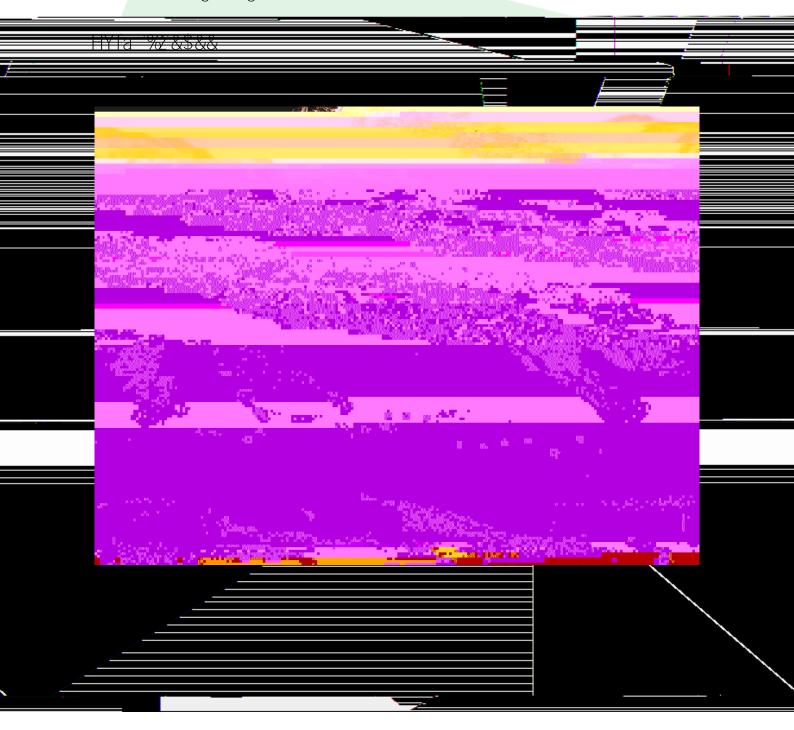


## **GSOE9758**

BYhkcf\_GmghYag5fWk]hYWhifY



## 7ci fgY<sup>-</sup>Cj Yfj ]Yk

#### GHJZ7cbHJWh8YHJ]`g

#### 7cbj Ybcfg

B Ua Y	9a U]`	5j U]`UV]`] <b>m</b>	@cWUh]cb	D\cbY
J]'Um'G]j UfUa Ub	j_]Um4_i_bgk_"YXi_"Ui_	A cb'- Ua !( da	; %+ Fcca (('	-',) '*)++

#### GWXcc`7cbHJWh =bZcfa Uh]cb

7 cbgi `hUhjcbg. '@YWhi fYf Wcbgi `hUhjcb'hja Yg'k ]``'VY'UXj ]gYX'Xi f]b[ 'h\Y'Zjfgh`YWhi fY" Mci 'UfY'k Y`Wca Y'hc'Ya U]`'h\Y'hi hcf'cf``UVcfUhcfmXYa cbghfUhcfžk \c'WUb'Ubgk Yf mci f'ei Yhf&k Y`Wca Y'hc'Ya U]`'h\Y'hi hcf'cf``UVcfUhcfmXYa cbghfUhcfžk \c'WUb'Ubgk Yf

#### D\cbY

```
fŽ*%'&Ł'-',) ',) $$'-Bi WYi g'Ghi XYbh'<i V

fŽ*%'&Ł'-',) '+**%'-'9b[]bYYf]b['±0Xi ghf]U`'HfU]b]b[

fŽ*%'&Ł'-',) '' %+-'-'I BGK 'Ghi Xm'5VfcUX'UbX'I BGK '9I W\Ub[Y'fZcf']bVci bX'ghi XYbhgŁ
.
```

#### 9a U]`

## 5 hmy b X Ub WY F Yei ] f Ya Yb hg

 $\hbox{Ghi XYbhg'UfY'ghfcb[`m'YbWc'i fU[YX'hc'UhhYbX'U```WUggYg'UbX'fYj]Yk'``YWhi fY'fYWc'fX]b[g''' } \\$ 

## 7ci fgY'GWXYXi `Y

J]Yk 'WUgg'ha YhUV'Y

### H]a YHJV`Y

8UHY	HmdY	7cbhYbh
K YY_"%"%(": YVfi Ufm! % ": YVfi Ufm	@YWhifY	⇒hfcXiWhjcb'hc'h\Y'5fW\]hYWhifY'dfcWYgg
K YY_'&.'&%: YVfi Ufm! &) ': YVfi Ufm	@YWhifY	6i g]bYgg'A cXY``7 Ubj Ug'f6A 7Ł'J ]g]cbgž; cU`gž FYei ]fYa Ybhg'fJ; FŁ
K YY_" ."&, ": YVfi Ufm! ("A UfVX	@YWhifY	HY`Wcž7`ci XžUbX'9I WXUb[Y'5fWX]hYWh fYg
K YY_"( . "+"A UfWX"!"	@YWhifY	BUNJcbU``6fcUXVUbX'BYkkcf_fB6BŁ
K YY_")."%("A UfVX"!"% A UfVX	DfYgYblUl]cb	Dfc:YWighU[Y:%dfYgYbhUh]cb
K YY_'*.'&%'A UfVX'!'&) A UfVX	5ggYgga Ybh	A ]X! hY fa 'hY gh
K YY_"+."&, "A UfVX"!"% 5df]"	@YWhifY	€H'BYhk cf_g
K YY_', .'('5df]`!', '5df]`	DfYgYblUljcb	DfcYVNghJ[Y'&'dfYgYbhJh]cb
K_YY_''%%'5df]`'!'%) 5df]`	@YWhi fY	Dfc[fUa a UV`Y`BYhk cf_g

