



7ci fgY`Cj Yfj JYk

`GHUZZ7cbhUW`i8YHU]`g`

`7cbj Ybcfg`

B Ua Y	9a U]`	5j U]UV]`]m	@cWU]hcb	D\cbY
N]hU`F c\`f	n"fc\`f4 i bgk "YXi "Ui	Hi YgXUmġ`%%"\$ \$ U"a `!`a ]XXUm`6m Uddc]bha Ybhcb`m`	A cfj Yb`6fck bž @Yj Y``žF cca &%%	5ddc]bha Ybh ġj ]U`Y!a U]`

`@YW`i fYfg`

B Ua Y	9a U]`	5j U]UV]`]m	@cWU]hcb	D\cbY
N]hU`F c\`f	n"fc\`f4 i bgk "YXi "Ui	Hi YgXUmġ`%%"\$ \$ U"a `!`a ]XXUm`6m Uddc]bha Ybhcb`m`	A cfj Yb`6fck bž @Yj Y``žF cca &%%	5ddc]bha Ybh ġj ]U`Y!a U]`

GWXcc``7cbhUW`i`bZcfa Uh]cb

GWXcc``cZ<i a Ub]h]Yġ`UbX`@Ub[ i U[ Yġ

@cWU]hcb. `GWXcc``C Z]WžA cfj Yb`6fck b`6i ]X]b[ ž`@Yj Y``ž&),

C dYb]b[ `<ci fg. `A cbXUm! : f]XUmž`- Ua `!`) da

D\cbY. `ž`\*%&`-`' , ) `)%\*, %

: U! . `ž`\*%&`-`' , ) ; +\$)

9a U]`. [\U`4 i bgk "YXi "Ui](#)

7 ci fgY'8YHJ]`g

7 fYX]hDc]bHg`\*`

Gi a a UfmicZ\hY'7 ci fgY

Gi VYWh5fYU.: [efack

H\]g`Wci fgY`WUb`U'gc`VY`gh`X]YX`]b.`7gdabWS` E fgV]Wc

H\Y'9i fcdYUbk cfXz%) \$\$!% \$\$`]g`Ub`]bfcXi Wc fmiWci fgY`hc`YUFmā cXYfb`\]ghcfm'`hU]a g`hc`dfcj`]XY`U  
[ YbYfU`\_bck`YX[ Y`cZ9i fcdYUbd`dc`]h]VgžgcW]YmžYVc bca miUbX`W`h`fY`VYtk`YYb`hY`F`YbU]ggUbW`UbX`hY  
: fYbW`F`Yj`c`i`h]cb`"K`Y`k`]"`ZcW`g`cb`hY`a`cghg][ b]Z]W]bhYj`YbHg`UbX`XYj`Y`cda`YbHg`h`Uhg`UdYX  
9i fcdYUbd`\]ghcfmž]bW`i`X]b[ `hY`f]gY`cZ\i`a`Ub]ga`ž`fY`][`]ci`g`fY`Zcfa`ž`ghU`Y`Zcfa`U]h]cb`UbX`W`b`fU`]gU]h]cbž  
cj`YfgYUg`Yi`dUbg]cbž[ `cVU`W]d]hU`]ga`ž`UbX`hY`Ya`Yf[`YbW`c`Z`fY`dfYgYb]h]j`Y`[`cj`Yfba`Yb`h`K`Y`k`]"`cc`\_`Uh  
hY`Wc`bgYei`YbW`g`Vfci`[`\hVmi`hY`gY`XYj`Y`cda`YbHg`ž`a`cghbchU`mcb`9i`fcdYUbd`dc`]h]W`UbX`W`h`fU`  
dfUW]W]g`UbX`gh`Xm`ck`hY`m]a`dUW`X`fU]X]h]cbU`i`bXYfg]h]bX]b[`g`cZ\i`a`Ub`bU`h`fY`hc`[`j`Y`f]gY`hc  
a`cXYfb`]XYUg`cZ\i`a`Ub`f][`\hg`"

