

### Hi hn]b[Yf'?]bc.BUW\``Ub[Ya K UfhYbghUfhYb X]Y K ]YXYfYfÒZZbi b[gUfVY]hYb

BUWX bYi b A cbUhYb J cfVYfY]hi b[ VY[]bbYb X]Y 5fVY]hYb ni f K ]YXYfYfÒZZbi b[ XYg Hi hn]b[ Yf ? ]bcg " 6Uff]YfYZfY]\Y]h i bX bYi Y HYWXb]\_ ghY\Yb ]a : c\_i g "

A ]h'Zf]gWX Ya '9`Ub'i bX'Y]bYa '\_`UfYb'N]Y`'j cf'5i [Yb'VY[]bbYb'X]Y 5fVY]hYb'ni f'K ]YXYfYfÒZZbi b[ 'XYg'Hi hn]b[Yf'?]bcgž'XUg j cfØVYf[Y\YbX']a '8YnYa VYf'&\$&' 'gWX`]Y» Yb'a i gghY'''8]Y J YfUbhk cfh`]WX Yb'XYg'?i fh\YUhYfg'Hi hn]b[ž'i bhYf'XYf'@Y]hi b['j cb@'W]Y'Jcf`]W\_cj Už'\UVYb'bUWX'a cbUhY`Ub[Yf'D`Ubi b['Y]bY k]WXh][Y'<ØfXY'ØVYfk i bXYb. '8Ug'@UbXfUhgUa h'\Uh'X]Y YfZcfXYf`]WXY'; YbY\a ][i b['YfhY]`h'''8]YgY'9bhgWXY]Xi b['YfZcfXYfh YXcWX'Y]b][Y'5i Z'U[Ybž'X]Y'bi b'gWXbY``gha Ò[`]WX'i a [YgYhnh kYfXYb'a ØggYbž'XUa]h'XYf'?]bcVYhf]YV'VU'X'k]YXYf Ui Z[Ybca a Yb'kYfXYb'\_Ubb''

8]Y'5fVY]hYb'\_cbnYbhf]YfYb'g]W\'U\_hi Y``Ui Z'XYb': ]`a j cfZØ\ffUi a ž k c'VY]gd]Y`gk Y]gY'U`hY'Dc`ghYfg]hnY'YbhZYfbh'i bX'X]Y
FÀi a `]W\\_Y]hYb'YbhfØa dY`h'k i fXYb"'6YgcbXYfY'5i Za Yf\_gUa \_Y]h
[]`h'XYa '6fUbXgW\i hnž'Y]bY'XYf'5i ZU[Yb'XYg'@UbXfUhgUa hg"
<]Yfni 'a ØggYb'X]Y'HfYddYbghi ZYb'Ua 'gØX`]W\Yb': `i W\hk Y[
]bghUbX[YgYhnh'k YfXYb"'8Yf'JYfdÀW\hYf'FcVYfh'< Ufh\Ui gYf'\Uh X]Y'U`hYb'Ghi ZYb'VYfY]hg'UV[Yf]ggYb'i bX'`Àggh'g]W\'Yhnh'j cb
Y]bYa '6fUbXgW\i hngUW\j Yfgh\bX][Yb'VYfUhYbž'i a 'Y]bY'g]W\YfY
@Òqi b['ni 'Z]bXYb"

J]Y`gY]h][Y'5bdUggi b[Yb'ZØf 6Uff]YfYZfY]\Y]h

9]b'k Y]hYfYf'k ]W\h][Yf'Di b\_h']gh'\X]Y'6Uff]\YfY\ZfY]\Y]h"'=a 'FU\a Yb

XYg'+b\_i g]cbg[YXUb\_Ybg'k]fX'Y]bY'a cV]'Y'Fc'`ghi \`fUa dY
]bghU``]Yfhž'X]Y'XYb'Ni [Ub['ni a '?]bcgUU`'Yf'Y]W\hYfh"5i W\'X]Y
VYghY\YbXYb'gUb]hÀfYb'5b`U[Yb'kYfXYb'Ub[YdUggh.'9]bY
VY\]bXYfhYb[YfYW\hY'Hc]`YhhY']gh']b'D`Ubi b[ž'X]Y'XYb
6YXØfZb]ggYb'U``Yf'6Ygi W\Yf'[YfYW\h'kYfXYb'gc``"'6Øf[Yfa Y]ghYf
@ Xk]['<cfb'\Uh'VYfY]hg'gY]bY'I bhYfghØhni b['Ub[YVchYb'i bXk]fX'bUW\': ÒfXYfa]hhY`b'5i ggW\Ui'\U`hYbži a 'X]Y'I a gYhni b[X]YgYf'AU» bU\a Yb'ni 'Yfa Ò[`]W\Yb"

