7YbhfY`=g`UbX`A Umcf`FUWY`]b`Hi fa c]`. @Uk gi]h`GdUf_g`7cbhfcj Yfgm

7YbhfY`=g`UbX/ _ \$' - /g`a UmcfU``fUWY`ZUWYg``Y[U``\ifX`Yg`Ug 5bXfYk `K ccXghcW_`gi Yg`Zcf`VU``ch`]bWi g]cbž`U``Y[]b[Y`YWh]cb`]ffY[i`Uf]h]Yg"



7YbhfY '=**g**`**UbXž**'**BYk** '**Mcf_ž**'**I G5**'! '=**b**`U'XfUa Uh]Whifb`cZ'YjYbhg 'YUX]b['id'hc'h\Y'\$ bY'%+ 'a UmcfU`Y`YWh]cb`cb'7YbhfY'=**g**`UbXž Vig]bYgga Ub'5bXfYk 'K ccXghcW_'\Ug'ZcibX'\]a gY`Z'X]geiU`]Z]YX Zfca 'fibb]b[''5g'hYbg]cbg'YgWU`UhYž'K ccXghcW_'\Ug'hifbYX'hc'h\Y Wcifhgž'Z]`]b['U``Uk gi]h`cb`\$ bY'&`U[U]bgh'U`\cgh`cZ'j]``U[Y cZZ]W]U`gž']bWiX]b['A Umcf'@Uk fYbWY'GW\a]X`Udd`UbX'\]g'k]ZY 7 Ufc`ž'J]``U[Y'7`Yf_'8 cbbU'< Uff]gž'UbX'h\Y'BUggUi '7 cibhm'6cUfX cZ'9`YWh]cbgž'WU]a]b['h\YmWcbgd]fYX'hc'h\kUfh'\]g'WUbX]XUVm'' H\]g'WUgY'fYZYWhg'h\Y'Wcad`YI]h]Yg'cZ'BYk'Mcf_g'Y`YWh]cb``Uk'g UbX'h\Y'W\U``Yb[Yg'WUbX]XUHYg'ZUWY'k]h\]b'h\Ya''

K ccXghcW_g'UhhcfbYmž'GhYjYb'@YjYbh\U`ž'\Ug'VYYb'jcWU`']b Uf[i]b['h\Uh'XY`Umg']b'h\Y'`Y[U`'dfcWfgg'UfY'gYjYfY`m

X]qUXjUbhU[]b[`KccXqhcW_"'<Y`qYY_q`bch`^iqh`hc`\UjY K ccXghcW_'UXXYX'hc'h\Y'VU``chž'Vi h'U`qc'hc'XY`Um'h\Y'Y`YWh]cb UbX'X]gWUfX'Ubm'VU``chg'h\Uh'Xc'bch']bWi XY'\]g'bUa Y"'J]``U[Y UhhcfbYm[·]DYhYf[·]AUW?]bbcb[·]\Ug[·]WcibhYfYX[·]@YjYbh\U[·]g[·]WU]agž $ghUh]b[h Uh K ccXghcW_ZU]YX h a YYh h Y XYUX]bY h W bhYgh$ h\Y`]bjU`]XUh]cb`cZ`\]g`dYh]h]cbžk\]W\`kUg`YIYW'hYX`cb`AUm`&+" H\Y'q]hi Uh]cb']g'Zi fh\Yf'Wca d`]WUhYX'Vm'UWW gUh]cbg'Uf]g]b['Zfca $K ccXghcW_{}^{} \ a gY^Zik \ c'Uf[i Yg'h Uh'7YbhfY'=g`UbX']g']g'df]a Ufm$ fYg]XYbWYž'XYgd]hY'\]g'\c`X]b[g']b': `cf]XU"

7cbhfcjYfg]U`5`Y[Uh]cbg'UbX'@Y[U` A UbYi j Yf]b[

5XX]b['Ubch\Yf``UmYf'hc'h\Y'i bZc`X]b['XfUa Už'A Umcf'GW\a]X`Udd Zcfa U``m`cV'YWhYX`hc`K ccXghcW_g`WUbX]XUWhž'Ya d\Ug]n]b[`hk c _Ym'WcbWffbg.'K ccXghcW_g'Wf]a]bU``fYWcfX'UbX'\]g'df]a Ufm fYq]XYbWY`ghUhi g"`=b`&\$&\$žK ccXghcW_`UbX`\]g`Wca dUbm`k YfY WVUf[YX`k]h\`kU[Y`h\YZhž`fYqi`h]b[`]b`U`a]qXYaYUbcf`d`YU`Zcf h\Y`WcadUbm`UbX`U`bcbWf]a]bU``j]c`Uh]cb`Zcf`KccXghcW_" 5XX]h]cbU``mž'@YjYbh\U`'\Ug'UWWgYX'7Ufc`'GW\a]X`Udd'cZ dUfh]W]dUh]b[']b'eiYqh]cbUV`Y'Y`YWh]cb'dfUWh]WYqžbchUV`m' VU``ch \UfjYgh]b[ž'U'WU]a'g\Y'Z]fa`m'XYb]YXž'UggYfh]b['h\Uh'dfYW]bWh VU``chg`\UjY`bch'YjYb`VYYb`df]bhYX`mYh"

