



7ci fgY 8YHJ] g

7 fYX]h'Dc]bhg'*

Gi a a UfmcZ'h\Y'7ci fgY

5 g/b]

]Ug

5g]Ub

W

‰ ‰

g

‰

‰

5ggYgga Ybh

5ggYgga Ybh'HUg_g

5ggYgga Ybh'tUg_	K Y][\h	8iY'8UHY	Gh XYbh@YUfb]b[Ci hWca Yg 5ggYggYX
DfYgYbfUljcb ⁻	&\$I	(da ˈcbˈdfYgYblIJljcbːXUm	%ž&Ž Ž(Ž)
±b!7`UggʻHYghi	' \$1	&-#\$,#&\$% `%\$.\$\$`5A	%ž&Ž Ž(ž)
F YgYUfW. '9ggUm') \$1	%#%\$#&\$% `\$(.%) `DA	%ž&Ž Ž(Ž)

5ggYgga Ybh8YhJ]`g

Hi fb]h]b 'gYh]b[. 'H\]g 'Ugg][ba Ybh']g 'gi Va]h]YX'h\fci [\'Hi fb]h]b 'UbX'gh XYbhg 'WUb'gYY'Hi fb]fYdcfhg"	h]b^g]a]`Uf]hm

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

Gh XYbhg UfY Yl dYWYX hc di hh\Y]f bUa Yg UbX gh XYbhbi a VYfg cb Yj YfmdU[Y cZh\Y]f Ugg][ba Ybhg"

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

#mci YbWci bhYf'U'dfcV'Ya k \Yb'UhYa dhJo['hc'gi Va]hmci f'Ugg][ba Ybhh\fci [\'Hi fb]h]bž'd'YUgY
hY'Yd\cbY'9| hYfbU'Gi ddcfhcb'-',) "''' %cf'Ya U]'h\Ya 'cb'<u>Yl hYfbU'hY'hgi ddcfh4 i bgk "YXi "Ui"</u>"'Gi ddcfh
\ci fg'UfY', .\$\$Ua '-'%\$.\$\$da 'cb'k YY_XUmg'UbX'-.\$\$Ua '-').\$\$da 'cb'k YY_YbXg'fl *) 'XUmg'U'mYUft'''#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'Yl hYbg]cbž'Vi hmci
a i ghfYhJ]b'mci f'h]W_Yhbi a VYf'Zfca '9| hYfbU''Gi ddcfhfU'cb['k]h\'Ubmch\Yf'fY'Yj UbhXcW'a Ybhgt'hc
]bWi XY'Ug'Yj]XYbWY'hc'gi ddcfhmci f'Yl hYbg]cb'Udd']WUh]cb'''#mci 'Ya U]''9| hYfbU''Gi ddcfhmci 'k]'`
Ui hca UhJWJ'`mfYWY']j Y'U'HJW_Yhbi a VYfž'Vi h]Zmci 'hY'Yd\cbY'mci 'k]'''bYYX'hc'gdYWJZJWJ'`mUg_'Zcf'cbY''
Hi fb]h]b'U'gc'dfcj]XYg'i dXUhYg'cb'h\Y]f'gmghYa 'gfUh' g'cb'Hk]hYf"

; YbYfU`mž'UggYgga YbhitUg_g'a i ghVY'gi Va]hhYX'Y`YWfcb]WU``mj]U'Y]h\Yf'Hi fb]h]b'cf'U'A ccX`Y Ugg][ba Ybh''=b']bghUbWfg'k \YfY'h\]g']g'bchdcgg]V`Yž']hk]```VY'ghUhYX'cb'mci f'Wci fgY'g'A ccX`Y'g]hY'k]h\U`hYfbUh]j Y'gi Va]gg]cb'XYhU]`g"

@UhY 5ggYgga Ybh'DYbU`h]Yg

Gh XYbhgʻUfYʻfYgdcbg]V`YʻZcfʻh\Yʻgi Va]gg]cbʻcZUggYgga YbhhUg_gʻVmh\YʻfYei]fYX`XUhYgʻUbXʻhJa Yg" 8YdYbX]b[ˈcZh\Y`YI hYbhcZXY`Um]bʻh\Yʻgi Va]gg]cbʻcZUbʻUggYgga YbhhUg_ʻdUghh\Y`Xi Y`XUhY`UbXʻhJa Yž

