

7ci fgY[·]Cj Yfj]Yk

GhJZZ 7 cbhJWh 8 YhJ] `g

7cbj Ybcfg

B Ua Y	9a U]`		

5W_bck `YX[Ya YbhcZ7ci bhfm

7ci fgY 8YW] g

 $I b h c Z 7 f Y X h^*$

K cf_`cUX

%) \$`\ci fg`]bWi X]b[`WUgg`WcbHUWh\ci fgž`fYUX]b[gž`WUgg`dfYdUfUh]cbž'UggYgga Ybhž'Zc``ck 'i d`UWh]j]h]Ygž YhW

Giaa UfmcZh\Y 7ci fgY

#Dirk.]giwci fgyžmci ik]```Xyj Y`cd'Ub'i bXyfgHUbX]b['cZfYgYUfW.']b'YXi WUhjcb"'H\]gik]```VY'UW.]yj YX'h\fci [\YI d`cf]b['X]ZZYfYbhfYgYUfW.'HUX]hjcbgžfYgYUfW.'Yh.]Wgžh\Y'fYgYUfW.'dfcWigg']bWi X]b[']ggi Yg'cZj U']X]mm UbX'fY`]UV]`]mmžUj Uf]YmmcZVch\ei U`]HUhjj Y'UbX'ei UbhjhUhjj Y'fYgYUfW.'UddfcUW.Yg'UbX'a Yh\cXc`c[]Ygi gYX']b'YXi WUhjcbU``fYgYUfW.žh\Y'a UbU[Ya Ybh'UbX'UbU`mg]g'cZXUhUžUbX'Wf]hjWU``h\]b_]b['UbX'X]ZZYfYbh [YbfYg'cZk f]hjb['YXi WUhjcb'fYgYUfW.'UbX'Z]bX]b[g"'H\Y'Wci fgY'k]``'dfYdUfY'mci 'Zcf'WcbXi Whjb['mci f'ck b fYgYUfW.'dfcYWhjbWi X]b[']ggi Yg'cZ]XYbhjZmjb['UbX'Zcfa i `Uhjb['U'fYgYUfW.'ei YghjcbžgY`YWhjb['UbX Udd`mjb['Uddfcdf]UhY'fYgYUfW.'UddfcUW.Yg'UbX'a Yh\cXg'cZ]bei]fmUbX']b'dfYgYbhjb['h\Y'fYgi `hg'cZmci f fYgYUfW."

7 ci fgY @YUfb]b[Ci hWca Yg

- %" 7 f]h]WU``mUbU`mgY h\Y a U'cfUddfcUW\Yg i gYX]b WcbXi Wf|b[fYgYUfW\]b YXi WUh]cb
- &" ⇒XYbr|Zmrh\Y fY`Uh|cbg\]d 'VYrk YYb 'h\Ycfmž'fYgYUfW\ 'ei Ygr|cbg 'UbX'a Yr\cXc`c[m
- "8]qWiqq:UbX:UbU:mqY:h\Y:qhfYb[h\q:UbX::]a]hUh|cbq:cZX]ZZYfYbhfYqYUfW\:aYh\cXq
- (" K f]hY`U`fYgYUfW\`dfcdcgU``h\Uh`]bWl XYg`_YmY`Ya Ybhg`UbX`\][\`][\hg`h\Y`fYgYUfW\`ei Ygh]cbž a Yh\cXc`c[mUbX`XYg][b"

HYUW lb['GhfUhY[]Ya'

