b[Ybž \ X]Y \cdot gck c \ ``X]Y \cdot ? cbhfc ``Yi fY \cdot U`g \cdot Ui WX X]Y \ \]`ZY`Y]ghYbXYb : U\f[A`ghY \ Yf`]hhYb \ UVYbž``A`ggh'Ui Z'Y]bY ni bY\a YbX \ Ub[YgdUbbhY \ @U[Y']a \ OZZYbh`]WXYb \ F Ui a \ gWX`]Y \ Yb'' \ \ \ a Yf'a Y\f'A YbgWXYb \ g]bX \ VYgcf[h'ØVYf'X]Y \ G]WXYf\Y]h'VY] \ XYf B i hni b['XYg'^2 DB J ž']bgVYgcbXYfY']b \ Ghc \ nY]hYbž'k Ybb'X]Y \ 6i ggY \ ØVYfZØ``h'g]bX''$

8 Yf'J cfZU```]b'?i ddYb\Y]a `]gh'b]W\h'bi f'Y]b']gc`]YfhYf'J cfZU``ž gcbXYfb'_ObbhY'HY]`'Y]bYg'[fO`» YfYb'HfYbXg'gY]bž'XYf'X]Y; YgY``gW\UZh']b'XYb'_ca a YbXYb'A cbUhYb'VYgW\AZh][Yb'k]fX" k\A\fYbX'X]Y'Dc`]nY]'a]h'9fa]hh'i b[Yb'VYgW\AZh][h']ghž']gh'Yg k]W\h][ž'XUgg'k]f'ØVYf'i bgYfY'Y][YbYb'G]W\Yf\Y]hgj cf_Y\fi b[Yb]a '5``hU['bUW\XYb_Yb"'9g']gh'j Yfgh\AbX`]W\ž'XUgg'j]Y`Y'DUggU[]YfYg]W\i bk c\``ZØ\`Ybž'bUW\XYa 'g]Y'j cb'gc`W\Yb'J cfZ\A``Yb'YfZU\fYb\UVYb"

 $Gck c \ ``X]Y \ ``c_U`Yb \ `6Y \ `OfXYb \ `U`g \ `Ui \ WX \ `X]Y \ `J \ Yf_Y \ fgVYhf]YVY$

a ØggYb`XUfUi Z'fYU[]YfYbž'i a `XUg`J YfhfUi Yb`XYf`DUggU[]YfY`]b X]Y`G]W\Yf\Y]h`XYg`ÒZZYbh`]W\Yb`BU\j Yf_Y\fg`ni fØW_ni [Yk]bbYb" C V`Xi fW\`Yf\Ò\hY`DfÀgYbn`j cb`G]W\Yf\Y]hgdYfgcbU``cXYf`UbXYfY A U» bU\a Yb. '9g``]Y[h`Ub`]\bYbž`X]Y`bchk YbX][Yb`GW\f]hhY`ni i bhYfbY\a Ybž`XUa]h`g]W\`qc`W\`Y]bY; Yk U`hhUh`b]W\h`k]YXYf\c`h"

<]bhYf[fi bX]bZcfa Uh]cbYb ni f G]WXYf\Y]h]a ÒZZYbh`]WXYb BU\jYf_Y\f</pre>

8]Y'G]WXYf\Y]h']a 'ÒZZYbh']WXYb'BU\j Yf_Y\f']gh'Y]b'nYbhfU'Yg
H\Ya U']b'j]Y'Yb'GhÀXhYb'8Yi hgWX`UbXg"'9g'[]Vh'nU\`fY]WXY
Ghi X]Ybž'X]Y'VY`Y[Ybž'XUgg'cVk c\`'X]Y'A Y\f\Y]h'XYf': U\f[ÀghYa]h'OZZYbh']WXYb'J Yf_Y\fga]hhY`b'g]WXYf'fY]ghž'; Yk U'hg]hi Uh]cbYbk]Y'X]Y']b'?i ddYb\Y]a 'XYbbcWX'j cf_ca a Yb"'@Ui h'Y]bYf
I a ZfU[Y'XYg'+bgh]hi hg'ZØf'8Ya cg_cd]Y'5``YbgVUWX'Ui g'XYa '*J\f
&\$&' '[UVYb'), 'i 'XYf'6YZfU[hYb'Ubž'g]WX'a UbWXa U``i bg]WXYf'ni
ZØ\`Ybž'k Ybb'g]Y'a]h'6i ggYb'cXYf'6U\bYb'ZU\fYb"'; fØbXY'\]YfZØf
g]bX'\Ài Z]['dYfgÒb`]WXY'9fZU\fi b[Yb'cXYf'6Yf]WXhY'ØVYf'J cfZÀ``Y
]b'XYb'A YX]Yb"

