

MUSC1101

A i g]WFY]bjYbhYX

HYfa 'C bY''##'&\$&\$

7ci fgY'Cj Yfj]Yk

Ghuzz 7 cbhuWh8 Yhu]`g

'7cbj Ybcfg'

B Ua Y	9a U]`	5j U]`UV]`]m	@cWJhjcb	D\cbY
>c\b'BUd]Yf	^bUd]Yf4 i bgk "YXi "Ui	: f]XUm'&'!'%cf'Vm Uddc]bha Ybhžcf Xfcd']b	KYVghYfFcca ‰	-',) '*-) '

GWkcc~7cbhJWh~abZcfa Uh]cb

Fcca " &ž`Yj Y`" FcVYfhK YVghYf`6i]`X]b[

D\cbY.'f\$&E'-',)'(,)*

9a U]` gUa 4 i bgk "YXi "Ui

K YVg]hY. \hdg.#gUa "Ufhg"i bgk "YXi "Ui

 $\label{thm:constraint} $$HY'GWKcc``cZhY'5ftg'UbX'AYX]U'kci`X``]_Y'hc'FYgdYWZI``m5W_bck`YX[Y'h\Y'HfUX]h]cbU``7ighcX]Ubgžh\Y'6YXY[U``fPYbg]b[hcb'WJadigłž; UX][U``fP]hmUbX'5fhV'8Yg][b'7UadigYgŁ'UbX'h\Y'B[ibbUkU`dYcd'Y'fbighfU`]Ub'8YZYbWY': cfWY'5WUXYam]b'7UbVYffUŁ'cZh\Y'`UbXg'k\YfY'YUWX'WJadig'cZIBGK']g`cWJhYX''$

5ggYgga Ybh

Mci 'UfY'cb`m'U``ck YX'cbY'gi Va]gg]cb'Zcf'Hi fb]hjb'Zcf'YUW.'Ugg][ba Ybh''=fi]g'mci f'fYgdcbg]V]`]mm'rc i bXYfghUbX'k \Uh'Wcbghjhi hYg'd'U[]Uf]ga ž'UbX'hc'Ybgi fY'h\Uh'mci f'k cf_']g'U``'mci f'ck b'VYZcfY'mci 'gi Va]h mci f'k cf_'''

5ggYgga Ybh'HUg_g'

5ggYgga Ybh'hJg_	K Y][\h	8i Y'8UHY	Gh XYbh@YUfb]b[Ci hWca Yg 5ggYggYX
9ggUmi))।	?YmXYZ b]h]cb`XiY': f]XUmcZ K YY_') " 9ggUmXiY': f]XUm K YY_',	%ž&
+b!WUgg``]ghYb]b['hYghg'	%) ।	HYghgik]``VY'\Y`X']bih\Y @YWhifYihjaYi]bikYY_gi(ž+ UbX'%\$	' <u>Ž</u> (
9h\bca i g]Wc`c[m8]Ufm	' \$ı	K YY_`mgi Va]gg]cb U	(ž)

5ggYgga Ybh'8YhJ]`g

5ggYgga Ybh'% '9ggUm

GHJfh:XUhY.

@Yb[h. XYZ]b]hcb" \$\$ k cfXgžZ]bU`YggUm% \$\$ k cfXg

5XX]h]cbU`XYhJ]`g.

: i ```XYhU]`g`k]```VY`[]j Yb`]b`a ccX`Y"`

 $\label{thm:continuous} \begin{tabular}{ll} Hi & fb & gYH & gYY Hi & fb & gYY Hi & fb$

5ggYgga Ybh& ±1!WUgg``]ghYb]b[hYghg

GhUfh'XUhY.

8YHJ]`g. '' 'L '%)!&\$ 'a]bi hYgA Uf_YX 'UbX fYhi fbYX"

5XX]h]cbU`XYhJ]`g.

