

# ; Ygi bX\Y]hgdfcV`Ya 'VY]'@Yj Yf\_i gYbg Hcfk Ufh. 'K Yf'ghY\h']a 'Dc\_U`']b'>YbU3

@ \_½ '<f½XYW\_Ù'\_Àa dZh'a ]h'[Ygi bX\Y]h`]W\Yb'DfcV`Ya Yb j cf'XYa '8: 6!Dc\_U`gd]Y`'[Y[Yb' $\Rightarrow$ bU"'K Yf'k ]fX']a 'Hcf ghY\Yb3

8 Yf 18: 6! Dc\_U``k ]fZhigY]bY 'GW\UhhYbij cfUi gži bX 'X]Y 'A UbbgW\UZh j cb '6 UmYf '@Yj Yf\_i gYbighY\hij cf'Y]bYa 'gdUbbYbXYb
5 i ZY]bUbXYfhfYZZYbia ]h'XYa : 7 '7 Uf``NY]gg \*\delta U"8]YgYg'8 i Y``
Z]bXYh'Ua 'A ]hhk cW\ia '&\\$.\\$\I\fighUhhi bX'gcf[h'VYfY]hg'Yhnh'ZØf
5 i ZfY[i b[i bhYf'XYb: Ubg"'9]b'nYbhfU`Yg'H\Ya U']gh'XUVY]'X]Y
: ]hbYgg'j cb'Hcfk Ufh'@ \_½' < f'\delta XYW\_\Uz'XYggYb'HY]`bU\a Y
Ui Z[fi bX'[Ygi bX\Y]h`]W\Yf'DfcV`Ya Y'i b[Yk]gg']gh"

## A Uh÷^?cj ½ 'U`gʻa Ò[`]WX Y '@Ògi b[']a 'Hcf

 $Gc ``hY' < f'/2XYW_\dot U `hUhgÀW\`]W\ `b]W\ h'Y]bgUhnZ\ \][ 'gY]bž'k ]fX'A Uh÷^? cj ½ ž'XYf'&(!'À\f][ Y'hgW\YW\]gW\Y'Hcfk Ufhž'j cfUi gg]W\ h`]W\ 'X]Y JYfUbhk cfhi b[ ']a '? UghYb'ØVYfbY\a Yb"'CVk c\``5`cbgc'Y]bYb 9]bgUhn'? cj ½ g'b]W\ h'cZZ]n]Y```VYghÀh][ h'\Uhž'k ]fX'U``[ Ya Y]b'XUa ]h$ 

?cj ½ 'ghY\h'VYfY]hž'gY]b '? ÒbbYb'i bhYf'6Yk Y]g'ni 'ghY``Ybž'i bX \_ÒbbhY'g]W\ a ]h'ghUf\_Yb'@Y]ghi b[Yb'ZØf'Y]bY': YghUbghY``i b[']b'XYf YfghYb'A UbbgW\UZh'Ya dZY\`Yb"'8]Yg'k ØfXY'b]W\h'bi f'ZØf']\bž gcbXYfb'Ui W\'ZØf'X]Y'[YgUa hY'A UbbgW\UZh'Y]bY'7\UbW\'XUfghY``Ybž']b'k]W\h][Yb'Gd]Y`Yb'Y]bY'g]W\YfY'Cdh]cb']a 'Hcf'ni\UVYb"

### DYfgcbU`g]hi Uh]cb j cf XYa Dc\_U`gd]Y`

K À\fYbX'g]W\ 'X]Y'Hcfk UfhZfU[Y'ni gd]hnhž'[]Vh'Yg'Ui W\ 'UbXYfY dYfgcbY``Y'<YfUi gZcfXYfi b[Yb'ZØf'6UmYf'@Yj Yf\_i gYb"'5V[YgY\Yb j cb'XYb'[Ygi bX\Y]h`]W\Yb'6YXYb\_Yb'i a '<f'\%XYW\_\U'V`Y]Vh'X]Y A UbbgW\UZh'k Y]h[Y\YbX'i bVYgW\UXYh"'9]bn]['9I Yei ]Y``DU`UW]cgž XYf'a ]h'Y]bYf'A Yb]g\_i gj Yf`Yhni b['ni '\_\Aa dZYb'\Uhž'\_Ubb']a HfU]b]b['b]W\h'a ]hk ]f\_Yb"'8UfØVYf'\]bUi g'ZY\`Yb'ZØf'XUg'Gd]Y``]b \\D'U'Ui W\XfY]'[YgdYffhY'Gd]Y`Yf.'J]Whcf'6cb]ZUWYž'A Ufh]b'HYff]Yf gck ]Y'CX]`cb'?cggci bci ž'XYggYb'HfUbgZYf'bUW\'6Yf[Ua c'j cf'XYf HØf'ghY\h"

