ARTS3270

FYZYWA]b['cb'<]ghcf]Yg'UbX'<]ghcf]Ubg. '7 UdghcbY

HYfa 'Hk c''##'&\$&%

7ci fgY 8YW] g

7 fYX]hDc]bhg * *

Gi a a UfmcZh\Y'7ci fgY

Gi VYWh5fYU. <]ghcfmi

#J 'h\]g' WudghcbY 'Wti fgY 'mci 'k]``'&]b' U``'h\Y'ch\Yfgh XYbhg'a U^&f]b[']b' <]ghcfm']b' U'k YY_`mgYa]bUf XYg][bYX'hc'dYfZYWiUbX'fYZYWicb'h\Y'g_]``g'mci '\Uj Y'`YUfbYX']b'mci f'\]ghcfmXY[fYY"'Mci 'k]```X]gW gg'UbX Wf]h]ei Y'gca Y'cZh\Y'a cgh]bZi Ybh]U``\]ghcf]\W\'a Yh\cXc`c[]Yg'cZci f'h]a Y"'\Mci 'k]```WtbXi WiU'fYgYUfW\ dfc YWiYI d`cf]b['h\Y'di V`]\WUbX'dc`]h]\W\'fc`Y'cZ\]ghcfm'5bX'mci 'k]```WtbXi Wimci f'ck b'a U'&f'fYgYUfW\ dfc YWh'ZfUa]b['U'ei YgMab'UVci hih\Y'dUghih\Uh\Wb'VY'UX\formallor Y'\to YgYX\formallor Y\to Ybhg'Zfca df]a Ufmgci f\Wgzk\]'Y'Yb[U[]b['k]h\ fY\W\bhg\Xc`Ufg\]d']b'mci f']bhYfdfYhUh]cb'cZh\YgY'Yj Ybhg"

7 ci fgY @YUfb]b[Ci hWca Yg

%" Yj U`i UhY'a U'cf'h\Ycf]Yg'UbX'a Yh\cXc`c[]Yg'k]h\]b'h\Y'X]gWjd`]bY'cZ\]ghcfm

- &" XYa cbghfUhY`U`Wf]hJWU``i bXYfghUbX]b['cZh\Y'dc`]hJWU``]a d`]WUhJcbg'cZ\]ghcf]WU``k f]hJb[
- ' "]XYbhJZma i `hJd`Y`dfUWJWYg`cZ\]ghcfmUbX`Yj U`i UhY`h\Ya `]b``][\hcZ`dfcZYgg]cbU``ghUbXUfXg`cZ gW\c`Ufg\]d`UbX`Yh\]\W``VY\Uj]ci f
- ("WcbXi WhUb bXYdYbXYbhfYqYUfWX dfc YWh

HYUWX]b[GlfUhY[]Yg

5ggYgga Ybh

5```UggYgga Ybhg`UfY`Wca di `gcfm'

Mci a i ghk f]hY h\Y hcd]WcZh\Y YggUmcb h\Y Z]fghdU[Y"I gY Ub YUgmZcbhhc fYUX fY"[""J YfXUbU '%\$ 5 f]U` %\$ H]a Yg B Yk F ca Ub '%£' UbX 'Xci V'Y!gdUW mci f'dUfU[fUd\g"

 $5gg][baYbhg'aighVY'Z'`mfYZYfYbWYX'''KY'igY'ZcchbchYgž'bchYbXbchYg'''H\Y'gmghYa''igYX']b'h\]g WcifgY']g'h\Y'7\]WU[c'ghmY''gYY'\hrd.#k kk''W\]WU[caUbiU'cZghmY''cf[#ncc`gSW]hUh]cb[i]XY#\]hUh]cb! [i]XY!\%'\ha`$

