

## 7ci fgY Cj Yfj ]Yk

### GHJZ7cbHJWh8YHJ]`g

### 7cbj Ybcfg

B Ua Y	9a U]`	5j U]`UV]`]lm	@cWUh]cb	D\cbY
>Ub`@Ub]WY_	>"@Ub]WY_4 i bgk "YXi "Ui	5ddc]bha YbhgʻVm	A cfj Yb 6fck b	-',) '%(-+
		Ya U]`	' * +	

#### Hi hcfg

B Ua Y	9a U]`	5j U]`UV]`] <b>m</b>	@cWJhjcb	D\cbY
Gcd\]Y <sup>-</sup> F cV]bgcb	gcd\]Y"fcV]bgcb4 i bgk "YXi "Ui			

### GWXcc`7cbHJWhi±bZcfa Uh]cb

GWkcc`cZ<iaUb]h]Yg'UbX'@Ub[iU[Yg

@c\\U||cb. G\\cc`C\\Z|\\\žA cfj\Yb'6fck\b'6i]\X]b[\zeroundergyj\Y`\&z\&),

CdYb]b[ '<ci fg. 'A cbXUm!': f]XUmž'- Ua '!') da

D\cbY.'Ž\*%'&'-',)'%\*,%

: UI . Ž \* % & - ' , ) ', +\$)

9a U]`. '<u>\U`4 i bgk "YXi "Ui</u>

## 7ci fgY 8YW] g

7 fYX]hDc]bhg\*\*

Gi a a UfmcZh\Y'7ci fgY

5a` fW\_ bacSck 7 gcabW[` 5 de[e, Bai WdS` V 5 g fgdWYI d`cfYg fh\Y'i bdfYWXYbhYX'W\U`Yb[ Yg ZJW]b[ WcbhYa dcfUfm9i fcdYžfh\fci [\'UWJXYa]WUbU`mg]gždc`]hJWJ`'Wca a YbfUfmž Zj`a 'UbX'bcj Y`g"'H\Y'dfcWYggYg cZYWcbca]WUbX'dc`]hJWJ`']bhY[ fUhjcbž\YfU`XYX'Vmh\Y'9i fcdYUb'I b]cbž'UfY i bXYfYI ]ghYbhJU`'h\fYUhž'UbX bUhjcbU']ga ']g 'cb fh\Y'f]gY"'Hc 'h\Y'k Yghž'6f]hjg\ X]gUZYWJcb'k ]h\ 'dYfW]j YX'`cgg cZgcj YfY][ bm\Ug`'YX'fc'U fYZYfYbXi a 'dUgg]b[ 'f6fY] ]hži]bX]WUhjb[ 'th\Y']bhYbhJcb'cZU'a Ya VYf'ghUhY'fc 'YUj Y'h\Y'9I 'Zcf'h\Y'Z]fghhJa Y" Hc']hg`gci h\ž9i fcdY']g'XYU']b[ 'k ]h\ 'U'fYZ [ YY'Wf]g]g'Vfci [\hcb'Vmk Ufg']b'bcfh\ '5 Zf]WJ'UbX'h\Y'A]XX'Y 9Ugh'C b']g'9UghYfb 'ZUb\_žhYbg]cbg'k ]h\ 'F i gg]U'UfY'\Y][\hYbYXžYgdYW]U`mcj Yf'I \_fU]bY"'H\Y fY`Uhjcbg\]d'cZ9i fcdY'k ]h\ 'h\Y'I G5']b'h\Y'YfU'cZ8cbUX'Hfi a dfg'dfYg]XYbWn]g'U`gc']b'Zi I "'5``'h\]g']g hU\_]b[ 'd'UWf'k\]Y'9i fcdY'\Ug'VYYb'fYY`]b[ 'Zfca 'h\Y'[ `cVU'Z]bUbWJU`Wf]g]gžk ]h\ 'ghf]b[ YbhUi ghYf]m a YUgi fYg']b'gca Y'Wci bhf]Yg'YUX]b[ 'hc'[ fYUhgcW]U`XYdf]j Uhjcb'UbX'dc']hJWJ''i bfYgh'H\]g'\Ug'WYUhYX'U fYgi f[ Ybhf][ \hk ]b[ žk \]W\ 'V`Ua Yg'9i fcdYfg']'g'cb']a a ][ fUbhdcdi `UhjcbgžYgdYW]U`mh\Y'=g`Ua]W Wca a i b]m''9i fcdY'dfYgg]b[ `mgYY\_g'hc'fYwcbW]Y']ng`']VYfU`UbX'gYW`Uf']XYU'g'k ]h\ 'h\Y'wca dYhJb[

# 5ggYgga Ybh

## 5ggYgga YbhHUg\_g

5ggYgga Ybh'hUg_	K Y][ \h	8iY'8UhY	Gh XYbh@YUfb]b[ CihWca Ygʻ5ggYggYX
FYZYW]cb'cb'WcbhYa dcfUfm dc`]h]WJ`žgcWjU`ž'Wi`hi fU`'cf		%	

GhUfhXUhY. Bch5dd`]WUV`Y

8YHJ]`g.