7 ci fgY`@YUfb]b[ `Ci`hWc`a`Yg

%` 5bU`mgY`]a`dcf]h]b]h`i`fb]b[ `dc]b]hgž`dYcd`Yž`]XYUg`UbX`XYj`Y`cda`YbHg`fY`Yj`Ub]h]c`h`h]g`Wci`fgY  
&` 8YgW]VY`hY`Wc`b]hYa`dcfUfm]fY`Yj`UbW`c`Z`UgdYW]g`cZ`h]g`Wci`fgY  
'` "⇒XYb]h]ZmUbX`XYgW]VY`\_Ym`\]ghcf]W]`Wc`bW`d]hg  
(` 9j`U`i`Uh`UbX`Wc`b]h]i`h`U`]gY`gci`fW]g  
)` 5bgk`Yf`\]ghcf]W]`ei`Ygh]cbg`i`g]b[ `Uf[`i`a`Yb]h]UbX`Yj`]XYbW  
\*` 7ca`a`i`b]W]h]Y`XYUg`Ua`cb[`ghd]Y]fg`UbX`Yb[`U[`Y`]b`X]g]W`gg]cbg`UbX`#`f`XYVU]h]g  
+` :`c`ck`Wc`b]j`Yb]h]cbg`cZ`UW]X]Ya`]Wk`f]h]b[ `UbX`fYgYUfVW`]b]h]f]m

HYUW]b[ `G]h]fU]h]` ]Yg`

H\]g`Wci`fgY`U]a`g`hc`dfcj`]XY`gh`XYbHg`k`]h`hY`cddcf]h`b]m]h]c`UddfYW]U]h`hY`fY`Yj`UbW`c`Z`\_Ym]g]gi`Yg`UbX  
XYVU]h]g`]b`YUf]mā`cXYfb`9i`fcdY`"`#`]"`bY`k`]h`hY`Wci`fgY`f]g`d`\]cgcd\]W]`VUg]g]ž`h]fY`a`U`cf`h]Ya`Yg`UfY  
dfYgYb]h]X`]b`U`fci`[`\m]W]fcb]c`c[`]W]`Z]Ua`Yk`cf`\_`%`6fYU`\_]8ck`b`cZA`YX]Yj`U`9i`fcdY`Xi`f]b[ `hY`G]i`h]Yb]h  
7Yb]h`fm`&`7`U`Yb[`Ygž`7`f]gYg`UbX`7`cbgc`]XU]h]cb`]b`hY`G]Yj`Yb]h]Yb]h`/`9][`\h]Yb]h`7Yb]h`f]Yg`/`"  
F`Yj`c`i`h]cbg`]b`hY`9][`\h]Yb]h`7Yb]h`fm`"

