

MMAN4010

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łłD`YUgY bchY h\Uhh\Y GVXcc`CZZVW k]``bch_bck k\Yb#Zmci f'Wci fgY Wcbj Ybcf']g'cb'WUa di g'cf
Uj U]`UV`Y
9a U
9b[]bYYf]b[ 'Gh XYbhGi ddcfhGYfj ]WYg - W ffYbhgh XYbhYbei ]f]Yg
       Y"["'Ybfc`a Ybhž'dfc[fYgg]cbž'WUg\'fYei Yghgž'Wci fgY']ggi Yg'cf'dfc[fUa!fY`UhYX'ei Yf]Yg
<u>9b[]b|YYf]b[ '±bXi glf]U`'HfU]b]b[</u> '-'±bXi glf]U`'lfU]b]b[ 'ei Ygl]cbg
I BGK "Gh Xm5VfcUX"—"gh XmUVfcUX"gh XYbhYbei ]f]Yg"fZcf"]bVci bX"gh XYbhgŁ
IBGK '91 WXUb[Y'-ghi XYbhYl WXUb[Y'Ybei ]f]Yg'fKcf']bVci bX'ghi XYbhgŁ
LBGKc: KhirDJW6kk XYbbb)-dch/bhJU`gh XYbhYbei ]f]Yg
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7ci fgY 8YHJ] g

7 fYX]hDc]bhg * *

Gi a a UfmcZh\Y'7ci fgY

 $H\g"Wci\ fgY"\g"h\Y'\Z\fghcZhk\ c'dUfhg'UbX'\g'i\ bXYfhU_Yb'VYZcfY'A\ A\ 5B\ (\$\&\$'H\Yg\g'6'''H\Y'H\Yg\g']bj\ c'j\ Yg\ Zcfa\ i'\Uh\b['h\Y'XYg]\[bg'Zcf'UbX'gc'i\ h\ccdYb!YbXYX'Yb\[]bYYf\]b['dfcV'Ya\ g'''H\Y'dfcV'Ya\ g''k\]```VY\ XfUk\ b'\Zca 'Wcbh'a\ dcfUfmdfUWf\W'\UbX'k\]```VY'a i'\h\Z\g\\]bUfm]b\[c'j\]b\[f\]$

Gh XYbhgʻg\ci `X`\Uj YʻdUggYX`% &`i b]hgʻUhih\Yʻh]a Yʻh\YmVca a YbWYʻh\]gʻWci fgY"`

7ci fgY 5 a g

7 ci fgY 5]a g

H\]g`Wci fgY`Yb\UbW'g`h\Y`ghi XYbhg`g_]``g`Zcf`i bXYfhU_]b[`gW.c`Uf`mYbei]fmVmUhhYa dh]b[`hc`UW\]Yj Y`U gdYW]Z]Whcd]WcVYWfj Y`k]h\]b`U`XYZ]bYX`dYf]cX`cZh]a Y"`5`g][b]Z]WUbhWca dcbYbhcZh\Y`Wci fgY`fY`UhYg`hc h\Y`fYj]Yk `cZ`]hYfUhi fYžk\]W\`dfca chYg`]bXYdYbXYbhUbX`fYZYWfj Y``YUfb]b[`Ug`k Y```Ug`]bWfYUgYg ghi XYbhg'`WUdUV]mhc`XYj Y`cd`]bZcfa Uh]cb``]hYfUWh''`H\Y`h\Yg]g`]g`YI dYWhYX`hc`fY]bZcfW\'h\Y`ghi XYbhg`UV]`]hm UbX`WcbZXYbW'`]b`h\Y`k f]hhYb`Wca a i b]WUh]cb`cZhYW\b]WU`]bZcfa Uh]cb"

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

HY'HYg]g']g'kYf	Y YUW gh XYbhk cf	g'i bXYf'h\Y'[i]XUbWY.cZUW	UXYa]WghUZZk]h\ `]bdi h'Zfc	a 'hYW\b]WU`
f]bXi ghfm#fYgYUfVX#	dfUWjhjcbYfŁgdYWjU	`]ghg""Hcd]Wg"Uf	Y 'fY`UhYX 'hc 'dfo	cYWhgigY`YWhY.	X'Zfca 'Wcbh	Ya dcfUfm
dfUWfW""H\Y"kcf_]bj c`j Yg fYgYUfW\!`	/UgYX ⁻]bj Yg <mark>h</mark>][l	Jh]cbgž [*]]bXi ghf]	U``dfcV`Ya g`U	bX'XYg][b'l	ldd`]WJh]cbg"