8]Y '5Vk YgYb\Y]hYb 'ghY``Yb 'ni gÀhn`]WXY '< YfUi gZcfXYfi b[Yb 'XUfž XU'@Yj Yf\_i gYb 'g]WX 'XUfUi Z'Y]bghY``Yb 'a i ggž gck c\`']b 'XYf C ZZYbg]j Y 'U`g 'Ui WX ']b 'XYf 8 YZYbg]j Y 'bYi Y 'GhfUhY[]Yb 'ni Ybhk ]W\_Y`bž'i a 'X]Y '5i ZghY``i b[ 'cdh]a U``ni '[ YghU`hYb"'9g']gh i bi a [Àb[`]WX ž'XUgg 'X]Y 'j YfV`Y]VYbXYb 'Gd]Y`Yf']\fY'GhAf\_Yb VØbXY`bž'i a 'XYf'DfcV`Ya Uh]\_'VY]'XYb '5i gZÀ``Yb Ybh[Y[Ybni k]f\_Yb'i bX'XUg'HYUa 'gc'\_cb\_i ffYbnZÀ\][ 'k]Y a Ò[`]WX 'ni '\U`hYb"

### 6YXYi hi b [ 'XYg'8i Y``g'ZØf'@Yj Yf\_i gYb

 $: \emptyset f'6UmYf'@YjYf_igYb'\backslash Uh'XUg'Dc_U`gd]Y``[Y[Yb'7Uf``NY]gg' \not \exists bU' f'b'' f$ 

k Y]hfY]WXYbXY'6YXYi hi b["'9g']gh'b]WX h'bi f'Y]bY'; Y`Y[Yb\Y]hži a X]Y'K c[Yb'XYf'gdcfh`]WXYb'<YfUi gZcfXYfi b[Yb'ni '[`ÀhhYbž gcbXYfb'Ui WX'Y]bY'7\UbW'ZØf''1 b[Y'HU`YbhY'k]Y'?cj ½ ž'g]WX']b XYb'J cfXYf[fi bX'ni 'gd]Y`Yb"' \Dix XYf'U\_hi Y```Ub[YgdUbbhYb Gd]Y`g]hi Uh]cb']gh'YXYf'Di b\_h'YbhgWXY]XYbX"'8]Y'5bgdfØWXY'Ub X]Y'A UbbgWXUZh'g]bX'\cWXž'i bX'YXYf'Gd]Y`Yf'k Y]» ž'XUgg'Yf [YZcfXYfh'k]fXž'i a ']b'XYb'\_ca a YbXYb'6Y[Y[bi b[Yb Ui Zhi hfYhYb"

8 Yf '8: 6!Dc\_U``]gh 'ZØf'j ]Y`Y 'HYUa g'Y]bY 'A Ò[`]W\\_Y]hž'g]W\`]b 'XYf

2 ZZYbh`]W\\_Y]hini 'dfÀgYbh]YfYb'i bX 'a Ò[`]W\Yfk Y]gY 'Y]bYb'H]hY`ini
Yff]b[Yb": Øf'HfU]bYf'5`cbgc'i bX'gY]b 'HYUa 'ghY``h'g]W\'X]Y': fU[Yž
]bk ]YZYfb'g]Y'X]Y'I bg]W\Yf\Y]hYb']a '? UXYf'ni ']\fYa 'J cfhY]`
bi hnYb'\_ÒbbYb"'I bUV\Àb[]['j cb'XYf'YbX[Ø`h][Yb'9bhgW\Y]Xi b[
VYnØ[`]W\'<f½XYW\_Ù'V`Y]Vh'X]Y'J cfZfYi XY'Ui Z'XUg'Gd]Y``gdØfVUfž
i bX'X]Y'@Yj Yf\_i gYbYf': Ubg'\cZZYb'Ui Z'Y]bY'gdUbbYbXY'DUfh]Yž']b
XYf'X]Y'A UbbqW\UZh']\f'k U\fYg'DchYbn]U`'YbhZU`hYb'\_Ubb"