@YUfb]b[ `UbX`h]UW]b[ `UfY`bYW]ggUf]m]U`h`c`!`k`UmidfcW]gg`"@YWh`fYg`UfY`XYg][`bYX`hc`]b]h]cXi`W`gh`XYbHg  
]b`5F`HG`&&`&`hc`hY`gdYW]Z]W]h]c]d]W]h]U]h`]i`gh]fU]h]`]a`dcf]h]b]h]UgdYW]g`cZ`YUW]h]h]Ya`Y`"H\Y`di`fdcgY`cZ  
`YWh`fYg`]g`hc`gYh]ci`h]hY`]g]gi`Yfg]ž`XY]Z]bY`h]V]X]b]W]`cf`gdYW]U`]gh]h]fa`gž`WUf]Z]m]h]Y`\]ghcf]c[`fUd\]W]`  
XYVU]h]gž`UbX`cZ]Yf`]i`gh]fU]h]`Y`Yi`Ua`d`Yg`Zcfa`hY`\]ghcf]W]`]"`h]fU]h]fY`"Hi`hc]f]U`WUggYg`[`]j`Y`gh`XYbHg`hY  
W]UbW`hc`XYa`cbg]h]fU]h]h]Y`f`\]ghcf]W]`i`bXYfg]h]bX]b[ `Vm]Wc`bg]h]f]W]b[ `Yi`d`Ub]U]h]cbgž`Ug\_]b[ `ei`Ygh]cbgž  
fY`U]h]b[ `hc]d]W]g`hc`cbY`Ubch]h]fž`UbX`XYVU]h]b[ `]b]h]f]d]fY]h]h]cbg`"H\Y`h`hc]f]U`dfc[`fUa`]g`UffU]b[`YX`hc`fi`b`cbY  
k`YY`\_`VY`\]bX`hY`YWh`fYgž`gc`h]U]h]c]d]W]g`W]b`VY`Yi`d`cfYX`Zcfa`Ub`]b]Zcfa`YX`gh]Ub]X]d]cb]h]":`cf`h]g`fYUgcb]h  
]g`YggYb]h]U`h]U]gh]h]XYbHg`Xc`hY`fYU]X]b[ `h]U]h]g`d]fYgW]V]YX`Zc]f`YUW]k`YY`\_`f]g`h`hc]f]U`hc]d]W]k`YY`\_`mi`h`hc]f]U`  
WUgg`k`]`[`]j`Y`gh`XYbHg`U`W]UbW`hc`Ug`\_`Zc]f`Ugg]g]h]U]b]W]`cb`dc]b]hg`h]U]h]h]Ym]Z]Y`b]Y]X`Y`U]Vc]fU]h]cb`cf  
WUf]Z]W]h]cb`"K`Y`k`]"`U`gc`Ub]U`mgY`U`Z]k`d]f]a`Ufm]h]i`hg]b]c]fXYf`hc`XYj`Y`cd`gh]XYbHg]f]Z]a`]j]Uf]m]k`]h`hY  
\_]b]X]g`cZ]Yj`]XYbW`Ya`d`cm]X`Vm`\]ghcf]U]bg`cZ]YUf]mā`cXYfb`9i`fcdY`"H\YgY`a`Uh]f]U`g`UfY`Uj`U]UV`Y`cb  
A`ccX`Y`"

8Yg][ b'UbX'UggYgga YbhcZhi hcf]U'dUfh]W]dUh]cb'UfY'VUgYX'cb'hY'I BGK '5ggYgga YbhHcc`\_]hg'UXj ]W''

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5ggYgga YbhHUg_	K Y][ \h	8i Y'8UHŸ	Gh XYbh@YUfb]b[ Ci hŸa Yg'5ggYggYX
: ]Y`Xk cf_`Dfc`YVh	' \$	&&#/%\$#&\$%-`%\$. \$\$`DA	&ž( ž) ž* ž+
!WUgg`hYgh	&\$	%- #/%&#&\$%-`\$- . \$\$`5A	%ž ž)
F YgYUfW`YggUm	) \$	\$( #/%&#&\$%-`\$( . \$\$`DA	%ž&ž ž( ž) ž+

5ggYgga Ybh8YHU]`g

5ggYgga Ybh% : ]Y`Xk cf\_`Dfc`YVh

GHfhXUHŸ. `Bch5dd`]WV`Y

8YHU]`g. `Gh XYbŸg`k ]`gi Va ]hUb ]bX] ]Xi U`dcfhž`c`fŸ) \$\$`k cfXgŸUbX`[ ]j Y`U`[ fci d`dfYgYbhUH]cb`fŸ\$  
a ]bgŸ`9UW`WŸa dcbYbhfdcfhž`c`UbX`dfYgYbhUH]cbŸWff]Yg`hY`gUa Y`k Y][ \h: YYXVUW`dfcj ]XYX`j ]U

5 hYbXUbW F Yei ]fYa Ybhg









K YY_ ; . ( ' Bcj Ya VYf! ; Bcj Ya VYf	@YWh fy	9i fcdY `jb`hY`K cfX. %() \$!%* \$\$

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	Hi hc]U`	Hi hc]U`g`k ]``VY`\Y`X`h`]g`k YY_`"Mci f UhhYbXUbW`i]g`gh]``fYei ]fYX"  ""9UfmA cXYfb`Hf]j ]U`7`U`Yb[ Y``fa ]b]`A Ufg`6Ufg Zc`hY`k ]bb]b[ `hYUa gE"  .  .

F Ygci fWg

DfYgWf]VYX`F Ygci fWg`

H\Y`Wci fgY`hI hVcc\_žA YffmK ]YgbYf!< Ub\_gž9Uf`mA cXYfb`9i fcdYž%( ) \$!%+, - ž7 Ua Vf]X[ Y.  
7I Dž&\$% ž]g`Uj U]UV`Y`hc`ghi XYbhg`]b`Y!Vcc\_žcfa Uhj ]U`hY`@]VfUfm]Y`YWfcb]WXUH`VUgYg`YfY.

