

7ci fgY[·]Cj Yfj]Yk

GHJZZ:7cbHJWh:8YHJ]`g`

7cbj Ybcfg

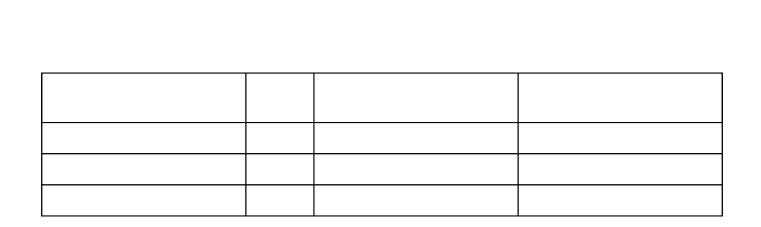
B Ua Y	9a U]`	5j U]`UV]`]hm	@cWUh]cb	D∖cbY

7ci fgY⁻8YHJ]`g

7fYX]hDc]bhg**

Gi a a UfmcZh\Y 7ci fgY

 $DYfZcfa\ UbW''a\ UffY'fg']b'fh'Y'k\ cf'X'''5ff]gfg'U'k\ Umg'fYgdcbX'fc'fh'Y'dfcV'Ya\ g'cZfh'Y]f'fh]a\ Y'''5bX'fh'YUffY!$



@Yb[h\. &ž\$\$\$!&ž)\$\$ k cfXg

8YHJ]`g. '&\$\$\$!&) \$\$ 'k cfXg; fUXYžF i Vf]WUbX '7 ca a YbH': YYXVUW_'j]U '@A G

5XX]h]cbU`XYhU]`g.

D`YUgY'bchY'h\Uhih\]g`Ugg][ba Ybh\\Ug'h\Y'Zc``ck]b['&'Wca dcbYbhg.

7 ca dlctbYtbt19%99ggbtifitDibb 'hc 'VY'gi Va]hhYX'hc 'Hi fb]h]b 'Vm) da 'cb'H\i fgXUm) 'A UfV\\ ']b 'K _'' "'H\]g Wta dcbYbh]g'a UbXUhcfmUbX'k]``'fY\W']j Y'Zcfa Uhjj Y'ZYYXVU_'f\wta a YbhUfmtk]h\]b '&'k YY_g'cZ gi Va]gg]cb"''< k Yj Yf\[\text{fill} hXcYg'bch\\UffmU'i 'k Y][\h]b["

H\Y`9ggUmD`Ub`g\ci`X`VY`%ï

С

@Yb[h\.'\\\$'a]bi h\g

8YHU] g. % a]bi h/g; fUXYžFi Vf]WžUbX 7 ca a Ybh: YYXVUW_j]U @ G

5XX]h]cbU`XYhJ]`g.

 $H\ [g'[fci\ d'dYfZcfa\ UbW''hU_Yg'd`UWY'Xi\ f]b[''h\ Y``YWi\ fY'g`ch']b'K\ _'\%$']"Y"'cb'K\ YXbYgXUm'\&\&'5df]``\&\%``ž Zfca'- Ua'hc''%JJa'''$

#J 'ga U```[fci dgž'mci 'k]``WfYUhY'U'%\$!a]bi hY'dYfZcfa UbWY'hc'VY'g\UfYX'k]h\ 'h\Y'fYghcZh\Y'WUgg']b'K YY_%\$"'`Fi Vf]W]bX]WUhJb[``Yj Y``cZdYfZcfa UbWY'U[U]bghYUW\'UggYgga YbhWf]hYf]Užk f]hhYb'Zcfa UhJj Y'ZYYXVUW_žUbX'dYfWbhU[Y'[fUXY"'`GY`ZYj U`i UhJcb'UbX'dYYf'fYj]Yk']g'hU_Yb']bhc'UWWci bhUbX'a UmfYgi `h']b'Ub]bX]j]Xi U``a Uf_'VY]b['[]j Yb']bghYUX'cZU'[fci d'a Uf_']b'WJgYg'cZX]gWfYdUbhWcblf]Vi hJcb"

