

# 7ci fgY<sup>·</sup>Cj Yfj ]Yk

## GhJZZ 7 cbhJWh 8 YhJ] `g

## 7cbj Ybcfg

BUa Y	9a U]`	5j U]`UV]`]lm	@cWUh]cb	D\cbY
A ]ħ/XY```< UfYm	a "\UfYm4 i bgk "YXi "Ui		Fcca "\$& 7J9B 6i]X]b[ fAcbXUmg cb`mŁ	f\$&Ł', \$+% -,,'

## **@YWW**innfiggg

BUa Y	9a U]`	5j U]`UV]`]lm	@cWUh]cb	D\cbY

## 7ci fgY 8YW] g

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Giaa UfmcZh\Y 7ci fgY

7 J 9 B - \$) % Zcfa gʻh\YʻgYWcbXʻdUfficZh\Yʻ7 ci fgYk cf\_'H\Yg]gʻdfc[fUa žʻUbXʻ]gʻWca dʻYhYXʻ]bʻh\YʻgYa YghYf
UZhYfʻh\YʻWca dʻYhJcbʻcZ7 J 9 B - \$) \$'H\Yg]gʻ5'''±bʻdfYdUf]b[ 'mci fʻh\Yg]gʻhcd]W]bʻH\Yg]gʻ6ʻZcfʻ7 J 9 B - \$) %
mci 'UfY`UV`Y`hcʻgY`YWhUbXʻbca ]bUhY`Uʻ7 ]j ]``UbX#cfʻ9 bj ]fcba YbHU``9 b[ ]bYYf]b[ 'hcd]Wh\Uh]gʻcZg][ b]Z]WUbh
]bhYfYghhc`mci "'`Nci fʻhcd]Wa UmiVY`UggcW]UhYX`k ]h\`WcfY`Y`Ya Ybhgʻgi W.`UgʻGffi Wh fU``8 Yg][ bž′K UhYf`UbX
<mXfUi `]Wgž; YchYWkb]WU``9 b[ ]bYYf]b[ žHfUbgdcfhUh]cbž7 cbghfi WhcbʻcfʻGi ghU]bUV]`]hmʻK ]h\]bʻH\Yg]gʻ6
h\YfY`UfY`Uʻgcʻdfc^YWha UbU[Ya YbhY`Ya Ybhgʻh\UhYb[]bYYf]b[ 'dfcZYgg]cbU`gʻk ci `X`VY`fYei ]fYX`hc
UXXfYggʻUbX`h\YgY`Y`Ya Ybhgʻk]``VY`]bWcfdcfUhYX`UgʻdUfhcZh\Y`H\Yg]gʻ6ʻgi Va ]gg]cb"`H\]

@YUfb]b[ 'Ci HMca Y	95 GHJ[Y %7ca dYHYbW]Yg
) "'9b[U[Y']b']bXYdYbXYbhUbX'fYZYW¶jY'`YUfb]b['k\Yb'gc'j]b[h\Y'W\cgYb'Yb[]bYYf]b['XYg][b'dfcV`Ya	D9' "%ŽD9' "&ŽD9' "' ŽD9' "(
*"'5dd`midf]bWJd`Yg`cZYh\]WU`'dfUWJWY'UbX'gcWJU`'fYgdcbg]V]`]hmhc h\Y'W\cgYb'Yb[]bYYf]b['XYg][b'dfcV`Ya	D9%") ž <sup>·</sup> D9%"* ž <sup>·</sup> D9' "%

### HYUWX]b[ 'GhfUhY[]Yg'

 $\label{thm:conditional} H\Y'A UghYfg'DfUWI)W'Dfc'YWi6'U]a g'Zcf'ghi XYbhg'hc'dfcXi W''Ub']bX]j ]Xi U`'fYdcfhi]b'k \]WX'YUWX'ghi XYbhg k cf_g'i bXYf'h\Y'[i]XUbW'cZUWUXYa ]WghUZk ]h\']bdi hZfca ']bXi ghfmgdYW]U`]ghg''Ghi XYbhg'k ]``\Uj Y UXYei UhY'cddcfhi b]h]Yg'hc'fYWY]j Y']bX]j ]Xi U`'UXj ]WY'UbX'a Ybhcf]b["'Hcd]Wg'UfY'fY`UhYX'hc']bXi ghfmdfc'YWfg gY`YWhYX'Zfca 'WcbhYa dcfUfmdfUW]WY'''H\Y'k cf_']bj c'j Yg']bj Ygh][ Uh]cbg'UbX'XYg][ b'Udd`]WUh]cbg''$ 

