PTRL4024

8f]``]b[': `i]Xg'UbX'7Ya Ybh]b[

HYfa "H\fYY" ## "&\$&\$

7ci fgY⁻Cj Yfj]Yk

GHJZ7cbHJWh8YHJ]`g

7cbj Ybcfg

B Ua Y	9a U]`	5j U]`UV]`]hm	@cWUhjcb	D\cbY
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			@Yj Y``&"`H9H6) % &

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GW.cc``cZA]bYfU`g`UbX`9bYf[mF Ygci fWYg C`X`A U]b`6i]`X]b[ž`@Yj Y``%z*%) - "fP %) Ł I BGK "GM8B9MBGK "&\$) &*51 GHF5@-5

H. 'Ž * %'f&Ł'-',) ')\$\$*

9. a YfY"hYUW.]b[4 i bgk "YXi "Ui

 $K \cdot \underline{k} \, \underline{k} \, \underline{k} \, \underline{"Yb[\]bYYf]b[\ "i\ bgk\ "YXi\ "Ui\ \#a\]bYfU\underline{"g!YbYf[\ mfYgci\ fWYg]} }$

7ci fgY 8YHJ] g

7 fYX]hDc]bhg**

Gi a a UfmcZh\Y 7ci fgY

H\Y`Wci fgY`Wcj Yfg`Vch\ h\Y`h\YcfmUbX`dfUWj\W\`Udd`]\Wbjcbg`cZXf]``]b['Zi]Xg`UbX`k Y```Wa Ybhjb[hYW.bc`c[m''H\Y`a U]b`hcd]\Wg`]bWi XY. h\Y`Z bWfjcbgž\Wca dcg]hjcb`UbX`UXX]hj Yg`cZXf]``]b['Zi]Xg\WUmUbX dc`ma Yf`VX.Ya]ghfmUbX`Udd`]\Wbjcbg`]b`Xf]``]b['Zi]Xg\Xf]``]b['Zi]X`XYbg]lmXYhYfa]bUhjcb`UbX`WJ`W``Uhjcbg/Xf]``]b['Zi]X`Zj`hfUhjcb`UbX`a i X`\W__]b['dfc\W`gg\5D=Xf]``]b['Zi]X`dfcdYfhjYgžYei]da YbhUbX`hYghjb[dfc\W`Xi fYg\W.Ya]\WJ``UbU`mg]g\Xf]``]b['Zi]X`gmghYa `XYg][b`Zcf`\Wcbhfc``Zcfa Uhjcb`XUa U[Y`UbX`k Y``VcfY ghUY]`]hm'Xf]``]b['Zi]X`\mXfUi `]\Wg`UbX`W hjjb[g`hfUbgdcfhUhjcb\W\a Ybha Ubi ZU\Mi fYž\Wca dcg]hjcb`UbX ghUbXUfX]nUhjcb\Wa Ybhg`i ffmf\Yc`c[mdfcdYfhjYg\5D=\Wa Ybhjb['Yei]da Ybh UbX`dfc\WXi fYg\Wa Ybhg`i ffmXYg][b`UbX`WJ`W``Uhjcbg\a i X`fYa cj U``Vm\Wa Ybh'[Ug`a][fUhjcb\\Wa Ybhjb['Yei]da YbhUbX`dfc\WXi fYg\dcgh'cV`\\bg'a Ybhjb['Yei]da YbhUbX`dfc\WXi fYg\dcgh'cV`\\bg'a Ybhjb['Yei]bf 'Zi]Xg`UbX\\Wa Ybhjb['Yei]da YbhUbX`dfc\WXi fYg\dcgh'cV`\\bg'a Ybhjb['Yuljcbg'\UbX`Yj U`i Uhjcb\Xf]``]b['Zi]Xg`UbX\\Wa Ybhjb['`UVcfUhcfm'

7 ci fgY 5]a g

H\]g`Wci fgY`k]```YbUV`Y`ghi XYbhg`rc`UWei]fY`Z bXUa YbhU``_bck `YX[Y`cZXf]``]b['Zi]Xgž'Xf]``]b['\mXfUi `]Wg UbX`WYa YbhJb['hYW\b]ei Y`UbX`rc`Udd`mih\Y`h\Ycfmhc`h\Y`XYg][bž'Yj U`i UhJcb`UbX`cdhJa]nUhJcb`cZXf]``]b[Zi]X`dfc[fUa ž'Xf]``]b[`\mXfUi `]Wg`UbX`WYa YbhJb['cdYfUhJcbg"