: i ```XYHJ]`g`cZh\Y`@]ghYb]b[`@]ghik]```VY`Uj U]`UV`Y`cb`A ccX`Y"`

Hi fb]hjb gYhjb[. H\]g]g bchU Hi fb]hjb Ugg][ba Ybh

5ggYgga Ybh' . '9h\bca i g]Wc`c[m8]Ufm

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FYgci fWyg

DfYgWf]VYX F Ygci fWYg

gYY'A ccX'Y

FYWca a YbXYX FYgci fWYg

gYY'A ccX'Y

7ci fgY 9j U'i Uhjcb UbX 8Yj Y'cda Ybh

Ghi XYbhgʻk]``VYʻUV`YʻhcʻYj Uʻi UhYʻh\YʻWci fgYʻUbcbma ci g`mh\fci [\`a m9l dYf]YbW\"'\#\fYgdcbgYʻhc dfYj]ci gʻYj Uʻi UhJcbgʻ=\Uj YʻUXXYXʻUʻVfYU_ʻ]bʻWUggYgžʻWUf]ZJYXʻh\YʻX]ghJbWfJcbʻVYʻhk YYbʻdck Yfdc]bh'hcd]Wg UbX``YWhi fYʻbchYgž'a UXYʻh\YʻZcfa YfʻUj Uj`UV`YʻcbʻA ccX`YʻVYZcfYʻWUggYgžʻh\Y``UhYfʻUZhYfk UfXgžʻ[]j Ybʻa cfY]b!WUggʻUhhYbhJcbʻhcʻh\Yʻ@JghYb]b['HYghžVfc_Ybʻh\Yʻ@JghYb]b['HYgh]bhcʻ' 'ga U```Wca dcbYbhg''=\WUbbch [i UfUbhYYʻh\Uhh\Yʻ=k]``UX\YfYʻhcʻh\Yʻ@YWhi fYʻGW\YXi `YžUgʻh\]gʻk]``j UfmUWVcfX]b['hcʻghi XYbhei YghJcbg UbXʻa mgdcbhUbYci gʻUXX]hJcbʻcZbYk 'a UhYf]U`''<ck Yj Yfžbcʻ]hYaʻk]``VYʻ]bWi XYX`]bʻh\Y``]ghYb]b[Yl Ua]bUhJcbʻ]Z]h\UgʻbchdfYj]ci gʻmVYYbʻX]gWi ggYX`]bʻWUgg"

Gi Va |gg|cb cZ5ggYgga YbhHUg_g

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

Hi fb]h]b Gi Va]gg]cb

Image: Ybwci bhYf'U'dfcV'Ya k \Yb'UhYa dhJb['hc'gi Va]hmci f'Ugg][ba Ybht\fci [\ 'Hi fb]hJbž'd'YUgY

HY'Yd\cbY'9| hYfbU''Gi ddcfhcb'-',) '' ' ' %cf'Ya U] 'h\Ya 'cb'Y! hYfbU'hY'hgi ddcfh4 i bgk "YXi "Ui '"'Gi ddcfh
\ci fg'UfY', .\$\$Ua '-'\\$.\$\$da 'cb'k YY_XUmg'UbX'-.\$\$Ua '-') .\$\$da 'cb'k YY_YbXg'fl *) 'XUmg'U'mYUfŁ" Image:

UfY'i bUV'Y'hc'gi Va]hmci f'Ugg][ba YbhXi Y'hc'U'ZJi 'hk]h\ 'Hi fb]hJb'mci 'a UmUdd'mZcf'Ub'Y! hYbg]cbž'Vi hmci
a i ghfYhJ]b'mci f'hJW_Yhbi a VYf'Zfca '9! hYfbU''Gi ddcfhfU'cb['k]h\ 'Ubmch\Yf'fY'Yj UbhXcW a YbhgŁ'hc
]bWi XY'Ug'Yj]XYbW' 'hc'gi ddcfhmci f'Y! hYbg]cb'Udd']WUh]cb" Image: Ya U]''9! hYfbU''Gi ddcfhmci 'k]''

Ui hca UhJWJ''mfYW'] Y'U'hJW_Yhbi a VYfž'Vi h]Zmci 'hY'Yd\cbY'mci 'k]'''bYYX'hc'gdYWJZWJ''mUg_'Zcf'cbY''

Hi fb]hJb'U'gc'dfcj]XYg'i dXUhYg'cb'h\Y]f'gmghYa 'ghUh' g'cb'Hk]hYf"

; YbYfU``mž'UggYgga YbhiHug_g'a i ghVY'gi Va]hhYX'Y`YVWfcb]\W)``mj]U'Y]h\Yf'Hi fb]hjb'cf'U'A ccX`Y Ugg][ba Ybh'' =b']bgHJb\W'g'k \YfY'h\]g']g'bchdcgg]V`Yž']hk]``'VY'gHJhYX'cb'mci f'\\circ i fgY'g'A ccX`Y'g]hY'k]h\ U`hYfbUhj Y'gi Va]gg]cb'XYHJ]`g''

cfi]bZcfa Uh]cbicbi\ckihcigi Va]hUgg][ba Ybhgicbi]bYij]UiA ccXiY.i\hdg.#gh XYbh'i bgk "YXi "Ui #\ck! qi Va]hUgq][ba Ybha ccXiY

