

PTRL2019

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7 fYX]hDc]bhg**

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*blfcXi Wljcb'hc'F YgYfj c]f'9b[]bYYf]b["F YgYfj c]f'8 YgWf]dh]cb" < mXfcghUh]WdfYggi fY'UbX'[Ych\Yfa U` [fUX]Ybhg"Dcfcg]mdYfa YUV]`]hmfY`Uh]cbg\]dg'UbX'fcW_'a]Wfcghfi Whi fYg"'J c`i a Yhf]WUbX']b]h]U`\nXfcWUfVcb'j c`i a Y": `i]X'GhUh]Wg": `i]X'Zck gž`Ua]bUf'UbX'hi fVi `YbhZck g"'6ci bXUfm`UmYfg": `ck ']bd]dYgž'Zf]Wh]cb']b'd]dYž'9i `Yf'UbX'6Yfbci ``]fg'Yei Uh]cb"'5b[i `Uf'a ca Ybhi a 'Yei Uh]cb"'GhYUXmZck 'YbYf[m Yei Uh]cb"'A]bcf``cggYg": `ck 'cj Yf'gi fZJWYg"'GhYUXmgHUhY']bW]bYX'Zck 'UbX'dfYggi fY'dchYbh]U`"'GhYUXmgHUhY']bW]bYX'Zck "': `ck ']b'qYf[Yg'UbX']b'dUfU`Y`"'J Yfh]WU`k Y``a cXY``UbX'q_]b'YZZYWh'

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7 ci fgY @YUfb]b[Ci hWca Yg

- %" I bXYfgHJbX`UbX`Udd`miZ bXUa YbHJ``f\Ycf]Yg`UbX`WcbWYdfg`fc`gc`j Y`a UbmfYgYfj c]f`Yb[]bYYf]b[dfcV`Ya gž`Y"["']b]fJU``\mXfcWJfVcb`]b`d`UWYž`VUg]WfcW_UbX`Zi]X`dfcdYffJYgž`\mXfcgfUfJWdfYggi fY X]gff]Vi fJcbž'k UfYf`]bZi I `UbX`g]b[`Y`d\UgY`Zi]X`Zck
- &" 7 f]h]WU``mUbU`mgY 'h\Y`i bXYfm]b['h\Ycf]YgžWcbWfdhgž'Uggi a dh]cbg'UbX'Uf[i a Ybhg'WcbWffb]b['Zi]X Zck 'i bXYf'X]ZZYfYbhfYgYfj c]f'WcbX]h]cbg

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Gi ddcfha UhYf]U`Zcf'h\]g'Wci fgY`]bWi X]b[žk \YbYj Yf'Uj U]`UV`Yž'Wcd]Yg'cZ`YWi fY'bchYgžfYWca a YbXYXfYUX]b[gžYhW'WJb'VY'Zci bX'cb'A ccX`Y"

H\Y``YWn fY'bchYa UmiVY'j]Yk YX'UbX'Xck b`cUXYX'Zfca 'h\Y'l BGK !A ccX`Y`\hd.##a ccX`Y"hY`h'i bgk "YXi "Ui #

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• 8g`VS_WifS'e aXDWeWtha[d7`Y[`WWtq\Yž'8U_Y'f%+, Ł"

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 Ybhg a i gh\Uj Y Ub UggYgga YbhWcj Yf g\YYhUHUWXYX"

@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]hiUb'Ugg][ba Ybh'cb'h]a Yž'UbX'h\Y'GW\cc``k]``UWWca a cXUhY'UbmZJ]f'UbX'fYUgcbUV'Y'YI hYbg]cb"'K Y'k ci `X'fYWca 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'Wcbhfc``a Um

- DfYj Ybhmci Zfca 'Wca d'Yhlb['U'Wci fqY fYei]fYa Ybh
- ? YYd 'mci 'Zfca 'UthYbX]b['Ub'UggYggUV'Y'UWhj]hm
- Ghodimoi igi Va]hhlb['UggYggUV'Y'k cf 'Zcf'U'Wci fgY

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

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H\Y`I b]j Yfg]lmUbX`lh\Y`: UW`lmdfcj]XY`U`k]XY`fUb[Y`cZgi ddcfhgYfj]Wyg`Zcf`gh XYblgž]bWi X]b[.

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

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5 WUXYa]W = b Zcfa Uh cb

7 ci fgY F Ygi `hg

: cf'XYHJ]'g'cb'l BGK 'UggYgga Ybhdc']Whž'd'YUgY'j]g]h <u>k k k "gh XYbh'i bgk "YXi "Ui #JggYgga Ybh</u>

±bʻgca Yʻ]bgHJbWYgʻmci fʻZ]bU``Wci fgYʻfYgi `ha UmVY`k]h\\Y`XʻUbXʻbchfY`YUgYXʻcbʻh\YʻI BGK ʻd`UbbYX`XUHY" H\]gʻ]gʻ]bX]WJHYX`VmU`Wci fgYʻ[fUXYʻfYgi `hcZY]h\Yf.

- @9'-']bX]\\Uh\g`mci'\Uj\Ybch\\cappaca d`Yh\X`cbY`cf'a cfY']h\ag'cZUgg\gga Ybh\cf
- K 8]bX]WJhYg h\YfY]g Ub]ggi Y k]h\ cbY cf a cfY Ugg][ba Ybh/cf
- K 7 K \]WX]bX]WUhYg`mci `\Uj Y`Udd`]YX`Zcf`GdYWJU``7 cbg]XYfUh]cb`Xi Y`hc`]``bYgg`cf`a]gUXj Ybhi fY UbX`h\Y`Wci fgY`fYgi `hg`\Uj Y`bchVYYb`Z]bU`]gYX"

 $\pm 0.17 \text{ lb.} Yf'Yj \text{ Ybh.} \text{lik ci.} X'VY'\text{mci.} f'fYgdcbg]V]']\text{mihc.} WcbhUWhh.Y.7 ci. fgY.7 cbj. YbYf'Ug'gccb.' Ug'dfUWf)WUV'Y'Vi. h. bc.'`UhYf'h. Ub.'Zj, Y'f). EXUmg'UZhYf'fY`YUgY'cZh.Y'Wci. fgY'fYgi.'h'.<math>=$ Zmci.' Xcb'hWcbhUWh.Y'Wcbj. YbYf'cb'h]a. Yzmci.'a UmVY'fYei.]fYX'hc'fY!gi.Va.]hUb'Ugg][ba.Ybhcf'fY!g]hh.Y'Z]bU''YI.Ua.'UbX'a UmfYgi.'h']b''mci.'ZJ]']b[.'h.Y

7F =7 C G 'Dfcj]XYf'7cXY. '\$\$\$-,;

$5W_bck YX[Ya YbhcZ7ci bhfm]$

 $\label{thm:linear} K Y `UW_bck `YX[Y `th Y `6YXY[U `dYcd `Y `k \c `UfY 'th Y `tfUX]t]cbU `W gtcX] Ubg `cZth Y ``UbXg `cb `k \] WX `I BGK ? Ybg]b[tcb `WUa di g `]g ``cWUhYX"$