HYUW]b['ghfUh'[]Yg. 'H\Y'Wti fgY']g'XY`]j YfYX'cb`]bY'UbX'dfcj]XYg'U'ZYI]V`Y'`YUfb]b['Ybj]fcba YbhZcf ghi XYbhg''K]h\]b'h\]g'`YUfb]b['Ybj]fcba Ybhghi XYbhg'k]```Yb[U[Y'k]h\ 'Wti fgY'a UhYf]U`'h\fci [\ 'cb`]bY 'YWi fYg'h\Uh]b\WtfdcfUhY'a UhYf]U''dfYgYbhYX'Vm'U'j Uf]YmmcZYI dYfhg']b'YXi WUhjcb'' C b`]bY'k YY_`mUWfj]h]Yg k]``i gY'U'fUb[Y'cZhYUW,]b['ghfUhY[]Yg'hc YbWti fU[Y'ghi XYbhg'hc Yb[U[Y']b'Wf]h]WJ''h\]b_]b['UbX'dfcV'Ya gc'j]b'h\Y'Udd`]WUhjcb'cZU'fUb[Y'cZfYgYUfW\'a Yh\cXg']b'h\Y']bj Ygh][Uhjcb'cZYXi WUhjcbU`'WtbhYI hg C b`]bY'X]gW gg]cb'Zcfi a g'k]``'U`ck 'ghi XYbhg'hc Yb[U[Y']b'Wt``UVcfUhj Y']bei]fmž'W\U``Yb[]b['UbX'fYZ]b]b[]XYUg'UbX'g\Uf]b['W'ffYbhdfUWhJW'''GY'ZX]fYWhYX'fYUX]b['k]```VfcUXYb'ghi XYbhi bXYfghUbX]b['cZh\Y'fUb[Y cZfYgYUfW\'a Yh\cXg'h\UhWb'VY'Udd`]YX'hc']bj Ygh][UhY'YXi WUhjcbU`'WtbhYI hg'''H\Y'dfYdUfUhjcb'cZk f]hhYb Ugg][ba Ybhg'k]```XfUk 'cb'ghi XYbhfYZYWfJcb'cZU'fUb[Y'cZfYgYUfW\'a Yh\cXg'Uddfcdf]UhY']b']bj Ygh][Uhjcbg cZYXi WUhjcbU`'WtbhYI hg''

 $\label{thm:conditional} F \ UhjcbU`Y. `H\Y`Wci fgY`]g`XY`]j \ YfYX`cb`]bY`hc`dfcj]XY`mci `k]h\`ZYI]V]`]hmhc`Yb[U[Y`]b`]bX]j]Xi U``UbX \\C``UVcfUhjj Y`]bei]fm'`H\Y`hYUW\]b[`UddfcUW\`]g`]bZcfa YX`VmfYWYbhfYgYUfW\`UbX`dfU\\JWY`cb`ghi XYbh \\]b_]b[`UbX``YUfb]b[`UbX`YZZY\\Jj Y`hYU\\\]b[`k \]\W\`\Ug`Ya d\Ug]gYX`h\Y`]a dcfhUb\\CZh\Y`ghi XYbh dYfgdY\\Jj Y''$

5ggYgga Ybh

5ggYgga Ybh'hJg_		

GdYWJZJW7 f]hYf]U	"flŁ	– 2fŽŁ
; YbYfU`Wcaa Ybhg#YWcaa YbXUh]cbg'Zcf'bYl h'h]aY.'		

FYWca a YbXYX. $\#\&\$^rfl @^rDG^r7F^r8B^r<8k$ KY][\h]b[. (\$i

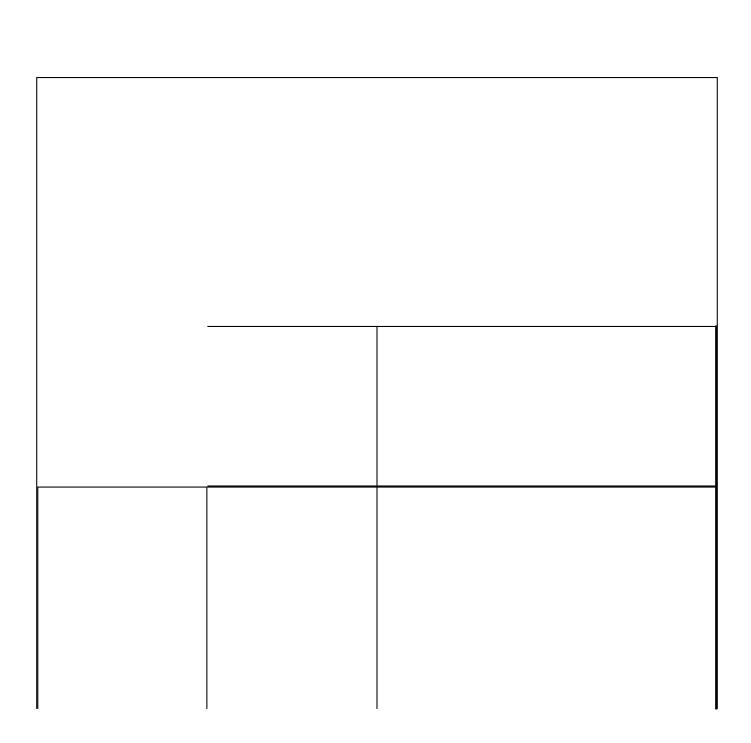
B6. H\Y'I]W_g']b'I\Y'j Uf]ci g'Vcl Yg'UfY'XYg][bYX'Ic'dfcj]XY'ZYYXVUW_'Ic'ghi XYbhg/I\Ym'UfY'bch'[]j Yb Yei U``k Y][\hi]b'XYhYfa]b]b['I\X'fYWca a YbXYX'[fUXY"8YdYbX]b['cb'I\X'bUhi fY'cZ'I\Y'UggYgga Ybh'H\g_ž YWfi fYfg'a Um'U`gc'WcbHYl hi U`]gY'UbX#cf'Ua YbX'I\X'gY'gdYWJZ]WWf]HYf]U"'H\Y'fYWca a YbXYX'[fUXY']g HYbHJHj Y'cb`mz'gi VYWfic'gHJbXUfX]gUIJcb'dfcWrggYg'UbX'Uddfcj U``VmH\Y'GW\cc``cZ9Xi WJIJcb'@YUfb]b[UbX'HYUW\]b['7ca a]HYY'"

