

# 7 ci fgY Cj Yfj ]Yk

## GHJZ7cbHJWh8YHJ]`g

#### 7cbj Ybcfg

B Ua Y	9a U]`	5j U]`UV]`]m	@cWUh]cb	D\cbY
?]a '6i fk Y``	_"Vi fk Y``4 i bgk "YXi "Ui_	D`YUgY'Ya U]`Zcf Ub`Uddc]bha Ybh'		

#### GWXcc``7cbHJWh'±bZcfa Uh]cb

GWXcc``cZhXY`5fhg`UbX`AYX]U

Fcca " ‰ž@Yj Y`" žFcVYfhK YVghYf'6i ]`X]b[ fl %(Ł

D\cbY.'f\$&Ł'-',)'(,)\*

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

K YVg]hY. k k k "Ufhg"i bgk "YXi "Ui #gUa

#### 5W\_bck `YX[ Ya YbhcZ7ci bhfm

I BGK '5frgž8Yg][b'UbX'5fW,]h'Wi fY'? Ybg]b[hcb'UbX'DUXX]b[hcb'Wa di gYg'UfY'Vi ]'hcb'5Vcf][]bU`@UbXg"'K Y'dUmci f'fYgdYWrg'hc'h\Y'6]X'][U''UbX'; UX][U''dYcd'Yg'k\c'UfY'h\Y'7i ghcX]Ubg'cZh\YgY'`UbXg" K Y'UW\_bck 'YX[Y'h\Y'5Vcf][]bU`'UbX'HcffYg'GHfU]h=g`UbXYf'dYcd'Ygž'h\Y': ]fgh5i ghfU`]Ubgžk\cgY'`UbXgžk]bXg'UbX'k UhYfg'k Y'U``'bck 'g\UfYž'UbX'dUmfYgdYWhc'h\Y]f'i b]ei Y'j U'i Ygž'UbX'h\Y]f'Wcbh]bi ]b['UbX'YbXi f]b['W'h fYg'k\]W\XYYdYb'UbX'Ybf]W\h\Y'`]ZY'cZci f'bUh]cb'UbX'Wca a i b]h]Yg"''

 $\label{eq:continuous} \begin{array}{ll} \text{$\stackrel{\cdot\cdot}{\to}$ U[Y'WciftYgmicZh\Y'CZh\Y'Dfc'J]WY!7\lubWY``cf'$$$ bX][Ybcig']$$ Ybcig'ghfUhY[m] $$ $$ U[Y'WciftYgmicZh\Y'CZh\Y'Dfc'J]WY!7$$ $$ U[Y'WciftYgmicZh\Y'CZh\Y'Dfc'J]WY!7$$ $$ U[Y'WciftYgmicZh\Y'CZh\Y'Dfc'J]WY!7$$ $$ U[Y'WciftYgmicZh\Y'CZh\Y'Dfc'J]WY!7$$ $$ U[Y'WciftYgmicZh\Y'CZh\Y'Dfc'J]WY!7$$ $$ U[Y'WciftYgmicZh\X'Ch'Zh\Y'Dfc'J]WY!7$$ $$ U[Y'WciftYgmicZh\X'Ch'Zh\Y'Dfc'J]WY!7$$ $$ U[Y'WciftYgmicZh\X'Ch'Zh\X$ 

# 7ci fgY 8YW] g

### $I b hg c Z 7 f Y X h^*$

## Giaa UfmcZh\Y 7ci fgY

9Xi WUhjb['h\Y'A i g]\WJ``Bcj ]\W'`]g`XYg][bYX`Zcf`UXj Ub\WX`a i g]\WJ``dYfZcfa Yfg`k \c`UfY``YUfb]b['hc`hYU\\ gdY\JU`]gh]bghfi a YbhU``cf'j c\WJ``g\_]``g`hc`VY[]bbYfg"'`Mci `k]```XfUk 'gY`Y\Mjj Y`mUbX`\Wf]hJ\WJ``mcb`mci f`ck b ghi X]c`hfUX]hJcbgž'k ]h\Y\VYbYZ]hcZh\Y`cVY\Mjj Y`gHUb\W`XYj Y`cdYX`]b`h\Y`[UhYk Um\\circ fgY'? fdZi def UZ e\\RTYZ\_X UbX`4\VT` ^ Z\_X R a\Vc\Wc^ \Vc''H\Ymk]```\VY`Z fh\Yf`gi ddcfhYX`\VmfYgYUf\\\`UbX`h\YcfYhJ\\U`\\_bck`YX[Y`fY`UhYX`hc`\\\]`XfYbfig``YUfb]b[`UbX`a i g]\WYXi \WUhJcb"

#### 7 ci fgY @YUfb]b[ Ci hWca Yg

%" ⇒XYbhjZmUbX`XYa cbghfUhY`hYUWX]b[ 'UbX``YUfb]b[ 'ghfUhY[]Yg`Uddfcdf]UhY`Zcf`bcj ]WY`a i g]WjUbgž'Uh j Uf]ci g`ghU[ Yg`cZXYj Y`cda Ybh⁄ &" F YWc[ b]gY`UbX`Wf\$ 'Ubm`UgY`h 'Uh