\$\times \text{f'\psi b ghyb'JYf[Ub[Yb\Y]h'gU\g]W\G]W\GUmYf\@YjYf\_i gYb'a ]h < YfUi gZcfXYfi b [Yb'\_cbZfcbh]Yfh\times X]Y'k Y]h'\times YfUjh' U\_hi Y'\Y Hcfk UfhdfcV\Ya Uh]\_\\\]bUi g[Y\Yb''8]Y'A UbbgW\UZh\Uh']b\XYb\YhhYb'\YV\]W\Y'JYf\AbXYfi b [Yb'Xi fW\YVh\times XUfi bhYf HfU]bYfk YW\gY\'i bX'Y]bYb'\_ca YhYb\UZhYb'5bgh]Y['XYf gdcfh']W\Yb'5a V]h]cbYb''LUV]'5\cbgc\times XYf']a 'C\_hcVYf'\&\&\U'g HfU]bYf'Ub'X]Y'GY]hYb']b]Y'VYfi ZYb'k i fXY\times \text{Uh'XUg'HYUa 'b}W\h'bi f hU\_h]gW\'i a [YghY\`ht'gcbXYfb'Ui W\'j Yfgi W\ht'Y]bY'\f b[Y'i bX XmbUa ]gW\Y'A UbbgW\UZh'ni 'Zcfa Yb\times X]Y'gck c\\`]b'XYf'\6i bXYg\]['U'g'Ui W\']bhYfbUh]cbU\`YfZc\[fY]W\'gY]b'\_Ubb''8]Yg'ghY\hi]a ?cbhfUgh'ni 'XYb'j cf\Yf][Yb'GU]gcbg\times Yh'b'\wellow Yf\_i gYb'\\Ai Z][a ]h'\times \_cbg]ghYbnYb'\_\Aa dZhY'i bX'cZh'b]W\h'XYb'9fk Ufhi b[Yb [YfYW\h'k i fXY'"

8]Y?cbgc`]X]Yfi b[ 'XYf'A UbbgW UZhi bX'X]Y '\delta hY[f]h\delta h'XYg'? UXYfg g]bX'YbhgW Y]XYbX'Z\delta f'XYb'9fZc`[ "'8UVY]'\UVYb'Ui W\'Z]bUbn]Y``Y 5gdY\_hY'Y]bY'Fc``Y'[Ygd]Y`h\delta XYbb'6UmYf'\Uh']b'XYb'`YhnhYb'\delta\fYb j Yfgh\delta f\_h']b''\delta b[ Y'HU`YbhY']bj Ygh]Yfh"'8]Yg'nY][h'g]W\']a HfUbgZYfa Uf\_h\delta k c'\@Yj Yf\_i gYb'i bhYf'UbXYfYa 'j ]Y`j YfgdfYW\YbXY Gd]Y`Yf'j YfdZ]W\hYh\Uh\delta i Y]bY'Ui g[ Yk c[ YbY'A ]gW\i b[ 'Ui g

