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7 ci fgY 5]a g

 $\label{thm:conditional} $$HYFYgYUfWX:HYYg]g:]g:Ub:]bX]j:]Xi:U``dfc.YWfi]b':k.]WX:YUWX:gfi:XYbfik.cf_g:i:bXYf:hXY:[i:]XUbWY:cZUbca]bUfYX:a:Ya:VYf:cZfhXY:UWUXYa]WgfUZZffhXY:"5b:UXX]f]cbU``a:Ya:VYf:cZUWUXYa]WgfUZZffhXY:"7c!gi:dYfj:]gcf"Ł'a:UmU`gc:VY:bca]bUfYX:XYdYbX]b[:cb:fhXY:gYfi:d:cZfhXY:dfc.YWf:HXY:fYgYUfWX:a:Um]bj:c`j:Y``UVcfUfcfmYI:dYf]a:Ybfgž:Z]Y`X:cf']bXi:gffm!VUgYX:]bj:Ygfl[:Uf]cbgž:XYg][:b:Udd`]WUf]cbg:cf'fhXycfYfl]WJ`fYgYUfWX:"HXY:FYgYUfWX:HXYg]g:U]a:g'fc:dfcj:]XY:gfi:XYbfg:k:]fhX:fhXY:cddcffi:b]fmfc.$

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- DfcXi WY 'U'gY`ZWcbHJ]bYX'fYgYUfW\ 'h\Yg]gž'k\]W\ 'a Um'VY'i bXYfghccX'UbX'i gYX'Vmch\Yfg'k]h\
 hYV\\b]\WJ`'VU\W_[fci bX'_bck `YX[Y']b'h\Y'gUa Y'X]g\W]d`]bY'UfYU'Ug'h\Y'h\Yg]g'hcd]\Wz'UbX'a Um
 dchYbhJU``mVY'qi]hUV'Y'Zcf'di V`]\WJh]cb/
- DfYgYbhh\Y]f'fYgYUfW\]b'U'gYa]bUf'cf'j]XYc"

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&"`7 f]h]WU``mifYZYWicb`U`gdYW]U`]ghVcXmicZ_bck`YX[Y`fY`UhYX`hch\Y]f`h\Yg]g`hcd]W'`	D9%"
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) "'8 Ya cbglfUlY'cfU`'UbX'k f]ltYb'Wca a i b]WUl]cb']b'dfcZYgg]cbU`UbX``UmXca U]bg"'	D9' "&

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5g'U'fci [\'[i]XY'cb`mž'Ub'Uj YfU[Y'ghi XYbhik ci `X'VY'YI dYWYX'hc 'gdYbX'Uddfcl]a UhY`m'%\$'\ci fg'dYf k YY_'cb'k cf_'fY`UhYX'hc'h\]g'Wci fgY"'A cfY'[i]XUbWY']g'bYYXYX']b]h]U``m'Zfca 'h\Y'gi dYfj]gcf'k \Yb'h\Y'hcd]W]g'VY]b['XYZ]bYX'hc'YghUV`]g\'h\Y'cV'YWfj Yg'UbX'a Yh\cxc`c[mcZh\Y'h\Yg]g"

Gi dYfj]g]cb

H\YfY`UfY`bc`gdYW]Z]W\ci fg`Ugg][bYX`rc`r\]g`Wci fgY"`A YYr]b[g`VYrk YYb`r\Y`gi dYfj]gcffg\L'UbX`r\Y`gh XYbh a UmrU_Y`d`UWr`dYf]cX]\U``mcf`Vmdf]j UhY`UffUb[Ya Ybh'`G\ci `X`gi dYfj]gcfg`VY`cb`gh Xm`YUj Y`cf i bUj U]`UV`Y`Zcf`U`Wcbg]XYfUV`Y`dYf]cX`cZh\Y`gYgg]cbž'U`hYfbUh]j Y`UffUb[Ya Ybhg`bYYX`rc`VY`YghUV`]g\YX UbX`a UXY`_bck b`rc`Vch\`r\Y`gh XYbh'UbXWci fgY`WccfX]bUrcf"

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 $H\Y'Wci fgY'Wcbj Ybcf'UbX'hi hcfg'k]```VY'Uj U]`UV'Y'j]U'A]WfcgcZhHYUa g'hc ``]U]gY'k]h\'Ybfc``YX'ghi XYbhg'Ug bYYXYX''$

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Mci f'df]cf]mm]g'hc 'Z]bX'U'Gi dYfj]gcf'UbX'U[fYY'cb'U'hcd]WVmk YY_'&cZh\Y'hYfa "'C bWYYbfc``YX']b'h\Y Wci fgYz'a U_Y'gi fY'h\Uhmci '[YhUWWgg'hc'h\Y'<u>A]WfcgcZhHYUa g'g]h</u>Y'!']Zbchd`YUgY'WcbhUWh\Y'Wci fgY Wcbj Ybcf'Zcf'UWWgg"

