

7ci fgY^{*}Cj Yfj]Yk

GHJZ7cbHJWh8YHJ]`g

7cbj Ybcfg

B Ua Y	9a U]`	5j U]`UV]`] m	@cWUh]cb	D\cbY
GU``m6U_Yf	gU``m'VU_Yf4_i_bgk_"YXi_"Ui_			

GWXcc`7cbHJWh =bZcfa Uh]cb

GWkcc~cZ9Xi WUhcb

5fhgž:8Yg][b:UbX:5fWX]hYWhifY

; fci bX': `ccfž'A cfj Yb'6fck b'6i]`X]b['fl &\$Ł

H. 'Ž * %'f&Ł'-',) '%-++

9. YXi WUhjcb4 i bgk "YXi "Ui

K.\hdg.#kkk"Ufhg"i bgk "YXi "Ui #YXi WUhjcb

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⁻8YHJ]^{*}g

I b]hg cZ7fYX]h**

K cf_`cUX

%) \$`\ci fg`]bWi X]b[`WUgg`WcbHUWfi\ci fgž`fYUX]b[gž`WUgg`dfYdUfUh]cbž`UggYgga Ybhž`Zc``ck`i d`UWhjj]hjYgž YHW

Gi a a UfmcZh\Y 7ci fgY

 $+ 0.1 \text{ lg Wc i fgY z mc i 'k]} \text{ 'N lg Y 'Ub 'cddcfhi b] hm hc 'Vi] 'X 'cb 'cf'YI hY bX '] bhY fY ghg 'XY j Y 'cdYX '] b 'mc i f'gdY W] U '] ghallow (a. 1) and (b. 1) an$

5ggYgga Ybh

5ggYgga Ybh'tUg_	K Y][\h	8iY'8UHY	7 ci fgY @YUfb]b[Ci hWca Yg 5ggYggYX
%"`Dfc^YWfdfcdcgU``UbX fYdcfh	%\$\$i	\$(#\$&#&\$&&`\$).\$\$`DA</td><td>%ž'&ž'</td></tr></tbody></table>	

5ggYgga Ybh% Dfc YWhdfcdcgU` UbX fYdcfh

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

Dfc YWidfcdcgU`'UbX'fYdcfh

5"'DfcdcgU''!'h\]g']g'U'\i fX'Y'fYei]fYa Ybh

@Yb[h\.'%\$\$\$'k cfXg

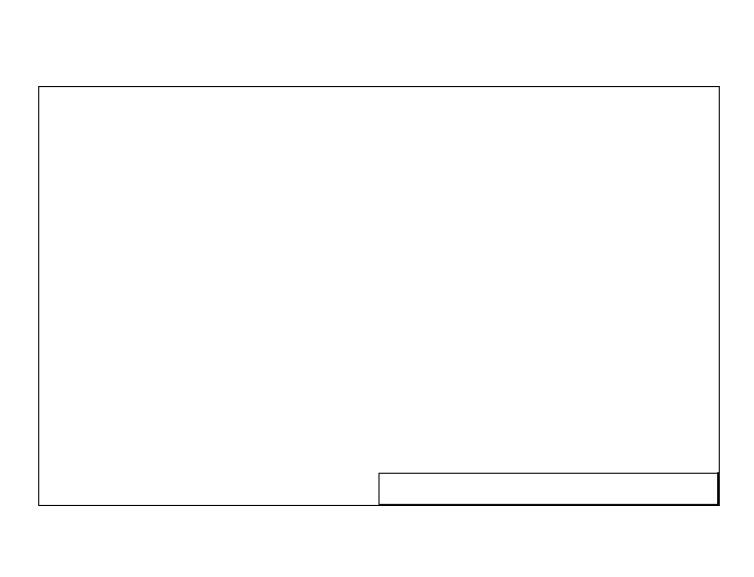
: cfa Uhjj Y ZYYXVUW_dfcj]XYX cb`]bY h\fci [\ 'Wci fgY k YVg]hY k]h\]b '%\$ XUmg cZgi Va]gg]cb"

6"'F Ydcfh

@Yb[h.:,!%\$ž\$\$\$'kcfXg

 $\label{thm:condition} \mbox{E i U`]hUh] Y`UbX`ei Ubh]hUh] Y`ZYYXVUW_`dfcj]XYX`cb`]bY`h\fci [\ \ Wci fgY`k YVg]hY`k]h\]b`%$`XUmg`cZ gi Va]gg]cb"$

GdYWJZJW7 f]HYf]U			



Fygci fWyg

DfYgWf]VYX F Ygci fWYg

 $H\YfY`UfY`bc`dfYgWf]VYX`fYgci fWYg''`<ck Yj Yfž'mci `a][\h``cc_'VUW_'hc`dfYj]ci g`Wci fgYg'mci `\Uj Y Wca d`YhYX`k]h\]b`mci f`gdYW]U`]gUh]cb`UbX`gY`YWhfYUX]b[g`UbX`a UhYf]U``h\Uh]bgd]fYX`mci 'h\Y`a cgh'$