7 ci fgY @YUfb]b[Ci hWca Yg

- %" 8 Yg][b`UbX`Yj U`i UhY`Xf]``]b[`Zi]X`dfc[fUa `UbX`WYa Ybh]b[`cdYfUh]cbg`i bXYf`gdYW]Z]Wk Y`` WcbX]h]cbg
- &" DfYdUfY UbX hYghXf]``]b['Zi]Xg UbX WYa Ybh]b['g`i ffmUVWcfX]b['hc '5 D=ghUbXUfXg
- "Cdha]nY:Xf]``]b[:Zi]X'\mXfUi`]Wa;Zcf'\][\fUhY:cZdYbYhfUh]cb:UbX:Wih]b[g:hfUbgdcfhUh]cb:YZ]W]YbWh

HYUWX]b['GhfUhY[]Yg'

%"K YY_`m``YWi fYg`UfY`XYg][bYX`hc`dfcj]XY`ghi XYbhg`Z bXUa YbhU``i bXYfghUbX]b[`h\fci[\`U`gYf]Yg`cZhcd]W cb`Xf]``]b[`Zi]Xgž`Xf]``]b[`\mXfUi`]Wg`UbX`WYa Ybh]b["

&"'H\Y'Z bXUa YbHJ``a UhYf]U``Wcj YfYX`]b`h\Y``YWi fYg`]g`gi ddcfhYX`VmdfcV`Ya !gc`j]b['Yl YfW]gYg`]b hi hcf]U`g`UbX`WUgg`X]gW gg]cbg"

'"'@YUfb]b['Xif]b['`YWnifYg']g'Zifn\Yf'giddcfnYX'Vm[fcid'VUgYX``UVcfUhcfmdfUWnJWYg"("'Cb`]bY``YUfb]b['giddcfn]g'U`gc'UjU]`UV`Y'n\fci[\'AccX`Y"

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DfYfYei]g]hY. DHF@\$%)

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5gg][ba Ybh'% '7`Um#dc`ma Yf W.Ya]ghfmi) ।	K YY'	%ž &
5gg][ba Ybh&') ၊	K YY_')	%ž [*] &
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5ggYgga Ybh'% 5gg][ba Ybh'% '7`Um#dc`ma Yf'W\Ya]ghfm

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Gi Va]gg]cb bchYg.Cb`]bY A ccX`Y Gi Va]gg]cb

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

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8YHJ]`g. A i X'k Y][\hWU`W `Uh]cbg`UbX'5D=dfcdYfh]Yg

5ggYgga Ybh' . A]XhYfa '91 Ua

GhUfhXUhY. K YY_+

8 YHJ]`g. A]XhYfa `Yl Ua `Wcj Yfg`k YY_'%hc`k YY_') ``YWh fY`WcbhYbhg"`cbY`\ci f`A ccX`Y`cb`]bY`E i]n"; i]XY`]bYg`Zcf`\Y`d]b['h\Y`dfYdUfUh]cb`Zcf`h\Y`a]XhYfa `Yl Ua `k]``VY`fY`YUgYX`df]cf`hc`h\Y`Yl Ua "

Gi Va]gg]cb bchYg.Cb]bY A ccX Y E i]n

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

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8YHJ]`g.

Gi Va]gg]cb bchYg.Cb`]bY A ccX`Y Gi Va]gg]cb

Hi fb]h]b gYh]b[. H\]g]g bchU Hi fb]h]b Ugg][ba Ybh

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8YHJ]`g.7YaYbh]b['WU`W`Uh]cbg

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 $\label{eq:higher_problem} \mbox{Hi fb]h]b$^{-}gYh]b[.^{-}H\]g$^{-}g$^{-}bchU$^{-}Hi fb]h]b$^{-}Ugg][$ba^{-}Ybh^{-}h]b$^{-}Ugg][$ba$^{-}h]b$^{-}Ugg][ba^{-}h]b$^{-}Hi fb]h]b$^{-}h]h$^{-}$

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8YHJ]`g.

&\$`BcjYaVYf	

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Gi ddcfha UhYf]U`Zcf`h\]g`Wci fgY`]bWi X]b[žk\YbYj Yf`Uj U]`UV`YžWcd]Yg`cZ`YWi fY`bchYgž`YWi fY`g`]XYgž fYWca a YbXYX`fYUX]b[gžYhWi`WUb`VY`Zci bX`cb`A ccX`Y" H\Y``YWi fY`bchYg#g`]XYg`a UmVY`j]Yk YX`UbX`Xck b`cUXYX`Zfca 'h\Y`I BGK !A ccX`Y.\hd.##a ccX`Y"hY`h'i bgk "YXi "Ui #

FYWca a YbXYX FYgci fWyg

: c``ck]b[g'UfY'h\Y'fYWca a YbXYX'Vcc_g'Zcf'h\]g'Wci fgY.