\hdg.##k k k !WJa Vf]X[ Y!cf[ "k k k dfcl n%" ]VfUfm]i bgk "YXi "Ui #Vcf#/#cc\_g#Ufmi  
a cXYfbYi fcdY!%( ) \$%+, - # \$ ' 56, ' : 995+)' %8 ( 55, \$9%9&) 8- 67, ) +.

Hc`UWWWgg`]hfYa ch`mžhYmk ]`bYXX`hc`g][ b`]b`k ]h`hY]f`n-8`UbX`dUggk cfX"

5XX]h]cbU`Wca di`gcfmfYUX]b[ g`cb`k YY`\_m]hcd]Vg`WUb`VY`Zci bX`cb`hY`A ccX`Y`Wci fgY`dU[ Y"

F YWca a YbXYX`F Ygci fWg

H\YgY`k ]`VY`]ghX`cb`hY`A ccX`Y`Wci fgY`dU[ Y"

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

Gh XYbhZYXVUW\_k ]`VY [ UH.YfYX`j ]U`A m9I dYf]YbW`Uh`hY`YbX`cZ`hY`Wci fgY`UbX`h`fci [ \ `U`Vf]YZ]b!WUgg  
Yj U`i Uh]cb`Xi f]b[ `hY`hf]a YghYf"

Gi Va ]gg]cb`cZ5ggYgga YbhHUg\_g

Gi Va ]gg]cb`cZ5ggYgga YbhHUg\_g

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

Ẓmci`YbWci bhYf`U`dfcV`Ya`k`Yb`U`H`Ya`dh]b[`h`c`gi`Va`]h`mci`f`Ugg][`ba`Ybh`h`fci`[`\`Hi`fb]h]b`z`d`YUgY`  
H`Y`d`\`cb`Y`9I`H`fb`U`Gi`ddcfh`cb`-`,`)`''`'`%`cf`Ya`U]`h`Ya`cb`YI`H`fb`U`H`h`gi`ddcfh`4`i`bgk`"YXi`"Ui`"Gi`ddcfh`  
\`ci`fg`UfY`,`.\$\$Ua`-`%\$.\$\$da`cb`k`YY`XUmg`UbX`-`.\$\$Ua`-`).\$\$da`cb`k`YY`YbXg`f`l`\*)`XUmg`U`m`Y`Uf`l`"Ẓmci`  
UfY`i`bUV`Y`h`c`gi`Va`]h`mci`f`Ugg][`ba`Ybh`Xi`Y`h`c`U`Z`U`h`k`]h`Hi`fb]h]b`mci`a`Um`Udd`m`Z`f`Ub`YI`H`bg]cb`z`Vi`h`mci`  
a`i`gh`f`Y`h`U]b`mci`f`h]W`Y`h`bi`a`VY`f`Z`ca`9I`H`fb`U`Gi`ddcfh`f`U`cb[`k`]h`Ub`m`c`h`Y`f`f`Y`j`Ub`h`X`c`W`a`Y`b`h`g`l`h`c`  
]b`Wi`XY`Ug`Y`j`]X`Y`b`W`h`c`gi`ddcfh`mci`f`YI`H`bg]cb`Udd`]W`h]cb"Ẓmci`Ya`U]`9I`H`fb`U`Gi`ddcfh`mci`k`]"`

## 5 WUXYa ]W<c bYghmUbX`D`U[ ]Uf]ga

D`U[ ]Uf]ga `]g`i g]b[ `hY`k cfXg`cf]XYUg`cZchYfg`UbX`dfYgYbh]b[ `hYa `Ug`mci f`ck b" `hWUb`hU`Y`a Ubm  
Zcfa gž Zca `XY`]VYfUHY`WXYU]b[ `hc`UWV]XYbhU`mW`dm]b[ `Zca `U`gci fW`k ]h`ci hUW\_bck`YX[ Ya Ybh`

I BGK `[ fci dg`d`U[ ]Uf]ga `]bhc`hY`Zc`ck ]b[ `WUHY`[ cf]Yg.