### 5ggYgga Ybh

5ggYgga Ybh'HJg_	K Y][\h	8iY'8UhY	7 ci fgY @YUfb]b[ Ci HWca Yg 5ggYggYX
%"'DfcdcgU`'#DfcV`Ya GrUhYa Ybh	) ।	&- #\$- #&\$&&`%%) - `DA	% <u>"</u>
&"'@jhYfUhi fY'F Yj ]Yk	&\$I	&(#%\$#&\$&&`%%) - `DA	&
' "'DfYgYbhJhjcb'UbX'DYYf A Uf_jb[	&) ı	K YY_', ž'K YY_'-	(
(": ]bU``F Ydcfh	) \$1	&' #%#&\$&&`%%) - `DA	%ž'&ž'' ž'( ž') ž'*

#### 5ggYgga Ybh% DfcdcgU`#DfcV`Ya GHJhYa Ybh

5ggYgga Ybh``Yb[ h\. '&'dU[ Yg'a Ul 8i Y'XUhY. '&- #\$- #&\$&&'%%) - 'DA

 $8 YHJ]gfY[UfX]b[WkcgYb'dfcYWf]bWiX]b[/k\Uh]gfhY'dfcV'Ya/k\mUfY'mci'UhHYadh]b['hcgc'jY#bjYgh][UHY']h/mci'f']b]hJU''UddfcUWk/UbX'hJaY']bY'''AUf_g'k]'``VY'U``cWJhYX'cb'YUgY'cZWcadfY\Ybg]cbUbX'ZYUg]V]`]hm'$ 

H\]g'Ugg][ ba Ybh]g'gi Va ]h\X\h\fci [\'Hi fb]h\b'UbX'gh XYbhg'Xc'bchgYY'Hi fb]h\b'g]a ]'Uf]hmfYdcfhg"

#### 5ggYgga Ybh& @]hYfUh fY F Yj ]Yk

5ggYgga Ybh``Yb[ h\. '%\$`dU[ Yg`fa Ul Ł 8i Y`XUhY. '&( #%\*&\$&&'%%) - 'DA

 $7 f ]h] WU`Yj U`i Uh] cb `cZ_Ym`]hYfUhi fY`]b`mci f`WkcgYb`hcd] W`Mci f``]hYfUhi fY`fYj ]Yk `g\ci `X`gmbh\Yg]nY`h\YUj U]`UV`Y`_bck `YX[Y`cZmci f`hcd] Wk \]Y`]XYbh]Zm]b[`_YmfYgYUfWk`[Udg"$ 

H\]q Uqq][ ba Ybh]q qi Va ]h\X h\fci [ \ Hi fb]hb UbX qh XYbhq Xc bchqYY Hi fb]hb q]a ]`Uf]hmfYdcfhq"

