

i b[Y'; YbYfUh]cb']b'5b[gh. K c'V`Y]Vh'X]Y g]WXYfY'FYbhY3

8]Y'> [YbXghi X]Y'&\$&) 'Ybh\Ø``h'Ÿb[ghY'jcf'5`hYfgUfaih'ibXk]fhgW\UZh`]W\Ya'8fiW_"'> b[Y'8YihgW\Y'ZcfXYfb'g]W\YfYFYbhYb'ibX'Ub[YaYggYbY'@YVYbgVYX]b[ib[Yb"



6Yf`]bž'8Yi hgWX`UbX'!'8]Y'Gcf[Yb'XYf'1 b[Yb'; YbYfUh]cb']b
8Yi hgWX`UbX'ghY\Yb'ghUf_']a :: c_i g"'9]bY'U_hi Y``Y'¾ [YbXghi X]Y
j cb'A YhU``fYbhYž'j cf[YghY``h'Ua 'A]hhk cWX']b'6Yf`]bž'nY][hž'XUgg
ØVYf'+) 'DfcnYbh'XYf'1 b[Yb'A YbgWXYb'5b[gh'j cf'5`hYfgUfa i h
\UVYb"8]YgY'NU\`Yb'ghY``Yb'Y]bYb'U`Ufa]YfYbXYb'5bgh]Y['XUf.
a '¾\f'&\$%* 'k UfYb'Yg'bi f'%) 'DfcnYbhž'X]Y'X]YgY'Gcf[Y'Ài »YfhYb"
bgVYgcbXYfY'' - 'DfcnYbh'[`Ui VYb'XUfØVYf'\]bUi gž'XUgg'g]Y'g]WX
Y]bY': Ua]']Y'b]WXh'`Y]ghYb'_ObbYb"'8]YgY'6YXYb_Yb'gd]Y[Y`b'Y]bY
h]YZY'I bg]WXYf\Y]h'k]XYfž'X]Y'j]Y`Y'1 b[Y'8Yi hgWXY'Ya dZ]bXYbž
k À\fYbX'g]Y']b'Y]bYf'g]WX'gWXbY``j YfÀbXYfbXYb'K Y`h'bUj][]YfYb"
@Ui h'XYf'Ghi X]Y'ZØ\`Yb'g]WX'X]Y'1 b[Yb'A YbgWXYb'ni bY\a YbX
i bhYf'8fi W_ž'gck c\``k]fhgWXUZh`]WX'U'g'Ui WX'gcn]U'ž'k Ug']\fY
@YVYbgd`Ubi b['ghUf_'VYY]bZi ggh"'8]Y'GUUfVfØW_Yf'NY]hi b[

 $9f[\grave{A}bnYbXnif^AYhU``fYbhY!GhiX]Y`nY][hX]Y`UWXhY`HfYbXghiX]Y \\ \Rightarrow [YbX']b`8YihgWX`UbX`&$&) \quad \check{z}XUgg`*&DfcnYbhXYf`6YZfU[hYbg]WX`ia`X]Y`Ub[YgdUbbhY`@U[Y`]b`XYf`I_fU]bY`ibX`]a`BU\YbCghYb`gcf[Yb"`8UfØVYf`\]bUig`g]bX`) + `DfcnYbh`kY[Yb`XYf`XYfnY]h\c\Yb`=bZUh]cb`VYgcf[hž`kUg`g]WX`bY[Uh]j`UiZ`]\fY`Z]bUbn]Y``YG]WXYf\Y]h`Uigk]f_h''NiXYa`aUWXh`g]WX`ZUghX]Y`<\A`ZhY`XYf`Ab[YbAYbGWXYb';YXUb_Yb`ØVYf`hYifYb`cXYf`_bUddYb`Kc\bfUia`ibXVYZØfWXhYhY]bY`aÕ[`]WXY`GdU`hib[`XYf`;YgY``gWXUZh''5iWX`X]Y?`]aU_f]gY`]gh`ZØf`(+`DfcnYbh`Y]b`VYgcf[b]gYffY[YbXYg`H\YaU''8]Yg`ZØ\fh`XUniž`XUgg`&)`DfcnYbh`XYf`Ab[Yb`AYbgWXYbdgmWX]gWXY`6Y`Ughib[Yb`k]Y`GhfYgg`ibX``9fgWX`OdZ\b[`Yf`YVYb`ibXY]bY`6Y\UbX`ib[`VYbOh][Yb''`8]Y`HU[YggWXUi`]bZcfa]Yfh`ØVYfX]Y`j]Y`ZÂ`h][Yb'<YfUigZcfXYfib[Ybžj]cf`XYbyb`X]Y`$[YbX`ghY\h''$

