



COMD5001

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7 ci fgY`Cj Yfj]Yk

GhJZZ'7cbhJWw'8YhJ]`g

7cbj Ybcfg

B Ua Y	9a U]`	5j U]`UV]`]m	@cW]h]cb	D\cbY
>cmW`K i	^cmW`k i 4 i bgk "YXi "Ui	9a U]`Zcf'cb`]bY Uddc]bha Ybh		\$(' (&% %) -

GW\cc``7cbhJWw'Zcfa Uh]cb

GW\cc``cZGcW]U`GWYbVWg

Fcca`%) -

A cfj Yb'6fck b'7 &\$

Ya U]`.gcgg4 i bgk "YXi "Ui

d\cbY. \$&-' ,)`% \$+

7ci fgY'8YHJ]`g

7fYX]hDc]bqg`*`

Gi a a UfmcZ`h`Y'7ci fgY

5fY`mci`]bHYfYghYX`hc`i` bXYfghUbx`k` \mi`h`YfY`]g`U`f]Wk`k`cfX`UbX`h`YfY`]g`U`d`ccf`k`cfX3`K` \Uhi`md`Y`c`Zgc`W]c!
Y`W`bca`]WUbX`Ybj`]fcb`Y`b`h`U`d`c`]W]Yg`W`b`VY`]XYbh]ZYX`UbX`]a`d`Ya`Y`b`h`X`h`c`U`X`X`f`Y`g`g`c`a`Y`c`Z`h`Y`g`Y`
XYj`Y`c`da`Y`b`h`W`U`Y`b`[`Yg3`#`h`h`g`W`c`i`fgY`z`mci`k`]`W`h`W`m`Y`b`[`U`[`Y`k`]h`g`Yj`Y`f`U`c`Z`h`Y`f`V`[`]g`g`i`Y`g`f`i`
W`c`b`W`f`b`]b`[`]b`h`f`b`U`h`c`b`U`X`Yj`Y`c`da`Y`b`h`d`c`]W`h`U`b`X`h`[`]`[`]`h`g`h`Y`h`]b`_`V`Y`h`k`Y`Y`b`]X`Y`U`g`z`d`c`]W`h`U`b`X`h`Y`f`Y`U`]m`
c`Z`X`Yj`Y`c`da`Y`b`h`k`]h`U`b`Ya`d`U`g`]g`c`b`h`Y`W`U`Y`b`[`Yg`Z`U`W`]b`[`]`c`W`h`W`c`a`a`i`b`]h`Y`g`]b`X`Yj`Y`c`d`]b`[`]W`c`i`b`f`]Y`g`"
H`h`Y`W`c`i`fgY`V`Y`b`X`g`h`Y`c`f`]Y`g`c`Z`X`Yj`Y`c`da`Y`b`h`k`]h`h`Y`f`U`d`X`m`Y`I`d`U`b`X`]b`[`]X`]g`W`d`]b`Y`c`Z`d`i`V`]W`d`c`]W`h`c`
Y`b`U`V`Y`mci`]h`]Y`I`U`a`]b`Y`U`b`X`Y`I`d`U`]b`h`Y`f`U`h`z`c`f`a`]U`b`X`d`U`h`f`b`g`c`Z`g`c`W]c`!Y`W`c`bca`]WUbX`Ybj`]fcb`Y`b`h`U`
XYj`Y`c`da`Y`b`h`W`U`Y`b`[`Yg`U`b`X`c`d`d`c`f`i`b`]h`Y`g`"M`c`i`k`]`Y`I`d`c`f`Y`h`Y`]b`Z`i`Y`b`W`g`i`d`c`b`h`h`g`d`U`h`f`b`]b`[`]U`b`X`h`Y`
f`Y`g`d`c`b`g`Y`V`m`c`W`h`W`c`a`a`i`b`]h`Y`g`z`g`h`U`h`c`f`[`]U`b`]g`U`h`c`b`g`U`b`X`c`h`Y`f`]b`g`h`h`]c`b`g`"H`h`Y`W`c`i`fgY`k`]`U`g`c`]b`W`i`XY`

5ggYgga Ybh

5ggYgga YbhHUg_g`

5ggYgga YbhHUg_	K Y][\h	8i Y'8UH	Gh XYbh@YUfb]b[Ci hWta Yg'5ggYggYX
F YgYUfW`DUdYf`) \$i	%/%\$, #&\$&\$`\$). \$\$`DA	%z&Z
A]X!hYfa `fYZYW]j Y`YggUm	&\$i	\$' #&\$+&\$&\$`\$). \$\$`DA	%z&
; fci d'5W]j]m	' \$i	%+&\$+&\$&\$`\$). \$\$`DA	%z&Z

5ggYgga Ybh8YHJ]`g

5ggYgga Ybh%`F YgYUfW`DUdYf`

GHUfhXUH. `Bch5dd]WUV`Y

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8YHJ]`g.