#### 5ggYgga Ybh' . DfYgYbHJh]cb UbX DYYf A Uf\_]b[

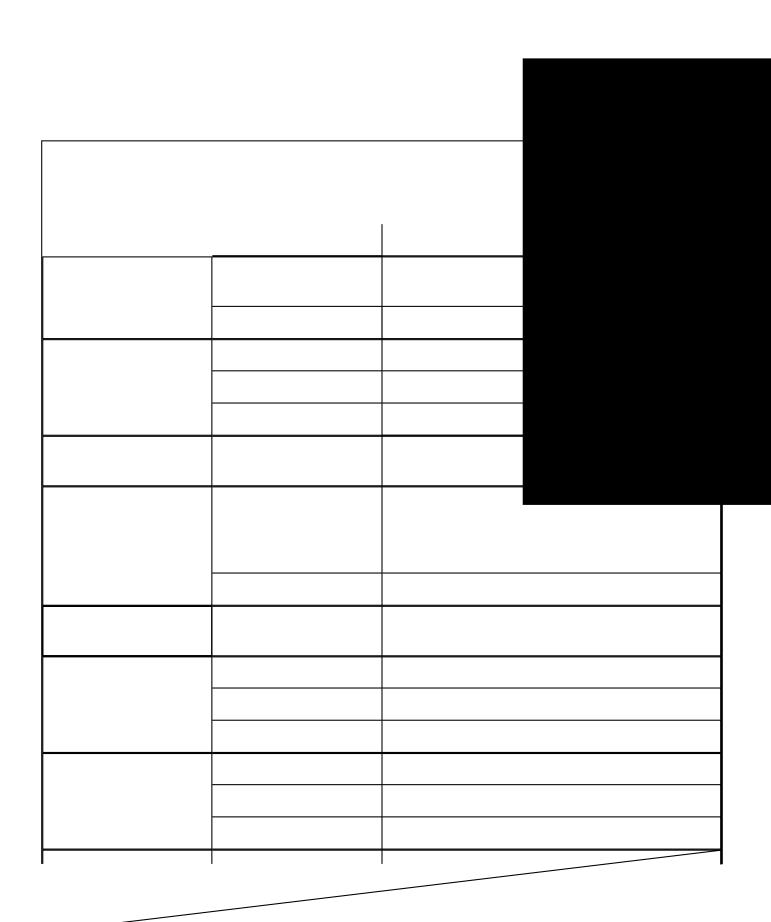
8i Y XUhY. K YY , žK YY -

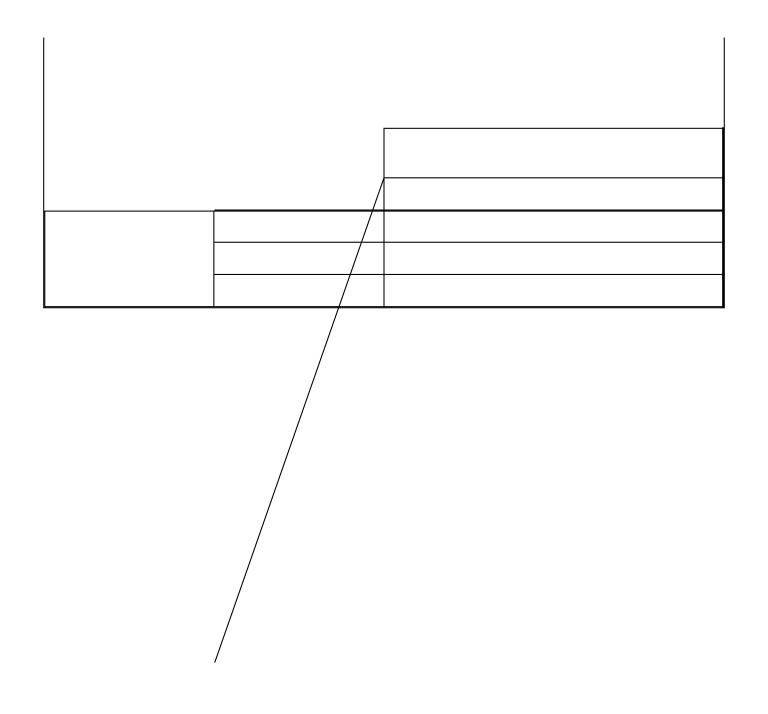
#### 5ggYgga Ybh(.:]bU`F Ydcfh

5ggYgga Ybh``Yb[ h\.'' \$`dU[ Yg`fa UI Ł 8i Y`XUhY. '&' #%#&\$&&'%%) - 'DA

: cfa U`k f]hhyb fYdcfhWcbhU]b]b[ `Ub`YI YW h]j Y`gi a a Ufmž`]bhfcXi Wh]cbž``]hyfUhi fY`fYj ]Yk ža Yh\cXgž`\_Ym Z]bX]b[ gž'WcbWi g]cbgž'UbX`fYWca a YbXUh]cbg" 5 cbY`dU[ Y`: UWig\YYhUbX`Wca a i b]WUh]cbg`gi a a Ufmk ]`` U`gc`VY`fYei ]fYX"

H\]gʻUgg][ ba Ybhʻ]gʻgi Va ]hhYXʻh\fci [\ʻHi fb]h]bʻUbXʻgh XYbhgʻXcʻbchigYYʻHi fb]h]bʻg]a ]`Uf]hmifYdcfhg"





## Gi Va ]gg]cb cZ5ggYgga YbhHUg\_g

D`YUgY`fYZYf`hc`h\Y`A ccX`Y`dU[Y`cZh\Y`Wci fgY`Zcf`Z fh\Yf`[i]XUbW\`cb`UggYgga Ybhigi Va]gg]cb"