: cfZ fh\Yf]bZcfa Uhcb gYY A ccX`Y"

Hi fb]hjb gYhjb[. H\]g]g bchU Hi fb]hjb Ugg][ba Ybh

5ggYgga Ybh' . 7f]h]WU`FYZYWh]cb

GhUfhXUhY. Bch5dd`]WUV`Y

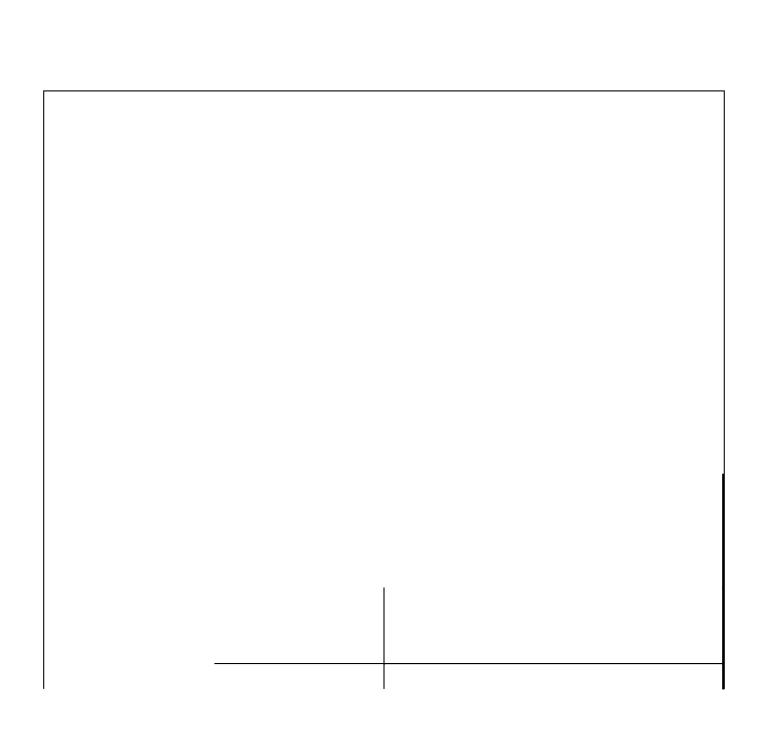
@Yb[h\. '%\$\$\$!\%\) \$ k cfXg

8YHJ]`g. `%\$\$!\%) \$`k cfXg; fUXY`UbX`F i Vf]W YYXVUW_`j]U`@A G"

5XX]h]cbU`XYhU]`g.

K f]hY`U`%\$\$\$!kcfX`dUdYf`h\Uh`Wf]h]WU``mfYZYWg`i dcb`h\Y`XYj]g]b[`UbX`fY\YUfgU``dfcWfgg`Ug`k Y```Ug`h\Y Z]bU``dYfZcfa UbW'`kcf_"``H\]g`]g`h\Y`Z]bU``UggYgga Ybh'HJg_"`Fi Vf]W]bX]WUh]b[``Yj Y``cZdYfZcfa UbW'`U[U]bgh YUW\`UggYgga Ybh'Wf]hYf]U`UbX`dYfWfbhU[Y`[fUXY"

 $\label{thm:limit} \begin{array}{ll} \mbox{Hi fb]h]b"gYhh]b" . "H\]g"Ugg][ba Ybh]g"gi Va]hhYX"h\fci [\ \ 'Hi fb]h]b"UbX"gh XYbhg"Xc"bchgYY"Hi fb]h]b g]a]"Uf]hmfYdcfhg" \\ \end{array}$



