

MDIA5024

7 ca a i b]WUnjcb GlfUhY[]Yg

HYfa "Hk c "#" &\$&%

7ci fgY^{*}Cj Yfj]Yk

GHJZZ:7cbHJWhi8YHJ]`g

7cbj Ybcfg

BUa Y	9a U]`	5j U]`UV]`] m	@cWUh]cb	D∖cbY
D51 @FM89F	d"fmXYf4 i bgk "YXi "Ui	Cb`]bYžVmUXj UbW	KYVghYf" ‱	
		Uddc]bha Ybh		

5Xa]b]ghfUhcfg

B Ua Y	9a U]`	5j U]`UV]`]m	@cWJhjcb	D\cbY
585A	U"gHJd`Yhcb4 i bgk "YXi "Ui	Cb`]bYž'VmUXj UbWY	K YVghYf" ‰	
GH5D@9HCB		Uddc]bha Ybh		

GWXcc`7cbHJWhi±bZcfa Uhjcb

GWVcc``cZhV'5fhg`UbX`AYX]U

D\cbY.`f\$&Ł'-',) '(,)*

9a U]`. 'gUa 4 i bgk "YXi "Ui

7ci fgY 8YW] g

7 fYX]hDc]bhg**

Gi a a UfmcZh\Y 7ci fgY

Dfyg]XYbh>c\b: ""? YbbYXmcbWi gu]X']b'Yghih Uhih Y'VYghighfUhY[]Yg'UfY'UWIXYbhU`"CZWci fgYz`\Y'a UXYh\Y'c_Y'rc'\][\`][\hYl UWimih Y'cddcg]hY"'H\Y'VYghighfUhY[]Yg'UfY'WJfYZ ``mUfW,]hYWhX'YbgYa V'Yg'h UhYl \] hYl by 'YbgYa V'Yg'h UhYl by 'YbgYa V'Yg'h UhYl ei]g]hY'gma a YhfmUbX'gmbYf[mcZcVYWh] Ygz'WcbWidhgz'UbX'hUwh]Wg'"+b'h]g'Wci fgY'mci k]``YUfb'h Uhidck YfZ ``WcbWidhg'`]Y'Uhih Y'\YUfhcZ[ccX'ghfUhY[mUbX'h Uhih YgY'WccfX]bUhY'UbX'X]gW]d']bYhUwl]Wg"'Mci k]``U'gc ``YUfb'h UhihUwl]Wu'`]a dUWi]g'a i `h]d`]YX'k \Yb'h\Y'f][\hiwcbWidhg'UfY'Vfci [\hinc[Yh\Yf"H\i gz'h]g'Wci fgY'k]```fUX]WU``mU'hYf'mci f'h]b_]b['UVci highfUhY[mUbX']hg'XmbUa]\Wg"'6UgYX'cb'U'gYhcZ Wca a YfW]U'`W]YbhgWibUf]cg'h UhidUfU``Y``fYU'!k cfX'dfcV'Ya gz']b'mci f'a U'cf'dfc YWimci 'k]```fYgYUfWX'h YXaa U]b']b'k\]Ww'mci f'W]YbhcdYfUhYgz'ZJg\]cb'UbX'XYZ/bX'U'WcbWidh'U''ZfUa Yk cf_'Zci bXYX'cb'XYYd! gYUhYX'Wca a i b]\WJh]cb'UbX'Wca a i b]\WJh]cb'UhX'h\Ycfmz'UbX'h\Ycfmz'UbX'h\Yb'XYj Y'cd'U'gi]hY'cZhUWl]\wg'h\Uhik]``UXXfYgg'h\Y'W U``Yb[Y''k \Yb'mci '\Uj Y'Wca d'YhYX'h\]g'Wci fgYz'mci 'k]``VY'dcg]h]cbYX'hc'cZYbXYUj ci fg''UhY[]Wca a i b]\WJh]cb'Wci bgY`'hc'U'`a UbbYf'cZYbhYfdf]gYg'i bXYffU_]b['U'j UghfUb[Y'cZYbXYUj ci fg''