7\ccgY`Zca`hY`]ghcZei Ygh]cbg`cf`WfYUH`mci f`ck b`fd`YUgY`Wcbgi`hk]h`hY`Wci fgY`Wcbj YbYf`]Z
 W\ccg]b[`mci f`ck b`ei Ygh]cbL`H\Y`dUdYf`]g`i d`hc`" \$\$\$`k cfxg`]b`UXX]h]cb`hc`fYZYfbWg`C F`mci `Uj Y`hY
 cdh]cb`cZ\Uj]b[`U`HJ`Y`ca Y`hYgh]bgh`UX`"H\Y`hU`Y`ca Y`hYghk]`[`c`Zcf`Z] Y`XUmgZ`UbX`mci`bYXX`hc`k f]hY
 h`fY`g`cfhYggUm] f`\$\$\$`k cfxg`dYf`g`cfhYggUmL`H\Y`ei Ygh]cbg`k]`VY`fY`YUgYX`cbY`XUmVYZcfY`hYgh
 ghUf]g`"K f]hYb`ZYXVUW`UbX`U`a Uf`_k]`VY`dfcj]YX`k]h]b`&k YY_g`cZgi Va]gg]cb"

Gi Va]gg]cb`bchYg.5`UggYgga Ybh]a i ghVY`gi Va]hYX`Y`YWfcb]WJ`mcb`mZ`h`fci [\ `hY`fY`Yj Ubh
 UggYgga YbhHi fb`#`d`c`f`h`]"b`A`ccX`Y"

Hi fb]h]b`gYH]b[. H\]g`Ugg][ba Ybh]g`gi Va]hYX`h`fci [\ `Hi fb]h]b`UbX`gh XYbhg`WJb`gY`Y`Hi fb]h]b`g)a]Uf]m
 fYdcf]g"

5ggYgga Ybh&. A]X!hYfa `fYZYW]j Y`YggUm

GHUfhXUH. `Bch5dd]WUV`Y

@Yb[h. `5g`XYgW]VYX`VY`ck

8YHJ]`g.

*\$\$\$`k cfx`fYZYW]j Y`YggUmVUgYX`cb`WUgg`a UHf]U`gZ`fYUX]b[gZ`UbX`hi`hc]U`X]gW`gg]cbg`"K f]hYb`ZYXVUW`
 UbX`U`a Uf`_k]`VY`dfcj]YX`k]h]b`&k YY_g`cZgi Va]gg]cb`"K f]hYb`ZYXVUW`UbX`U`a Uf`_k]`VY`dfcj]YX`
 k]h]b`&k YY_g`cZgi Va]gg]cb"

..

Hi fb]h]b`gYH]b[. H\]g`Ugg][ba Ybh]g`gi Va]hYX`h`fci [\ `Hi fb]h]b`UbX`gh XYbhg`WJb`gY`Y`Hi fb]h]b`g)a]Uf]m

fYdcftg"

5ggYgga Ybh' .; fci d'5Wlj]lm

GhUfhXUHY. 'Bch5dd`]WVY

@Yb[h. :+) \$'k cfXg

8YHU]`g.

H\Y'5i ghfU]Ub'; cj Yfba Ybh\Ug'a UXY'U'WU`Zcf'gi Va]gg]cb'Ug]h]g]b'hY'dfcW'gg'cZfYj]Yk]b['hY
ZcfY][b'U]X'dc`]Wm' b'U'ga U`'[fci d'z'mci 'k]`k cf_'hc[YhYf'UbX'XYj Y'cd'U'h'fYY!dU[Y'U]X'dc`]Wm'fYj]Yk
gi Va]gg]cb'VUgYX'cb'mci f'[fci d'g'dc`]Wmidcg]h]cb"'Mci 'k]`VY'U`cWUHYX'cf'gY'Zbca]bUHYX']bhc'U'[fci d
k]h'gdYV]ZWdc`]Wm]bhYfYghg'UbX'U[YbXUg"'Mci 'WUbi'gY'6'UW'VcUfX'7c`UVcfUhj' YZ'Ncca 'cf'XYg][bUHYX
A ccX'Y'Zcfi a g'Zcf'mci f'[fci d'g'X]gW'gg]cbg'UbX'k cf_]b['hc[YhYf'"K f]hYb'ZYXVUW'UbX'U'a Uf_'k]`VY
dfcj]YX'k]h.]b'&'k YY_g'cZgi Va]gg]cb"