# HYWX b]gWX Y F ]WX h`]b]Yb i bX bYi Y < YfUi gZcfXYfi b[ Yb</pre>

8]Y?]bc`Y]hYf]b'BUX'U'?fUa Yf!A Ufh]b'gck]Y']\f'GhY``j YfhfYhYf

\*U\_cV'<Ufa g'ghY\Yb'j cf'XYf'<YfUi gZcfXYfi b[ž'g]W\']b'X]Y'bYi Y

HYW\b]\_'Y]bni UfVY]hYb'i bX'X]Y'Y\fYbUa h`]W\Yb'A]hUfVY]hYfž'X]Y

gc[YbUbbhYb'?]bcYb[Y` ž'YbhgdfYW\YbX'ni 'gW\i `Yb'':Øf'XYb

fY]Vi b[g`cgYb'5V`Ui Z'XYf':]`a j cfZØ\fi b[Yb']gh'Yg'j cb

YbhgW\Y]XYbXYf'6YXYi hi b[ž'XUgg'U``Y'6YhY]`][hYb'a]h'XYa

?UggYbgmghYa 'i bX'XYb'hYW\b]gW\Yb'; YfÀhYb'j YfhfUi h'g]bX''

 $9]b \cdot gdYn]Z]gWXYg \cdot 8 \ Uhi \ a \cdot \ Z\!\emptyset f \cdot X]Y \cdot K \ ]Y \ XYfYf \rangle DZ\!bi \ b [ \cdot ghY \setminus h \cdot XYfnY]h$ 

bcW.b]WhiZYgh"8]Y DfcY\_hY]hi b[ \UhiYXcW.iXYb Y\f[Y]n][YbD`Ubž5bZUb[ C\_hcVYf'&\$&( k]YXYfini `OZZbYb"8]YgYfiNY]hfU\a Yb\\\\\\\ablab[highUf\_ijcb:XYb:cfhgWkf]hhYb:XYf'5fVY]hYbi]a ::cmYfiibXi]a?]bcgUU`i]a @Ui ZY:XYg'GYdhYa VYfg'UV"'9]bi[YbUi Yg9f\OZZbi b[gXUhi a '\_\ObbhY'V]g'A]hhY'GYdhYa VYff'&\$&( 'VY\_Ubbh [Y[YVYb'kYfXYb"

8 UgʻHi hn]b[Yfʻ?]bcʻj Yf\_ÒfdYfhʻb]Wk hʻbi fʻY]bYbʻC fhʻXYf
I bhYf\Uʻhi b[ʻzʻgcbXYfbʻUi WkʻY]bʻ\_i ʻhi fYʻ`Ygʻ9fVYʻXYfʻFY[]cb"·8Yf
9]bgUhnʻXYfʻ9\fYbUa hʻ]WkYbʻi bXʻXUgʻ9b[U[Ya YbhʻXYf
JYfUbhk cfhʻ]WkYbʻj YfXYi hʻ]WkYbʻXUgʻ6YghfYVYbžʻY]bYbʻk ]Wkh][Yb
HY]``XYfʻ; Ya Y]bgWkUZhʻni fØW\_ni Vf]b[Yb"·8]Yʻ`Ui ZYbXYbʻ5fVY]hYb
i bXʻ5bdUggi b[Ybʻg]bXʻY]bʻGWkf]hhʻ]bʻX]Yʻf]Wkh][YʻF]Wkhi b[ʻzʻi a
X]YʻJYfUbghUʻhi b[Ybʻi bXʻXUgʻ; Ya Y]bgWkUZhgYfʻYVb]gʻ]a
?i fh\YUhYfʻk]YXYfʻni ʻYfa Ò[ʻ]WkYb"·8]Yʻ\_ca a YbXYbʻA cbUhY
k YfXYbʻYbhgWkY]XYbXʻgY]bžʻi a ʻXYbʻhfUX]h]cbYʻ`Ybʻ?]bcgUUʻ`]b
gY]bYfʻbYi Ybʻ: cfa 'k]YXYfni VYʻYVYb"