 $\\ \pm \frac{1}{N}Y''HYUa g'dU[Yz''hYY''UfY''U'']gh'cZdchYbh]U''hcd]Wg''i bXYf''hY''; \underline{YbYfU'''hUV'!2'':]'Yg'!2'5j U]'UV'Y \underline{Dfc'YWg''}$

C bWY 'mci '\Uj Y'U'gi dYfj]gcf'UbX'hcd]Wzmci 'k]``bYYX'hc'Z]``ci h'U'Zcfa '<u>A 9F 9'F YgYUfW\'H\Yg]g'#A UgHYfg Dfc YWiGi dYfj]gcf'B ca]bUh]cb': cfa 'H&z'&\$&%'k\]W\'k]``'gYbX'Ub'Ya U]`'hc'mci f'gi dYfj]gcf'Zcf'Uddfcj U''' 8 c'h\]g'Vmh\Y'YbX'cZK &"</u>

CbY Dfc YWMzH\fYY 7ci fgYg

H\fYY`Wci fgYg`Wcj Yf`k f]h]b['mci f`F YgYUfW\ H\Yg]g`UbX`fY`UhYX`UggYgga Ybhg"

- F YgYUfW\\ 'H\Yg]q'5. 'H\Y'ZcW' g'cZ5']g'hc'Wca d'YhY'U'`]hYfUh' fY'fYj]Yk "
- F YgYUfW\"H\Yg]g`6. Mci `k]```k f]hY`U`dfc[fYgg`fYj]Yk ž`]bWi X]b[`U`a Yh\cXc`c[m`UbX`a U_Y`U`g\cfh fYZYWh]cb'j]XYc"'Mci f`k cf_`]b`H\Yg]g`6`k]``VY`hc`Wc``YWhmci f`XUHU`UbX`gHUfhk f]h]b[`mci f`fYgi `h`YUj Y`cf

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DfYgYbhUh]cb	h\Y`dfc[fYgg]cb`cZh\Y`dfcYWYxa]`YghcbYg`UbX`XYdYbXYbW]Yg"	
	H\Y`XcWaYbh]g`kY``!kf]hhYb`UbX`WhUh]cbg`UfY`Wcbg]ghYbh`m	
	UbX`WcffYWnmZcfaUthYX`UWWcfX]b['tc'th\Y`[i]XY`]bYg"`	

 $\label{thm:condition} \mbox{Hi fb]h]b"gYh]b"[."H\]g"Ugg][ba Ybh"]g"gi Va]hhYX"h\fci [\Thi fb]h]b"UbX"ghi XYbhg"Xc"bchigYY"Hi fb]h]b g]a]`Uf]hmfYdcfhg"$

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 $\hbox{\bf 8YhJ]$`g.Gi Va] $$ hU'h Yg] g'dfcdcgU``XfUZh'hc'mci f'gi dYfj] gcf$

5XX]h]cbU``XYhU]`g.

Mci f'gi dYfj]gcf'WUb'dfcj]XY'mci 'ZYYXVUW_'Zcf'mci f'fYdcfh]Zmci 'gi Va]h&'k YY_g'VYZcfY'h\Y'XYUX`]bY"

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: YYXVUW_`Zfca 'ghi XYbhg']b'k Y`Wca YXž'UbX']g'i gYX'hc'Wcbh]bi ci g`mi]a dfcj Y'h\Y'Wci fgY ci hWca Yg'UbX'Yl dYf]YbW'g'Zcf'ghi XYbhg"

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D`YUgY`WcbhUWimci f`gi dYfj]gcf`Zcf``UVcfUhcfmYei]da YbhžUVWWgg`cf`ch\Yf`gdYWJU``fYgci fWYg`mci `a][\hbYYX`hc`Wca d`YhY`mci f`h\Yg]g"

a]gg]cb cZ5ggYgga YbhHUg_g

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bWcifU[Y`mci`hc`fYhJ]b`U`WcdmcZYjYfmUgg][baYbhigiVa]hh/X`Zcf`UggYggaYbhZcf`mcif`ckb`fYWcfX ``]b`\UfXWcdmcf`Y`YWfcb]WZcfa"

gYgga Ybhgʻa i ghi\Uj YʻUbʻUggYgga YbhWcj Yfʻg\YYhUHUWXYX".