5`\YUf]b[`]q`qYhZcf`H\i fqXUmž`cj YfqYYb`Vm`>i qh]WY`FUbXm`Gi Y AUfVYfžk\c`\Ug`ibXYfqWcfYX`h\Y`if[YbWm`cZfYqc`j]b[`h\YqY]ggi Yg[·][]j Yb[·]h\Y[·]UddfcUWX]b[[·]Y[·]YWh]cb[·]h]a Y[·]]bY["]@Yj Ybh\U^{··}\Ug U`gc 'Z]`YX 'U a ch]cb 'hc 'X]gei U`]Zm'? Y]h\ '7 cfVY hhž h\Y 'j]``U[Y g UhhcfbYmždc]bh]b['cih'U'WcbZ]Wh'cZ']bhYfYgh']b'7cfVYhhg'XiU`'fc`Y fYdfYgYbh]b['h\Y'BUggUi '7ci bhm'6cUfX'cZ'9`YWh]cbg"'<ck Yj Yfž h\Y`VcUfX`\Ug`WUf]Z]YX`h\Uh`]h``UW_g`f`f]qX]Wh]cb`cj`Yf`h\Y`Y`Wh]cbž YUj]b['h\Y'Wci fh'hc'XYW]XY'h\Y'Wf]h]WU`'a UhhYfg'Uh'\UbX"

IbXYfghUbX]b[BYk Mcf_9`YWh]cb@Ukg

 $H = \frac{1}{2} \frac{1}{2}$ `Ukg`d`Um`]b`Ybgif]b[`ZU]f`Y`YWhcfU``dfcWYggYg"`5WWcfX]b[`hc`

6Ygi WXYb'G]Y'i bg'Ui Z.'a Y]b!k]Yb"bYh

8YhU]`g	
Cfh	7YbhfYʻ=g`UbXžBYk Mcf_žIG5
EiY``Yb	• k k k "bYk gXUm"Wca
	• k k k "`]\YfU`X"Wca
	• `Y[U`WUf]hm"cf[

5g'7YbhfY'=g`UbX'bUj][UhYg'h\]g'hi a i `hi ci g'Y`YWh]cb'dYf]cXž'cbY h\]b[']g'WYfhU]b.'h\Y'Yj Ybhg'i bZc`X]b['k]```bch'cb`m']a dUWh K ccXghcW_g'Z hi fY'Vi h'U`gc'\Uj Y'f]dd`Y'YZZYWhg'cb'h\Y'Y`YWhcfU` dfcWYggYg'UbX'Wca a i b]hm'XmbUa]Wg'k]h\]b'h\Y'j]``U[Y"

H\Y`i dWca]b[`Y`YWh]cb`]g`Vci bX`hc`VY`WcgY`m'a cb]hcfYX`Ug`h\Y ci hWca Y`cZ`K ccXghcW_ g``Y[U``Z][\h`a Um`W\Ub[Y`h\Y``UbXgWUdY cZ`[cj YfbUbWY`cb`7YbhfY`=g`UbX"`H\cgY`]bhYfYghYX`]b`Zc``ck]b[h\Y`Y`YWh]cb`WcgY`m`WUb`[U]b`]bg][\h`]bhc`h\Y`j ch]b[`dfcVWgg`UbX fYgi `hg`XYhU]`YX`cb`@"="`< YfU`Xž`k \YfY``]j Y`i dXUhYg`UfY`gYh`hc`fc``]b`Ug`h\Y`dc``g`WcgY`cb`Bcj Ya VYf`) ž`&\$&(ž`Uh`-.\$\$`DA`9GH"`

H\Y`BYk`Mcf_`GhUhY`6cUfX`cZ'9`YWh]cbg`cjYfgYYg`h\Y UXa]b]ghfUh]cb`UbX`Wca d`]UbWY`cZ`h\YgY``Uk gžYbgi f]b[hfUbgdUfYbWm`UbX`]bhY[f]hm`k]h\]b`h\Y`Y`YWhcfU``gmghYa "`@Uk g`UfY WYUf`m`XYg][bYX`hc`dfchYWh`jchYfg`UbX`a U]bhU]b`h\Y`XYa cWfUh]W dfcWYggžYghUV`]g\]b[`h\Uh`h\cgY`W\Uf[YX`k]h\`Y`YWh]cb`cjYfg][\h a i gh`UWh`]b`UWWcfXUbWY`k]h\`YghUV`]g\YX`bcfa g"

@Y [U``7`Uf]hmž'WUbX]XUhYg'UfY'fYei]fYX'hc'a YYh'gdYW]Z]W
Y`][]V]`]hm'Wf]hYf]Už']bWi X]b['VY]b['I "G"'W]h]nYbg'UbX'fYg]XYbhg'cZ
BYk 'Mcf_"'A cfYcj Yfž'WUbX]XUhYg'WUbbch'\Uj Y'ZY`cbm'Wcbj]Wh]cbg
i b`Ygg'h\Y]f'f][\hg'\Uj Y'VYYb'fYghcfYX"'K ccXghcW_g'`Y[U``VUhh`Y
gdYU_g'j c`i a Yg'UVci h'h\Y'ghU_Yg'cZ'gi W\'fY[i`Uh]cbg"