#### FYgci fWyg

#### DfYgWf]VYX F Ygci fWYg

H\Y`fYWca a YbXYX`ff\\ci [\'bchfYei]fYXE`fYZVfYbWY`Vcc\_g`Zcf`f\\]g`Wci fgY`UfY.`fUE`Df]gWj``U`C ddYb\Y]a Yfž "Hcd!8ck b`BYkk cf\_`8Yg][ b"ž'H\]fX`9X]h]cbž'7]gWc`DfYggž &\$\\$\$`UbX`fVE`>Ua Yg`8"`A W7 UVYž''BYkk cf\_5bU`mg]gž'5fW\]hYWfi fYž'UbX`8Yg][ b"ž' fX`9X]h]cbž'A cf[ Ub!? Ui Za Ubž'&\$\$+"

#### FYWca a YbXYX FYgci fW/g

GYWNjcbg'Zfca ij Ufjci g'ch\Yf'Vcc\_gž'dUdYfgž'UbX'ch\Yf'fYUXjb[ 'a UhYfjU``k ]``'VY'i gYX'h\fci [\ci h'h\jg Wci fgY/]bZcfa Uhjcb'UVci h'h\YgY'k ]``'VY'dcghYX'cb'h\Y'Wci fgY'A ccX`Y'dU[Y'UbXZh\Y'k YV!dU[Y.\hdg.##gi V'YWmg"YY"i bgk "YXi "Ui # gcY-+), #

#### 7ci fgY 9j U`i Uh]cb UbX 8Yj Y`cda Ybh

H\]g`Wci fgY`]g`i bXYf`WcbgHJbhfYj ]g]cb`]b`cfXYf`hc`]a dfcj Y`h\Y``YUfb]b[ `ci HWca Yg`Zcf`U``ghi XYbhg"`D`YUgY Zcfk UfX`UbmZYYXVUW\_fdcg]hj Y`cf`bY[ Uhj YE'cb`h\Y`Wci fgY`hc`h\Y`Wci fgY`Wcbj YbYf`cf`j ]U`h\Y`7 ci fgY`UbX HYUW\]b[ `9j U`i Uhjcb`UbX`\=a dfcj Ya YbhDfcW\gg\"Mci `WJb`U`gc`dfcj ]XY`ZYYXVUW\_hc`9@GC 7 k\c`k]``fU]gY mci f`WcbW\fbg`Uhghi XYbhZcW\g`[ fci d`a YYh]b[ g\"5g`U`fYgi `hcZdfYj ]ci g`ZYYXVUW\_cVhJ]bYX`Zcf`h\]g`Wci fgY UbX`]b`ci f`YZZcfhg`hc`dfcj ]XY`U`f]W\`UbX`a YUb]b[ \Z\```YUfb]b[ \YI dYf]YbW\z`k Y`\Uj Y`Wcbh]bi YX`hc`Yj U`i UhY UbX`a cX]Zmci f`XY`]j YfmUbX`UggYgga Ybha Yh\cXg\"

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

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

D`U[]Uf]ga `]g`h\Y`i bUW\_bck `YX[YX`i gY`cZch\Yf`dYcd`Y'g`k cf\_ž`]bWi X]b[ `h\Y`Wcdm]b[ `cZUgg][ ba Ybhk cf\_g UbX``UVcfUhcfmfYgi `hg`Zfca `ch\Yf`ghi XYbhg"`D`U[]Uf]ga `]g`Wcbg]XYfYX`U`Zcfa `cZUWUXYa ]Wa ]gWcbXi WhžUbX h\Y`I b]j Yfg]hm\Ug`j Yfmghf]Whfi `Yg`h\Uh`]bWi XY`gca Y`gYj YfY`dYbU`h]Yg": cf`I BGK `dc`]WjYgž'dYbU`h]Yg`UbX ]bZcfa Uh]cb`hc`\Y`d`mci `Uj c]X`d`U[]Uf]ga ž`gYY`\hdg.#ghi XYbh'i bgk "YXi "Ui #d`U[]Uf]ga "'Hc`Z]bX`ci h]Zmci i bXYfghUbX`d`U[]Uf]ga 'WcffYWhmž'hfmh\]g`g\cfhiei]n. \hdg.#ghi XYbh'i bgk "YXi "Ui #d`U[]Uf]ga !ei]n"