		8 i Y 'hc 'Hi fb]h]b 'Vm') da 'cb 'H\i fgXUm') 'A UfWX ']b 'K _ '	
K YY_'(.'-'A UfWX'!'%' A UfWX	@YWh fY	K YX'%%A UfW\ž-!%\Ua žI BGK '6i g]bYgg'GW\cc` &%*	
		@YWhifYf."8f">cbUh\Ub"6c``Yb	
		DcghWc`cb]U`]ga . H\Ycfm	
	Hi kcf]U`	: f]X ⁻ % ⁻ A UfVXž ⁻ -!%/Ja ⁻ cf ⁻ %/3 %da ž ⁻ K YVghYf ⁻ ' ')	
		CbY`\cif`X]gWgg]b[`fYUX]b[g/cbY`\cif`cZdYfZcfaUbWYYIYfW]gYg"	
K YY_').'%*'A UfW\'!'&\$ A UfW\	@YWh fY	K YX'% 'A UfW\ž-!%\Ja ž'l BGK '6i g]bYgg'GW\cc` &\%*	
		@YWhifYf."8f">cbUh\Ub"6c"Yb	
		DcgtWc`cb]U`]ga . '7 UgY 'Gti X]Yg	
	Hi hcf]U`	: f]X^&\$^A UfVXž-!%/Ja ^cf^\%4\%da ž*K YVghYf*' ')	
		C bY`\ci f`X]gW gg]b[`dYfZcfa UbWY`WUgY`ghi X]Yg/ cbY`\ci f`cZdYfZcfa UbWY`YI YfW]gYg"	
K YY_'*.'&' 'A UfWX'!'&+ A UfWX	@YWhifY	K YX'&) 'A UfW\ž'-!%\Ja ž'I BGK '6i g]bYgg'GW\cc` &%*	
		@YWhifYf."8f">cbUh\Ub"6c``Yb	
		Dcghi a Ub]ga . H\Ycfm	
	Hi hcf]U`	: f]X^&+^A UfVXž-!%/Ja ^cf^\%d\%da ž'K YVghYf'' ')	
		CbY`\cif`X]gWgg]b[`fYUX]b[g/cbY`\cif`cZdYfZcfaUbWYYIYfW]gYg"	
	5ggYgga Ybh	5ggYgga Ybh%ž7ca dcbYbh& 9ggUmf(\$ı Ł	
		DfYdUfY'h\]g'Ugg][ba Ybhk\]W\']g'Xi Y'hc'Hi fb]h]b'Vm) da 'cb'Hi Yg'' %A UfW\"'	
K YY_'+." \$"A UfWX"!" 5df]`	@YWhifY	K YX'%'5df]`ž'-!%\Ja ž'l BGK '6i g]bYgg'GW\cc``&\	
July		@YWhifYf. 8f'AY['AiaZcfX	
		Dcgh\i a Ub]ga . '7 UgY 'Gh X]Yg	
	Hi hcf]U`	: f]X'' '5df]`ž-!%Ja 'cf'%H%da žK YVghYf'' ')	
		CbY`\cif`X]gWigg]b[`dYfZcfa UbWY`WUgY`ghiX]Yg/ cbY`\cif`cZdYfZcfa UbWY`YIYfW]gYg"	
K_YY_', .'*'5df]`'!'%\$'5df]`	F YUX]b[H\]g`]g`U`fYUX]b[`k\YY_"``H\YfY`]g`bc``YWi fY"``8i f]b[h\]g`k\YY_`mci `g\ci `X`k\cf_`cb`h\Y`; fci d DYfZcfa\UbVW`Vch\`]bXYdYbXYbhmUbX`k]h\`mci f	
		[fci d"	

	F YUX]b[H\]g`]g`U`fYUX]b[`kYY_"``H\YfY`]g`bc`h hcf]U`"``8if]b[h\]g`kYY_`mci`g\ci`X`kcf_`cb`h\Y`;fcid DYfZcfaUbWY`Vch\`]bXYdYbXYbhmUbX`k]h\`mcif [fcid"
K_YY_''%'5df]`'!'%+ 5df]`	Gh X]c	K YX'%) '5df]'ž''-!%\Ja ž'j Ybi Yg'HVW : UWJ']HUhcfg. '8f'A Y['A i a ZcfX'/ '8f'>cbUh\Ub'6c``Yb
	Gh X]c	FY\YUfgU``Zcf'; fci d'DYfZcfa UbWV : f]X'%+'5df]`z'-!%%Ua 'cf'%%I%da z'K YVghYf''')
K_YY_"%\$."&\$"5df]"!"&(5df]		FY\YUfgU``Zcf'; fci d'DYfZcfa UbW

