

JYc`]U Hck Yfg. GU]gcbYfÒZZbi b[a]h Vi bhYa Dfc[fUa a]a '=bgY`dUf_

9f`YVYb`G]Y`XUg`GYUgcb`CdYbYf`XYf`JYc`]U`HckYfg`Ua &) "\$, "`]a '=bgY`dUf_'<Ua Vi f["'8Ug`ÒZZYbh`]W\Y`HYghgd]Y` [Y[Yb`9K 9`6Ug_Yhg`VY[]bbhi a '%+`I\f°

8 UgʻK UfhYbʻ\UhʻY]bʻ9bXY. 5a ʻGcbbhU[žʻXYa ʻ&) "'5i [i ghžʻYfZØʻ`Yb X]YʻJ Ycʻ]UʻHck Yfgʻ< Ua Vi f[ʻ]\fYʻgdcfh`]W\YbʻJ YfgdfYW\YbʻUi Z XYa ʻDUf_Yhh"'B UW\ʻØVYfʻ%\$\$ʻHU[YbʻgY]hʻXYa ʻ`YhnhYbʻ< Y]a gd]Y`_Y\fh`X]Yʻ6Ug_YhVU``a UbbgW\UZhʻYbX`]W\ʻ]bʻX]Yʻ\gY`dUf_'5fYbU ni fØW_"'8]YʻJ cfZfYi XYʻ]ghʻgdØfVUfžʻXYbbʻXUgʻHYUa 'k]fXʻbUW\Y]bYfʻi a ZUggYbXYbʻl a ghfi _hi f]Yfi b[ʻbi bʻni a ʻYfghYbʻA U`ʻj cf XYbʻY][YbYbʻ: UbqʻUbhfYhYb"

: Øf'X]Y'< Ua Vi f[Yf': Ubgž'X]Y'gY]h'XYa '`YhnhYb'Gd]Y`']\fYf
A UbbgW\UZh']b'XYf'5fYbU'[YXi `X]['[Yk UfhYh'\UVYbž'k]fX'X]YgYf
HU['Y]b'VYgcbXYfYg'9f`YVb]g"'8Yf'GYUgcb'CdYbYf']gh'b]W\h'bi f
Y]b'k Y]hYfYf'HYgh']b'XYf'GU]gcbj cfVYfY]hi b[ž'gcbXYfb'Ui W\'Y]bY
; Y`Y[Yb\Y]hž'g]W\'Ui Z'X]Y'_ca a YbXYb'< YfUi gZcfXYfi b[Yb
Y]bni ghY``Yb"'8]Y'; Y[bYfž'X]Y'9K 9'6Ug_Yhg'C`XYbVi f[ž'g]bX'Y]b
X]fY_hYf'F]j U'Y'XYf'JYc`]U'Hck Yfg'i bX'V]YhYb'gca]h'XYb
dYfZY_hYb'5b`Ugg'ZØf'Y]bYb'gdUbbYbXYb'K Yhh_Ua dZ''

FU\a Ybdfc[fUa a i bX YfghY 9]bXfØW_Y

8]Y '5fYbU' OZZbYh']\fY 'HcfY' VYfY]hg'i a '%("' \$'I \fž'gcXUgg'g]W\'X]Y 6Ygi W\Yf'Ui Z'Y]b'Vi bhYg'FU\a Ybdfc[fUa a 'ZfYi Yb'_ObbYb"; Ya Y]bgUa 'a]h'XYa 'DUf_Gdcfh=bgY`'Y"J"\UVYb'X]Y'JYc`]U Hck Yfg'nU\`fY]W\Y'5_h]j]h\AhYb'cf[Ub]g]Yfh\z'X]Y'gck c\`'[fc>Y'U`gUi W\'_`Y]bY'gdcfhVY[Y]ghYfhY'Ni gW\Ui Yf'UbgdfYW\Yb"'Jcb'A]b]!: i >> VU``'ØVYf'K]b_]b[YfgW\UW\'V]g'\]b'ni '8]gW; c`Z'i bX'Fci bXbYh

[]Vh'Yg'j]Y`ni 'Yf`YVYb'i bX'Ui gni dfcV]YfYb"'BUhØf`]W\'XUfZ'Ui W\ Y]b'YfZf]gW\YbXYf'; YhfÀb_YghUbX'b]W\h'ZY\`Ybž'i a 'X]Y'9bYf[]Y'ZØf XYb'VYj cfghY\YbXYb'6Ug_YhVU``UVYbX'Ui Zni `UXYb"

A]h'XYf'6Y_Ubbh[UVY'j cb'BYi ni [Àb[Ybž'k]Y'XYa 'Y\Ya U`][Yb? Ud]hÀb'GYh\'<]bf]W\gžXYf'bi b'ZØf'X]Y'6Ug_Yhg'gd]Y`hž'[]Vh'Yg Ui W\'Y]bY']bhYfYggUbhY'5bY_XchY.'<]bf]W\g'k]fX'j cb'nk Y] k Y]hYfYb'Y\Ya U`][Yb'J Yc`]U!Gd]Y`Yfbž'@Yb'GW\ccfa Ubb'i bX'A UI 8]@Ycž'VY[`Y]hYhž'X]Y'a]hh`Yfk Y]`Y'YVYbZU``g']b'C`XYbVi f['gd]Y`Yb" K À\fYbXXYggYb'\Uh'XYf'HfU]bYf'XYf'9K 9ž'DYXfc'7U``Ygž'Y]bY; YgW\]W\hY'a]h'<Ua Vi f[ž'XYbb'Yf'ZØ\fhY'XUg'HYUa 'VYfY]hg nk Y]a U`']b'X]Y'D`UmcZZg"

