

# MINE4710

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@YUfb]b[ `Ci hWta Y	95 `GHU[ Y`%7ca dYhbWYg
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) "5dd`m`h`Y`df]bW]dU`dYfZcfa UbW`a YUgi fYg`i gYX`]b`a ]bY a UbU[ Ya Ybh	D9%`%žD9&`%žD9' "( žD9%`&
*`8Ya cbgfhU`h`Ub`Uk UfYbYgg`cZa ]b]b[ `Uk `fgUZymž`a ]b]b[ `YUgYg`YhW	D9&`( žD9' "%
+`F YWt[ b]gY`UbX`UddfU]gY`h`Y`ZUWc`fg`Wc`bf]Vi h]b[ `hc`gUZym/`f]g_ a UbU[ Ya Ybh]ggi Yg`]b`gdYW]Z]Wa ]b]b[ !fY`UH`X`dfcW]ggYg	D9%) žD9%`* žD9&`"
, "`b] Ygh[ U`h`h`Y`W]i`gYg`UbX`Wc`bgYei YbW]g`cZa ]b]b[ !fY`UH`X` gYf]ci g`]bW]X`Yb]g`UbX`dfc`dcgY`f]g_`a UbU[ Ya Ybh]ghU`h[ ]Yg	D9%) žD9&`%žD9' "%
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8]gUghYf'7 UgY'Gh Xm	&\$!	%* # \$ + # & \$ & % \$ ) . \$ \$ ' DA	%ž' ( ž* ž' + ž, ž%\$ž%%
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GhUfhXUH. '\$&# \$ \* # & \$ & % \$ - . \$ \$ ' 5A

8YHU]`g.

8Ygd]h' hY'Udd']W]h]cb'cZUXj UbVWX'f]g\_a UbU[ Ya Ybhia YhcXc'c [ ]Ygž ]bXi gh]U'UVW]XYbhg'Wcb]bi Y'hc  
cVWV f' H\Y'di fdcgY'cZ h]g'YI YfW]gY'g'hc'gY'YVWU'fYVWbh\][ \!dfcZ]Y'UVW]XYbhfa ]b]b[ 'cf'chYfk ]gYłž'hc

]bbYf'hci [ \hg'UVci h'hY'j Uf]ci g'hd]Wg'X]gW ggYX'Xi f]b[ 'hY'k YY\_"H\Ymk ]''U'gc '\Uj Y'hY'cddcfh b]mhc  
W'a a Ybhcb'hY]f'WUgga Uhg' ]XYUg'UbX'dc]b'g'cZj ]Yk "H\Y' [ cU'cZ'h.]g'UW]j ]m]g'hc'YbW'i fU[ Y'hY  
g\Uf]b[ 'cZ]XYUgžXYj Y'cd'W]h'W' h'b\_]b[ žZYI ]V] ]mUbX'cdYb!a ]bXYXbYgg'Ug'k Y''Ug'Yb\UbW' hY  
gh XYbhg'g\_]`g' ]b'bY[ ch]U]cb'UbX'h]a Y'a UbU[ Ya Ybž'U''cZk \]W' UfY'W' W]U'g\_]`g'cZUb'YZZYW]j Y  
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- 7 ci bgY``b[ 'gi ddcfh! [k k k "Wti bgY``\]b\[ "i bgk "YXi "Ui](#)