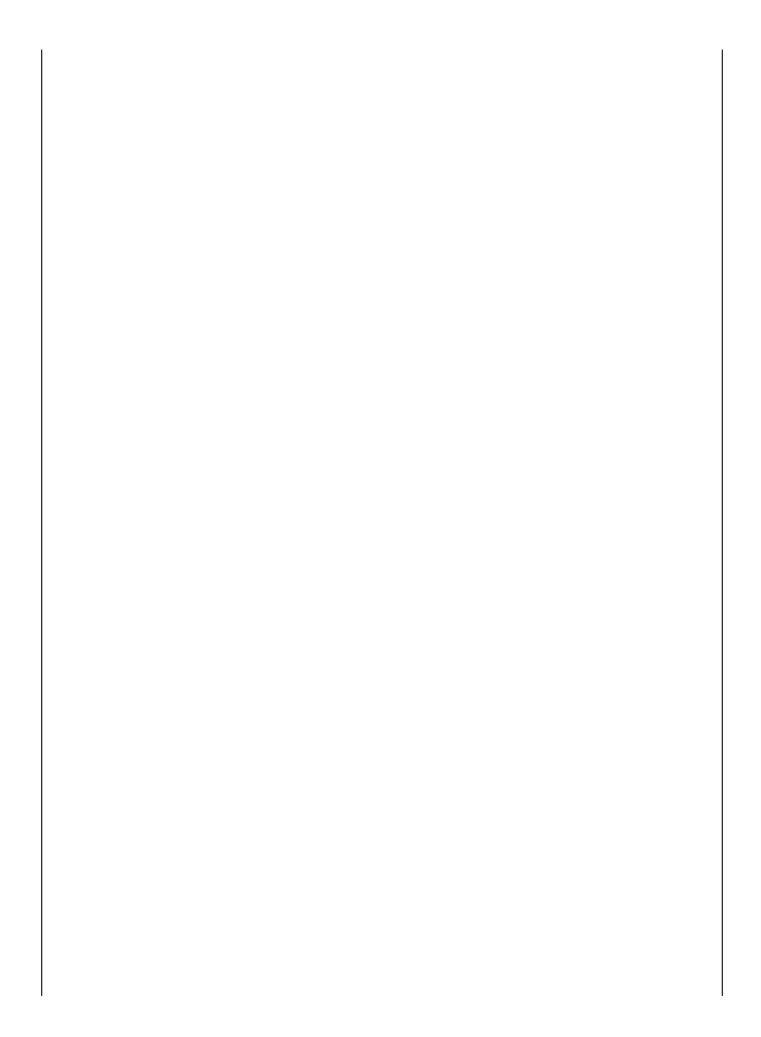
FI 6F = 7 # 998657? G < 99H 98GH)((, '98I 75H € B5@F 9G95F7 < I BGK 'G7 < CC@'C: '98I 75H € B