9]b'[Ubn'Y][YbYg'?Ud]hY`']b'X]YgYf'6Y[Y[bib['ghY``h'X]Y
`Yhnh'À\f][Y'GU]gcb'XUfž']b'XYf'X]Y'JYc`]U'Hck Yfg'XYb'YfghYb'D`Um!

\$\del{\text{b}}!G]Y['XYf'66@; YgW\]\W\hY'[Y[Yb'X]Y'9K 9'6Ug_Yhg'Yfn]Y`h
\UVYb"'7U``Yg'k i fXY']b'X]YgYf'NY]h'ni a 'JYf\\\Ab[b]g\text{z}XUgg'[YbUigY]bY'Y\Ya U`][Y'A Ubbg\W\UZh'XYa 'C`XYbVif[Yf'HYUa 'XYb'K Y[nif'YfbYihYb'DcghgYUgcb!EiU`]Z]_Uh]cb'j Yfk Y\fhY"

5i gV`]W_Ui Z'X]Y GU]gcb

8 Yf 'GU]gc bghUfh'j Yf\Y]» h'Gd Ubbi b[ž'b]W h'bi f'Xi fW 'X]Y ']bhYbg]j Y F]j U`]hÀh'nk]gWXYb'XYb'HYUa gž'gc bXYfb'Ui W 'Xi fW 'X]Y 'bYi Yb Gd]Y 'Yfž'X]Y ']\fYb'HY]` 'ni f'9fZc`[g[YgW]W hY 'XYf'9K 9'6Ug_Yhg VY]hfU[Yb'k c``Yb'' 'i gh]b' *Jk cfg_]ž'XYf'nk Y]hVYghY'GWcfYf'XYf 'YhnhYb'GU]gc bž'i bX'UbXYfY'j cb'Ui g`ÀbX]gWXYb'@][Yb'YfZU\fYbY Gd]Y 'Yf'k]Y'9`]'6fcc_g'i bX'A Uh\]g'8 cggci!Mcj c'Yfk Y]hYfb'XUg c\bY\]b'VYfY]hg'hU`Ybh]YfhY'HYUa "'8]YgY'BYi ni [Àb[Y'nY][Yb'_`Ufž XUgg'XUg'HYUa 'Ui g'C`XYbVi f['b]WXh'bi f'Ub'Y]bYf'gc`]XYb'GU]gcb]bhYfYgg]Yfh']ghž'gcbXYfb'i a 'X]Y'Gd]hnYbd'ÀhnY']b'XYf'@][U

Gc XUfZa Ub [YgdUbbhgY]bžk]Y g]Wk X]Y J Yc`]U Hck Yfg [Y[Yb']\f ghUf_Yg DYb XUbhgWk `U[Yb k YfXYb" 8]Y J cfZfYi XY `Ui Z XUg gdUbbYbXY `8 i Y````Àgghg]Wk `]b `XYf `GhUXhgdØfYbž i bX `Yg `V`Y]Vh `ni \c ZZYbž XUgg `X]Y : Ubg `]\fYb `HY]``ni `Y]bYa `j c``Yb '< Ui g i bX `Y]bYf Y`Y_hf]g]YfYbXYb '5 ha cgd\ÀfY `VY]hfU[Yb k YfXYb"

GU]gcbUi ZhU_ha]h [fc» Yb 5a V]h]cbYb

8 Yf GY Ugc b C dYbYf k]fX 'U `gc `k Y]h a Y\f 'U `g `bi f 'Y]b `HYghgd]Y`gY]b " 9f `gma Vc `]g]Yfh XUg '7 ca YV UW_ XYf 'J Yc `]U `Hck Yfg i bX XYb K i bgW XYf : Ubgž YbX`]WX 'k]YXYf '6 Ug_YhV U````]j Y `ni 'Yf `YVYb " A]h nU\`fY]WXYb '5_h]j]h AhYb i bX 'Y]bYa 'UhhfU_h]j Yb F U\a Ybdfc[f Ua a 'j Yfgdf]WXh XYf B UWXa]hhU['b]WXh bi f gdUbbYbXY 'Gdcfha ca YbhYž gcbXYfb 'Ui WX 'X]Y 'A O[`]WX_Y]hž X]Y 6 Ug_YhV U``! 7 ca a i b]hm]b '< Ua Vi f['ni 'ZY]Yfb i bX 'g]WX 'Ui Z'X]Y < YfUi gZcfXYfi b[Yb XYf _ca a YbXYb 'GU]gcb 'Y]bni ghY ``Yb"

