

/ `h/d/ [h// `h/ghfcb[/ [h/; ØhYfhfUa ']b : fUb_Zi fh. '9]b 'A cbUh'ZØf'bUWX \ U`h][Yb DU_YhhfUbgdcfh/ `h/#ghfcb[/ [h// `h/#d/ [h/

±b:: fUb_Zi fh'Ua 'A U]b'hYghYh'Y]bY'; ØhYfhfUa 'ZØf'Y]bYb'A cbUh XYb'DU_YhhfUbgdcfhž'i a 'JYf_Y\fgVY`Ughi b['i bX 7 C!9a]gg]cbYb'ni 'fYXi n]YfYb"

±0:: fUb_Zi fh'Ua 'A U]b 'ghUfhYh'Y]b 'VYa Yf_Ybgk YfhYg'9I dYf]a Ybh ZØf'X]Y'i fVUbY'@c[]gh]_...9]bY'; ØhYfhfUa 'k]fX'ZØf'Y]bYb'A cbUh [YhYghYh"'=a 'FU\a Yb'XYg': cfgW\i b[gdfc'Y_hg' @UghA]'YHfUa F\Y]bA U]b'J 'hfUbgdcfh]Yfh'X]YgY'Y][Ybg'ZØf'DU_Yh']YZYfi b[YbY]b[YgYhnhY'GhfU» YbVU\b'DÀW_W\Yb'i bX'DU_YhY'j ca 'FUbX'XYf GhUXh'X]fY_h']bg'NYbhfi a "'8]Y'?ccdYfUh]cb'i a ZUggh'X]Y': fUb_Zi fh I b]j Yfg]hm'cZ'5dd']YX'GW]YbW'gž'X]Y'J Yf_Y\fg[YgY``gW\UZh: fUb_Zi fh'Ua 'A U]b'i bX'XYb'a i 'h]bUh]cbU`Yb'Cb`]bY!<ÀbX`Yf 5a Uncb"'8]Y' ₺]h]Uh]j Y'gc```\Y'ZYbž'XYb'J Yf_Y\fgZi gg'ni j YfVYggYfb'i bX'[`Y]W\nY]h]['X]Y'@Àfa VY`Ughi b['gck]Y 7C !9a]gg]cbYb']b'XYf']bbYfghÀXh]gW\Yb'I a [YVi b['ni fYXi n]YfYb"

9]b 'nYbhfU`Yg`9`Ya Ybh'XYg'?cbnYdhg`]gh'Y]b 'Y`Y_hf]gW\Yg
@UghYbZU\ffUXž'XUg'X]Y 'UbZU``YbXYb`@]YZYfi b[Yb`Ub`X]Y`< Ui ghØfYb
XYf`?i bXYb`Vf]b[h"'8]Y`: U\ffÀXYf`hfU[Yb`Y]bY`5i ZgW\f]Zhž'X]Y`Ub
Y]bY`VY_UbbhY`FYXYk YbXi b[`Ui g'Y]bYf'VY`]YVhYb`5F8!
: YfbgY\gYbXi b[`XYf'%-, \$Yf`*J\fY`Yf]bbYfh"'8]YgY`?ca V]bUh]cb
Ui g`]bbcj Uh]j Ya `HfUbgdcfh'Ui Z'GW\]YbYb`i bX`YZZ]n]YbhYa
: U\ffUXj YfgUbX`a UW\h'XUg`Dfc^Y_h'VYgcbXYfg`]bhYfYggUbh"

J Y f`Ui Z'i b X '@c []gh]_

 $8] Y ; \emptyset h Y f h f U a " j Y f _ Y \setminus f h `nk] g W X Y b ` X Y b ` < U `h Y g h Y ``Y b ` G h U X] c b " i b X Y b ` < U `h Y g h Y ``Y b ` G h U X] c b " i b X Y b ` < U `h Y g h Y ``Y b ` G h U X] c b " i b X Y b ` < U `h Y g h Y ``Y b ` G h U X] c b " i b X Y b ` < U `h Y g h Y ``Y b ` G h U X] c b " i b X Y b ` < U `h Y g h Y ``Y b ` G h U X] c b " i b X Y b ` < U `h Y g h Y ``Y b ` G h U X] c b " i b X Y b ` X Y b ` < U `h Y g h Y ``Y b ` G h U X] c b " i b X Y b `$

