



5`UWWi U'7ci b hmž'l G5'!' \$ '5`UWWi U'7ci b hmž'U'fYa Uf_UV`Y

]b]h]Uh]j Y']g'hU_]b['c\omegazzei]hY'`]hYfU``m°'H\Y'5`UWWi U'7ci b hm

X]gUghYf'Wca a i b]WUh]cbg'< Ua 'FUX]c'7`i V'\Ug'fYWYbh`m

XYj Y`cdYX'U'[fci bXVfYU_]b['Xi U`!Ul]gž'Xi U`!UbhYbbU'gUhY``]hY

UbhYbbU'gmghYa 'U]a YX'Uh'a U]bhU]b]b['WcbhUWh'k]h\'h\Y

\$ hYfbUh]cbU``GdUWY'GhUh]cb'ffGGŁ'UbX'j Uf]ci g'Ua UhYi f'fUX]c

gUhY``]hYg"'H\]g'Y\omegazcfh'gdfUb['\omegachanger' Zfca 'Ub']a U[]bUh]j Y'Wca dYh]h]cb

h\Uh'hi fbYX'-\\$'mYUfg'c`X\omegachanger' XfY'\Ua 'fUX]c'Ybh\i g]Ughg'j]YX'\omegachanger' Zcf

GUhY``]hY'6cbi g'Dc]bhg'Vm'YghUV`]g\]b['hk c!k Um'Wca a i b]\WUh]cb

k]h\'cfV]h]b['Ua UhYi f'fUX]c'gUhY``]hYg"

D]cbYYf]b[HYWXbc`c[mUbX 5WWygg]V]`]hm

;]VVmg'W ghca 'UbhYbbUž']b[Yb]ci g`m'WfUZhYX'Zfca 'fUk 'U`i a]bi a Uffck 'g\UZhg'UbX'DJ 7'd]dYgž'UWWca d`]g\YX'k \Uh'k Ug'bYYXYX'hc gYW' fY' WJfW'`Uf'dc`Uf]nUh]cb 'Zcf'YZZYWh]j Y'=G'WcbhUWh'''H\Y dfc 'YWh'dfca]gYg'\][\'dYfZcfa UbW'k]h\ci h'h\Y'\][\'df]W''hU[ž cdYb]b['Xccfg'Zcf'j Uf]ci g'\][\'gW\cc``fcVch]Wg'hYUa g'YU[Yf'hc j Ybhi fY']bhc'h\Y'fYU'a 'cZ'gdUW''Wca a i b]WUh]cbg'''A Ya VYfg'cZ h\Y'5`UW\i U'hYUa 'UfY'XYX]WUhYX'hc'cZZYf]b['ZfYY'cf'UZZcfXUV`Y gcZhk UfYž'cdYb!gci fWY'd`Ubgž'UbX'U'di V`]Wm'UWW'gg]V`Y'WJfW']h VcUfX'Zcf'gW\cc`g']bhYfYghYX']b'dUfh]\WJdUh]b[']b'h\]g'YI WJh]b[j Ybhi fY''

 $GWk cc `g`UfY`U`gc `YbWci fU[YX`hc`Udd`m`Zcf`U`i b]ei Y`cddcfhi b]hm h\fci [\`h\Y`5a UhYi f`FUX]c`cb`h\Y`$hYfbUh]cbU``GdUW`GhUh]cb fbF $= GGŁ`dfc[fUa ž`U`Wc``UVcfUh]j Y`YZZcfh`h\Uh`\Ug`U`fYUXm`Yb[U[YXcjYf`%ž+$$`gWkcc`g`k cf`Xk]XY"`H\]g`]b]h]Uh]j Y`WcbbYWhg`ghi XYbhg k]h\`UghfcbUi hg`UVcUfX`h\Y`$= Gž`cZZYf]b[`h\Ya `Z]fgh\UbX`]bg][\hg]bhc``]ZY`]b`gdUW''`8YhU]`YX`[i]XUbW'`cb`\ck`hc`Udd`m`]g`Uj`UV`YUh`Uf]gg"cf[ž`ghfYUa`]b]b[`h\Y`dfcWygg`Zcf`Ubm`Ybh\i g]Ugh]WhYUa g`k]``]b[`hc`X]j Y`]bhc`h\Y`k cf`X`cZ`Ua UhYi f`fUX]c"$