#### I BGK \UgʻUʻghUbXUfX``UhYʻgi Va ]gg]cb dYbUʻhmcZ

• )ı 'dYf'XUmž'Zcf'U``'UggYgga Ybhg'k \YfY'U'dYbU'hm'Udd`]Ygž'WUddYX'Uh'Zj Y'XUmg'f1%\$'\ci fgŁž'UZNYf k\]WX'U'gh XYbh'WUbbchgi Va ]h'Ub'UggYgga Ybhž'UbX'bc'dYfa ]hNYX'j Uf]Uh]cb"

## 5 WUXYa ]W<cbYghmUbX D`U[]Uf]ga

6Yk UfY "5b" Ugg][ ba Ybhh\Uh]bWi XYg"d`U[ ]Uf]gYX"a UhYf]U``k ]```fYWY]j Y"U"\$ı ': U]`žUbX`ghi XYbhg`k \cd"\U[ ]Uf]gY\"a UmZU]``h\Y'Wci fgY"'Ghi XYbhg`k \cd"\U[ ]Uf]gY\"UfY\"U`gc"`]UV`Y'hc"X]gW]d`]bUfm'UWf]cbž]bWi X]b[YI Wi g]cb'Zfca 'Ybfc`a Ybh'

 $D`U[]Uf]ga ~]g'hY'i gY'cZUbch\Yf'dYfgcb'g'k cf\_'cf']XYUg'Ug']Zh\Ymk YfY'mci f'ck b'''K ~Yb']h]g'bYWYggUfmcf XYg]fUV'Y'hc'i gY'ch\Yf'dYcd'Y'g'a UhYf]U`'mci 'g\ci `X'UXYei UhY`mUW_bck `YX[Y'k \cgY'k cfXg'cf']XYUg'h\Ym$ 

#### 5 WUXYa ]W = DZcfa Uhjcb

: ]bU`'9l Ua ]bUh]cbg.

: ]bU`YI Ua g`]b`H' `&\$&&`k ]```VY`\Y`X`cb`]bY`VYlk YYb`&) h\`Bcj Ya VYf`!`, h\`8YWYa VYf`&\$&&`]bWi g]j Yž`UbX gi dd`Ya YbhJfmYl Ua g`VYlk YYb`-h\`!`% h\`>Ubi Ufm&\$&' `]bWi g]j Y"'Mci `UfY`fYei ]fYX`hc`VY`Uj U]`UV`Y`cb h\YgY`XUhYg"`D`YUgY`Xc`bchhc`a U\_Y`UbmdYfgcbU``cf`lfUj Y``UffUb[ Ya Ybhg`Xi f]b[ `h\]g`dYf]cX"'

#### 57589A = 7.58J = 7.9

- ? YmiGtUZztc '7 cbtUWiZcf '5 WUXYa ]W5 Xj ]WY flc[ ']b 'k ]th 'mci f 'n=8 'UbX dUggk cfXt '\text{htdg.#|btfUbYtiW| Yb[ "i bgk "YXi "Ui # YmlgtUZItc!WcbtUWiXi f]b[!mci f!gti X]Yg!Utli bgk
- <u>? Ymil\_BGK\_'8 UhYg'</u>! 'Y["'7 Ybgi g'8 UhYžYI Ua 'XUhYgž``UghiXUmhc 'Xfcd'U'Wci fgY'k]h\ci h UWUXYa ]\#Z|bUbW]U```]UV]`]miYhW''
- 7 J 9B 'Ghi XYbhi=bhfUbYhrflc[ ']b 'k ]h\ 'mci f'n=8 'UbX dUggk cfXŁ '\hadg.#|bhfUbYh'W| Yb[ "i bgk "YXi "Ui #ahi XYbh]bhfUbYh'
- Gh XYbh@ZY 'Uh7 J 9Bž]bWi X]b[ 'Gh XYbh GcW]Yh]Yg. \( \frac{1}{2} \) Htdg. #k k k "i bgk "YXi "Ui #Yb[ ]bYYf]b[ #M] \( \frac{1}{2} \)! UbX!Ybj ]fcba YbHU\!Yb[ ]bYYf]b[ #gh XYbH\]ZY \( \frac{1}{2} \)
- GdYV)JU``7 cbg]XYfUhjcb. \https://https://www.https://https://https://https://https://www.https://ht