#### 9]b bYi Yf 5VgWXb]hh ZØf XUg Hi hn]b[Yf?]bc

8]Y'K]YXYfYfÒZZbi b['XYg'?]bcg'gdf]Wkh'ZØf'XYb'i bYfa ØX`]WkYb
9]bgUhn'XYf'?i `hi fY]bf]Wkhi b[Yb'i bX'JYfY]bY']b'Hi hn]b["'\delta'Y]bYf
NY]hž']b'XYf'j ]Y`Y'?]bcg'a ]h'<YfUi gZcfXYfi b[Yb'ni '\_Aa dZYb
\UVYbž'k]fX'\]Yf'Y]bY'VYa Yf\_Ybgk YfhY'\delta]h]Uh]j Y'Yf[f]ZZYbž'i a
Ui Wk'\_ØbZh]['Y]b'VfY]hYg'GdY\_hfi a 'Ub':]`a Yb'i bX
JYfUbghU`hi b[Yb'Ubni V]YhYb"'8]Y'JcfVYfY]hi b[Yb'g]bX']a 'j c``Yb
; Ub[Yž'i bX'X]Y'7ca a i b]hm'\_Ubb'[YgdUbbh'Ui Z'XUg'9f[YVb]g'XYf]bhYbg]j Yb'5fVY]hYb'k UfhYb"

8 Ug'Hi hn]b[Yf'?]bc'\Uh'Y]bY'`Ub[Y'HfUX]h]cbž'X]Y'V]g']bg'%-"

\*J\f\i bXYfh'ni f@W\_fY]W\h"'I fgdf@b[`]W\']a 'J\f'%,)' 'YfVUi hž'\Uh

Yg']a '@Ui Z'XYf'\*J\fnY\bhY'nU\`fY]W\Y'JYfÀbXYfi b[Yb'i bX

FYbcj]Yfi b[Yb'YfZU\fYb"'\*\D'XYb'%-+\\$Yf'\J\fYb'k i fXY'XUg'?]bc

XYi h`]W\'j Yf\_`Y]bYfhž'k Ug'XYb'6Yhf]YV'YXcW\'b]W\h'YfgW\@hhYfhY"

J]Y`Y'6@f[Yf]bbYb'i bX'6@f[Yf'XYf'FY[]cb'\UVYb'bcghU`[]gW\Y

9f]bbYfi b[Yb'Ub'X]Y'Xcfh'[YnY][hYb':]`a Y'i bX'X]Y'VYgcbXYfY

5ha cgd\ÀfY'XYg'<Ui gYg''A]h'XYf'K]YXYfYfÒZZbi b['gc``b]W\h'bi f

Y]bY'@@W\_Y']a '\_i `hi fY``Yb'5b[YVch'XYf'; Ya Y]bXY'[YgW\`cggYbž

gcbXYfb'Ui W\'Y]b'Cfh'XYf'6Y[Y[bib['ibX'XYg'5ighUigW\g[YgW\UZZYb'k YfXYb"

a '?cbhYl h'XYf'U``[Ya Y]bYb'9bhk ]W\_`i b['j cb'?]bcg']b8Yi hgW\`UbX']gh'XYf'BYi UbZUb['XYg'Hi hn]b[Yf'?]bcg
VYa Yf\_Ybgk Yfh"'8]Y'?]bc`UbXgW\UZh'\Uh'g]W\']b'XYb'`YhnhYb
\U\fYb'Xi fW\'X][]hU`Y'5b[YVchY'i bX'GhfYUa]b[!D`UhhZcfa Yb
XfUgh]gW\'j YfÀbXYfh"'8]YgY'<YfUi gZcfXYfi b[Yb'j Yf`Ub[Yb'j cb?]bcg']bbcj Uh]j Y'5bgÀhnYž'i a ']\f'Di V`]\_i a 'Ubni gdfYW\Yb"'8U\Yf
]gh'Yg'k]W\h][ž'XUgg'XUg'?]bc']b'Hi hn]b['Y]bY'UbgdfYW\YbXY
Dfc[fUa a dU`YhhY'UbV]YhYhž'X]Y'gck c\``U\_hi Y``Y':]`a Y'U`g'Ui W\
`c\_U`Y'JYfUbghU`hi b[Yb'i a ZUggh"