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DfYgYbhUhjcb hc gi dYfj]gcf	&\$I	%*#\$(#&\$&%`\$).\$\$`DA	%ž'&ž' ž'(

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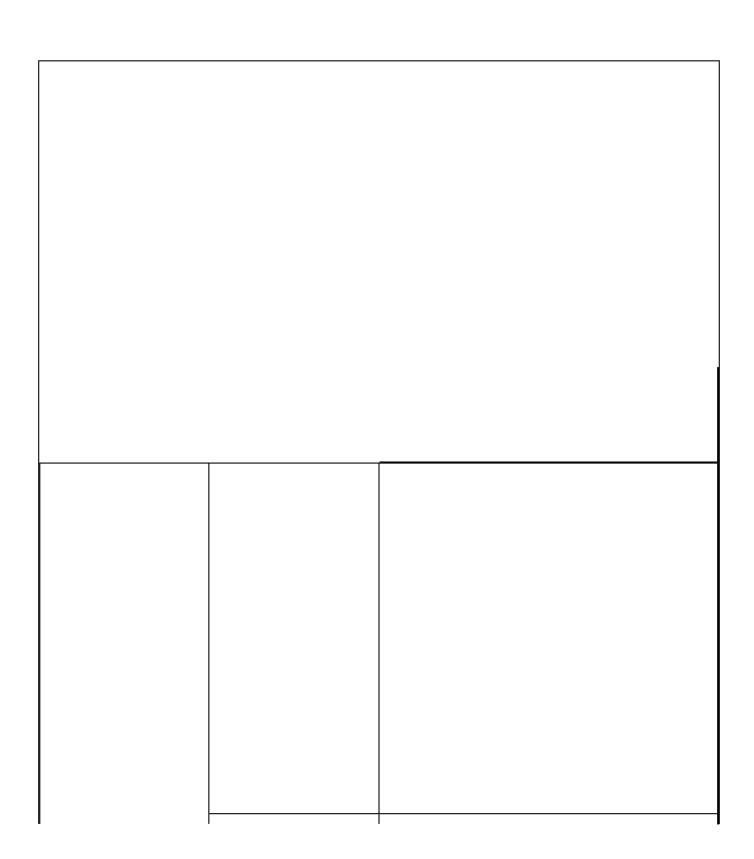
8YHJ]`g.

