

@]b_Y`_Àa dZh`i a `A UW\h`]a `bYi Yb 8cddY`\Ui g\U`h. : cfXYfi b[Yb`cZZYbVUfh°

8]Y`@]b_gdUfhY]`ghY``h`6YX]b[ib[Yb`ZØf`XYb`8cddY`\Uig\U`h &\$&)#&*`]b`GUWXgYb"`K]WXh][ghY`H\YaYb.`GWXi`XYbVfYagYž A]hhY`jYfhY]`ib[ž'5ig[UVYb"



A Y]» Ybži8 Yi hgWX `Ub X !! 8]Y 'dc`]h]gWX Y G]hi Uh]cb fi bX ii a 'XYb 8 cddY`\Ui g\U'h'&\$&) #&\$&* ']b 'GUWX gYb 'gcf[h'ZØf'fY]WX `]WX ; YgdfÀWX gghc ZZ"'6Y] 'XYa '_Øfn`]WX 'ghUhh[YZi bXYbYb 'DUfhY]hU['XYf gÀWX g]gWX Yb 'Øb_Yb ']b '@Y]dn]['k i fXYb '_`UfY '6YX]b[i b[Yb 'ZØf'X]Y Ni gh]a a i b['ni a '< Ui g\U'hgYbhk i fZ'Ui Z[YghY``h" 8]Y '@b_Y 'ZcfXYfh i bhYf'UbXYfYa 'Y]bY '@cW_Yfi b['XYf'GWXi `XYbVfYa gY']a ': fY]ghUUh gck]Y 'A]hVYgh]a a i b[gfYWX hY 'VY] 'XYf'J YfhY]'i b['XYf'; Y`XYf'Ui g XYa 'GcbXYfj Yfa Ò[Yb 'XYg'6i bXYg" '9]bY 'A Y\f\Y]h'XYf 8 Y`Y[]YfhYb'i bhYfghØhnhY 'X]Y 'YbhgdfYWX YbXYb '5bhfA[Yž'k Ug'XYf ghY``j YfhfYhYbXY 'J cfg]hnYbXY 'A Uf_i g'Dc\`Y 'VYhcbhY" '9f'ZcfXYfhY X]Y '78 I 'XUni 'Ui Zž']\fY '5i g[UVYbd'AbY 'ZØf'DZY[Yž'; Ygi bX\Y]hž 8 Ya c_fUh]Yž'?i 'hi fdfc 'Y_hYž'gcn]U`Yb'K c\bi b[gVUi 'i bX *DZfUghfi _hi f'_`UfYf'ni 'fYWX hZYfh][Yb'i bX'k UfbhY'j cf'XYb'F]g]_Yb

 $Y]bYg`JYfV`Y]Vg`]b`XYf`j cf`Ài Z][Yb`<Ui g\U`hgZØ\fi b[ž`X]YnU\`fY]WXY`Dfc Y_hY`]b`; YZU\f`Vf]b[Yb`_ObbhY"`$

8]Y'A]bXYf\Y]hgfY[]Yfi b['Ui g'781'i bX'GD8'ghY\h'j cf'Y]bYf < YfUi gZcfXYfi b[.'=\bYb'ZY\`Yb'nY\b'Gh]a a Yb'ZØf'X]Y'A Y\f\Y]h]a 'DUf'Ua Ybhž'k cXi fW'g]Y'Ui Z'X]Y'I bhYfghØhni b['XYf'Cddcg]h]cb Ub[Yk]YgYb'g]bX"'8Yf' < Ui g\U`hg!'i bX':]bUbnUi ggWi gg'\Uh VYfY]hg'a]h'XYb'JYf\UbX`i b[Yb']b'gY]bYf'? `Ui gi f'VY[cbbYbž'i bX X]Y'YfghY'5Vgh]a a i b[']a '@UbXhU['k]fX'ZØf'X]YgYb'A cbUh Yfk UfhYh"8]Y'J]Y`nU\`'Ub': cfXYfi b[Yb'_ObbhY'XYb'VYfY]hg gWkk]Yf][Yb'DfcnYgg'YXcW\'ni gAhn`]W\'j Yf_ca d`]n]YfYb'''@Ui h' Z]bUbnYb''gUW\ gYb''XY'k i fXY'XYf' < Ui g\U`hgYbhk i fZ'XYf GhUUhgfY[]Yfi b['VYfY]hg'Ua''''5df]`'&\$&)']a '@UbXhU[Y]b[YVfUW\h''