 $HYZCchbchYgUbXVVV^*[c[fUd\mUfYbYjYf^*]bWiXYX^*]b^*hY'kcfX'Wcibh'$

5ggYgga YbhHUg_g

5ggYgga Ybh'tUg_	K Y][\h	8i Y'8UHY	Gh XYbh@YUfb]b[Ci hWca Yg 5ggYggYX
8 lgW gglcb ei Yghcbg	&\$ı	9j Yfmk YY_ž'VYZcfY GUhi fXUmž'‰da	%ž'&ž''
F YgYUfVX 'YggUmdfcdcgU` UbX 'UbbcHJHYX'V]V`]c[fUd\m	&\$ı	\$(#\$+#&\$&%`%%\$\$`DA	%ž'&ž'(
F YgYUfW. '9ggUm'	* \$1	\$%#\$, #&\$&%`%%\$\$`DA	%ž'&ž'(

5ggYgga Ybh'8YhJ]`g

5ggYgga Ybh% 8]gW gg]cb ei Ygh]cbg

GhUfhiXUhY. '&-#\$) #&\$&%'\% \$\$ DA

8 YW] g.

Ghi XYbhgik]```gi Va]hcbYiei Ygh]cbidYfik YY_if]"Y"'- iei Ygh]cbgŁcZi dihcii \$ik cfXgiYUWX"'E i Ygh]cbgi\Uj Yihc VYigi Va]hhYXidf]cfihcigYa]bUfg"

: YYXVUW_i jU'U'fi Vf]W

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

Mci `\Uj Y`hc`gi Va]hcbY`ei Ygh]cb`fY`UhYX`hc`h\Y`fYUX]b[gžk \]W\`k ci `X`h\Yb`VY`i gYX`hc`ZfUa Y`h\Y`WUgg X]gW gg]cb"

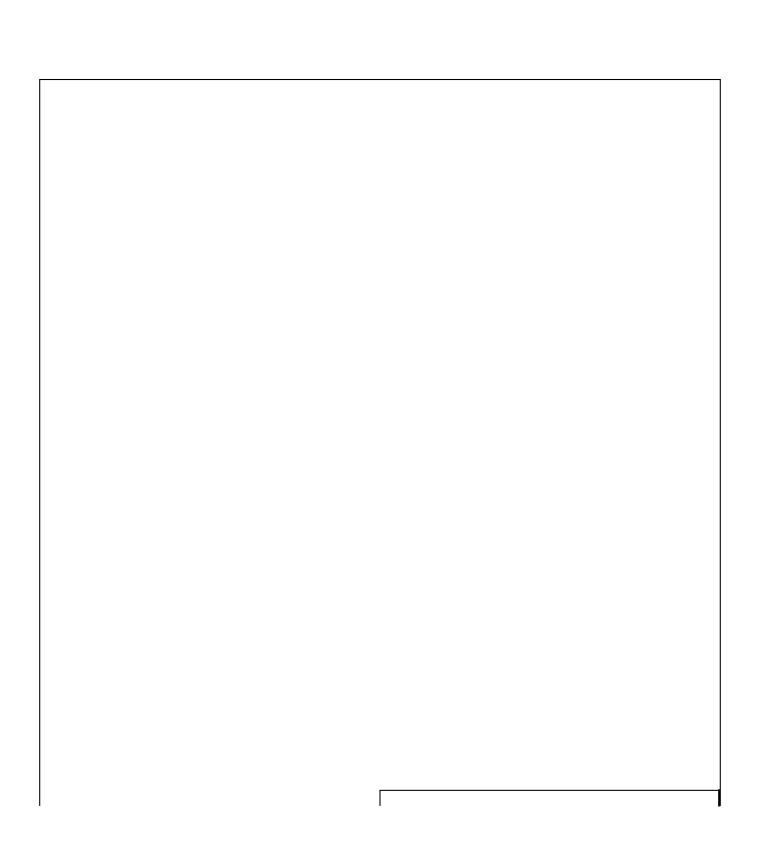
Mci fei Yghlob cfcVgYfj Uhlob \Ug hc VY WYUfmZcfa i `UhYX"