# 5ggYgga Ybh

5 Zcfa U``Vf]YZZcf'YUWX UggYgga Ybh'HJg\_'k]```VY'[]j Yb'cb'a ccX`Y"``

5ggYgga YbhhUg_	K Y][\h	8iY'8UHY	7 ci fgY @YUfb]b[ Ci hWca Yg 5ggYggYX
%".7 f]h]ei Y cZdi V`]g\YX`hi hcf Vcc_g	' \$I	&(#\$-#&\$&%'%%) - 'DA	&ž'
&"'6Y[]bbYffgihhcfVcc_	')	&- #%\$#&\$&%`%%) - `DA	%ž &
' " <sup>.</sup> 9ggUm	')	%-#%#&\$&%`%%)- `DA	&ž¨'

## 5ggYgga Ybh% 7f]h]ei Y cZdi V`]g\YX h hcfVcc\_g

8i Y'XUhY.'&(#\$-#&\$&%'%%)-'DA

%\$\$\$!k cfXg

'\$!dYfWybh

7 f]h]ei Y'cZdi V`]g\YX'hi hcf'Vcc\_g

: YYXVUW\_'dfcj ]XYX'j ]U'@A G

# 5ggYgga Ybh& 6Y[]bbYffg h hcf Vcc\_

8i Y'XUhY.'&-#%\$#&\$&%'%%)-'DA

5gʻUddfcdf]UhYž'h\YʻVY[]bbYffgʻhihcfʻVcc\_'a Umi]bWiXY'a i g]WžYlYfW]gYgžX]U[fUa gž']``i ghfUh]cbgž'UbX W\Ufbg"

')!dYfWYbh

: YYXVUW\_dfcj ]XYX^j ]U^@A G

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5ggYgga Ybh' . '9ggUm

8i Y'XUhY.'% #%\$\$&%'%%)-'DA

&\$\$\$!k cfXg

')!dYfWYbh

 $\label{eq:first-condition} F Y`UhYX`hc`XYj Y`cda YbhU``m`Uddfcdf]UhY`a i g]WYXi WUh]cb$ 

: YYXVUW\_'dfcj ]XYX'j ]U'@A G

H\]g`]g`h\Y`Z]bU``UggYgga Ybh

.

.

# FYgci fWfg

### DfYgWf]VYX F Ygci fWYg

H\Y`Wci fgY`hYI hi]g`6i fk Y``ž'? `f&\$%&£` ef UZ ŽSRdVU Z\_decf ^ V\_eR]]VRc\_Z\_X"``: Ufb\Ua .``5g\[UhY

#### FYWca a YbXYX FYgci fWYg

@]VfUfmigci fWrgik]``VYia UbU[YXih\fci [\ih\Yi@Y[UbhcigmghYa icbih\YiWci fgYia ccXiYig]hY"

## 7ci fgY 9j U`i Uh]cb UbX 8Yj Y`cda Ybh

: cfa U`Yj U`i Uhjcbg`k]``VY`gci [\h'Uhih\Y`YbX`cZgYa YghYfž'UbX`]bZcfa U``ZYYXVUW\_'UbX`ei Yghjcbg`k]``VY k Y`Wca Y`Uh'Ubmiha Y"

# 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 VYfž'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<cbYglmUbX D`U[]Uf]ga

D`U[]Uf]ga i]gii g]b[ih\Yik cfXgicfi]XYUgicZch\YfgiUbXidfYgYbh]b[ih\Ya iUgimci fick b"i±i\WbihU\_Yia Ubm Zcfa gžZfca iXYi]VYfUhYiW\YUh]b[ihciU\W]XYbhU`m\Wcdm]b[iZfca iUigci f\Wik ]h\ci hiU\w\_bck iYX[Ya Ybh'

I BGK '[fci dg'd'U[]Uf]ga ']bhc'h\Y'Zc``ck]b['WUhY[cf]Yg.

7 cdm]b[. I g]b[ 'h\Y'gUa Y'cf'j Yfmg]a ]'Uf'k cfXg'hc'h\Y'cf][ ]bU`'hYl hcf']XYU'k ]h\ci h'UW\_bck 'YX[ ]b[ 'h\Y gci fW' cf'i g]b[ 'ei chUh]cb'a Uf\_g"'H\]g']bWi XYg'Wcdm]b[ 'a UhYf]U`gž']XYUg'cf'WcbW'dhg'Zfca 'U'Vcc\_ž'Ufh]WYž fYdcfhcf'ch\Yf'k f]hhYb'XcW a Ybhz'dfYgYbhUh]cbž'Wca dcg]h]cbž'Uffk cf\_ž'XYg][ bž'XfUk ]b[ ž'W]fWi ]hfmž'Wca di hYf dfc[ fUa 'cf'gcZk UfYž'k YVg]hYž']bhYfbYhz'ch\Yf'Y`YWfcb]WfYgci fW'z'cf'Ubch\Yf'dYfgcbfg'Ugg][ ba Ybhk ]h\ci h Uddfcdf]UhY'UW\_bck 'YX[ Ya Ybh''

**₺Uddfcdf]UhY** 'dUfUd\fUg]b[.'