Ncc i bX'V]YhYh'Ui WX'JYfV]bXi b[Yb'ni 'XYa '6Yhf]YVg\cZ; i h'Yi h''8]Y'DU_YhY'[Y`Ub[Yb'ni bÀWXgh'a]h'Y'Y_hf]gWX
VYhf]YVYbYb'HfUbgdcfhYfb'j ca '5a Uncb!JYfhY]`nYbhfi a ']b
FUi b\Y]a 'ni f'HfUa !GhUh]cb'''Jcb'Xcfh'Ui g'ØVYfb]a a h'X]Y; ØhYfhfUa 'XYb'k Y]hYfYb'HfUbgdcfh']b'X]Y'=bbYbghUXh'''8Yf'9]bgUhn
j cb'Ya]gg]cbgUfa Yb': U\fnYi [Yb']gh'Y]b'_`UfYf'GWXf]hh']b
F]WXhi b['bUWX\U`h][Yf'@c[]gh]_'i bX'Y]bY'FYU_h]cb'Ui Z'X]Y
Xf]b[YbXYb'5bZcfXYfi b[Yb'Ub'X]Y'i fVUbY'A cV]`]hÀh''

CVk c\`DU_YhX]YbghY`]a a Yf'a Y\f'Ui Z'i a k Y`hgWkcbYbXYfY
Ni ghY``a Yh\cXYb`gYhnYbž`]gh'XYf`9]bgUhn`j cb:: U\fnYi [Yb`a]h
JYfVfYbbi b[ga chcfYb`]a a Yf'bcWk`k Y]h'j YfVfY]hYh''`8]Y
Dfc Y_hj YfUbhk cfh`]WkYb`\YVYb`\Yfj cfž'XUgg`ZØf`Y]bY`7C !Ufa Y
@]YZYf`c[]gh]_`nU\`fY]WkY:: U_hcfYb`i bX`_ca d`Yl Y
Ni gUa a Yb\Ab[Y`VYfØW_g]Wkh][h'k YfXYb`a ØggYb''`8 Uni `[Y\ÔfYbb]Wkh'bi f'[YY][bYhY:: U\fnYi [Yž'gcbXYfb`Ui Wk`Y]bY
ZÀWkYbXYW_YbXY`@UXY]bZfUghfi _hi f'gck]Y`A]_fcXYdchl@Ògi b[YbžX]Y`j cf`U``Ya `]b`ghÀXh]gWkYb`; YV]YhYb`cZh`gY`hYb`i bX`_cghgd]Y`][
g]bX''

 $8 \ Yf'; \ \emptyset h Yfhf Ubgdcfh' Ui \ Z'XYf'GWX] YbY']gh'j \] Y'j \ Yfgdf YWX YbX \ \check{z}'gc \ X] Y' = \] h] Uhcf Yb' X Yg' Dfc' Y_hg'' G] Y' a \ OWX h Yb' \ Yf Ui gZ] b X Yb \check{z}'k \] Y'g] WX X] Yg Yg' b Yi Y' @] Y Z Yf_cbn Ydh'] a \ J Yf[`Y] WX' ni f'hf UX] h] cb Y``Yb \ Ni gh Y``i b [`gWX' \A [h'' K] WX h] [Y': U_hcf Yb' k] Y' = \ DZ' Uh] cb'i b X \ 7 C !Gh Yi Yfb' k Yf X Yb' X UVY] 'YVY b ZU``g'] b' 6 Yhf UWX h' [Ync [Yb'' 8 Uf Ø V Yf' \] b Ui g'k] f X'i bh Yfgi WX h \check{z}'k] Y' DU_Yhni Z Ø gg Y'] b \ Gd] hn Ybn Y] h Yb' YZ] n] Ybh' V Yk \ A`h] [h'k Yf X Yb'_\ Obb Yb'i b X'k] Y'g] WX \ H f Ubgdcfhn Y] h Yb'gh f Uh Y[] g WX' j Yfg WX] Y V Yb'` Ugg Yb''$