### 8]Y'Fc``Y'XYf'9\fYbUa h`]W\Yb']a 'Hi hn]b[Yf ?]bc

9]b'nYbhfU`Yf'5gdY\_h'XYg'Dfc'Y\_hg']gh'XUg'9b[U[Ya Ybh'XYf
9\fYbUa h`]W\Ybž'X]Y'Y]bY'GW\`ØggY`fc``Y']b'XYf'K]YXYfYfÒZZbi b[
XYg'?]bcg'gd]Y`Yb"'Fi bX') \$\$'I bhYfghØhnYf'g]bX'VYfY]hž']\fY'NY]h
i bX'FYggci fWb']b'X]Y'K]YXYfVY`YVi b['XYg'?]bcg'ni ']bj Ygh]YfYb"
8]YgYg'A U» 'Ub'ZfY]k]``][Ya '9b[U[Ya Ybh']gh'Y]b'NY]W\Yb'XYf
; Ya Y]bgW\UZhgV]bXi b['i bX'XYg'\DhYfYggYg'Ub'Y]bYa '`YVYbX][Yb
?i `hi fghUbXcfh'

8]Y'5igV]`Xib['bYiYf'9\fYbUah`]W\Yfž'UiW\'U`g'?]bcYb[Y`VYnY]W\bYhž'nY][h'XUg'6YghfYVYb'XYg'JYfY]bgž'b]W\h'bif
Ò\_cbca]gW\Yž'gcbXYfb'UiW\'gcn]U`Y'BUW\\U`h][\_Y]h'ni
[YkÀ\f`Y]ghYb"'8]Y'9]bV]bXib['XYf'6Øf[Yf']b'XYb'6Yhf]YV'ghY][Yfhb]W\h'bifX]Y'=XYbh]Z]\_Uh]cb'a]h'XYa'?]bcž'gcbXYfb'gW\UZZh'UiW\Y]bY'D`UhhZcfa'ZØf'\_i`hifY``Yb'5ighUigW\'ibX'JYfbYhnib["

## 5\_hi Y``Y'< YfUi gZcfXYfi b[Yb'XYf ?]bcVfUbWXY</pre>

8]Y'<YfUi gZcfXYfi b[Ybž'a]h'XYbYb'?]bcg'U\_hi Y``'\_cbZfcbh]Yfh g]bXž'g]bX'j]Y`ZÀ`h]["'=bgVYgcbXYfY'XYf'9]bZi gg'j cb GhfYUa]b[X]YbghYb'\Uh'XUg'6Ygi W\Yfj Yf\U`hYb'g][b]Z]\_Ubh j YfÀbXYfh" @Ui h'Y]bYf'Ghi X]Y'XYf': ]`a ZÒfXYfUbghU`h'\UVYb'X]Y
Ni gWX Ui YfnU\`Yb']b'XYb'`YhnhYb'\J\fYb'ghUf\_'[YgWXk Ub\_hž'k cVY]
j ]Y`Y'\_`Y]bYfY'?]bcg'GWXk ]Yf][\_Y]hYb'\UVYbž'a ]h'XYb'[fc\'Yb
A i `h]d`Yl Yb'i bX'XYa 'k UWXgYbXYb'GhfYUa ]b[!5b[YVch
a ]hni \U`hYb"'8]Y'5fVY]h'XYg'J YfY]bg'k ]fX'b]WXh'bi f'Xi fWX'X]Y
fÀi a `]WXYb'5bZcfXYfi b[Ybž'gcbXYfb'Ui WX'Xi fWX'X]Y
Bchk YbX][\_Y]hž'Y]b'UVk YWXg`i b[gfY]WXYg'i bX'UbgdfYWXYbXYg
Dfc[fUa a 'ni 'V]YhYbž'a U\[YV`]WX'YfgWXk Yfh"

Ni gàhn`]W\ a ØggYb?]bcg'a cXYfbYg'9ei]da Ybh'i bX'HYW\bc`c[]Y ]bhY[f]YfYbž'i a 'XYb'5bgdfØW\Yb'XYg'Di V`]\_i a g'[YfYW\h'ni k YfXYb"'\delta 'Hi hn]b['k]fX'\]Yfni '[Yn]Y`h'Ui Z'X]Y'5bgW\UZ\ b['bYi Yf 6]`X!'i bX'Hcb!HYW\b]\_'[YgYhnhž'i a 'Y]b'\cW\k Yfh][Yg'?]bcYf`YVb]g ni '[Yk \angle \forall f`Y]ghYb"'I a 'X]YgYb'5bZcfXYfi b[Yb'[YfYW\h'ni 'k YfXYbž]ghY]bY'Yb[Y'Ni gUa a YbUfVY]h'a ]h'XYf':]`a ZÒfXYfUbghU`h'i bX UbXYfYb'\delta gh]hi h]cbYb'i bYf`\angle qg`]W\"

8 Y hU]`g

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