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GdYWJZJW7f]HYf]U	``flŁ——	——2fŽ-
I bXYfghUbX]b[cZh\Y'ei Ygh]cb'cf']ggi Y'UbX'h\Y'_YmWcbWYdhg]bj c'j YX • 7 YUf'i bXYfghUbX]b[cZh\Y'bUh fY'cZfYgYUfW		

d YWjZjWTJfjmmfjb gdZdfhYfX`bfWggY`cjYWVi 7`m\Y`izcgd`fbX]zbX	"f]Ł	——2fŽŁ
h\Y`fYgYUfW\`XYg][b		
8Ya cbglfUhjcb'cZh\Y'i gY'UbX'i bXYfgHJbX]b['cZdfcdYf'WjhJhjcb cZfY`Yj Ubhgci fWrg'UbX'hYI hVcc_g'hc'`]b_'h\Y'XUHJ'Wc``YWfjcb'UbX UbU`mg]g'd`Ub		
fi Whi fY'UbX'cf[Ub]gUh]cb'cZfYgdcbgY		
7`Uf]miUbX`We\YfYbWk'は径破採枷めJbUUNVobgg]g7`U]fgd\gUb		
YMMYZKribJbV ggZ df g YffX`bfWyfgYUbbd7UfXJffgdhdzXfgUhJcl		





FYgci fWyg

DfYgWf]VYX F Ygci fWYg

A U]b HYI hVcc_,

.

Gi dd`Ya YbhJfmHYI hVcc_.

6fma Ubž5"'f&\$%* Ł"'GcWJU``fYgYUfW\'a Yh\cXg"'C|ZcfXž|?.'C|ZcfX`|b]j Yfg]lmiDfYgg"

: fUYb_Y`ž'>"`F "ž'K U``Ybž'B"`9"ž/ '<mi bž'<"`< "`f&\$%\&"`<ck 'hc`XYg][b`UbX`Yj U`i UhY`fYgYUfW\`]b`YXi WUh]cb" BYk 'Mcf_.`A W fUk!<]```<i a Ub]h]Yg#GcW]U``GW]YbWYg#@Ub[i U[Yg"

FYUX]b[g'Zcf'YUW\acki Y']b'h\]g'Wci fgY'a U]b`mWca Y'Zfca 'h\YgY'hYI hVcc_g"'H\Y'WcbhYbhcZh\YgY'Vcc_g]g``Uf[Y`mh\Y'gUa Y'UbX'ghi XYbhg'Wb'i gY'UbmcbY'cZh\YgY'h\fYY"'H\Y'Vcc_g'UfY'Uj U]`UV'Y'h\fci [\'h\Y IBGK '@]VfUfm'UbX'Zcf'di fW\UgY']b'h\Y'IBGK '6cc_g\cd"'5XX]hJcbU``fYUX]b[g'UbX'fYgci fW'g'k]```U`gc'VYdfcj]XYX'cb'AccX'Y"

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

A cghighi XYbhgʻfYgdcbXYX`dcg]hji Y`mUVci hih\Y`cb`]bY`a cXY`cZh\]gʻWci fgYžVi higca Y`ghi XYbhgʻYl dfYggYX UʻbYYX`Zcf`a cfY`"\i a Ub"`WcbhUWhlja Y`k]h\`dYYfg"`5g`UʻfYgi `hz`UʻbYk `X]gW gg]cb`Zcfi a `W\Uhfcca `\Ug VYYb`qYhi d`Zcf`ghi XYbhg`hc`q\UfY`h\Y]f`fYqYUfW\`]XYUq`YUf`m]b`h\Y`Wci fqY"````

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

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

Image: Ybwci bhYf'U'dfcV'Ya k \Yb'UhYa dhJb['hc'gi Va]hmci f'Ugg][ba Ybht\fci [\'Hi fb]hJbž'd'YUgY