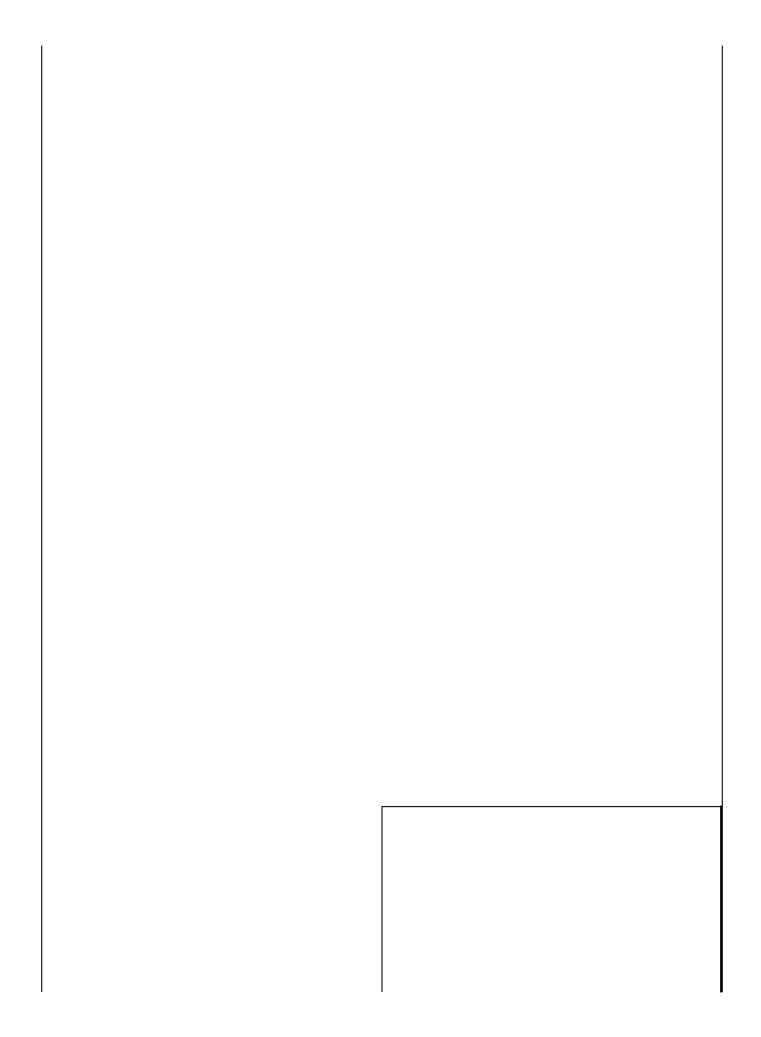
Dfc[fYggfYdcfhVUgYX*cb*AccX*Y*hYad*UhY*

5ggYgga Ybh'& 'DfYgYbhUh]cb'hc'gi dYfj]gcf

8YHJ]`g.

±bX]j]Xi U`dfYgYbhUh]cb'a UXY'hc'gi dYfj]gcf"





FYgci fWyg

DfYgWf]VYX F Ygci fWYg

7 cbhYbhcb h\Y 'Wci fgY 'A ccX`Y 'du[Y 'UbX 'HYUa g 'k]```VY 'i dXUhYX 'cZhYb 'k]h\ 'h]dgž'X]gW gg]cbg 'UbX fYgci fW gž gc 'mci 'UfY 'ghfcb[`mUXj]gYX hc 'a U_Y 'gi fY 'mci 'W.Y.W_ 'Zcf'U`` i dXUhYg"

I BGK @VfUfmk YVg]NY. \hdg.#k k k "\VfUfm'i bgk "YXi "Ui #

A ccX`Y. `\hdg.##a ccX`Y"hY`h'i bgk "YXi "Ui #c[]b#bXYI "d\d

FYWca a YbXYX FYgci fW/g

BchUj U]`UV`Y

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

: YYXVUW_cb`h\Y`Wci fgY`]g`[Uh\YfYX`dYf]cX]WU``mi g]b['j Uf]ci g`a YUbgž]bWi X]b['h\Y`I BGK a m9I dYf]YbW'`dfcW'ggž]bZcfa U``X]gW gg]cb`]b`h\Y`Z]bU``WUgg`Zcf`h\Y`Wci fgYžUbX`h\Y`GW\cc`'g Gh XYbh#GhUZZa YYh]b[g"`Mci f`ZYYXVUW_`]g`hU_Yb`gYf]ci g`mžUbX`Wcbh]bi U``]a dfcj Ya Ybhg`UfY`a UXY`hc`h\Y Wci fgY`VUgYXž]b`dUfhžcb`gi W\`ZYYXVUW_"

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UggYgga YbhidYfZcfa UbWYžmci 'UfY'Y`][]V`Y`hc'Udd`m'Zcf'GdYWJU``7cbg]XYfUhJcb'df]cf'hc'gi Va]htjb['UbUggYgga Ybhicf'g]htjb['Ub'Yl Ua"

: cf`XYhJ]`g`cZUdd`m]b['Zcf`GdYW]U``7cbg]XYfUh]cb`UbX`WcbX]h]cbg`Zcf`h\Y`Uk UfX`cZgi dd`Ya YbhUfm UggYgga Ybhž'd`YUgY`gYY`h\Y`]bZcfa Uh]cb`cb`I BGK 'g`<u>GdYW]U``7cbg]XYfUh]cb`dU[Y</u>"

D`YUgY'bchY'h\Uhghi XYbhg'k]``bch'VY'fYei]fYX'hc'dfcj]XY'Ubm'XcW'a YbhUfm'Yj]XYbWY'hc gi ddcfh'UVgYbWg'Zfca 'Ubm'WUggYg'a]ggYX'**VYWUi gY'cZ'7CJ=8!%** 'di V`]W\YU'h\ 'a YUgi fYg'gi W\'Ug]gc`Uh]cb"'| BGK 'k]``bch'VY']bg]gh]b['cb'a YX]WU`'VW'fh]ZJWUh'Yg'Zfca 'UbmcbY'XYYa YX'hc'VY'U'dcg]h]j Y'WUgYZ cf'k\Yb'h\Ym\Uj Y'fYWcj YfYX"'Gi W\'WYfh]ZJWUh'Yg'UfY'X]ZZJW 'hhc'cVhU]b'UbX'di h'Ub'i bbYWYggUfmghfU]b'cb ghi XYbhg'UbX'a YX]WU`'ghUZZ''

 $5\,dd^{3}WUhlcbg^{3}Zcf^{3}gdYW_{U}^{3}W^{3}bg^{3}XYfUhlcb^{3}k^{3}XYfUhlcb^{3}XYfUhlcb^{3}xYfUhlcb^{3}xYfUhlcb^{3}XYfUh$