- K cf_'gi Va]hh'X`%\$`hc`% 'XUmg`UZhYf`h\Y`gh]di `UhYX`XYUX`]bY`k]```VY`UggYggYX`UbX`ZYYXVUW_dfcj]XYX`Vi h'U`a Uf_'cZnYfc`k]```VY`fYWcfXYX"`\Zh\Y`k cf_'k ci `X`\Uj Y`fYWf]j YX`U'dUgg`a Uf_'Vi h'Zcf h\Y``UhYbYgg`UbX`h\Y`k cf_']g`U`Wca di `gcfm'Wci fgY`Wca dcbYbh'f\i fX`Y`fYei]fYa Ybh\ž`U'gh XYbhk]``VY`XYYa YX`hc`\Uj Y`a Yhh\Uh'fYei]fYa Ybh\
- K cf_'gi Va]hhYX`&\$`cf`a cfY`XUmg`UZhYf`h\Y`gh]di `UhYX`XYUX`]bY`k]```bchVY`UWWdhYX`Zcf UggYgga YbhUbX`k]```fYWY]j Y`bc`ZYYXVUW_ža Uf_'cf`[fUXY"'=Zh\Y`UggYgga YbhHUg_']g`U`Wca di `gcfm Wca dcbYbhcZh\Y`Wci fgY`U'ghi XYbhik]```fYWY]j Y`Ub`l bgUh]gZJWcfmi: U]``fl : Ł`[fUXY`Ug`U`fYgi `hcZ i bgUh]gZJWcfmidYfZcfa UbWY`]b`Ub`YggYbh]U``Wca dcbYbhcZh\Y`Wci fgY"

H\]g^]bZcfa Uh]cb^]g^U^gc^Uj U]^\$

‰fm

‰ ‰

‰

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"'=hWJb'hU_Y`a Ubm Zcfa gžZfca `XY`]VYfUhY`W\YUh]b['hc`UWW]XYbhU`mWcdm]b['Zfca `U`gci fWY'k]h\ci hUW_bck `YX[Ya Ybh'

IBGK [fcidg'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 h'cf']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'U`gc'Udd`]Yg'hc']a U[Ygž'Ufh'UbX'XYg][b'dfcYWhgž'Ug'k Y``'Ug dfYgYbhUh]cbg'k \YfY'gca YcbY'dfYgYbhg'Ubch\Yf'g']XYUg'cf'k cfXg'k]h\ci h'WfYX]h'

⇒ Uddfcdf]UhY 'dUfUd\fUg]b[...7\Ub[]b['U'ZYk'k cfXg'UbX'd\fUgYg'k\]Y 'a cghmfYhU]b]b['h\Y'cf][]bU` ghfi Wh fY 'UbX#cf'dfc[fYgg]cb'cZ]XYUg'cZh\Y'cf][]bU`žUbX']bZcfa Uh]cb'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['"

7 c``i g]cb. k cf_jb[k]h ch\Yfg'Vi hdUgg]b[cZZh\Y'k cf_'Ug'U'dYfgcb'g']bX]j]Xi U``k cf_"'7 c``i g]cb'U`gc]bWi XYg'dfcj]X]b['mci f'k cf_'hc'Ubch\Yf'ghi XYbhVYZcfY'h\Y'Xi Y'XUhYžcf'Zcf'h\Y'di fdcgY'cZh\Ya d`U[]Uf]g]b['Uh'Ubmh]a Yž'dUm]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'cZYf]b['hc'Wca d'YhY'Ubch\Yf'dYfgcb'g'k cf_'cf'gYY_]b[dUma YbhZcf'Wca d'Yh]b['UWUXYa]Wk cf_"

±bUddfcdf]UhY`W]hUh]cb.`7]h]b[ˈgci fWYg'k\]WX`\Uj Y`bchVYYb`fYUXžk]h\ci hUW_bck`YX[]b[`h\Y`″gYWcbXUfm″gci fWY`Zfca 'k\]WX`_bck`YX[Y`cZh\Ya`\Ug'VYYb`cVhU]bYX"

8 i d`]\WUh]cb`ffgY`Zd`U[]\Uf]ga "Ł gi Va]\h]b[`mci f`ck b`k cf_ž]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 cffYWhfYZYfYbWb[dfUWhWyg.