Hi fb]h]b'gYh]b[. H\]g'Ugg][ba Ybh]g'gi Va]hYX'h'fci [\ 'Hi fb]h]b'UbX'ghi XYbhg'WU'gY'Y'Hi fb]h]b'g'a]Uf]lm
fYdcftg"

<p>K YY_(. :&&'>i bY!'&* >i bY</p>	<p>K YV</p>	<p>; YbXYf'jb' bHf'fbUhc'bU''8Yj Y'cda YbhDc'jWYg 5VW]Yj]b['[YbXYf'Yei U']mUbX'↑ gh]W']b'['cVU' XYj Y'cda Ybh\Ug''cb['VYYb'fYW' [b]gYX'Ug'j]U' Zcf gi ghU]bUV'Y'XYj Y'cda Ybh' < ck Yj Yfz'WU''Yb[Yg fYa U]b'Zcf'[YbXYf'fc' VY'W'bg]XYfYX'a YUb]b[Z ''mVm Xcbcf'g'UbX'dc'jWna U_Yfg''H\]g'k YY_žk Y'k]' X]gW gg'k \m[YbXYf']g'ja dcfU'bhžk \UhUfY' hY' _Ym ghfU'Y []Yg'Zcf'[YbXYf'fc' VY']bh' [fU'YXZ'UbX'k \YhYf "Zc'ck]b['hY'a cbYm''WUb' VY'i gYZ']']b'a YUgi f]b[['cVU'dfc[fYgg'cZ[YbXYf'UbX'XYj Y'cda Ybh'</p>
<p>K YY_) :.&- ' >i bY!' " ' >i 'm</p>	<p>K YV</p>	<p>Gi ghU]bUV'Y'8Yj Y'cda Ybh; cU'g.] j]g]cbUfm 6'i Ydf]bhcf'Dfc'YWh' bX]W]h'fg3 H\Y'G8; g'k YfY'a YUbh'fc' VY'hY'Vc'Xžj]g]cbUfm gi W'ggcf'cZ'hY'A]'Ybb]i a '8Yj Y'cda Ybh; cU'g fA'8; g'žk \]W'k Ug'W'h]WgYX'Zcf'UW]b[']b'W'cbW'Yh']a d'Ub'Uhc'b'UbX'[i]XYg''K]h' &' %]bX]W]h'fgž'hY G8; g']g'a YUbh'fc' VY'U'V'i Ydf]bhZcf'['cVU' gi ghU]bUV'Y'XYj Y'cda YbhUbX'fc' YZhc'cbY'VY\]bX" 6i h'↑ gh'ck' a i W']bZi YbW'Xc'hY'G8; g'\Uj Y']b hY'gdUW'cZ]bh'fbUhc'bU''XYj Y'cda Ybhdc'jWYg3 K]h' &\$' '\$'5 [YbXU'Zcf'Gi ghU]bUV'Y'8Yj Y'cda Ybh 'Ygg'h'Ub'%'\$'m'YUfg'Uk Umž'h']g'k YY_'k Y'k]' 'YI Ua]bY G8; g' W'cbf]Vi h'cbg'fc'XYj Y'cda Ybhdc'jWYgž']hg W'h]Wg'UbX'k \UhWUb'VY'XcbY'fc'Ybgi fY'hY'j]g]cb']g cb'fUW."</p>
<p>K YY_*. '* >i 'm! '%\$ >i 'm</p>	<p>K YV</p>	<p>F]g]b[' ; 'cVU''8cbcf'gžA'cj Yfg'UbX'G\U_Yfg'cZ'hY 8Yj Y'cda YbhDc'jWn' < cf]ncb 7 \]bU'\Ug'VYYb'\U]YX'Ug'hY "bYk " Xcbcf/ \ck Yj Yfz'7 \]bU'\Ug'VYYb' []j]b['U]X'g]bW'UbW'Ybh h]a Yg''H\]g'k YY_ž[i Ygh'YWh' fYf'8f'DUhf]W' ?]Vm Z'ca 'hY'5i ghfU']Ub'BUhc'bU''I b]j Yfg]m'k]''hU' UVci h'7 \]bU'g'fc'Y'Ug'['cVU''Xcbcfž']hg'fc'Y']b g\Ud]b[' ['cVU''XYj Y'cda Ybhdc'jWYg'UbX'dfUW]W'gž Ug'k Y''Ug'U'a i W' 'cj Yf'cc_YX'a'cj Yfg'UbX'g\U_Yfg]b'hY''UbXgWUdY'cZXYj Y'cda Ybhdc'jWn' hY d\]Ub'h'fcd]WZci bXU'h'cbg'gi W'Ug'; U'Ygž F cW_YZ''Yf'UbX': cfX"</p>
<p>K YY_+. '% >i 'm! '%+ >i 'm</p>	<p>K YV</p>	