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]bz'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 UmUdd'mZcf'Ub'Y! hy'bg]cbz'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 Ybhgthc
]bWi XY'Ug'Yj]XYbW' hc'gi ddcfhmci f'Y! hy'bg]cb'Udd']\WJh]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'gdY\WZ]\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 `]g`i g]b['h\Y`k cfXg`cf`]XYUg`cZch\Yfg`UbX'dfYgYbh]b['h\Ya 'Ug`mci f`ck b"'=h\Wb'hU_Y`a Ubm Zcfa qžZfca 'XY`]VYfUhY'W\YUh|b['hc`UWW]XYbhU`mWcdm]b['Zfca 'U'gci fW'k]h\ci h'UW_bck 'YX[Ya Ybh'

IBGK [fcidgdu[]Uf]ga]bhch\YZc``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 hUW_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'WfW]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''

Duddfcdf]UhY dufud\fug]b[...7\ub[]b[...12\k...k.cfXg.UbX.d\fugYg.k.\]Y a cghmfYhJ]b]b[...h\Y.cf][]bU`]bZcfa Uh]cbžghfi Wh fY UbX#cfdfc[fYgg]cb.cZ]XYUg.cZh\Y.cf][]bU`k]h\ci hUW_bck `YX[Ya Ybh'.H\]g.U`gc Udd`]Yg.]b`dfYgYbhUh]cbg`k \YfY gca YcbY dufUd\fugYg.Ubch\Yf'g.]XYUg.cf`k cfXg`k]h\ci h`WfYX]h`UbX`hc d]YW]b[...hc[Yh\Yf'ei chYg.UbX.dUfUd\fugYg.]bhc.U`bYk `k\c`Yžk]h\ci h`Uddfcdf]UhY`fYZYfYbW]b[...hc]

7c``i g]cb. 'K cf_]b['k]h\ ch\Yfg'Vi hdUgg]b['cZZh\Y'k cf_'Ug'U'dYfgcb'g']bX]j]Xi U``k cf_"'7c``i g]cb'U`gc]bWi XYg'dfcj]X]b['mci f'k cf_'hc'Ubch\Yf'ghi XYbhZcf'h\Y'di fdcgY'cZh\Ya 'd`U[]Uf]g]b[ždUm]b['Ubch\Yf dYfgcb'hc'dYfZcfa 'Ub'UWUXYa]WhUg_žghYU`]b['cf'UWei]f]b['Ubch\Yf'dYfgcb'g'UWUXYa]Wk cf_'UbX'Wcdm]b[]hz'cZZYf]b['hc'Wca d`YhY'Ubch\Yf'dYfgcb'g'k cf_'cf'gYY_]b['dUma YbhZcf'Wca d`Yh]b['UWUXYa]Wk cf_"

Duddfcdf]UhY`W]hUh]cb. 7]h]b['gci fW/g'k \]W\`\Uj Y`bchVYYb`fYUXžk]h\ci hUW_bck `YX[]b['h\Y "gYWcbXUfm" gci fW' Zfca 'k \]W\`_bck `YX[Y'cZh\Ya `\Ug'VYYb`cVhJ]bYX"

8i d`]\Uhrcb`ff`gY`Zd`U[]Uf]ga "Ł`Gi Va]\hrb[`mci f`ck b`k cf_ži]b`k \c`Y`cf`]b`dUfhžk\YfY`]h\Ug`dfYj]ci g`m VYYb`dfYdUfYX`cf`gi Va]\hYX`Zcf`Ubch\Yf`UggYgga Ybhcf`Wci fgY`UhI BGK `cf`Ubch\Yf`i b]j Yfg]\m'

7 cffYWhfYZYfYbWjb[dfUWhJWYg

H\Y'<u>I_BGK_'5WUXYa_]WG_]``g`gi_ddcfh</u>icZYfg`fYgci_fWrg`UbX`]bX]j]Xi_U``Wcbgi_`HUh]cbg"`Ghi_XYbhg`UfY`U`gc fYa_]bXYX'h\UhWUfYZ_``h]a_Y'a_UbU[_Ya_Ybh]g`Ub`]a_dcfhUbhdUfhcZghi_Xm''CbY`cZh\Y']XYbh]Z]YX`WUi_gYg`cZ d`U[_]Uf]ga_']g`dccf'h]a_Y'a_UbU[_Ya_Ybh''Ghi_XYbhg`g\ci_`X`U``ck_'gi_ZZW]Ybh'h]a_Y`Zcf'fYgYUfW\žXfUZh]b[_'UbX dfcdYf'fYZYfYbW]b[_'cZgci_fWrg']b'dfYdUf]b[_'U```UggYgga_Ybh']hYa_g"

I BGK "@]VfUfm\Ug'h\Y'9@-69'hcc"Uj U]'UV'Y'hc'Ugg]ghmci k]h\'mci f'gh Xm'Uhi BGK "'9@-69']g'XYg][bYX'hc]bhfcXi WY'bYk 'ghi XYbhg'hc'ghi Xm]b['Uhi BGK 'Vi h]hWUb'U'gc'VY'U'[fYUhifYZfYg\Yf'Xi f]b['mci f'ghi Xm' 7 ca d'Yh]b['h\Y'9@-69'h hcf]U''UbX'ei]n'k]"\YbUV'Y'mci 'hc.