

? UbY'k]``A Ø``Yf'dYfZY_hYb'5VgWX]YX'VY] 6UmYfb']b'XYf'7`i V!K A'VYgWXYfYb'



I G5 !! < Uffm? UbY 'Ài » Yfh'g]WX 'ni j Yfg]WX h`]WX 'ØVYf'X]Y
VYj cfghY\YbXY : = 5 '7 i V!K Y`ha Y]ghYfgWX UZhž'X]Y j ca '%("'i b] 'V]g
%' "'i \in \]'&\$&) ']b 'XYb 'I G5 'ghUhhZ]b XYb 'k]fX" '8 Yf 'GhØfa Yf 'XYg': 7
6UmYfb 'A ØbWX Yb 'VYhcbhž'XUgg'Yg'XYa 'HYUa 'Ub'A ch]j Uh]cb 'b]WX h
a Ub[Y`Y'i bX'g]Y\h'XUg'Hi fb]Yf'U`g'Yfbghni bY\a YbXYb
K YhhVYk YfV'Ub"'@Ui h: 5 N'gY]'X]Y'J cfVYfY]hi b['XYg'HYUa g'[i h
j Yf`Ui ZYb"'? UbY'\YVh'\Yfj cfž'XUgg'XYf'VYj cfghY\YbXY'5VgWX]YX
j cb 'H\ca Ug'A Ø``Yf'U`g'ni gÀhn`]WXY'A ch]j Uh]cb 'ZØf'X]Y'A UbbgWX UZh
Z b[]Yfh'i bX'nY][h'g]WX'cdh]a]gh]gWX. 9]b'H]hY``VY]'XYf'7`i V!K A
k ÀfY'XYf'dYfZY_hY'5VgWX'i gg'ZØf'A Ø``Yf"

8]Y'7`i V!K A 'k]fX'a]h'' &'HYUa g'Ui g'U``Yf'K Y`h'Ui g[YhfU[Ybž'i bXbYVYb'6UmYfb'A ØbW.Yb'k]fX'Ui W.'6cfi gg]U'8cfha i bX

 $\label{lem:hylinder} $$ hYlinder he in XYf Zlb Ubn Y b 5 hhf U_h lij] hAh XYg Hi fb] Yfg [] Vh Yg 6 Y XYb_Yb `\]bg] WAh i] WA XYf `\ c \ Yb 6 Y `Ughi b [`ZØf X]Y `Gd]Y `Yf Z] bg V Yg c b XYf Y `b U WA `Y] b Yf `Ubghf Yb [Yb XYb `GU] g c b `i b X `XYb ni g Ahn`] WAYb `9] bg Ahn Yb `ZØf X]Y `B Uh] c b U`a Ub bg WA UZh Yb "`8] Yg `k] f X U`g '< Yf Ui g Zc f XYf i b [`ZØf X]Y `Gd]Y `Yf [Yk Yfh Yh Z X]Y `]b `XYb ``Yhn h Yb K c WAYb `j]Y ``9b Yf []Y `]b j Ygh] Yfh`\ U V Yb "$

?Yfbgd]Y`YfXYg: 7 6UmYfb

I a `XYb`H]hY``ni `[Yk]bbYbž'gYhnh`6UmYfb`Ui Z'Y]bY`FY]\Y`j cbGW\`ØggY`gd]Y`Yfb.