9]b 'k Y]hYfYg'N]Y``XYg'Dfc Υ_hg']gh'X]Y'9fdfcVi b[ž'cV'X]Y GhfU» YbVU\b'Ui W\'ZØf'XYb'HfUbgdcfh'j cb'GdYff[ØhYfb'[YY][bYh]gh''<]YfZØf'k YfXYb'dchYbn]Y```[YY][bYhY'@UXi b[ghfÀ[Yf'[YhYghYhž X]Y'Yg'Yfa Ò[`]W\Ybž'GYbXi b[Yb'VYggYf'ni 'VØbXY`b'i bX'ni cf[Ub]g]YfYb'''5```X]YgY'5gdY_hY'g]bX'HY]`'Y]bYf'i a ZUggYbXYb 6YhfUW\hi b[ž'X]Y'Yg'XYb'Dfc Υ_hd UfhbYfb'Yfa Ò[`]W\hž']bbcj Uh]j Y @Ògi b[Yb'ZØf'X]Y'ni _ØbZh][Y'@c[]gh]_'ni 'Ybhk]\W_Y`b''

6YfY]hg VYghY\YbXY =b]h]Uh]j Yb

 $8]Y \xrightarrow{} YY XYg ; \emptyset hYfhfUbgdcfhg]bbYf \ U `V `XYg `OZZYbh`]WXYb \\ DYfgcbYbbU \ j Yf_Y \ fg ff DBJŁk]fX `Ub `XYf : fUb_Z fh I b]j Yfg]hm cZ \\ 5 dd `]YX `GW]YbW g `gY]h `&$ %, `]bhYbg]j `j YfZc `[h" `6YfY]hg `]a `$U \ f &$ %- `k i fXY `Y]bY ` @c []gh]_hfUa ` [YhYghYhž X]Y `gck c \``; ØhYf `U `g Ui WX `DUggU[]YfY `hfUbgdcfh]YfhY i bX j ca `; i h`Yi hj]YfhY ``ni f `A YggY Z \ f" `8]YgY `ZfØ \ YfYb `9fZU \ fi b[Yb `Z]Y » Yb `bi b `]b `X]Y `U_hi Y ``Y Ghi X]Y `Y]b i bX `hfU[Yb `XUni `VY]ž `XUg `DchYbn]U ``XYf ; ØhYfhfUa `]b : fUb_Z fh `k Y]hYf `ni `Yj U`i]YfYb"$

8 Ugʻ`Ui ZYbXYʻDfc $Y_h'_ObbhY`X]Y`KY]WXYbʻZØfY]bYʻbYiYʻŸfUʻXYfghÀXh]gWXYbʻ@c[]gh]_ʻghY``Yb"ʻKYbbʻg]WXʻ\YfUi gghY``hžʻXUggʻXYf6Yhf]YVʻY]bYfʻ; ØhYfhfUaʻgckc\``O_c`c[]gWXʻU`gʻUi WXʻO_cbca]gWXg]bbj c```]ghžʻ_ObbhYʻX]YgʻXYbʻKY[ʻZØfʻÀ\b`]WXYʻ<math>\pm$ 0]h]Uh]jYbʻ]bUbXYfYbʻGhÀXhYbʻYVbYbʻi bXʻY]bYʻbUWX\U`h][YfYʻNi_i bZhʻZØfʻXYbDU_YhhfUbgdcfhʻ]bʻi fVUbYbʻNYbhfYbʻYfa O[`]WXYb"

8 YhU]`a

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