<p>K YY_ ; . & \$ ' > i ` m ! ' & (' > i ` m</p>	<p>K YV</p>	<p>Dc`]Wm5Xj cWUWm : fca ; fUggfcchg'hc'hY DUF]Ua Ybh</p> <p>Bcb! [cj Yfba Ybhcf [Ub]gUhc]cbg'fB ; Cgtz'dc`]Wm UXj cWUWgZ'UWj]ghg'UbX'hY`'_Y'cZ'Yb'↑ [['Y'U'Z]bY VU'UbW'VYtk Yyb fYdfYgYbh]b ['hY'j]Yk'g'cZ'hY Wca a i b]miUbX'j i `bYfUV'Y' [fci dg'UbX'gdYU_'fci h hc'dck Yfz'hc'Yi YfW]g]b ['X]d'ca UWmUbX'WU i h]cb'k \Yb XYU]b ['k]h]bX]ZYfYbhcf'Yj Yb \cg]Y [cj Yfba Ybhg" H\]g']g'dUfh]W'Ufmi'hY'WUgY'Zcf dc']h]W'`mgYbg]h] Y']ggi Yg'gi V\ Ug' \i a Ub'f] [\hgž gYi i U'UbX'fYdfcXi W]j Y' \YU'hž'UbX'W]a UH V\Ub [Y" H\]g'k YY_žk Y'k]'Yi d'cfY'hY'Wca d'Yi]h]Yg cZdc`]WmUXj cWUWm]b'hY'gdUW'cZ]bhYfbU]cbU' XYj Y'cda Ybh"</p>
<p>K YY_ - . & + ' > i ` m ! " % > i ` m</p>	<p>K YV</p>	<p>< i a Ub]hUf]Ub'Dc`]WmUbX'DfUW]W</p> <p>K \Uh]g' \i a Ub]hUf]Ub'dc`]W]Yg'fY'U]cbg\]d'hc]bhYfbU]cbU'XYj Y'cda Ybhž'UbX']g']hZYI]V'Y'Ybci [\ hc'UXUdh'hc'hY'Wcbg]h]bhmV\Ub []b ['UbXgWUdY'cZ \i a Ub]hUf]Ub'g]h] U]cbg3 < ck 'Xc' ['cVU'ži b]j YfgU' \i a Ub]hUf]Ub'dc`]W]Yg'fUbg'U'Y']bhc'`cWU'WcbhYi hB</p>
<p>K YY_ % \$. " ' 5i [i gh ! + 5i [i gh</p>	<p>K YV</p>	<p>K fUdd]b ['l d</p> <p>H\]g'k YY_'k]'VY'U'fYZYW]cb'cb'hY'hd]Mg'Wcj YfYX h'fci [\ci h'hY'hYfa žk]h'h'ci [\hg'cb'hY'ja dUW]cZ dc`]WmUbX'Xcbcf'hYbXg"</p>

F Ygci fWg

DfYgWf]VYX`F Ygci fWg`

5`hY`k YY`mfYUX]b[g`UbX`dfY!fYW`fXYX`YVW`fYg`k]`VY`Uj U]UV`Y`Zcf`Xck b`cUX`Zca`A ccX`Y`

F YWca a YbXYX`F Ygci fWg

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

Gh XYbhZYXVUW`]g[U`hYfYX`dYf]cX]WU`mi g]b[žUa cb[`chYf`a YUbgžI BGK `g`a n9I dYf]YbW`dfcWgg`
 bZca U`ZYXVUW`UbX`WUgg![YbYfUH`X`ZYXVUW`UfY`]a dcfUbh`5`Vf]YZgi fj Ymk]`VY`W`bXi W`X`Ufci bX
 hY`a]XX`Y`cZ`hY`gYa YghYf`h`]XYbh]ZmUfYUg`cZgh XYbh]ggi Yg`5bU`ng]g`cZZYXVUW`k]`]bZca`hY
 fYUgcbUV`Y`UX`g`ha Ybh`cZ`W`i fgY`W`b`h`bh`UbX`XY`]j Yfmk`Y`fY`dcgg]V`Y`"Gh XYbhZYXVUW`]g`hU`Yb
 gYf]ci g`nž`UbX`W`b`h`bi U`]a dfcj Ya Ybhg`UfY`a UXY`h`h`Y`W`i fgY`VUgYX`]b`dUf`h`c`b`gi W`X`ZYXVUW`"7`Ub[Yg
 h`h`Y`W`i fgY`k]`VY`]b`h`c`Xi W`X`h`c`gi VgYei YbhW`c`f`h`g`cZgh XYbhg`hU`]b[`h`Y`W`i fgY`"