9ei ]HUV`Y`@YUfb]b[ 'GYfj ]Wg

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`Ug`j Yfm`WYUf`[ 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[ `hY`k`cfXg`cf`  
]XYUg`cZ`ch`Yfg`UbX`dfYg`Ybñ]b[ `h`Ya` `Ug`mci f`ck b`D`U[ ]Uf]ga` ]g`U`hmd`Y`cZ]bñY`YWñ U`h`Y`Z`ñ`ñ`Wb`hU`Y`  
a`Ubm`Z`fa`gž`Z`ca` `XY`]VYfU`h`W`X`Y`U`h]b[ `hc`U`W`W`X`Y`b`hU`m`W`d`m]b[ `Z`ca` `U`gci`f`W`k` ]h`ci`h`U`W`b`ck`Y`X[ `Ya`Y`bñ`  
H`Y`I` b]j`Y`fg]m`i`U`g`U`X`cd`h`X`U`b`Y`Xi`W`h]j`Y`U`dd`f`c`U`W`hc`d`U[ ]Uf]ga` `UbX`U`g`X`Y`j`Y`cd`Y`X`U`f`U`b[ `Y`c`Z`  
f`Y`gci`f`W`g`hc`gi`d`d`c`f`h`g`h`X`Y`b`ñ]"5`h`Y`X`Y`hU]g`cb`d`U[ ]Uf]ga` ž]b`W`i`X]b[ `gca`Y`i`g`Y`Z` `f`Y`gci`f`W`g`ž`W`b`V`Y`  
Z`ci`b`X`U`h`[k`k`k`"gh`XY`bñ`i`bgk`"Y`X`i`"U`i`#`U\[ \]Uf\]ga`"](#)

5`A` ]b]b[ `9`b[ ]b`Y`Y`f]b[ `gh`X`Y`bñg`U`f`Y`f`Y`ei` ]f`Y`X`hc`W`ca`d`Y`h`U`g`h`X`Y`bñ`X`Y`W`U`f`U`h]c`b`Z`c`f`U`W`X`Y`a` ]W]bñ[ ]f]m`  
k` \]W` ]g`ci`h]b`Y`X` ]b`h`Y`U`gg][ ba`Y`bñ`W`c`j`Y`f`g` \`Y`Y`h]"6`m`g][ b]b[ `h` ]g`X`Y`W`U`f`U`h]c`b`ž`mci`U[ ]f`Y`h`U`h`mci`f`k`cf` ]g`  
mci`f`ck`b`cf][ ]b`U`k`cf\_"

ž`mci`b`Y`Y`X`gca`Y`U`X`X]h]c`b`U`gi`d`d`c`f`h`k` ]h`mci`f`k`f]h]b[ `g\_]`gž`d`Y`U`g`Y`W`c`b`h`U`W`h`h`Y`@`Y`U`f`b]b[ `7`Y`bñ`Y`c`f`j` ]Y`k`  
gca`Y`c`Z`h`Y`f`Y`gci`f`W`g`cb`h`Y]f`k`Y`V`g]h`Y`[k`k`k`"W`i`bgk`"Y`X`i`"U`i`"](#)H`Y`@`Y`U`f`b]b[ `7`Y`bñ`Y` ]g`X`Y`g][ b`Y`X`hc` \`Y`d`  
mci` ]a`d`f`c`j`Y`mci`f`U`W`X`Y`a` ]W`k`f]h]b[ `UbX`W`ca`a`i`b]W`h]c`b`g\_]`g`"Gca`Y`g`h`X`Y`bñ`i`g`Y`h`Y`7`Y`bñ`Y`g`Y`f] ]W`g`  
V`Y`W`i`g`Y`h`Y`m`U`f`Y`Z]b`X]b[ `h`Y`f`U`gg][ ba`Y`bñg`U`W`U`Y`b[ `Y`ž`c`h`Y`fg`V`Y`W`i`g`Y`h`Y`m`k`U`bñ`hc` ]a`d`f`c`j`Y`U`b`U`f`Y`U`X`m`  
gi`W`W`g`g`ž` `U`W`X`Y`a` ]W`d`Y`f`Z`ca`U`b`W`"

5 WUXYa ]W#Zcfa Uh]cb

7 ci fgY`F Ygi `hg

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#`gca Y`]bghUbWg`mci f`Z]bU`Wci fgY`fYgi `ha UmVY`k ]H\Y`X`UbX`bchfY`YUgYX`cb`hY`l BGK `d`UbbYX`XUH`" H\]g`]g`]bX]WUH`X`VmU`Wci fgY`[ fUXY`fYgi `hcZY]hYf.