7ci fgY GWX YXi `Y

J]Yk 'WUgg'ha YHUV'Y

H]a YtUV`Y

8 UhY	HmdY	7cbhYbh
K YY_'% '&' '>i `m'! '&- '>i `n	@YWnifY	±blfcXiWh]cb'hc'; YbXYf']b'7∖]bU
		H\]g`k YY_`dfcj]XYg`Ub`cj Yfj]Yk `cZh\Y`Wci fgYž UggYgga Ybh'UbX`_YmWcbW'dhg"`#i]bhfcXi W'g`h\Y a U]b`h\Ya Yg`Zcf'h\Y`Wci fgY"
K_YY_"&."' \$">i `m'!")	@YWn fY	A Uff]U[Yž'ZJa]`m'UbX gcW]Ylm'''
5i [i gh		FYUX]b['%'8Uj]gž8"'&\$%(''Cb'h\Y'']a]hg'cZdYfgcbU''Ui hcbca m'DF7'@Uk'UbX'h\Y'=bgh]hi h]cb'cZAUff]U[Y'ž']b'8Uj]g'8"'UbX': f]YXaUbžG"'fYXgŁ'I [hWeł: geTS`VełS`V>ahWde,? Sdd[SYWS`VeWjgS{fk[':a`Y]a`YłFS[iS`VS`VgdTS`5Z[SłGHUbZcfX'Ib]jYfg]hmDfYggždd"'(%!*%"
		FYUX]b['&.''5HUbYž'=''&\$%*''fGYWcbX'7\]`X 8YW]g]cbg']b'7\]bUfZBabg'Sf[a` S`V6WhWab_Wf DWh[W Z(&f1Ł')%!'*"'
K YY_" . '* '5i [i gh! '‰ 5i [i gh	@YWh fY	A Uff]U[Y`UbX`a cV]`]hm
		FYUX]b['%' '7 cbghUV'YžB" '&\$\$('falfcXi Wjcb. 7 fcgg!VcfXYf'a Uff]U[Ygž[YbXYfYX'a cV]]mž'UbX ['cVU''\mdYf[Ua mž]b '7 cbghUV'Y'B "flYX"L'7 fcgg! VcfXYf'A Uff]U[Yg.; YbXYf'UbX'a cV]]mi]b HfUbgbUhjcbU' '5g]Už'D\] 'UXY'd\]Už'I G5. I b]j Yfg]m cZDYbbgmj Ub]U' DfYggž'dd" '%'* FYUX]b['&' 'K Ub[ž'DUb' &\$% ž'fi cfY][b!fY'UhYX a Uff]UY']b 'WcbhYa dcfUfm'7\]bU'% +-!&\$% fi]b 'NUb[
		L "K "'UbX'N\Uc'L"'@''flYXgŁ' <ubxvcc_'cb'th\y':]`m<br="" ua="">UbX'A Uff]U[Y']b'7\]bUž'9Xk UfX'9`Uf'Di V`]g\]b[ž'dd" , -!%\$+"</ubxvcc_'cb'th\y':>
K YY_'(.'%'5i[igh!'% 5i[igh	@YWh fY	9Wcbca]WgʻUbXʻi fVUb]nUh]cb
0 1 gii		FYUX]b['%```?]a ž'>cb[gib['&\$% ž; YbXYf X]ZYfYbWY]b'Ya d`cma YbhUbX]bWca Y`]b'7\]bU'g `UVcifa Uf_Yhž'H\Y`>cifbU`cZ9Ugh5g]Ub'5ZU]fgž dd"''%)&"
		FYUX]b['&'``'< UbgYfž'5"'&\$\$) ž'fH\Y'; YbXYfYX'F]\W 6ck `.'H\Y'GYI i U`'Dc`]h]\Wg'cZGYfj]\W'K cf_']b'I fVUb

	7 \]bU'ž; YbXYf'UbX'GcWJYhm'J c`"'% ž'Bc"') ž'dd") , % *\$\$
K YY_').'&\$'5i[igh!'&* 5i[igh	