- < Uffm? UbY. 'A]h' + 'HcfYb']b'U``Yb'K YhhVYk YfVYbž XUfi bhYf'&* ']b'XYf'6i bXYg`][U'i bX'%%']b'XYf'I 9: 5 7\Ua d]cbg'@YU[i Yž'\Uh'?UbY'Y]bY'\YfUi gfU[YbXY'GU]gcb\]b[Y`Y[h"Ni XYa '`]YZYfhY'Yf'%%'5gg]ghgž'k cj cb', ']b'XYf @[U'k UfYb"
- H\ca Ug`A Ø``Yf. '8Yf`Yhnh'' (!À\f][Y`\Uh`_Øfn`]W\gY]bYb %' "'6i bXYg`][U!H]hY``[Yk cbbYb`i bX`_ÒbbhY`gY]bY``YhnhY 7`i V!K A 'a]h'6UmYfb'VYghfY]hYb"'GY]bY`k]W\h][Y`Fc``Y`]a HYUa 'k]fX`VYgcbXYfg'XYi h`]W\Xi fW\gY]bY`@Y]ghi b[']b XYf'7\Ua d]cbg'@YU[i Yžk c'Yf']a 'J]YfhY`Z]bU`Y'Y]bYb 5i g[`Y]W\[Y[Yb' +bhYf`A U]`UbX`Yfn]Y`hY"
- *Ja U``A i g]U`U.`BUWX`Y]bYf'j Yf`Yhni b[gVYX]b[hYb 5i gZU``nY]h']b'XYf'GU]gcb'nY][h'A i g]U`U': cfhgWXf]hhY'i bX []`h'U`g'GWX`ØggY`Z][i f'a]h'%, 'HcfYb']b'X]YgYf'Gd]Y`nY]h"
- A]WX UY`C`]gY.'8Yf'BYi ni [Ub['j cb'7fmghU`DU`UWY'\Uh g]WX'gWXbY``']b'XUg'HYUa ']bhY[f]Yfh'i bX'Yfn]Y`hY'%&'HcfY gck]Y'%) '5gg]ghg']b'gY]bYf'Fcc_]YgU]gcb"
- xbUh\Ub'HU\. '5`g'bYi Yf'Gd]Y`Yf'j cb'6UmYf'@Yj Yf_i gYbk]fX'Yf'j cfUi gg]W\h`]W\']b'XYf'7`i V!K Y`ha Y]ghYfgW\UZhXYVØh]YfYb'i bX'nÀ\`h'ni 'XYb'9fk Ufhi b[Yb'XYf'5Vk Y\f"

Gdcfh`]WXYf'?cbhYlh'ibX'<YfUigZcfXYfib[Yb

6UmYfb A ØbWXYb \UhY]bY \Ub[Y'; YgWX]WXhY']a 'XYi hgWXYb :i » VU\'i bX']gh'' (!ZUWXYf A Y]ghYfž'k cVY]'X]Y A UbbgWXUZh']b 'XYf 6i bXYg\'][U'ØVYfk]Y[YbX'Xca]b]Yfh'\Uh''Gc'\Uh'XYf'JYfY]b'''' j cb

*&'6i bXYg`][U!GU]gcbg'[Yk cbbYbž'Ui g[YghfU\`h'j cb'HfU]bYf

J]bW'bh'? ca dUbmž'XYf'gY]h'&\$&('XUg'Fi XYf'ØVYfbca a Yb'\Uh"

I bhYf'gY]bYf': Ø\fi b['VYY]bXfi W_h'XUg'HYUa 'Xi fW\'Y]bYb

VU``VYg]hncf]Ybh]YfhYb'Gh]`'i bX'\c\Yg'DfYgg]b["'5``YfX]b[g'[]Vh'Yg

Ui W\'8YZ]n]hY']b'XYf'8YZYbg]j Y'i bX']a 'A]hhY`ZY`Xž'X]Y'X]Y'9ZZ]n]Ybn
[YZÀ\fXYb'_ObbhYb"

BYk 'Mcf_'H]a Yg'VYf]W\hYh'ni gÀhn`]W\'ØVYf'X]Y'; YgW\]W\hY'i bX 8ca]bUbn'j cb'6UmYfb']b'XYf'6i bXYg`][Už'X]Y'XUg'HYUa 'U`g Z]bUbn]Y```ghUf_Yb'i bX'gdcfh`]W\'Ua V]h]cb]YfhYb'5_hYi f'Ui Z'XYf]bhYfbUh]cbU`Yb'6Ø\bY'dfÀgYbh]YfYb"

| 8 Y hU]`g | |
|-----------|---------------------------|
| Cfh | I G5 |
| Ei Y``Yb | • k k k "ZUn"b Y h |
| | • k k k "Vi bXYg`][U"Wca |
| | • k k k "bmh]a Yg"Wca |

6 Ygi WX Yb 'G]Y 'i bg 'Ui Z. 'b!U["bYh