 $8]Y ``c_U`Yb `6Y\ OfXYb `UfVY]hYb `XUfUbž'X]Y `G]WX Yf\Y]h `ni `Yf\ O\Ybž]bXYa `g]Y `G]WX Yf\Y]hg_fÀZhY `j YfghÀf_Yb `i bX `a Y\f , VYfk UWXi b[g_Ua YfUg`]bghU``]YfYb"' <math>\Rightarrow$ `j]Y `Yb `GhÀXhYb `k YfXYb gdYn]Y ``Y `GWXi `i b[Yb `ZØf`A]hUfVY]hYf`]a `2 DBJ `Ub[YVchYbž'i a `]b ?cbZ`]_hg]hi Uh]cbYb `VYgcbbYb `fYU[]YfYb `ni `_ObbYb" `8]YgY \Rightarrow]h]Uh]j Yb `gc ``Yb `XUg`J YfhfUi Yb `]b `X]Y `OZZYbh`]WX Yb $J Yf_Y \fggmghYa Y `ghÀf_Yb `i bX `XUg`G]WX Yf\Y]hg[YZØ\``XYf : U\f[AghY `Yf\O\Yb"]$

GhUh]gh]_'ØVYf'; Yk U`h']a 'ÒZZYbh`]W\Yb BU\jYf_Y\f

[Y[Yb'A]hUfVY]hYf']a 'BU\j Yf_Y\fž'Y]bgW\`]Y»`]W\'?cbhfc``Yi fY i bX'6i gZU\fYfž'ni [Ybca a Yb'\UVYb"'8]YgY'HYbXYbn'\Uh'b]W\h bi f'5i gk]f_i b[Yb'Ui Z'XUg'G]W\Yf\Y]hg[YZØ\``XYf'6Ybi hnYfž qcbXYfb'Ui W\'Ui Z'X]Y'5fVY]hgVYX]b[i b[Yb'XYf'5b[YghY``hYb"

8]Y '9fZUggi b['j cb'8 UhYb'ØVYf'J cfZÀ``Y']a '2 DBJ'nY][hž'XUgg']b ghÀXh]gWXYb'; YV]YhYb'XUg'F]g]_c'ZØf'gc`WXY'; Yk U`hU_hY'\Ò\Yf']gh" ±b'Y]bYf'I bhYfgi WXi b['ni a 'H\Ya U' G]WXYf\Y]h']a 'BU\j Yf_Y\f Ui g'XYa '\$J\f'&\$&' 'Ài "YfhYb'ØVYf'+\$'i 'XYf'VYZfU[hYb A]hUfVY]hYf']a 'ÒZZYbh`]WXYb'BU\j Yf_Y\fž'XUgg'g]Y'VYfY]hg'NYi [Yb j cb'; Yk U`h'cXYf'6YXfc\i b[Yb']b']\fYa '5fVY]hgi a ZY`X'[Yk cfXYb g]bX"'8]YgY': U_hYb'VY`Y[Yb'X]Y'Xf]b[YbXY'Bchk YbX][_Y]h'j cb A U» bU\a Yb'ni f'JYfVYggYfi b['XYf'G]WXYf\Y]h"

FYU_h]cbYb XYf; Ya Y]bXYi bX G]WXYf\Y]hga U»bU\a Yb

BUWW XYa "JcfZU```]b"?iddYb\Y]a 'Ài » YfhYb 'g]WW 'gck c\``X]Y

Ofh`]WW Yb 'Dc`]h]_Yf'U`g'Ui WW 'X]Y 'J Yf_Y\fgVYhf]YVY 'VYgcf[h'ØVYf'X]Y

G]WW Yf\Y]h']a 'OZZYbh`]WW Yb 'BU\j Yf_Y\f" '8 Yf'6Øf[Yfa Y]ghYf'XYf

GhUXh'ZcfXYfhY 'Y]bY'ia ZUggYbXY'I bhYfgi WW ib['i bX'VYhcbhY'X]Y

6YXYi hi b['j cb 'DfÀj Ybh]cbga U» bU\a Yb"' \DXYf'bÀWW ghYb

; Ya Y]bXYfUhgg]hni b['k]fX'Yfk UfhYhZ'XUgg'ØVYf'ni gÀhn`]WW Y

G]WW Yf\Y]hgZcbXg'X]g_i h]Yfh'k]fXZ'ia 'gck c\``X]Y', VYfk UWW ib['U`g

Ui WW 'X]Y'DfÀgYbn'j cb'G]WW Yf\Y]hg_fÀZhYb'ni 'Yf\O\Yb"'

8 Yg'K Y]hYfYb'g]bX' = b]h]Uh]j Yb'ni f'GYbg]V]`]g]Yfi b['XYf': U\f[AghY i bX'ni f': OfXYfi b['Y]bYf'fYgdY_hj c``Yb'A]hZU\fh'[Yd`Ubh"'8]YgY A U» bU\a Yb'gc``Yb'b]W\h'bi f'XUg'6Yk i gghgY]b'ZØf'X]Y'[Y`hYbXYb JYf\U`hYbgfY[Y`b']a '6i g'ghAf_Ybž'gcbXYfb'Ui W\'XUg [YgY``gW\UZh`]W\Y'A]hY]bUbXYf'ZOfXYfbž'i a 'gc`W\Y'JcfZA``Y']b Ni_i bZh'ni 'j Yf\]bXYfb"

6 Ygi WX Yb 'G]Y 'i bg 'Ui Z. 'b!U["XY