() 'a ]bi <code>hYg/gh</code> <code>XYbhg</code> 'k ]```fY\\Y]j <code>Y'U'</code>[ <code>fUXY'</code>j ]<code>U'</code> a <code>ccX'Y</code> ž'Vi hbc 'k <code>f]hh</code> b '<code>ZYYXVU</code>\\\_"

 $\label{eq:higher_high_substitution} \mbox{Hi fb]h]b "gYhh]b[."H\]g"]g"bch"U"Hi fb]h]b"Ugg][\ ba\ Ybh$ 

-		
-		

## FYgci fW/g

#### DfYgWf]VYX F Ygci fWyg

H\]g`Wci fgY`fYUX]b[g`k]```VY`Uj U]`UV`Y`cb`@Y[Ubhc"`Ghi XYbhg`U`gc`bYYX`hc`W\YW\_h\Y]f`Ya U]``fY[i`Uf`mZcf i dXUhYg`cb`fYgci fWg`UbX`fYUX]b[`a UhYf]U`"`G]bWY`h\]g`Wci fgY`XYU`g`k]h\`W ffYbh`UZU]fgžghi XYbhg`UfY i f[YX`hc`fYUX`bYk gdUdYfg`UbX`VY`Uhhi bYX`hc`ch\Yf`a U]bghfYUa `a YX]U`Zcf`bYk g`]hYa g`UbX`UbU`mg]g fY`Uh]b[`hc`9i fcdYUb`W ffYbh`UZU]fg"`Ghi XYbhg`g\ci `X`U`gc`Wcbgi `hih\Y`bYk g`k YVg]hY`9I C VgYfj Yf\hdg.##Yi cVgYfj Yf"Wca #

#### FYWca a YbXYX FYgci fW/g

 $H \ YfY \ "UfY \ "gYj \ YfU \ "Vcc\_g \ "h \ Uh' \ f \ J \ Uh' \ f \ J \ "A \ cghcZh \ Y \ "a \ Uh' \ f \ J \ "g'ei \ ]h' \ "dc \ Ya \ ]WU \ "ž \ Vih \ k \ Y \ "b \ Y \ Y \ "k \ "h \ "J \ Y \ Ug' \ k \ Y \ "X \ "b \ "h \ "gi \ ddc \ f \ "c \ U[ \ Y \ Y \ k \ ]h \ "gi \ ddc \ f \ "c \ U[ \ Y \ Y \ k \ ]h \ "$ 

## Gi Va ]gg]cb cZ5ggYgga YbhHUg\_g

### Hi fb]h]b Gi Va ]gg]cb

Image: Ybwei bhyfu'dfcv'ya k \yb'uhhya dhjb[ 'hc'gi va ]hmci f'Ugg][ ba Ybhh\fci [ \ 'Hi fb]h]bž'd'YUgY

Hy'Yd\cby'9| hy'fbu''Gi ddcfhcb'-', ) '' ' ' %cf'Ya U]''h\Ya 'cb'Y! hy'fbu'hy'hgi ddcfh4 i bgk "YXi "Ui "''Gi ddcfh
\ci fg'UfY', .\$\$Ua '-'%\$.\$\$da 'cb'k YY\_XUmg'UbX'-.\$\$Ua '-').\$\$da 'cb'k YY\_YbXg'fl \*) 'XUmg'U'mYUft"'=Z'mci
UfY'i bUV'Y'hc'gi va ]hmci f'Ugg][ ba YbhXi Y'hc'U'ZJi 'hk ]h\ 'Hi fb]h]b'mci 'a Um'Udd'mZcf'Ub'Y! hy'bg]cbž'Vi hmci
a i ghfYhJ]b'mci f'h]W\_Yhbi a VYf'Zfca '9! hy'fbU''Gi ddcfhfU'cb[ 'k ]h\ 'Ubmch\Yf'fy'Yj UbhXcW a Ybhgt'hc
]bWi XY'Ug'Yj ]XYbW' 'hc'gi ddcfhmci f'Y! hy'bg]cb'Udd']WUh]cb"'=Zmci 'Ya U]''9! hy'fbU''Gi ddcfhmci 'k ]'`
Ui hca Uh]WJ'`mfYW']j Y'U'h]W\_Yhbi a VYfZ'Vi h]Zmci 'hY'Yd\cbY'mci 'k ]``bYYX'hc'gdYW]Z]WJ'`mUg\_'Zcf'cbY''
Hi fb]h]b'U'gc'dfcj ]XYg'i dXUhy'g'cb'h\Y]f'gmghYa 'ghUh' g'cb'Hk]hyf''

; YbYfU`mž'UggYgga YbhiHug\_g'a i ghVY'gi Va ]hhYX'Y`YVWfcb]\WJ``mij ]U'Y]h\Yf'Hi fb]h]b'cf'U'A ccX`Y Ugg][ ba Ybh''=b']bgHJb\W'g'k \YfY'h\]g']g'bchdcgg]V`Yž']hk ]```VY'gHJhYX'cb'mci f'\\circ i fgY'g'A ccX`Y'g]hY'k ]h\U`hYfbUh]j Y'gi Va ]gg]cb'XYHJ]`g"

cfi]bZcfa Uhjcbicbi\ckihcigi Va ]hUgg][ ba Ybhgicbi]bYij ]UiA ccXiY.i\hdg.#gh XYbhi bgk "YXi "Ui #\ck! gi Va ]hUgg][ ba Ybha ccXiY

## 5 WUXYa ]W<cbYghmUbX D`U[]Uf]ga

D`U[]Uf]ga i]gii g]b[ih\Yik cfXgicfi]XYUgicZch\YfgiUbXidfYgYbh]b[ih\Ya iUgimci fick b"i=hWJbihU\_Yia Ubm Zcfa gžZfca iXYi]VYfUhYiWXYUh]b[ihciUWW]XYbhU`mWcdm]b[iZfca iUigci fWYik]h\ci hiUW\_bck iYX[Ya Ybh'

IBGK [fcidg'd'U[]Uf]ga ]bhc'h\Y'Zc``ck]b['WUhY[cf]Yg.

• i bXYfgHJbX'mci f'f][\hg'UbX'fYgdcbg]V]`]h]Yg'Ug'U'gh XYbh'Uhil BGK