FYgci fW/g

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±iWUbihU_Yia Ubm Zcfa qžZfca iXYi]VYfUhYiW\YUh|b[ihciUVW]XYbhU`mWcdm]b[iZfca iUiqci fWYik]h\ci hiUW_bck iYX[Ya Ybh'i

IBGK '[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 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 cghmfYhJ]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 hWfYX]hUbX'hc d]YW]b['hc[Yh\Yf'ei chYg'UbX'dUfUd\fUgYg']bhc'U'bYk 'k \c`Yžk]h\ci hUddfcdf]UhY'fYZYfYbW]b["

7 c``i g]cb. 'k cf_]b['k]th 'cth Yfg'Vi hidUgg]b['cZZth 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_'thc'Ubcth Yf'ghi XYbh'VYZcfY'th Y'Xi Y'XUlfYZcf'Zcf'th Y'di fdcgY'cZth Ya

- i bXYfgfUbX mci f'f][\hg'UbX'fYgdcbg]V]`]hJYg'Ug'U'gh XYbhUhl BGK
- VY`Uk UfY`cZd`U[]Uf]ga ž`Wcdmf][\hz'l BGK `Gh XYbh7cXY`cZ7cbXi WhUbX`5VWWdhUV`Y`l gY`cZ I BGK `=\forall H`F Ygci f\W\g`Dc`]\m\m
- VY 'Uk UfY 'cZh\Y 'ghUbXUfXg 'cZVY\Uj]ci f'Yl dYWYX 'cZYj YfmcbY ']b 'h\Y 'l BGK 'Wca a i b]hm
- `cWUHY 'gYfj]WYg'UbX ']bZcfa UH]cb'UVci hI BGK 'UbX'I BGK '@]VfUfm

Gca Y'cZh\YgY'UfYUg'k]``VY'ZJa]`]Uf'hc'mci žch\Yfg'k]``VY'bYk"'; U]b]b['U'gc`]X'i bXYfgHJbX]b['cZU``h\YfY`UhYX'UgdYWhg'cZ9@&9'k]``\Y`d'mci 'a U_Y'h\Y'a cghicZmci f'ghi X]Yg'Uh'l BGK "'\\hd.##gi V'YWfi |XYg"`]VfUfm'i bgk "YXi "Ui #\`]qY#JVci hY`]qY

5 WUXYa]W = b Zcfa Uh cb ·

: cf`YggYbhJU``gh XYbh`]bZcfa UhJcb`fY`UhJb['hc.

- fYei Yghg Zcf Yl hYbg]cb/
- `UhY`gi Va]gg]cbg`[i]XY`]bYg/
- fYj]Yk 'cZa Uf_g/
- I BGK '< YU`h\ 'UbX'GUZYhm'dc`]W[Yg/
- YI Ua]bUhcb dfcWXi fYg/
- gdYWJU``Wcbg]XYfUhJcb`]b`h\Y`Yj YbhcZ]``bYgg`cf`a]gUXj Ybh fY/
- gh XYbhYei]lmUbX X]gUV]`]lm/
- UbX'ch\Yf'YggYbhJU`'UWUXYa]W]bZcfa UhJcbž'gYY

<u>\hdg.#k k k "Ufng"i bgk "YXi "Ui #W ffYbhghi XYbhg#UWUXYa]W]bZcfa Uhlcb#dfchcWc`g![i]XY`]bYg#</u>

.

∍a U[Y'7fYX]h

I BGK "H\YUlfY"UbX"DYfZcfa UbW

7F = 7CG

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