- F mYb 7 UYbbž < 7 < '8 Uf Ymž; Ycf[Y F "; fUm 7 ca dcg]h]cb 'UbX 'DfcdYfh]Yg 'cZ8 f]``]b['UbX 7 ca d`Yh]cb : 'i]Xgž +h\ 'YX]h]cbž; i 'ZDfcZYgg]cbU``Di V`]g\]b[ž'9 'gYj]Yfž &\$%* "
- 6ci f[cmbY :5"H"'>f"žA]``\Y]a :? "? "ž7 \YbYj YfnA "9"'UbX'Mci b[:: "G"'>f". :5dd`]YX'8 f]``]b[9b[]bYYf]b[žGD9'HYI Mcc_'GYf]YgžJ c`" &žF]WUfXgcbžHL žI G5ž% %"
- BY`gcbž'9"6"'UbX'; i]``ch'8". 'K Y```7 Ya Ybh]b['fGYWcbX'9X]h]cblž'GW\`i a VYf[Yfž'&\$\$*"

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

5 hih\Y'YbX'cZYUW\'Wci fgYž'U```ghi XYbhg`k]```\Uj Y'h\Y'cddcfhi b]hmhc Wca d`YhY'U'Wci fgY'Yj U`i Uh]cb'Zcfa "H\YgY'Ubcbma ci g'gi fj Ymg'\Y'd'i g'i bXYfghUbX'mci f'j]Yk g'cZh\Y'Wci fgYžmci f'`YWhi fYfg'UbX'h\Y'Wci fgY a UhYf]U`g"'K Y'UfY'Wcbh]bi ci g`m`]a dfcj]b['ci f'Wci fgYg'VUgYX'cb'ghi XYbhZYYXVUW_ž'UbX'mci f'dYfgdYWf]j Y]g'j U`i UV`Y"

: YYXVUW_`]g`[]j Yb`j]U`<u>\hdg.#ghi XYbh'i bgk "YXi "Ui #a mYl dYf]YbW</u>`UbX`mci `k]```VY`bch]Z]YX`k \Yb`h\]g`]g Uj U]`UV`Y`Zcf`mci `hc`Wca d`YhY"

K Y'U'gc'YbWci fU[Y'U'`'gh XYbhg'hc'g\UfY'Ubm'ZYXVUW_'h\Ym\Uj Y'Ubm'h]a Y'Xi f]b['h\Y'Wci fgY'—']Zmci\Uj Y'U'WcbWfbž'd'YUgY'WcbhUWhi g']a a YX]UhY'm'

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

H\Y'GWkcc``\Ug'XYj Y`cdYX'U'[i]XY`]bY'hc'\Y`d'mci'k\Yb'gi Va]hh]b['U'Wci fgY'Ugg][ba Ybh'

K Y YbWci fU[Y'mci'hc'fYhJ]b'U'WcdmcZYj YfmUgg][ba Ybhgi Va]hYX'Zcf'UggYgga YbhZcf'mci f'ck b'fYWcfX Y]hYf']b'YUfXWcdmcf'Y'YWfcb]WZcfa "

5 "UggYgga Ybhy a i gh\Uj Y Ub UggYgga YbhWcj Yf g\YYhUHUW\YX"

@UhY Gi Va [gg]cb cZUb 5gg][ba Ybh

: i ```a Uf_g`Zcf`Ub`Ugg][ba Ybh'UfY`cb`mdcgg]V`Y`k \Yb`Ub`Ugg][ba Ybh]g`fYVW]j YX`Vmh\Y`Xi Y`XUhY"`

K Y'i bXYfgHJbX'h\UhiUhih]a Yg'mci 'a Umbch'VY'UV'Y'hc'gi Va]hUb'Ugg][ba Ybh'cb'h]a Yž'UbX'h\Y'GW\cc``k]``UWWta a cXUhY'UbmZJ]f'UbX'fYUgcbUV'Y'YI hYbg]cb"'K Y'k ci `X'fYWta a YbX'mci 'fYj]Yk 'h\Y'I BGK 'GdYWJU` 7 cbg]XYfUh]cb'[i]XY`]bYg'—'gYY'gYWfJcb'VY`ck "

@UhY`gi Va]gg]cb`k]``bchVY`UVWYdhYX`UbX`k]``VY`Wcbg]XYfYX`Ug`bc`gi Va]gg]cb"