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

D`U[]Uf]ga i]gii g]b[ih\Yik cfXgicfi]XYUgicZch\YfgiUbXidfYgYbh]b[ih\Ya iUgimci fick b"i±i\WbihU_Yia Ubm Zcfa gžZfca iXYi]VYfUhYiW\YUh]b[ihciU\W]XYbhU`m\Wcdm]b[iZfca iUigci f\Wik]h\ci hiU\w_bck iYX[Ya Ybh'

IBGK [fcidg'd'U[]Uf]ga]bhc'h\Y'Zc``ck]b[WUhY[cf]Yg.

7 cdm]b[.'i g]b['h\Y'gUa Y'cf'j Yfmg]a]`Uf'k cfXg'hc'h\Y'cf][]bU`hYl h'cf']XYU'k]h\ci h'UW_bck `YX[]b['h\Y gci fW'cf'i g]b['ei chUh]cb'a Uf_g"'H\]g'U`gc'Udd`]Yg'hc']a U[Ygž'Ufh'UbX'XYg][b'dfcYWhgž'Ug'k Y``'Ug dfYgYbhUh]cbg'k \YfY'gca YcbY'dfYgYbhg'Ubch\Yf'g']XYUg'cf'k cfXg'k]h\ci h'WfYX]h'

⇒ Uddfcdf]UhY 'dUfUd\fUg]b[. '7\Ub[]b['U'ZYk'k cfXg'UbX'd\fUgYg'k\]Y 'a cghmfYhU]b]b['h\Y'cf][]bU`ghi Wh fY 'UbX#cf'dfc[fYgg]cb'cZ]XYUg'cZh\Y'cf][]bU`žUbX']bZcfa Uh]cb'k]h\ci hUW_bck`YX[Ya Ybh'H\]g'U`gc Udd`]Yg']b'dfYgYbhUh]cbg'k\YfY'gca YcbY'dUfUd\fUgYg'Ubch\Yf'g']XYUg'cf'k cfXg'k]h\ci h'WfYX]h'UbX'hc d]YW]b['hc[Yh\Yf'ei chYg'UbX'dUfUd\fUgYg']bhc'U'bYk'k\c`Yžk]h\ci h'Uddfcdf]UhY'fYZYfYbW]b['"

7 c``i g]cb.'k cf_jb['k]h\ch\Yfg'Vi hdUgg]b['cZZh\Y'k cf_'Ug'U'dYfgcb'g']bX]j]Xi U``k cf_"'7 c``i g]cb'U`gc]bWi XYg'dfcj]X]b['mci f'k cf_'hc'Ubch\Yf'ghi XYbhVYZcfY'h\Y'Xi Y'XUhYžcf'Zcf'h\Y'di fdcgY'cZh\Ya d`U[]Uf]g]b['UhiUbmh]a Yž'dUm]b['Ubch\Yf'dYfgcb'hc'dYfZcfa 'Ub'UWUXYa]WhUg_ž'ghYU']b['cf'UWei]f]b[Ubch\Yf'dYfgcb'g'UWUXYa]Wk cf_'UbX'Wcdm]b[']hz'cZYf]b['hc'Wca d'YhY'Ubch\Yf'dYfgcb'g'k cf_'cf'gYY_]b[dUma YbhZcf'Wca d'Yh]b['UWUXYa]Wk cf_"

±bUddfcdf]UhY`W]hUh]cb.`7]h]b[`gcifWrg`k\]W\`\UjY`bchVYYb`fYUXžk]h\cihUW_bck`YX[]b[`h\Y`″gYWcbXUfm″gcifWrZfca`k\]W\`_bck`YX[Y`cZh\Ya`\Ug`VYYb`cVhU]bYX"

8 i d`]\WUh]cb`ffgY`Zd`U[]\Uf]ga "Ł gi Va]\h]b[`mci f`ck b`k cf_ž]b`k \c`Y`cf`]b`dUfhžk \YfY`]h\Ug`dfYj]ci g`m VYYb`dfYdUfYX`cf`gi Va]\hYX`Zcf`Ubch\Yf`UggYgga Ybhcf\Wci fgY`UhI BGK `cf`Ubch\Yf`i b]j Yfg]\m'

7 cffYWnfYZYfYbWlb['dfUWnWyg.

• DUfUd\fug]b[z'gi a a Uf]q]b[z'YggUmk f]hb['UbX'ha Y'a UbU[Ya Ybh