#### $8]Y Fc^Y j cb A Uh+^?cj ½ ]a HYUa$

A Uh÷ "? cj ½ ž XYf "& (! 'À\f][ Y 'HgW\YW\Yž'k i fXY 'Ui g'XYf 'I &%'j cb A UbW\YghYf 'I b]hYX 'j Yfd Z]W\hYh'i bX 'V`]W\_h'Ui Z'Y]bY j ]Y 'j YfgdfYW\YbXY'? Uff]YfY 'ni fØW\_ž'Ui W\k Ybb'gY]b'K Y[ ']b @Yj Yf\_i gYb'b]W\h'c\bY' < YfUi gZcfXYfi b[ Yb'k Uf" K À\fYbX'gY]bYf NY]h']b'XYf 'YhnhYb'GU]gcb'k i fXY 'Yf'U`g'ni j Yf`Agg][ Y '5`hYfbUh]j Y ni '< f½XYW\_Ù'VYhfUW\hYh''GY]bY': ]hbYgg'i bX': cfa '\_ÒbbhYb YbhgW\Y]XYbX'gY]bž'ZU``g' < f½XYW\_Ù'`Àb[ YfZf]gh][ Y 'DfcV`Ya Y '\Uh''?cj ½ '\_ÒbbhY'X]Y'A Ò[ `]W\\_Y]h'VY\_ca a Ybž'g]W\ni 'VYk À\fYb'i bX k Yfhj c``Y'Gd]Y`dfUl ]g'ni 'gUa a Y`bž'VYgcbXYfg']b'XYf'8: 6!  $C_U$ `fi bXYž'k c'XYf'8 fi W\_[ Yf]b[ Yf'U`g']b'XYf'6i bXYg`][ U']gh''

9gʻ]ghʻni ʻVYcVUW\hYbž'k ]YʻX]YʻHfU]bYfdcg]h]cbʻ]bʻ@Yj Yf\_i gYbʻg]W\
]bʻXYbʻ\_ca a YbXYbʻA cbUhYbʻYbhk ]W\_Y`bʻk ]fXžʻVYgcbXYfgʻ]b
5bVYhfUW\h`XYfʻgW\k Ub\_YbXYbʻ@Y]ghi b[Ybʻi bXʻXYfʻ\c\Yb
9fk Ufhi b[Yb"·5`cbgcʻg]Y\h`k Y]hYf\]bʻDchYbn]U``]a '?UXYfž'i bXʻX]Y
I bhYfghØhni b[ʻj cbʻ?cj ½ʻ\_ÒbbhYʻ\Y`ZYbžʻX]Yʻ5a V]h]cbYbʻXYg
J YfY]bgʻ]bʻXYfʻ@][Uʻi bXʻ]a 'Yi fcdÀ]gW\YbʻK YhhVYk YfVʻni
i bhYfa Ui Yfb"

#### 5\_hi Y``Y J Yf`Yhni b[g!i bX GdYffghUh]gh]\_

Gd]Y`Yf	GhUhi g	6Ya Yf_i b[Yb
@ _½ '< f½XYW_Ù	: fU[ `]W\	?fUb_\Y]hž
		VYgWX`cggYb`bUWX
		5 V g W `i g g h f U ] b ] b [
91 Yei ]Y``DU`UW]cg	JYf`Yhnh	A Yb]g_i gj Yf`Yhni b[
J]Whcf.6cb]ZUVY	; YgdYffh	8 ]gn]d`]bUf]gVX Y
		A U» bU\a Y
A Ufh]b 'HYff]Yf	; YgdYffh	8 ]gn]d`]bUf]gVX Y
		A U» bU\a Y
CX]`cb'?cggci bci	; YgdYffh	Jcf <sup>*</sup> K YW\gY` <sup>*</sup> bUW\
		6Yf[Uac

 $8\,]Y\,'j\,\,Yf\,\dot{}Yhni\,\,b\,[\,\,gV\,Y\,X\,]b\,[\,\,hY\,b\,\,\dot{}'\,5\,i\,\,gZ\dot{A}\,\dot{}'\,\dot{}Y\,'i\,\,b\,X\,\,\dot{}Gd\,Y\,ff\,Y\,b\,\,\dot{}g\,]b\,X\,\dot{}gh\,Y\,hg\,\dot{}Y\,]b$ 

k YgYbh`]WXYf`: U\_hcfž`XYf`X]Y`5i ZghY``i b[`i bX`X]Y`HU\_h]\_`Y]bYg
: i » VU``hYUa g`VYY]bZi ggYb`\_Ubb"`\D`@Yj Yf\_i gYb`k ]fX`a Ub`XUfUi Z
\cZZYbž`XUgg`g]WX`X]Y`G]hi Uh]cb`gWXbY``\_`Afhž`i a `Y]bY`ghUV]`Y`i bX
\_cb\_i ffYbnZA\][ Y`A UbbgWXUZh`ZØf`X]Y`bAWXghYb`Gd]Y`Y
Ui Zhi ghY``Yb"

8 Y hU]`c

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