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]Y`Wcad`Yh]cb`fYei]fYg`giVa]gg]cb`cZU```UggYggaYbh`]hYag": U]`ifY`hc`giVa]hU```UggYggaYbh`]hYag Ygi`h`]b`h\Y`UkUfX`cZUb`IbgUh]gZJWcfm: U]`ifY`fI: Ł`[fUXY`Zcf`h\Y`7cifgY`ib`Ygg`gdYW]U` XYfUh]cb`\Ug`VYYb`giVa]hhYX`UbX`UddfcjYX"`D`YUgY`bchYž'U`WcadYhYbWn\ifX`Y`cZ)\$i]g`Udd`]YX`hc pU``UggYggaYbh'

' Gi Va]gg]cb cZUb 5gg][ba Ybh

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

bXYfgHUbX`H\Un'Uh'Hja Yg`mci `a Umbch`VY`UV`Y`hc`gi Va]h`Ub`Ugg][ba Ybh`cb`Hja Yž`UbX`H\Y`GW\cc``k]`` La cXUHY`UbmZJ]f`UbX`fYUgcbUV`Y`YI HYbg]cb"`K Y`k ci `X`fYWca a YbX`mci `fYj]Yk `H\Y`I BGK `GdYW]U` |XYfUH]cb`[i]XY`]bYg`—`gYY`gYWf]cb`VY`ck"

gi Va]gg]cb'k]``bchVY'UWWdhYX'UbX'k]``VY'Wcbg]XYfYX'Ug'bc'gi Va]gg]cb"

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Wb`Udd`m'Zcf`gdYWJU``Wcbg]XYfUh]cb`h\fci[\`<u>H\Y`BiWYig`GhXYbh<iV</u>`k\Yb`]``bYgg`cf`ch\Yf ghUbWfg`]bhYfZYfY`k]h\`mcif`UggYggaYbhdYfZcfaUbWf"`G]W_bYggža]gUXjYbhifY`cf`ch\Yf ghUbWfg`VYmcbX`mcif`Wcblfc``aUm

DfYj Ybhmci Zfca 'Wca d'Yhjb['U'Wci fgY'fYei]fYa Ybh

O YYG'mci Zfca 'UhhYbX]b['Ub'UggYggUV'Y'UWhjj]hm

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ZYWhmci f'dYfZcfa UbW']b'UggYggUV'Y'k cf_ž'VY']hiU'Zcfa U''YbX!cZgYa YghYf

WUgg'hYghz'U''UVcfUhcfmihYghz'U'gYa]bUf'dfYgYbhUhjcb'cf'Ubmich\Yf'Zcfa 'cZ

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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 "

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⊋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±bZcfa Uhjcb

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 $K_{Y'UW\underline{b}ck} YX[Y'hY'6YXY[U''dYcd'Y'k \c'UfY'hY'ffUX]h]cbU''W ghcX]Ubg'cZhY''UbXg'cb'k \]WX'I_BGK_?Ybg]b[hcb'WJa_di_g']g''cWJhYX'''$

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

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D9%'('8]gWfba YbhcZ_bck `YX[Y 'XYj Y`cda YbhUbX'fYgYUfWX 'X]fYWf]cbg'k]h\]b'h\Y Yb[]bYYf]b['X]gW]d`]bY	
D9%) '? bck 'YX[Y'cZYb[]bYYf]b['XYg][b'dfUWjWY'UbX'WcbhYl hi U`'ZJWcfg']a dUWjb['h\Y Yb[]bYYf]b['X]gWjd`]bY	
D9%"* I bXYfgHJbX]b['cZh\Y'gWcdYž'df]bW]d`Ygž'bcfa gž'UWVci bHJV]`]h]Yg'UbX'Vci bXg'cZ gi gHJ]bUV`Y'Yb[]bYYf]b['dfUWfJWY']b'h\Y'gdYW]ZJWX]gW]d`]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 YbhiUdd`]WUh]cb'cZYb[]bYYf]b['hYVXb]ei Ygžhcc`g'UbX'fYgci fWYg	
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 WhUbX'a UbU[Ya YbhcZYb[]bYYf]b[dfcYWng	
DfcZYgg]cbU`'UbX'dYfgcbU`'Ultf]Vi hYg	
D9' "%'9h\]WU`'WcbXi Wh'UbX'dfcZYgg]cbU`'UWWci bHJV]`]hm	
D9' "&'9ZYWAj Y'cfU`'UbX'k f]MYb'Wcaaib]WUAjcb']b'dfcZYgg]cbU`'UbX'`Um'XcaU]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'mia UbU[Ya YbhcZgY`Zi'UbX`dfcZygg]cbU``WcbXi Wh	
D9' "* '9ZZYWNjj Y'NYUa 'a Ya VYfg\]d'UbX'NYUa 'YUXYfg\]d	