$K = \frac{1}{h} \frac{1}{h}$

8 Y f '8 c d d Y '\ Ui g \ U 'h 'k] f X '] b 'Y] b Ya 'k] f hg W U Zh '] W 'Ub [Ygd Ubb h Y b I a ZY 'X 'Ui Z [Ygh Y '`h " 8] Y 'U_hi Y ``Y 'G] hi Uh] c b 'n Y] W b Y h 'g] W 'X i f W Y] b Y b 'F Ø W [Ub ['X Y g '6 fi h h c] b `Ub X g d f c X i _hg 'i b X 'gh Y] [Y b X Y \ \dangle Z Uh] c b 'U 'Y a '] b Z Uh] c b g V Y X] b [h i b X 'b] W h _c b ' i b _hi f U V \ A b [] [" '8] Y 5 i g [UV Y b 'Ø V Y f g h Y] [Y b 'h f c h n 'U ``Y f '6 Y a Ø \ i b [Y b 'X] Y '9] b b U \ a Y b 'Z B g V Y g c b X Y f Y 'V Y] 'X Y b 'D Y f g c b U `Ui g [UV Y b " 8] Y g Y 'g] b X 'Ui Z [fi b X j c b 'H U f] Z U V g W `Ø g g Y b 'i a 'fi b X '* \$ \$ A] ``] c b Y b '9 i f c '[Y g h] Y [Y b " 5 i W X X] Y '? c g h Y b '] b 'X Y f 'A] [f U h] c b 'i b X '5 g m `Y f f Y] W Y b 'Z U g h X Y b < O W g h g h U b X 'j c b '& \$ % * " ''

I a 'X]Y 'Z]bUbn]Y ``Yb' < YfUi gZcfXYfi b[Yb'ni 'VYk À`h][Ybžg]bX
9]bgW\b]hhY']a ' < Ui g\U`h'i bUi gk Y]W\`]W\"I bhYf'UbXYfYa 'a ØggYb
%Z 'A]``]UfXYb'9i fc'Ui g'XYf' < Ui g\U`hgUi g[`Y]W\gfØW_`U[Y
Ybhbca a Yb'gck]Y 'X]Y'9]bnU\`i b[Yb']b'XYb'; YbYfUh]cbYbZcbXg
i a ') \$\$ 'A]``]cbYb'9i fc'fYXi n]Yfh'k YfXYb"'5i W\'X]Y
?cZ]bUbn]Yfi b['j YfgW\]YXYbYf': ÒfXYfdfc[fUa a Y'k]fX'[YgYb_h''
Hfchn'U``Yf'GdUfa U» bU\a Yb'k YfXYb'\bj Ygh]h]cbYb']b'6]`Xi b['i bX
: cfgW\i b[']b' < Ò\Y'j cb'%* 'A]``]UfXYb'9i fc'Y]b[Yd`Ubhž'k cVY]'X]Y
\]bni [Yk cbbYbYb'@Y\fYfghY``Yb'j cb']f[YbXk Y`W\Yb'? Øfni b[Yb
j YfgW\cbh'V`Y]VYb'gc``Yb"'9]b'_`UfYf': c_i g'k]fX'Ui Z'X]Y

⇒ [YbXZÒfXYfi b['[Y`Y[hži a 'bY[Uh]j Y'@Ub[nY]hZc`[Yb'ni
j Yfa Y]XYb'i bX'X]Y'9]bghY``i b['j cb'BUW\k i W\g_fÀZhYb']b'Dc`]nY]ž

⇒ gh]n'i bX'GhYi Yfj Yfk U`hi b['g]W\Yfni ghY``Yb"

8 Y f 'K Y [']b 'X]Y 'Ni _i b Zh

8]Y'gÀW\g]gW\Y'GhUUhgfY[]Yfi b['\Uh'VYfY]hg'Ua''\\$"'i bX'\\"''
: YVfi Uf']b'Fc\kY]b'ØVYf'XYb'8cddY\\Ui g\U'h'VYfUhYb'''N]Y\']gh
YgžY]bYb'ghUV]\Yb', VYf[Ub[g\Ui g\U'h'ni 'gW\UZZYbž'XYf'b]W\h'bi f
X]Y'U_hi Y\'Y'G]hi Uh]cb'VYfØW_g]W\h][hž'gcbXYfb'Ui W\'Ui Z
bchk YbX][Y'Ghfi _hi ffYZcfa Yb'j cfVYfY]hYh'''K]Y'
a YX]YbgYfj]WW''gUW\\gYb''XY'VYf]W\hYhž'VYhfÀ[h'XUg
<Ui g\U'hgj c'i a Yb'ZØf'\\$\\$\\)) i bX'\\\$\\$*'Yhk U'\\\)) 'A]\']UfXYb'9i fc
dfc'\J\f''8]Y'_ca a YbXYb'K cW\Yb'k YfXYb'YbhgW\Y]XYbX'gY]bž']b
XYbYb'X]Y'dc\]h]gW\Yb'5_hYi fY'[YZfU[h'g]bXž
?ca dfca]ggVYfY]hgW\UZh'ni 'nY][Yb'i bX'j YfUbhk cfhi b[gVYk i ggh
ni '\UbXY\bž'i a 'XYb': fY]ghUUh'GUW\\gYb'ni _i bZhgg]W\Yf'ni
[YghU'hYb''

8 Y hU]`g	
Cfh	AY]» Ybž'8 Ying WX`UbX
EiY``Yb	k k k "X]YgUWXgYb"XY
	k k k "Z]bUbnYb"gUW\ gYb"XY
	k k k "a YX]YbgYfj]WY "gUWX gYb"XY

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