GdYWJU`7cbg]XYfUhJcb

Mci 'Wub'Udd`mZcf'gdYWJU`'Wcbg]XYfUhJcb'h\fci [\'<u>H\Y'Bi WYi g'Gh XYbh<i V</u>'k\Yb']``bYgg'cf'ch\Yf WJfW a ghUbWfg']bhYfZYfY'k]h\'mci f'UggYgga YbhdYfZcfa UbWf'''G]W_bYggža]gUXj Ybh fY'cf'ch\Yf WJfW a ghUbWfg'VYmcbX'mci f'Wcblfc``a Um

- DfYj Ybhmci Zfca Wca d`Yhlb['U'Wci fgY fYei]fYa Ybh
- ? YYd 'mci 'Zfca 'UthYbX]b['Ub'UggYggUV'Y'UWhj]tm
- Ghodimoi igi Va]hhlb['UggYggUV'Y'k cf 'Zcf'U'Wci fgY
- G][b]ZJWJbhmUZZYWimci f'dYfZcfa UbWY]b'UggYggUV'Y'k cf_ž'VY']h'U'Zcfa U`'YbX!cZgYa YghYf Yl Ua]bUh]cbž'U'WUgg'hYghž'U'`UVcfUhcfmhYghž'U'gYa]bUf'dfYgYbhUh]cb'cf'Ubmch\Yf'Zcfa 'cZ UggYgga Ybh

K YʻUg_ʻh\Uhmci 'd`YUgY WcbhUWh\Yʻ7 ci fgYʻ7 cbj Ybcfʻ]a a YX]UhY`mcbWYʻmci '\Uj Y`Wca d`YhYX'h\YʻgdYW]U` Wcbg]XYfUh]cbʻUdd`]WUh]cbžbc``UhYf'h\UbʻcbY`k YY_`Zfca 'gi Va]gg]cb"

A cfY XYHJ] \dot{g} cb \dot{g} dYWJU \dot{w} bg]XYfUh]cb \dot{w} bb \dot{v} Y \dot{z} ci bX \dot{u} b \dot{k} k k \dot{g} h \dot{x} Y bh'i bgk \ddot{y} Xi \ddot{u} i \ddot{y} dYWJU \dot{w} bg]XYfUh]cb

Gh XYbhGi ddcfh

H\Y`I b]j Yfg]miUbX`h\Y`: UW`mdfcj]XY`U`k]XY`fUb[Y`cZgi ddcfhgYfj]Wyg Zcf`gh XYbhgž]bWi X]b[.

- @VfUfmifU]b]b['UbX'gi ddcfhgYfj]WYg'! 'k k k "`]VfUfm'i bgk "YXi "Ui
- I BGK '@YUfb]b['7 YblfY'! 'k k k "'Wi bgk "YXi "Ui
- 7 ci bay``]b['gi ddcfh! 'k k k "Wti bay``]b["i bak "YXi "Ui

9ei]HUV`Y'@YUfb]b['GYfj]WYg'U]a g'hc'dfcj]XY'U``gh XYbhg'k]h\'U'ZYYY'UbX'WcbZ]XYbh]U`'gYfj]WY'h\Uh dfcj]XYg'dfUWf]WU`'gi ddcfhhc'Ybgi fY'h\Uh'mci f'\YU`h\'WcbX]h]cb'XcYgbfhiUXj YfgY`mUZZYWhmci f'gh X]Yg'''\\htda.##ah XYbh'i bak "YXi "Ui #Y`a

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

Mci f`YWi fYf'UbX'h\Y'I b]j Yfg]lmk]``YI dYWimci f`gi Va]lhYX'Ugg][ba Ybhg'UfY'lfi `mmci f`ck b'k cf_"'I BGK \Ug'j YfmWYUf'[i]XY`]bYg'cb'k \Uhd`U[]Uf]ga ']g'UbX'\ck 'hc'Uj c]X']h'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"'D`U[]Uf]ga ']g'U'mdY'cZ]bhY``YWi U`'h\YZh''±i\Wb'hU_Y a UbmZcfa gžZfca 'XY`]VYfUhY'W\YUh]b['hc'UW]XYbhU``mWcdm]b['Zfca 'U'gci fW'k]h\ci hUW_bck `YX[Ya Ybh' H\Y'I b]j Yfg]lm\Ug'UXcdhYX'Ub'YXi WUh]j Y'UddfcUW\ 'hc'd`U[]Uf]ga 'UbX'\Ug'XYj Y`cdYX'U'fUb[Y'cZ fYgci fW'g'hc'gi ddcfhghi XYbhg"'5``h\Y'XYhU]`g'cb'd`U[]Uf]ga ž]bWi X]b['gca Y'i gYZ ``fYgci fW'gžWUb'VY Zci bX'Uhk k k "qhi XYbhi bak "YXi "Ui #d`U[]Uf]ga "