5 WUXYa]W<cbYghmUbX D`U[]Uf]ga

 $\label{thm:continuous} IBGK ``Ug`Ub`cb[c]b[`Wcaa]haYbhhc`ZcghYf]b[``U`W``hifY`cZ`YUfb]b[`]bZcfaYX`VmUWUXYa]W]bHY[f]hm'`5``IBGK ``ghiXYbhg``UjY`U`fYgdcbg]V]`]hmhc`UX\YfY`hc`h\]g`df]bW]d`Y`cZUWUXYa]W]bHY[f]hm'`D`U[]Uf]gaibXYfa]bYg`UWUXYa]W]bHY[f]hmUbX`]g`bchhc`YfUhYX`UhIBGK "`B'SY[Sde_SfG@EI[eVW{`WSege[YfZW_aXSekagdai`ž$

Mci 'UfY'U'gc'fYa]bXYX'h\UhWUfYZ ``h]a Y'a UbU[Ya Ybh]g'Ub']a dcftUbhdUfhcZgh XmUbX'cbY'cZh\Y]XYbh]Z]YX'Wai gYg'dXdd[]Uf]ga ']g'dccf'h]a Y'a UbU[**%a** Ybh'Gh XY**%a**g'g**%**X'U``ck 'gi Z]W]Ybh'h]a Y'Zcf fYgYUfW\žXfUZ\]b['UbX'h\Y'dfcdYf'fYZYfYbW]b['cZgci fWYg']b'dfYdUf]b['U```UggYgga Ybh'lUg_g''

⊋d`U[]Uf]ga i]gʻZci bXi]bimci fik cf_ik \Ybimci i'UfYi]biZ[fghmYUfžimci fi`YWhi fYfik]``cZYfimci i'Ugg]ghUbWYihc]a dfcj Yimci fi'UWUXYa]Wg_]``g'''H\Yma UmUg_imci ihc ``cc_'Uhigca Yicb`]bYifYgci fWYgž'UhhYbXih\Yi@YUfb]b[7 YbhfYžcfigca Yh]a YgifYgi Va]himci fik cf_ik]h\ih\YidfcV`Ya iZ[l YX'''<ck Yj Yfia cfYigYf]ci gi]bghUbWYgi]biZ[fgh mYUfžgi W\iUgighYUi]b[i'Ubch\Yfighi XYbhgik cf_icfidUm]b[i'gca YcbYihciXcimci fik cf_žcc_ib

5 WUXYa]W = b Zcfa Uh cb

7 fYX]hdc]bhg

7 ci fgY'WfYX]h']g'WU'W'`UhYX']b'I b]hg!C ½7 fYX]hfl C 7 L'''H\Y'bcfa U``k cf_`cUX'YI dYWfUhJcb'Zcf'cbY'I C 7]g'UddfcI]a UhY`m'&) '\ci fg'dYf'hYfa "'H\]g']bWi XYg'WUgg'WcbhUWh'\ci fgz'df]j UhY'ghi Xmz'ch\Yf'`YUfb]b[UWfj]]h]Ygz'dfYdUfUhJcb'UbX'hJa Y'gdYbh'cb'U``'UggYggUV`Y'k cf_"

Cb!WUa di g WUgg UHYbXUbW

Di V`]WX]ghJbV}b['WcbX]hJcbg'a i ghVY'Zc``ck YX'Zcf'U```ZJWY!hc!ZJWY'WUggYg"'Hc'Ybgi fY'h\]gž'cb`migh XYbhg

a dcfhUbh'@]b_g

- A ccX`Y
- <u>@UV:5\W\/aa</u>
- < YU`h\`UbX`GUZY m</p>
- <u>7 ca di h|b[: UW|^]h|Yq</u>
- Gh XYbhF Ygci fWg
- 7 ci faY 'C i hlbYa
- 9b[]bYYf]b['Gh XYbhGi ddcfhGYfj]\Wg:7YblfY
- <u>A U YfadUW</u>
- I BGK 'H]a YHUV'Y
- I BGK '< UbXVcc
- LBGK 'A YWXUb]WU`'UbX'A Ubi ZUWi f]b['9b[]bYYf]b[
- <u>9ei]hUV`Y`@YUfb]b['GYfj]WYg</u>

a U[Y'7fYX]h

GmbYf[]Yg^]b^GcibX^&\$%*

7F = 7CG

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

5W_bck `YX[Ya YbhcZ7ci blfm

 $K Y : UW\underline{b} ck `YX[Y : h, Y : 6YXY[U : dY cd `Y : k \ c : UfY : h, Y : hfUX]h\underline{b} cb U : W ghcX]Ubg : cZh, Y ``UbXg : cb : k \]WX : I B G K ? Ybg]b[hcb : WUa di g :]g ``cWUhYX''$