9bhk]W_`i b['XYf'6Ug_YhVU``!6i bXYg`][U

8]Y 6Ug_YhVU``!6i bXYg`][U'fl66@L'\Uh'g]W\']b'XYb'`YhnhYb'\\fYb ghUf_'Ybhk]W_Y`h'i bX'gd]Y`h'Y]bY'VYXYi hYbXY'Fc``Y']a 'XYi hgW\Yb Gdcfh"8]Y'@][U']gh'VY_Ubbh'ZØf']\fY'\c\Y'K YhhVYk YfVgZÀ\][_Y]h i bX'n]Y\h'HU`YbhY'Ui g'U``Yf'K Y`h'Ub"'5_hi Y``'VYghY\h'X]Y'66@'Ui g %, 'J YfY]bYbZ'X]Y'b]W\h'bi f'bUh]cbU`Z'gcbXYfb'Ui W\']bhYfbUh]cbU`]b'j YfgW\]YXYbYb'K YhhVYk YfVYb'UbhfYhYb"'8Yf'9]bZ'i gg Z]bUbn]Y``Yf'5gdY_hYZ'k]Y'Gdcbgcf]b['i bX'A YX]YbfYW\hYZ'\Uh ni [Ybca a Yb'i bX'hfÀ[h'ni f'DfcZYgg]cbU`]g]Yfi b['XYf'@][U'VY]"

9]b'k]Wh][Yf'5gdY_h'X]YgYf'9bhk]W_`i b[']gh'X]Y'ghY][YbXY
Ni gWXUi YfnU\`'VY]'XYb'Gd]Y`Yb"'GhUh]gh]_Yb'nY][Ybž'XUgg'X]Y
Xi fWXgWXb]hh`]WXY'Ni gWXUi YfnU\`']b'XYf'66@']b'XYb'`YhnhYb'XfY]
\(\frac{1}{2}\frac{1}{2

8]Y'Fc``Y'XYf'JYc`]U'Hck Yfg']b'XYf'66@

A]h'XYa 'GU]gcbUi ZhU_h'[Y[Yb'X]Y'9K 9'6Ug_Yhg'C`XYbVi f['k]fX XYi h`]WX ž'XUgg'X]Y'Hck Yfg'YbhgWX`cggYb'g]bXž']b'X]YgYf'GU]gcb]\fY'@Y]ghi b['ni 'ghY][Yfb'i bX'g]WX']b'XYf'HUVY``Y'k Y]hYf'bUWX cVYb'ni '_Aa dZYb"'8]Y'dcg]h]j Yb'9fZU\fi b[Yb'i bX'XYf HYUa ni gUa a Yb\U`h'Ui g'XYf'`YhnhYb'GU]gcb'_ÒbbhYb YbhgWXY]XYbX'XUni 'VY]hfU[Yb"'

5_hi Y``Y'Gd]Y`YfghUh]gh]_Yb

 $8]Y `DYfZcfa UbW `XYf `Gd]Y `Yf `]gh `Yb hgWX Y]XYb X `ZØf `XYb `9fZc`[`XYf JYc`]U `Hck Yfg" `\pi `XYf ``YhnhYb `GU]gcb `_cbbhYb `Y]b][Y `Gd]Y `Yf \YfUi gfU[YbXY `@Y]ghi b[Yb `nY][Yb " 8 Yf '< Ui dhgWcfYf `XYf j cf\Yf][Yb `GU]gcb \(\times XYf `]a \\ A \]hhY `di b_h `XYf `GhfUhY[]Y `XYf `Hck Yfg ghY \h\(\times X \)]Y gYf `GU]gcb `YfbYi h`a \]h`Y]bYa \\c\Yb \Di b_hYgWX b]hh`Yfk UfhYh" `GY]bY `9bhk]\(\times X \) \(\times X \)]Y \(\pi bhY \) \(\times X \) \(\times Y \) \(\times X \) \(\times X$

 $<]Yf^*g]bX^*Y]b][Y^*U_hi Y^*Y^*GhUh]gh]_Yb^*ni f^*V]g\\Yf][Yb^*GU]gcb.^*$

Gd]Y`Yf	Di b_hY dfc	FYVci bXg ⁻ dfc	5gg]ghg [·] dfc
	Gd]Y`	Gd]Y`	Gd]Y`
< Ui dhgWcfYf	%, ž&) ž(' ž%
GYh\ '<]bf]W\g	%(Ž+	(ž\$	&ž*
⅓ gh]b ¾Jk cfg_]	%) ž%	' Ž,	&Ž+

8]YgY'GhUh]gh]_Yb'nY][Yb'XUg'DchYbn]U`XYg'HYUa g'i bX'XUg 9b[U[Ya Ybh'XYf'Gd]Y`Yfž'X]Y'XUni 'VY]hfU[Yb'k YfXYbž'XUgg'X]Y JYc`]U'Hck Yfg']b'X]YgYf'GU]gcb'i a 'X]Y'Gd]hnYbd`ÀhnY'_Àa dZYb _ÒbbYb"

8 Y hU1 c

6Ygi WXYb G]Y i bg Ui Z b!U["XY