 $5 ```A]b]b["9b[]bYYf]b["ghi XYbhg"UfY"fYei]fYX"hc "Wca d`YhY"U"ghi XYbhXYWUfUh]cb" Zcf"UWUXYa]W]bhY[f]hm k \]W.]g"ci h]bYX']b"h\Y"Ugg][ba YbhWcj Yf"g\YYhg""6mg][b]b["h\]g"XYWUfUh]cbž"mci "U[fYY"h\Uh'mci f"k cf_"]g mci f"ck b"cf][]bU"k cf_"$

⊋mci 'bYYX'gca Y'UXX]h]cbU``gi ddcfhk]h\ 'mci f`k f]h]b['g_]``gž'd`YUgY'WcbhUWh\Y'@YUfb]b['7 YbhfY'cf'j]Yk gca Y'cZh\Y'fYgci fWg'cb'h\Y]f`k YVg]hY. 'k k k "`Wi bgk "YXi "Ui "'H\Y'@YUfb]b['7 YbhfY']g'XYg][bYX'hc'\Y`d mci ']a dfcj Y'mci f'UWUXYa]Wk f]h]b['UbX'Wca a i b]WUh]cb'g_]``g"'Gca Y'ghi XYbhg'i gY'h\Y'7 YbhfY'gYfj]W/g VYWUi gY'h\YmUfY'Z]bX]b['h\Y]f'Ugg][ba Ybhg'U'W\U``Yb[Yžch\Yfg'VYWUi gY'h\Ymk Ubhhc']a dfcj Y'Ub'U`fYUXm gi WW/ggZ ``UWUXYa]WdYfZcfa UbW/"

5 WUXYa]W + DZcfa Uh]cb

7 ci fgY F Ygi `hg

: cf[']XYfU][']g[']cb[']I BGK [']UggYgga Ybh'dc[']]Whž'd[']YUgY[']j]g]h '<u>k k k "gh XYbh'i bgk "YXi "Ui #UggYgga Ybh</u>

 $\pm gca\ Y']bgHUbW'g'mci\ f'Z]bU``Wci\ fgY'fYgi\ `hia\ Um'VY'k\]h\ Y`X'UbX'bch'fY'YUgYX'cb'h\Y'I\ BGK 'd`UbbYX'XUHY'' H\]g']g']bX]WUHYX'VmU'Wci\ fgY'[\ fUXY'fYgi\ `hicZY]h\ Yf.$

• @9 '-']bX]\WUhYg'mci '\Uj Y'bch\Wca d'YhYX'cbY'cf'a cfY']hYa g'cZUggYgga Ybh/cf

- VfcUXVUbX'WcbbYWfjcb'f&) * '_V]h#gYWcf'ZUghYfŁ
- UV]]mhc'j]Yk 'ghfYUa]b['j]XYc'f\][\'cf'`ck 'XYZ]b]h]cb'l BGK 'HJ 'cdh]cbgŁ

A cfY]bZcfa Uh]cb UVci hgmghYa 'fYei]fYa Ybhg]g Uj U] UV Y UhKkk mgh XYbh'i bgk "YXi "Ui #a ccX Y! gmghYa!fYei]fYa Ybhg

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5 WWYgg]b['7ci fgY'A UhYf]U`g'H\fci [\'AccX`Y

7 ci fgY'ci h]bYgžgi ddcfna UhYf]U`g`UfY'i d`cUXYX`hc`A ccX`Yž'h\Y'i b]j Yfg]lmighUbXUfX`@YUfb]b[A UbU[Ya Ybh'GmghYa 'f@A GŁ"'+b`UXX]r]cbžcb!`]bY`Ugg][ba Ybh'gi Va]gg]cbg`UfY`a UXY'i g]b['h\Y Ugg][ba Ybh'XfcdVcl 'ZUVJ']lmdfcj]XYX`]b'A ccX`Y"'5```Ybfc``YX'gh XYbhg`UfY`Ui hca Ur]VW\`m]bWl XYX`]b

K_Y`UW_bck_`YX[Y`h\Y`6YXY[U``dYcd`Y`k\c`UfY`h\Y`'fUX]h]cbU``W_ghcX]Ubg`cZh\Y``UbXg`cb`k\]W\`I_BGK ?Ybg]b[hcb`WJa di_g`]g``cWJhYX"