5ddYbX]I . '9b[]bYYfg'5i ghfU`]U'f95Ł'DfcZYgg]cbU` '9b[]bYYf'7ca dYhYbWm GHJbXUfX

Dfc[fUa '±bHYbXYX'@YUfb]b['Ci HWca Yg	
?bck `YX[Y`UbX'g_]```VUgY	
D9%"%7ca dfY\Ybg]j Yžfh\YcfmVUgYX`i bXYfgfUbX]b[`cZh\Y`i bXYfd]bb]b[`bUh fU``UbX d\mg]\WJ``g\\]Yb\W`g`UbX`h\Y`Yb[]bYYf]b[`Z bXUa YbHJ`g`Udd`]\WJV`Y`hc`h\Y`Yb[]bYYf]b[`X]g\\]d`]bY	
D9%"&"7cbWYdh U``i bXYfgHUbX]b['cZh\Y'a Uh\Ya Uh]Wgz'bi a Yf]WU``UbU`mg]gz'gHUh]gh]Wgz'UbX Wca di hYf'UbX']bZcfa Uh]cb'gW]YbWYg'k\]W\'i bXYfd]b'h\Y'Yb[]bYYf]b['X]gW]d`]bY	
D9%" =: 1xYdh\i bxYfgHbx]b[cZgdYW]U`]ghVcX]Yg`cZ_bck YX[Y`k]h\]b`h\Y`Yb[]bYYf]b[x]gW]d`]bY	
D9%'('8]gWfba YbhcZ_bck `YX[Y`XYj Y`cda YbhUbX`fYgYUfW\ 'X]fYWf]cbg`k]h\]b`h\Y Yb[]bYYf]b['X]gW]d`]bY	
D9%) '? bck 'YX[Y'cZYb[]bYYf]b['XYg][b'dfUWf]WY'UbX'WcbfYl fi U`'ZUWcfg']a dUWf]b['f\Y Yb[]bYYf]b['X]gW]d`]bY	
D9%"* I bXYfgHJbX]b['cZh\Y'gWcdYž'df]bWjd`Ygž'bcfa gž'UWVci bHJV]`]hjYg'UbX'Vci bXg'cZ gi gHJ]bUV`Y'Yb[]bYYf]b['dfUWfJWY']b'h\Y'gdYWjZJWX]gWjd`]bY	
9b[]bYYf]b['Udd`]WUh]cb'UV]`]hm	
D9&"%5dd`]WUh]cb`cZYghUV`]g\YX`Yb[]bYYf]b[`a Yh\cXg`hc`Wca d`Yl `Yb[]bYYf]b[`dfcV`Ya gc`j]b[
D9&"&": `i Ybh'Udd`]WUh]cb'cZYb[]bYYf]b['hYVXb]ei Ygž'hcc`g'UbX'fYgci fWfg	
D9&" '5dd`]WUh]cb'cZgmghYa Uh]WYb[]bYYf]b['gmbh\Yg]g'UbX'XYg][b'dfcWYggYg	
D9&"('5dd`]WUh]cb'cZgmghYa Uh]WUddfcUWXYg'hc'h\Y'WcbXi Wh'UbX'a UbU[Ya YbhcZYb[]bYYf]b[dfcYWhg	
DfcZYgg]cbU``UbX`dYfgcbU``Ultf]Vi lYg	
D9' "%"9h\]WU``WcbXi Wh'UbX'dfcZYgg]cbU``UWWci bHUV]`]hm	
D9' "&'9ZZYW¶j Y'cfU`'UbX'k f]MYb'Wca a i b]WUŊcb']b'dfcZYgg]cbU`'UbX'`UmXca U]bg	
D9' "' '7 fYUhjj Yž']bbcj Uhjj Y'UbX'dfc!UWhj Y'XYa YUbci f	
D9' "('DfcZ/gg]cbU`i gY'UbX'a UbU[Ya YbhcZ]bZcfa Uh]cb	
D9' ") 'C fXYf'ma UbU[Ya YbhcZgY`ZiUbX'dfcZYgg]cbU`'WcbXi Wh	
D9' "* '9ZZYW¶j Y'HYUa 'a Ya VYfg\]d'UbX'HYUa '`YUXYfg\]d	