H\Y'Fc`Y'cZ'5a UhYi f'FUX]c']b'9Xi WUh]cb

]bgd]fY 'ghi XYbhg' [`cVU``m'hc'YI d`cfY'WUfYYfg']b'gW]YbWYž hYW\\bc`c[m\overline{\chi}Yb[]bYYf]b[\overline{\chi}UbX'a Uh\'fGH9A \overline{\chi}\fci [\'Ua UhYi ffUX]c'Wca a i b]WUh]cbg'\k]h\'h\Y'=\GG'WfYk'''Ghi XYbhg' [Yh'U'i b]ei Y\\\UbW'bch'cb`m'hc'`YUfb'UVci h``]ZY'UVcUfX'h\Y'=\GG'Vi h'U`gc'hc\\CbXi \Wh'g\W]Ybh]Z]\WUbX'a Uh\Ya Uh]\W\`'U\Wh]j]h]Yg'fY`UhYX'hc'gdU\WYYI d`cfUh]cb''

A cfYcj Yfž'5F \oplus G'U]a g'hc'gdch'][\h'h\Y'g][b]Z]WUbW'cZ\i a Ub gdUWZ][\h'UbX'h\Y'Wf]h]WU`YI d`cfUh]cb'hU_]b['d`UWY'Xi f]b[a]gg]cbg": i bXYX'Vm'Ybh]h]Yg'`]_Y'h\Y' \oplus hYfbUh]cbU`'GdUW''GhUh]cb I "G"'BUh]cbU`'@UVcfUhcfmž'B5G5ž'UbX'gYj YfU`'Ua UhYi f'fUX]c gcW]Yh]Ygž'5F \oplus G']g'dUfh'cZ'h\Y'`Uf[Yf']b]h]Uh]j Y'hc'Yb\UbW''h\Y'i gY cZ'h\Y' \oplus G'Zcf'YXi WUh]cbU`'di fdcgYgž'g\Ud]b['Z hi fY'[YbYfUh]cbg cZ'qW]Ybh]ghgžYb[]bYYfgž'UbX']bbcj Uhcfg"

BUj][Uh]b['h\ Y '7 \ U``Yb[Yg'cZ 7ca a i b]WUh]cb

± gi a a Ufmžh\Y'5`UW\i U'7ci bhm'< Ua 'F UX]c'7`i V g'Vc`X
YbXYUj cf'bch'cb`m'Vf]X[Yg'h\Y'[Ud'VYhk YYb'ghi XYbhg'UbX'h\Y
k cbXYfg'cZgdUWY'Vi h'U`gc'hfUbgZcfa g'h\Y'`UbXgWUdY'cZ
YXi WUh]cbU``fYgci fW'g'Uj U]`UV`Y'Zcf'`YUfb]b['h\fci [\'fUX]c
Wca a i b]WUh]cbg'k]h\'h\Y'=GG"'5a]Xgh'W\U``Yb[Yg'UbX
UXj UbWYa Ybhgžh\YfY']g']bXYYX'gca Yh\]b['hc'VY'gU]X'Zcf
ZcghYf]b['W'f]cg]hm']b'ci f'bYI h'[YbYfUh]cb U'VYUi h]Zi``V`YbX'cZ
hYW\bc`c[mž'YXi WUh]cbž'UbX'h\Y']bZ]b]hY'k cbXYfg'cZ'h\Y'Wcga cg"

8 YhU]`g	
Cfh	5`UWXiU'7cibhmžIG5
EiY``Yb	• U`UWXi UWX fcb]WY"Wca
	• k k k "eg`"bYh
	• Uf]gg!i gU"cf[

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