HY'Yd\cbY'9| hYfbU'`Gi ddcfhcb'-',) '' ' ' %cf'Ya U]`'h\Ya 'cb'Y! hYfbU'hY'hgi ddcfh4 i bgk "YXi "Ui '"'Gi ddcfh
\ci fg'UfY', .\$\$Ua '-'%\$.\$\$da 'cb'k YY_XUmg'UbX'-.\$\$Ua '-').\$\$da 'cb'k YY_YbXg'fl *) 'XUmg'U'mYUfŁ"'=Imci
UfY'i bUV'Y'hc'gi Va]hmci f'Ugg][ba YbhXi Y'hc'U'ZJi 'hk]h\'Hi fb]hJb'mci 'a UmUdd'mZcf'Ub'Y! hYbg]cbž'Vi hmci
a i ghfYhJ]b'mci f'hJW_Yhbi a VYf'Zfca '9! hYfbU'`Gi ddcfhfU'cb['k]h\'Ubmch\Yf'fY'Yj UbhXcW a YbhgŁ'hc
]bWi XY'Ug'Yj]XYbW'hc'gi ddcfhmci f'Y! hYbg]cb'Udd']WUhJcb"'=Imci 'Ya U]`'9! hYfbU'`Gi ddcfhmci 'k]``
Ui hca UhJWJ'`mfYWY]j Y'U'hJW_Yhbi a VYfž'Vi h]Zmci 'hY'Yd\cbY'mci 'k]``bYYX'hc'gdYWJZJWJ'`mUg_'Zcf'cbY"
Hi fb]hJb'U'gc'dfcj]XYg'i dXUhYg'cb'h\Y]f'gmghYa 'ghUh' g'cb'Hk]hYf"

; YbYfU``mž'UggYgga YbhiHug_g'a i gh'VY'gi Va]hhYX'Y`YWfcb]WJ``mj]U'Y]h\Yf'Hi fb]h]b'cf'U'A ccX`Y Ugg][ba Ybh'' = D`]bgHJbWYg'k \YfY'h\]g']g'bchdcgg]V'Yž']hk]``VY'gHJhYX'cb'mci f'Wci fgY'g'A ccX`Y'g]hY'k]h\

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`hJ_Y`a Ubm Zcfa gžZca `XY`]VYfUhY`W\YUh]b['hc`UVW]XYbhJ``mWcdm]b['Zfca `U`gci fWY`k]h\ci hUW_bck `YX[Ya Ybh'

IBGK [fcidgdu[]Uf]ga]bhch\YZc``ck]b[WUhY[cf]Yg.

 $\begin{tabular}{ll} \hline \textbf{7.cdm}b[...] g]b[...] MY cf'j Yfmg]a] ``Uf'k cfXg'hc'h\Y'cf][] bU``HYI hcf']XYU'k]h\ci h`U\W_bck ``YX[]b[...] b[...] MY cf'i g]b[...] bU``HYI hcf']XYU'k]h\ci h`U\W_bck ``YX[]b[...] b[...] MY cf'i g]b[...] a UhYf]U`gž']XYUg'cf'WcbW'dhg'\bar{Z}ca '`U'Vcc_\bar{Z}Ufh]WY\bar{Z}ca '`U'Vcc_\bar{Z}Ufh]\bar{Z}ca '`U'Vcc_\bar{Z}Ufh]\bar{Z}ca '`U'Vcc_\bar{Z}Ufh]\bar{Z}ca '`U'Vcc_\bar{Z}Ufh]\bar{Z}ca '`U'Vcc_\bar{Z}Ufh]\bar{Z}ca '`U'Vcc_\bar{Z}Ufh]\bar{Z}ca '`U'Vcc_\bar{Z}Ufh]\bar{Z}ca '`U'Vcc_\bar{Z}Ufh]\bar{Z}ca '``U'Vcc_\bar{Z}Ufh]\bar{Z}ca '``U'Vcc_\bar{Z}Ufh]\bar{Z}ca '``U'Vcc_\bar{Z}Ufh]\bar{$

5 WUXYa]W + DZcfa Uh]cb

8 i Y 'hc 'Yj c'j]b['UXj]\W 'VmBGK '< YU't\ ž'ghi XYbhg'a i gh'\W.Y\<u>V</u>'Zcf'i dXUh\YX']bZcfa Uh]cb 'fY[UfX]b['cb`]bY 'YUfb]b['Zcf'U``'5fhgž'8Yg][b 'UbX'5f\W.]h\Y\ni fY '\wci fgYg't\]g't\Yfa 'f]]U'A ccX`Y'cf'\wci fgY']bZcfa Uh]cb dfcj]\XYX"Ł

: 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'GUZYhm'dc`]W]Yg/
- YI Ua]bUh]cb dfcWYXi fYg/

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