- VfcUXVUbX`WcbbYWjcb`f&) \*`\_V]hgYWcf`ZJghYfŁ
- UV]`]mhc`j`Yk`ghfYUa`]b[`j`XYc`fŁ][`\\`cf`ck`XYZ]b]hcb`I`BGK`HJ`cdh]cbgŁ

A cfY`]bZcfa`Uhcb`UVci`hgmgH`a`fYei`]fYa`YbHg`]g`Uj`U]`UV`Y  
[Uhk k k "gh XYbhi bgk "YXi "Ui #a ccX`Y!gmghYa`lfYei`\]fYa`YbHg](#)

## 5VWYgg]b[ `7ci fgY`A UHYf]U`g`H\fcI [ \ `A ccX`Y

7ci fgY`ci`h]bYgZgi`ddcfha`UHYf]U`g`UFY`i`d`cUXYX`hc`A`ccX`Yz`h`Y`i`b]j`Yfg]mghUbxUfX`@YUfb]b[  
 A`UbU[`Ya`YbhGmgH`a`f@a`GŁ`"b`UXX]hcbz`cb!`]bY`Ugg][`ba`Ybhgi`Va`]gg]cbg`UFY`a`UXY`i`g]b[`h`Y`  
 Ugg][`ba`YbhXfcdVcl`ZUW]`]midfcj`]YX`]b`A`ccX`Y`"5`"Ybfc`"YX`gh`XYbHg`UFY`Ui`hca`UHW`"m]bW]`YX`]b`  
 A`ccX`Y`Zc`f`YUW`Wc`i`fgY`"Hc`UWVY`gg`h`Y`g`Y`XcW`a`YbHg`UbX`ch`h`Y`f`Wc`i`fgY`fYgci`fW`gZ`d`Y`Ug`Y`j`]g]h`  
[k k k "a ccX`Y`h`h`i`bgk`"YXi`"Ui`](#)

## <ck`K`Y`7cbhUWh`Mci

5hi]a`YgZ`h`Y`GW`cc`"cf`mci`f`Wc`i`fgY`Wc`bj`Ybcfg`a`Umb`Y`Y`X`hc`Wc`bhUWh`mci`UVci`h`mci`f`Wc`i`fgY`cf`mci`f`  
 Ybfc`a`Ybh`Mci`f`Wc`i`fgY`Wc`bj`Ybcfg`k`]`i`g`Y`h`Y`Ya`U]`Z`bW]cb`k`]h]b`A`ccX`Y`cf`k`Y`k`]`Wc`bhUWh`mci`cb`  
 mci`f`4`gh`XYbhi`bgk`"YXi`"Ui`Ya`U]`UXXfYgg"

K`Y`i`bXYfghUbx`h`Uh`mci`a`Um`Uj`Y`Ub`Yi`]gh]b[`Ya`U]`UW`Wc`i`bhUbx`k`ci`X`dfYZf`Zc`f`mci`f`I`BGK`Ya`U]g`hc`  
 VY`fYX]fYWYX`hc`mci`f`dfYZf`fYX`UW`Wc`i`bh`D`Y`Ug`Y`g`Y`Y`]bg]h`i`W]cbg`cb`ck`hc`fYX]fYW`mci`f`I`BGK`  
 Ya`U]g`" "<ck`WUb`=Zc`fk`UfX`a`mYa`U]g`hc`Ubch`Yf`UW`Wc`i`bfB"

## <ck`Mci`7Ub`7cbhUWh`I`g

K`Y`UFY`U`k`Umg`fYUXmhc`Ugg]ghmci`k`]h`mci`f`]bei`]f]Yg`"Hc`Ybgi`fY`mci`f`ei`Ygh]cb`]g`X]fYWYX`hc`h`Y`Wc`ffYWh`  
 dYfgcbZ`d`Y`Ug`Y`i`g`Y`h`Y`Ya`U]`UXXfYgg`VY`ck`Zc`f.

- 9bfc`a`Ybhcf`ch`Yf`UXa`]b`ei`Ygh]cbg`fY[`UfX]b[`mci`f`dfc[`fUa`.  
[\hdg.## bgk \]bg\[ \h'a \]fcgcZ\]Wfa dcfU`g`Wca #k YV!Zcfa g#](#)
- 7ci fgY`]bei`]f]Yg`g`l`ci`X`VY`X]fYWYX`hc`h`Y`7ci`fgY`7cbj`Ybcf`

⇒ U[`Y`7`fYX]h

I`BGK`GM`BB`9`M

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7F`⇒`CG`D`fcj`]XYf`7`cXY`.\$\$\$`-`,`;

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