		FYUX]b['&'`>YZEYgm'9"'UbX'M ' <u]e]b['&\$%)="" ž'<br="">'7 ca a YfWjU``GYI'']b'>YZEYmg'UbX'M '<u]e]b['flyxgł'<br="">EWj [5Z[Sž'7 Ua Vf]X[Y. Dc`]hmDfYggž'dd"'-*!%%-"'</u]e]b[></u]e]b[>
K YY_''%+'GYdhYa VYf'! &' 'GYdhYa VYf	@YWi fY	<pre>< YU`h\` F YUX]b['%''@YYž'< mYccb'>i b['&\$%(ž'fi YUf`Ygg `cj YžXYUh\ 'cZf'X][b]mm'ZYa U`Y'gi]MJXY'UbX'[YbXYfYX gi V^YWfj]mm]b'fi fU``bcfh\ '7 \]bUfzFZW5Z[` S <agd` &"="" '&<="" c`"'+%z'dd"'&)!(="" f="" j="" pre="" s^z="" yux]b[=""></agd`></pre>

		cZh\Y`<]ghcfmcZGdcfhždd"`&(&!&**"
K YY_'% .'&&'C WhcVYf'! &, 'C WhcVYf	@YWn fY	A YX]U'UbX'Dcdi `Uf'W `hi fY' F YUX]b['&''K U``]gž7"'&\$%) '; YbXYf'UbX'W\]bU'g cb`]bY'Wbgcfg\]d'dfchYghW `hi fY'ž8W_ [` [ef? WW[S E fgV[WežJ c`"'%) ž'bc"&ž'dd"'&&'!&', " F YUX]b['' '''@]'@ n\ci ž'&\$%) ''⊋mci 'UfY'h\Y'cbY.

FYgci fWyg

DfYgWf]VYX F Ygci fWYg

fYZYf hc Wci fgY gWXYXi Y

.

FYWca a YbXYX FYgci fW/g

9Xk UfXgž@"&\$\$, ž9W VWd Baff[Uel S`V 6W_aUdSUk, I a_W e EgXdSYW[5Z[SžGHJbZcfXž75žGHJbZcfX I b]j Yfg]hmDfYgg"

9j Ubgž'< "'% - +žI a_ W S` V eWj gS {fk [` 5 Z [` S, Va_ [` S` f V [eUag deWe a X X V_ S WeWj gS {fk S` V Y W V W de [` UW# + & +ž 7 Ua V f] X [Y. `Dc`] miDf Y gg"

Gcb['; Yb['UbX'<]fXž8"'&\$%(ž? W S`V? SeUg1 [f]We[' 5a`fW_ bac6ck 5Z[' Sž@Y]XYbžBYh\YfUbXg. 6f]`"

K Ub['DUb'&\$%) z'>ahWS` V ? Scd[SYW[9 aTS1] [Y 5 Z[Sz5V]b[XcbzClcb'/BYk 'Mcf_'. "Fci hYX[Y"

 $N\ Ub[\ 'L\]Uck\ Y]\ UbX`N\ Uc'L\]Uc'@''fl'XgL'&$\% \ \check{z}<UbXVcc_'cb''h\ Y': \ Ua\]`m'UbX`A\ Uff]U[\ Y']b'7\]bU\check{z}'9Xk\ UfX 9`[\ Uf'Di\ V`]g\]b[$

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

H\]g`Wci fgY`k]``VY`Yj U`i UhYX`j]U`h\Y`A m7 ci fgY`9| dYf]YbWY`dfcWYggYg`Uhh\Y`YbX`cZh\Y`gYa YghYf"`\Zmci\Uj Y`gi [[Ygh]gcbg`Zcf`k Umg`hc`]a dfcj Y`h\Y`Wci fgY`Xi f]b[`h\Y`gYa YghYfž'd`YUgY`ZYY``ZfYY`hc`Wca Y`UbX`hU`_ hc`i q"`K Y`k Y`Wca Y`mci f`ZYYXVUW_"

a U[Y'7fYX]h

D\chc VmGUa Ubh\U Gcd\]U cb I bgd Ug\

7F = 7CG

7F = 7CG Dfc|]XYf 7cXY. \$\$\$-,;