7 cdm]b[ .`i g]b[ `hY`gUa Y`cf`j Yfmg]a ]Uf`k cfXg`hc`hY`cf][ ]bU`hYI hcf]XYU`k ]h`ci hUW\_bck`YX[ ]b[ `hY`  
gci fW`cf`i g]b[ `ei chU]cb`a Uf\_g" `H\]g`U`gc`Udd`]Yg`hc`]a U[ Ygž UfhUbX`XYg][ b`dfc`YWgž`Ug`k Y`U`g  
dfYgYbhU]cbg`k \YfY`gca YcbY`dfYgYbh]g`UbchYf`g`]XYUg`cf`k cfXg`k ]h`ci hWYX]h`

hUddfcdf]UHY`dUfUd`fUg]b[ .`7`U`b[ ]b[ `U`ZYk`k cfXg`UbX`d`fUgYg`k`Y`a cghmifYU]b]b[ `hY`cf][ ]bU`  
ghfi W`fY`UbX`#`f`dfc[ fYgg]cb`cZ]XYUg`cZ`hY`cf][ ]bU`ž`UbX`]bZcfa U]cb`k ]h`ci hUW\_bck`YX[ Ya Ybh`H\]g`U`gc  
Udd`]Yg`]b`dfYgYbhU]cbg`k \YfY`gca YcbY`dUfUd`fUgYg`UbchYf`g`]XYUg`cf`k cfXg`k ]h`ci hWYX]hU`bX`hc  
d]YW]b[ `hc[ YhYf`ei chYg`UbX`dUfUd`fUgYg`]bhc`U`bYk`k \c`Yž`k ]h`ci hUddfcdf]UHY`fYZYfYbW]b[ "

7 c`i g]cb.`k cf\_]b[ `k ]h`chYfg`Vi hdUgg]b[ `cZ`hY`k cf\_]Ug`U`dYfgcb`g`]bX]j ]Xi U`k cf\_]7 c`i g]cb`U`gc  
]bWi XYg`dfcj ]X]b[ `mci f`k cf\_]hc`UbchYf`gh`XYbhVYZc`fY`hY`Xi Y`XUHYž`cf`Zc`f`hY`di fdcgY`cZ`hY`a

- i bXYfghUbx'mci f'f][ \hg'UbX'fYgdcbg]V]h]Yg'Ug'U'gh XYbhUhl BGK
- VY'Uk UfY'cZd'U[ ]Uf]ga ž'Wc'dmf][ \hžI BGK 'Gh XYbh7cXY'cZ7cbXi W'Ubx'5Ww'dhUV'Y'I gY'cZ I BGK '⇒H'F Ygci f'Wg'Dc`]Wm
- VY'Uk UfY'cZh'Y'ghUbxUfXg'cZVY\Uj ]ci f'YI dYW'X'cZYj Yfmcby'jb'h'Y'I BGK 'Wc a i b]m
- `cWJh'gYfj ]Wg'UbX'jbZcfa Uhcb'UVci hl BGK 'UbX'I BGK '@VfUfm

Gca Y'cZh'YgY'UfYUg'k ]`VY'ZJa ]]Uf'hc'mci ž'ch'Yfg'k ]`VY'byk "; U]b]b[ 'U'gc`X'i bXYfghUbx]b[ 'cZU`h'Y fY'UH'X'UgdYW'g'cZ9@G9'k ]`Y'd'mci 'a U\_Y'h'Y'a cghcZmci f'gh X]Yg'Uhl BGK ""

[\hd. #gj V'YWf i \]XYg" \]VfUfm'i bgk "YXi "Ui #'\]gY#JVci h' \]gY](#)

5 WUXYa ]WbZcfa Uh]cb`

: cf`YggYbh]U`ghi XYbh]bZcfa Uh]cb`fY`Uh]b[ `hc.

- fYei Ygh]Zc`fYI h`bg]cb/
- `Uh`gi Va ]gg]cbg`[ i ]XY`]bYg/
- fYj ]Yk `cZa Uf\_g/
- I BGK `<YU`h`UbX`GUZY`midc`]WYg/
-