Dc`]h]gWXY'9]bghY``i b'i bX Ni _i bZhgdYfgdY_h]jYb

8]Y'dc`]h]gW\Y'@U[Y'gW\Y]bh'ZØf'j]Y'Y''\ b[Y'AYbgW\Yb
YbhhÀi gW\YbX'ni 'gY]b"'9]b'j YfgW\k]bXYbXYf'; `Ui VY'Ub'X]Y
hfUX]h]cbY``Y'Dc`]h]_'\Uh'XUni '[YZØ\fhžXUgg'j]Y`Y'\ [YbX`]W\Y'g]W\
fUX]_UYb'cXYf'U'hYfbUh]j Yb'6Yk Y[i b[Yb'ni k YbXYb"; `Y]W\nY]h][
nY][h'X]Y'\ [YbXghi X]Y\ ZXUgg'Y]bY'AY\f\Y]h'XYf'6YZfU[hYb'\O\YfY
6Y]hfÀ[Y'ni f'FYbhYbj Yfg]W\Yfi b['U_nYdh]Yfh"(('DfcnYbh'ZØ\`Yb
g]W\ a]hj YfUbhk cfh`]W\ ZØf'X]Y':]bUbn]Yfi b['XYf'\Yi h][Yb'FYbhYb"
; `Y]W\nY]h][''Y\bYb'*) 'DfcnYbh'Y]bY'9f\O\i b['XYg
FYbhYbY]bhf]hhgU'hYfg'UV\Z'k\A\fYbX'+('DfcnYbh'[Y[Yb'Y]bY
GYb_i b['XYg'FYbhYbb]j YUi g'g]bX"'8]YgY'FYgi `hUhY'j YfXYi h`]W\Yb
XYb'K i bgW\ 'bUW\'Y]bYa 'ZU]fYb'; YbYfUh]cbYbj YfhfU['i bX'Y]bYf
gh\Af_YfYb'ghUh']W\Yb'I bhYfghØhni b['ZØf'X]Y'FYbhYb"'8]Y
HU[YggW\Ui '\YVh'\Yfj cfz'k]Y'gY\f'X]Y'\ b[Y'; YbYfUh]cb'Ui Z
Y]bY'[YfYW\hYfY'JYfhY]`i b['XYf'FYgqci fW\b'dcW\h"

8]Y'<YfUi gZcfXYfi b[Yb'g]bX'YXcW\'b]W\h'bi f'dc`]h]gW\Yf'cXYf Z]bUbn]Y``Yf'BUhi f"'8]Y'X][]hU`Y'HfUbgZcfa Uh]cb'i bX'X]Y ni bY\a YbXY'5i hca Uh]g]Yfi b['Vf]b[Yb'gck c\``7\UbW\b'U`g'Ui W\ F]g]_Yb'a]h'g]W\"'*) 'DfcnYbh'XYf'6YZfU[hYb'V`]W_Yb'cdh]a]gh]gW\']b X]Y'Ni _i bZhž'k Ug'X]Y'9]bghY``i b[Yb'ni f'5fVY]h'VYhf]ZZh"'=a a Yf a Y\f'^\tab[Y'A YbgW\Yb'ghfYVYb'Y]bY'[Ygi bXY'K cf_!@]ZY!6U`UbW\Ub'i bX'j Yfgi W\Ybž', VYf`Ughi b['i bX'8 Ui YfghfYgg'ni j Yfa Y]XYb"8]Y'8 UhYb'XYg'GhUh]gh]gW\Yb'6i bXYgUa hYgi bhYfa Ui Yfbž'XUgg'XYf'5bhY]`'^\tab[Yf'A YbgW\Yb'Ub'XYf; YgUa hVYj O`_Yfi b['gY]h'&\$\$)'_cbghUbh'g]b_hž'k Ug'X]Y[YgY``gW\UZh`]W\Yb'<YfUi qZcfXYfi b[Yb'k Y]hYf'j YfgW\AfZh"

@YVYbgfYU`]hÀhYb i bX GhUh]gh]_Yb

 $= \frac{1}{2} \left[\frac{1}{2} \left(\frac{1}{2} \right) \right] \left[\frac{1}{2} \left(\frac{1$

| 6Y | Ò`_ | Yfi | b[| gghUh]gh]_ | ·&\$&% | 5bhY] | ` f | Ł |
|----|-----|-----|----|------------|--------|-------|-----|---|
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| i [YbXYfk YfVg`cg][_Y]h ii [YbXYfk YfVg`cg][_Y]h | * Ž- |
|---|------|
| 5i Z'9]b_ØbZhY'j cb'5b[Y\Òf][Yb |) % |
| Ub[Yk]YgYb | |
| 5iZ`ÒZZYbh`]WXY`@Y]ghib[Yb | %\$ |
| Ub[Yk]YgYb | |

8]Y'U_hi Y``Y'G]hi Uh]cb'XYf'i b[Yb'A YbgW\Yb']b'8Yi hgW\`UbX']gh
Ub'j]Y`Yb': fcbhYb'\YfUi gZcfXYfbXž'j cb'Z]bUbn]Y``Yb'Gcf[Yb'ØVYf
[YgY``gW\UZh`]W\Y'i bX'dc`]h]gW\Y'9bhhÀi gW\i b[Yb'V]g'\]b'ni 'Y]bYa
k UW\gYbXYb'6Yk i gghgY]b'ZØf'_`]a Uh]gW\Y'i bX'gcn]U`Y'H\Ya Yb"
8]YgY'Ghi X]Yb'nY][Yb'YXcW\'Ui W\'Y]bYb'<cZZbi b[ggW\]a a Yf.
XYb'K i bgW\'i bX'X]Y'6YfY]hgW\UZh'XYf'\$\frac{1}{2}}[YbX\Z'g]W\'U_h]j'ZØf']\fY
Ni _i bZh'Y]bni gYhnYb'i bX'g]W\'ghÀf_Yf'Ub'dc`]h]gW\Yb
9bhqW\Y]Xi b[Yb'ni 'VYhY]`][Yb"

| 8 Y hU]`g | |
|-----------|------------------------------------|
| Cfh | 6Yf`]bž'8Yi hgWX`UbX |
| EiY``Yb | • k k k "gUUfVfi YW_Yf!nY]hi b["XY |
| | • k k k "hU[YggW\Ui "XY |
| | |

| 8 Y hU]`g | |
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| | k k k "XYghUh]g"XY |

 $6\,Y\,gi\ W\!\!X\,Y\,b\,{}^*\!G\,]Y\,{}^*\!i\ b\,g\,{}^*\!Ui\ Z.\,{}^*\!b\,!\,U\,[\,\,"b\,Y\,h\,]$