# 5ddYbX]I . '9b[]bYYfg'5i ghfU`]U'f95Ł'DfcZYgg]cbU` '9b[]bYYf'7ca dYhYbWm GHJbXUfX

Dfc[fUa =bhybXYX=@YUfb]b[ 'Ci hWca Yg	
?bck `YX[Y`UbX'g_]```VUgY	
D9%"%7ca dfY\Ybg]j Yž'h\YcfmVUgYX'i bXYfghUbX]b[ 'cZh\Y'i bXYfd]bb]b[ 'bUhi fU`'UbX d\mg]\WJ`'g\WJYb\Wg'UbX'h\Y'Yb[ ]bYYf]b[ 'Z bXUa YbhJ`g'Udd`]\WJV`Y'hc'h\Y'Yb[ ]bYYf]b[ 'X]g\WJd`]bY	
D9%"&"7cbWYdh U``i bXYfgHJbX]b['cZh\Y'a Uh\Ya Uh]Wgžbi a Yf]WJ``UbU`mg]gžgHJh]gh]Wgž'UbX Wca di hYf`UbX`]bZcfa Uh]cb'gW]YbWYg'k\]W\'i bXYfd]b'h\Y'Yb[]bYYf]b['X]gW]d`]bY	
D9%" '=b!XYdh\'i bXYfghUbX]b['cZgdYW]U`]ghVcX]Yg'cZ_bck `YX[Y'k]h\]b'h\Y'Yb[]bYYf]b[X]gW]d`]bY	
D9%'( '8]gWfba YbhcZ_bck `YX[ Y 'XYj Y`cda YbhUbX'fYgYUfWX 'X]fYWf]cbg'k ]h\]b'h\Y Yb[ ]bYYf]b[ 'X]gW]d`]bY	
D9%) '? bck 'YX[Y'cZYb[]bYYf]b[ 'XYg][b'dfUWjWY'UbX'WcbhYl hi U`'ZJWcfg']a dUWjb[ 'h\Y Yb[]bYYf]b[ 'X]gWjd`]bY	
D9%"* I bXYfgHJbX]b[ 'cZh\Y'gWcdYž'df]bW]d`Ygž'bcfa gž'UWVci bHJV]`]h]Yg'UbX'Vci bXg'cZ gi gHJ]bUV`Y'Yb[ ]bYYf]b[ 'dfUWfJWY']b'h\Y'gdYW]ZJWX]gW]d`]bY	
9b[]bYYf]b['Udd`]WUh]cb'UV]`]hm	
D9&"%5dd`]WUh]cb`cZYgHUV`]g\YX`Yb[]bYYf]b[`a Yh\cXg`hc`Wca d`Yl `Yb[]bYYf]b[`dfcV`Ya gc`j ]b[	
D9&"&": `i YbhiUdd`]WUh]cb'cZYb[]bYYf]b['hYVXb]ei Ygžhcc`g'UbX'fYgci fWYg	
D9&" '5dd`]WUh]cb`cZgmghYa Uh]WYb[]bYYf]b[`gmbh\Yg]g`UbX`XYg][b`dfcWYggYg	
D9&"('5dd`]WUh]cb'cZgmghYa Uh]WUddfcUWXYg'hc'h\Y'WcbXi WhUbX'a UbU[Ya YbhcZYb[]bYYf]b[dfcYWng	
DfcZYgg]cbU`'UbX'dYfgcbU`'Ultf]Vi hYg	
D9' "%'9h\]WU`'WcbXi Wh'UbX'dfcZYgg]cbU`'UWWci bHJV]`]hm	
D9' "&'9ZYWAj Y'cfU`'UbX'k f]MYb'Wcaaib]WUAjcb']b'dfcZYgg]cbU`'UbX'`Um'XcaU]bg	
D9' "' '7 fYUhjj Yž']bbcj Uhjj Y'UbX'dfc!UWhj Y'XYa YUbci f	
D9' "( 'DfcZ/gg]cbU`i gY'UbX'a UbU[ Ya YbhcZ]bZcfa Uh]cb	
D9' ") 'C fXYf'mia UbU[ Ya YbhcZgY`Zi'UbX`dfcZygg]cbU``WcbXi Wh	
D9' "* '9ZZYWNjj Y'NYUa 'a Ya VYfg\]d'UbX'NYUa 'YUXYfg\]d	