#### ; YbYfU`7cbXiWhUbX6Y\Uj]cif

7 cbg]XYfUh]cb"UbX`fYgdYWhZcf"h\Y`bYYXg`cZmci f`ZY``ck `ghi XYbhg`UbX`hYUW\]b[ `ghUZZ]g`Ub`Yl dYWhUh]cb" 7 cbXi Whk \]W\`i bXi `mX]gfi dhg`cf`]bhYfZYfYg`k]h\`U`WUgg`]g`bchUWWdhUV`Y`UbX`ghi XYbhg`a UmVY`Ug\_YX`hc`YUj Y`h\Y`WUgg"

## 5 WUXYa ]W + DZcfa Uhjcb

7CJ=8%: !=a dcfhJbh'<YU`h\ FY`UhYX'Bch]\W'

 $\label{thm:linear} $$ Mcif'(YU)h(U)X'h(Y'(YU)h(CZh)cgY']b'mcif'WUgg']g'Wf]hWU''mi]a\ dcfhUbh''McifaighghUmUh(CaY']ZmcifUfYg''YU'h(Cf'(U)Y'YYYb'UX)]gYX'hc'gY'Z]gc'UhY'VmBGK_(YU)h(Cf'(U)YfbaYbhUih(Cf)hJYg'''7iffYbhUYfhg'UbX'U$ 

# 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 Yžih\YcfmVUgYX'i bXYfgHJbX]b[ 'cZh\Y'i bXYfd]bb]b[ 'bUhi fU``UbX d\mg]\WJ`g\YbWYg'UbX'h\Y'Yb[ ]bYYf]b[ 'Z bXUa YbHJ`g'Udd`]\WJV`Y'hc'h\Y'Yb[ ]bYYf]b[ 'X]g\\Jd`]bY	
D9%"&"7cbWYdhiU``ibXYfgHUbX]b['cZh\Y'aUh\YaUh]WgžbiaYf]WU``UbU`mg]gžgHUh]gh]WgžUbX WcadihYf`UbX`]bZcfaUh]cb`gW]YbWYg`k\]W\`ibXYfd]b'h\Y'Yb[]bYYf]b['X]gW]d`]bY	
D9%" '=b!XYdh\'i bXYfgHJbX]b[ 'cZgdYW]U`]ghVcX]Yg'cZ_bck `YX[ Y`k ]h\]b'h\Y'Yb[ ]bYYf]b[ X]gW]d`]bY	
D9%"( '8]gWYfba YbhcZ_bck `YX[ Y`XYj Y`cda YbhUbX`fYgYUfW\ 'X]fYWIjcbg`k ]h\]b`'h\Y Yb[ ]bYYf]b[ 'X]gWJd`]bY	
D9%") '? bck `YX[Y`cZYb[]bYYf]b[ 'XYg][b`dfUWf]WY`UbX`WcbHYI hi U``ZUWcfg`]a dUWf]b[ 'h\YYb[]bYYf]b[ 'X]gW]d`]bY	
D9%"* I bXYfgHJbX]b[ 'cZh\Y'gWcdYždf]bW]d`Ygžbcfa gž'UWWci bHJV]`]h]Yg'UbX'Vci bXg'cZ gi gHJ]bUV`Y'Yb[ ]bYYf]b[ 'dfUWf]WY']b'h\Y'gdYW]Z]WX]gW]d`]bY	
9b[]bYYf]b['Udd`]WUh]cb'UV]`]hm	
D9&"%5dd`]\Whjcb`cZYgHUV`]g\YX`Yb[]bYYf]b[`a Yh\cXg`hc`Wca d`Yl `Yb[]bYYf]b[`dfcV`Ya gc`j ]b[	
D9&"&": `i YbhiUdd`]WUhjcb"cZYb[]bYYf]b["hYWXb]ei Ygžhcc`g"UbX"fYgci fWYg	
D9&" '5dd`]WUh]cb`cZgmghYa Uh]WYb[]bYYf]b['gmbh\Yg]g`UbX`XYg][b'dfcWYggYg	
D9&"('5dd`]\Whjcb'cZgmghYa Uhj\WUddfcU\\XYg'hc'h\Y'\\cbXi \WiUbX'a UbU[Ya YbhcZYb[]bYYf]b[dfcY\\mathred{Mg}	
DfcZ/gg]cbU`'UbX'dYfgcbU`'UHrf]Vi H/g	
D9' "%'9h\]WU``W&bXi Wh'UbX'dfcZYgg]cbU``UVW&i bHJV]`]hm	
D9' "&'9ZYWNjjY'cfU`'UbX'k f]hhYb'Wcaaib]WUhjcb']b'dfcZYgg]cbU`'UbX'`UmiXcaU]bg	
D9' "' '7 fYUhjj Yž']bbcj Uhjj Y'UbX'dfc!UWhjj Y'XYa YUbci f	
D9' "( 'DfcZ/gg]cbU`i gY'UbX'a UbU[ Ya YbhcZ]bZcfa Uh]cb	
D9' ") 'C fXYf`ma UbU[ Ya YbhcZgY`ZzʿUbXʿdfcZYgg]cbU``WcbXi Wh	
D9' "* '9ZZYWNj Y'NYUa 'a Ya VYfg\]d'UbX'NYUa ''YUXYfg\]d	