7 ci fqY @YUfb]b['Ci hWca Yq

- %" 5dd`mih\Y`df]bW]d`Yg`UbX`dfUWI)WYg`fY`Yj Ubhihc`]bhYfdfYh]b[`'U'Vf]YZz`gWUbb]b[''U'Wca a YfW]U`Ybj`]fcba Ybhz`UbX`X]gh]b['']g\]b[''VYlk YYb`cVYWIj Yqz`WcbWYdhgz`UbX`HUWIWq
- &" 9I d`U]b`h\Y`ZYUh fYg`UbX`XmbUa]Wg`cZU`a Uf_Yhd`UWY`Udfcdcg`h\Y`W]fW a ghUbWrg`cZU`[]j Yb Wca a YfWlU`Ybh]hm
- '" 8 Yj Y`cd`UbX`XYZYbX`U`fY`Yj Ubh'WcbWYdh U``ZfUa Yk cf_`UbX`dfcZZYf`Wcbh]b[Ybh'hUWf]WU``ci hdi hg`Zcf`U []j Yb`Wca a YfW]U``Ybh]hm

HYUW]b['GhfUhY[]Yg'

 $H\[g'WcifgY'k\]^{``VY'HJi}\[\h]b'Xi\ U``a\ cXY'fcb`]bY'UbX'ZJWY!hc!ZJWY!k\YfYVm`YWhifYg'k\]^{``VY'XY']j\ YfYX cb`]bY'j\]U'6`UW_VcUfX'7c``UVcfUhY'fb67Ł'UbX'hihcf]U'g'k\]^{``VY'XY']j\ YfYX'ZJWY!hc!ZJWY'hc!ZJWY'hhci [\hark YY_'+"5Wfcgg'K\ YY_g', hc%$žh\Y'WcifgY'XY']j\ Yfma cXU']hmik\]^{``WXUb[\Y'hc'W]Ybh\WbhfYX']bhYbg]j\ Y'fcb`]bYŁ'a\ U'cf\ dfc YWhYbgji\ hUh]cbg'j\]U'667"'$

5ggYgga Ybh

5ggYgga YbhHUg_g

&ž\$\$\$ 'k cfXg'

: fca 'U'g\cfh`]ghcZcdh]cbgž'U'gh XYbhk]``'W\ccgY'U'W]YbhgWrbUf]c'UbX'cZYf'U'fYdcfhh\UhfUŁ'gWUbg'UbX Yj U`i UhYg'h\Y'Wf]r]WU`'ZYUh fYg'cZh\Y'fY`Yj UbhWca a YfW]U`'Ybj]fcba Ybhfl+)\$!k cfXgŁž'fVŁ'Yb[U[Yg Wca a i b]WUh]cb'UbX'Wca a i b]WUh]cb!fY`UhYX'h\Ycfmhc'XYj Y`cd'UbX'XYZYbX'U'WcbWrdh U`'ZfUa Yk cf_'U]a YX

5 https://bxubwww.Fyei]fYaYbhg

Ghi XYbhgʻUfYʻghfcb[`miYbWci fU[YX'hcʻUhhYbX'U```WUggYgʻUbX'fYj]Yk '`YWhi fY`fYWcfX]b[g"