7cbgfi W]j`Y`ZYXVUW`]g[fYUhmUddfYW]UH`X`"K`Y`U]a`h`c`W`b`h`bi`Y`h`c`]a`d`f`c`j`Y`U`b`X`i`d`X`U`h`h`h`Y`W`i`f`g`Y`/`d`U`m`
 g`c`a`Y`d`U`f`h`]b`Y`d`]b[`i`g`h`c`X`c`g`c`"G`U`f`Y`m`c`i`f`ZYXVUW`ž`m`c`i`f`f`Y`g`c`i`f`W`g`ž`m`c`i`f`]X`Y`U`g`"D`U`m`U`d`U`f`h`]b`
 Z]W`]h`h`]b[`h`Y`Y`U`f`b`]b[`c`Z`U`a`Ya`V`Y`f`g`c`Z`h`Y`W`U`g`g`"

Gi Va]gg]cb`cZ5ggYgga YbhiHUg_g

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

≠mci`YbWci bHYf`U`dfcV`Ya`k` \Yb`UHYa` dh]b[`hc`gi`Va`]hmc`i`f`Ugg][`ba`YbhiHfci`[`\`Hi`fb]h]bzd`YUgY`
HY`Yd\cbY`9I`HYfbU`Gi`ddcfhcb`-`,`,)``'``'``%cf`Ya`Uj`h`Ya`icb`YI`HYfbU`HY`hgi`ddcfh4`i`bgk`"YXi`"Ui`""Gi`ddcfh`
\ci`fg`UfY`,`.\$\$Ua`-`-%\$.\$\$da`icb`k`YY`XUmg`UbX`-`.\$\$Ua`-`).\$\$da`icb`k`YY`YbXg`fI`*)`XUmg`U`mY`UfI`≠mci`
UfY`i`bUV`Y`hc`gi`Va`]hmc`i`f`Ugg][`ba`YbhiXi`Y`hc`U`ZU`ihk`]h`Hi`fb]h]b`mci`ia`UmUdd`mZc`f`Ub`YI`HYbg]cbz`Vi`hmc`i`
a`i`ghfYhU]b`mci`f`h]W`Yhbi`a`VYf`Zca`9I`HYfbU`Gi`ddcfhU`cb[`k`]h`Ubmc`h`Yf`fY`Yj`UbhXcW`a`Ybhtg`hc`
]bWi`XY`Ug`Yj`]XYbVW`hc`gi`ddcfhmc`i`f`YI`HYbg]cb`Udd`]W]h]cb`≠mci`Ya`Uj`9I`HYfbU`Gi`ddcfhmc`i`k`j`
Ui`hca`U]WU`mifYW]j`Y`U`h]W`Yhbi`a`VYfz`Vi`h]Zmci`HY`Yd\cbY`mci`k`j`bYYX`hc`gdYW]Z]WU`mUg`Zc`f`cbY`
Hi`fb]h]b`U`gc`dfcj`]XYg`i`dXUH`g`cb`h`Y]f`gmghYa`ig`hU`h`g`cb`Hk`]HYf`"

;`YbYfU`mz`UggYgga`YbhiUg_g`a`i`ghVY`gi`Va`]hYX`Y`YWfcb]WU`mj`]U`Y]h`Yf`Hi`fb]h]b`cf`U`A`ccX`Y`
Ugg][`ba`Ybhi`h`]bghU`bVW`g`k`\YfY`h`lg`]g`bchidcgg]V`YZ`]hk`j`VY`ghU`YX`cb`mci`f`Wci`fgY`g`A`ccX`Y`g]h`k`]h`
U`HYfbU]h]`Y`gi`Va`]gg]cb`XYhU]g`"

:`cf`]bZcfa`U]cb`cb`\ck`hc`gi`Va`]hUgg][`ba`Ybhtg`cb`]bY`j`]U`A`ccX`Y`.\`hhdg`#gh`XYbhi`bgk`"YXi`"Ui`Ack`!
gi`Va`]hUgg][`ba`Ybhta`ccX`Y`"

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