7ci fgY'GWXYXi `Y

J]Yk 'WUgg'ha YhUV'Y

H]a YtUV`Y

8 UHY	HmdY	7 cbhYbh
K YY_'%'' %'A Um!'('>i bY	@YWhi fY	H\]g`cdYb]b[``YWifY`]blfcXiWig`mci`hc`h\Y`fighcfmficZ glfUhY[mUbX`hc`h\Y`fighfUhY[]WYeiUh]cbfi'Mci`k]`` U`gc`VY`]blfcXiWYX`hc`h\Y`WfiW]U``eiYgh]cb`cZ glfUhY[]WXmbUa]Wg''`
	Hi hcf]U`	Hi lbcf]U`g`Zc``ck ``YWh fY`WcbhYbhUbX`k YY_`mfYUX]b[g UbX#cfj]XYc`fYgci fWfg"`5g`Zcf``YWh fYgž'h lbcf]U` g`]XY`XYW_g`k]``VY`i d`cUXYX`lb`A ccX`Y`Uhlh\Y`YbX`cZ YUWX`fY`Yj Ubhk YY_"`
K YY_`&.`+`>i bY`!`%% >i bY	@YWn fY	H\]g`k YY_fg```YWfi fY`]g`U```UVci hfYWcbbU]ggUbWf. fYgYUfWk`a YfkcXc`c[mUbX`a YfkcXg"``Mci 'k]````YUfb fkUhk]fkci hYZZYWfj Y`fYgYUfWkžfkYfY`WUb`VY`bc YZZYWfj Y`ghfUhY[m'``
	Hi hcf]U`	Hi lbcf]U`gʻZc``ck ``YWh fY`WcbhYbhUbX`k YY_`mfYUX]b[g UbX#cfj]XYc`fYgci fWrg"`5gʻZcf``YWh fYgž'h lbcf]U` g`]XY`XYW_g`k]```VY`i d`cUXYX`lbc'A ccX`Y`Uhh\Y`YbX`cZ YUW\`fY`Yj Ubhk YY_"`
K YY_" ."%) '>i bY"!"% >i bY	@YWhi fY	5g'U'di V`]W\c`]XUmZJ``g'cb'A cbXUmcZh\]g'k YY_fin Y XUmcZh\Y'i gi U```YWi fYŁžfYd`UWjb['h\]g'k YY_fin YWi fY']g'U'j]XYc'fYWcfX]b['cZF]W\UfX'Fia Y`hfth\YUi h\cf'cZmci f'hYI hVcc_Ł[]j]b['U``YWi fY'hc'h\Ygh XYbhg'cZh\Y'@cbXcb'GW\cc``cZ9Wcbca]Wg'''Mcia Umk UhW\'h\]g'`YWi fY'Uhmci f``Y]gi fYžTgfb'WSeWh[W' [f bd[adfa kagdfgfad[S^fZ[e i WW]"''
	Hi hcf]U`	Hi lbcf]U`gʻZc``ck ``YWh fY`WcbhYbhUbX`k YY_`mfYUX]b[g UbX#cfj]XYc`fYgci fWg"`5gʻZcf``YWh fYgž'h lbcf]U` g`]XY`XYW_g`k]```VY`i d`cUXYX`lbc`A ccX`Y`Uhh\Y`YbX`cZ YUW\`fY`Yj Ubhk YY_"`
K YY_'(.'&%'>i bY'!'&) >i bY	@YWhi fY	H\]g`k YY_fg``YWf fY`Wcbg]XYfg`HJWfJWJ` U`][ba Ybhg`UbX`X]gdcg]h]cbg"`#iU`gc`Wcbg]XYfg`h\Y fY`Uh]cbg\]d`VYhk YYb`h\YgY`UbX`h\Y`WcbWfdhg`h\Uh Xf]j Y`h\Ya "`
	Hi hcf]U`	Hi fcf]U`gʻZc``ck ``YWhfYVcbhYbhUbX`k YY_`mfYUX]b[g UbX#cfj]XYc'fYgci fWrg"`5gʻZcf``YWhf fYgž'hi fcf]U` g`]XY`XYW_g`k]``VY`i d`cUXYX`fc`A ccX`Y'Uhh\Y`YbX`cZ YUW\fY`Yj Ubhk YY_"'
K YY_').'&, '>i bY'!'&'>i `m		H\]g`k YY_fg```YWfi fY`UXXfYggYg`h\Y`dck Yf`cZ bUffUh]j Y`fghcfmhY``]b[Ł`]b`Wca a YfWJU``gYhr]b[g"`
	Hi hcf]U`	Hi hcf]U`g`Zc``ck ``YWh fY`WcbhYbhUbX`k YY_`mfYUX]b[g

	5ggYgga Ybh	UbX#cfj]XYcfYgcifWYg"5gZcf`YWYifYgžHifcf]U`g`]XYXYW_g'k]``VY'id`cUXYX'fcAccXY'UhfkY'YbX'cZYUWX'fY`YjUbfkYY_"' Cb'GibXUm\$('>i`m&\$&%'mci'k]``g]hfkY (\$!eiYgf]cbž(\$!a]bifYž(\$!aUf_ai`f]d`Y _bck`YX[Y'Wxc]WY'fYgff'H\Y'fYgfk]``cdYb'Uh'%.\$\$ f#DA Ł'59GH'UbX'WcgY'Uh'%.(\$'f#"(\$DA Ł"'D`YUgY
K YY_'*.")	F YUX]b[H\]g`]g`U`a UbXUhYX`VfYU_`k YY_"`Bc`bYk `k cf_`]g dfYgYbhYX`]b`h\]g`k YY_"`
K YY_'+.''&\'>i `m!''%* '>i `n	n@YWhi fY	

FYgci fWfg

DfYgWf]VYX F Ygci fWYg

Di V`]g\YX`VmDfcZjY`6cc_gžmci `k]```bYYX`U`WcdmcZF]W\UfX`Fi a Y`hfg`&\$\%'j c`i a Y`; ccX`GhfUhY[m6UXGhfUhY[m'H\Y`X]ZZYfYbWY`UbX`k\m]ha UhYfg"`H\Y`I b]j Yfg]\m\vc_g\cd`\c`Xg`Wcd]Yg"`

FYWca a YbXYX FYgci fWYg

GYY Wci fgY 'A ccX Y 'g]hY"

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

 $\label{eq:continuity} $$H^{g'}g'' = C'X'cb'Zcf'h Y'f]XY'cZmcif'']XY'cZmcif'']XY'cZmcif'']XY''K Yfi'Yj U'i UhY'k \Uhk]``VY'U'f]ddYfcZU'WcifgY'Ug'k Y'[c''']$

Gi Va]gg]cb cZ5ggYgga YbhHUg_g Hi fb]h]b Gi Va]gg]cb

-Zmci 'YbWci bhYf'U'dfcV`Ya 'k \Yb'UhhYa dh]b['hc'gi Va]hmci f'Ugg][ba Ybhh\fci [\'Hi fb]h]bž'd`YUgY hY`Yd\cbY'9I hYfbU``Gi ddcfhcb'-',)'''' %cf'Ya U]`'h\Ya 'cb'YI hYfbU`hY`hgi ddcfh4 i bgk "YXi "Ui '"'Gi ddcfh

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]XYbhJ``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.

 $7 \text{ cdm}b[...i g]b[...h\Y.gUa Y.cf.j Yfmig]a] \Uf'k cfXg'hc'h\Y.cf][]bU''hYl h'cf']XYU'k]h\ci h'U\V_bck `YX[]b[...h\Y.cf][]bU''hYl h'cf']XYU'k]h'cf']$

- i bXYfgHUbX'mci f'f][\hg'UbX'fYgdcbg]V]`]h]Yg'Ug'U'gh XYbhUhI BGK
 VY'Uk UfY'cZd`U[]Uf]ga ž'Wcdmf][\hz'I BGK 'Gh XYbh7cXY'cZ7cbXi WhUbX'5VWWdhUV`Y'I gY'cZ IBGK =7 HF Ygci fWrg Dc`]Wh

5WUXYa]W±bZcfa Uh]cb

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

- fYei YghgʻZcfʻYl hYbg]cb/
- `UhY`gi Va]gg]cbg`[i]XY`]bYg/
- fYj]Yk 'cZa Uf_g/
- I BGK '< YU`h\ 'UbX'GUZYmdc`]\\\Yg/
- YI Ua]bUh]cb dfcW/Xi fYg/
- gdYWJU``Wcbg]XYfUhjcb`]b'h\Y'Yj YbhcZ]``bYgg`cf'a]gUXj Ybh fY/
- gh XYbhYei]mUbX X]gUV]`]m/
- UbX'ch\Yf'YggYbhJU`'UWUXYa]W]bZcfa UhJcbž'gYY

\hdg.#k k k "Ufhg"i bgk "YXi "Ui #W ffYbhgh XYbhg#UWJXYa]W]bZcfa Uh]cb#dfchcWc`g![i]XY`]bYg#

a U[Y'7fYX]h

 $H\[g']a\ U[\ Y']g'\]a\ U[\$

7F = 7CG