9a U]`a Y'mci f'ei Ygh]cb hc g"VY`a Yggci g4 i bgk "YXi "Ui

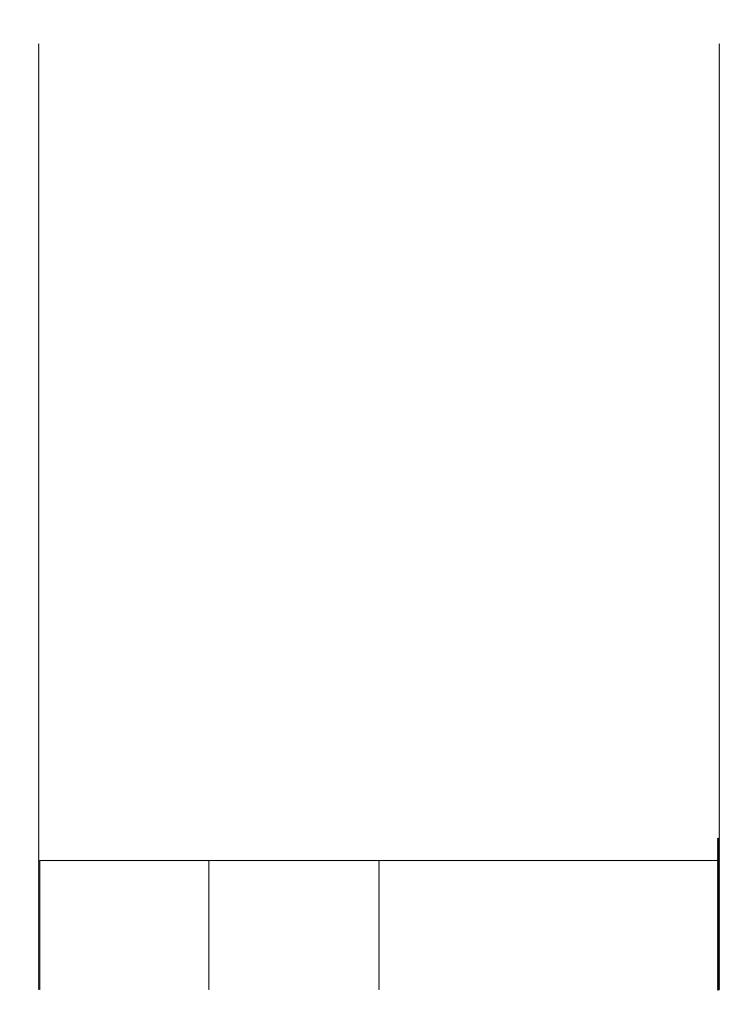
 $\label{eq:higher_problem} \mbox{Hi fb]h]b "gYhh]b[. "H\]g"]g"bch"U"Hi fb]h]b "Ugg][\mbox{ba Ybh}$

Mci 'a i ghWcbhUWia Y'k Y``']b'UXj UbW'hc'dfYgYbhmci f'dfc'YWiUbX'a U_Y'gi fY'h\Uh']hgUh]gZ]Yg'h\Y Ugg][ba YbhfYei]fYa Ybhg"

5 bmiYggUmihcd]WbchX]gWiggYX'k]h\ 'a Y 'VYZcfY'h\ Y 'XYUX`]bY'k]``'Ui hca Uh]WU``mifYWi']j Y 'bc'\][\Yf'h\ Ub'U : U]`"



K YY_'' .'%) '>i bY'!'%	GYa]bUf	<pre><]ghcf]WU`'gWXc`Ufg\]d'UbX'UXj cWUWm</pre>
21.01		5 fy `\]ghcf]Ubg gi V Y White Y h\]WU``ghUbXUfXg V Y mcbX k\Uh]g fY ei]fY X Zcf'h\Y di V`]WUh]cb c Z h\Y]f'k cf_]b dY Y f! fY j]Y k Y X 'ci fbU`g fY "["'hfi h\Z ``UbX Wca d`Y hY fY dcfh]b['c Z df]a UfmYj]X Y b WY 'gci f W gž`c[]WU` Uf[i a Y b hUh]cb ž W]hUh]cb 'c Z]b Zi Y b h]U``cf'ch\Y fk]gY]a dcfhUbhg Y Wcb X Ufmgci f W g L3: cf'Y I Ua d`Y ž g\ci `X h\Y m di V`]W m X]gW gg ']ggi Yg 'cb `mk]h\]b 'h\Y]f X ca U]b 'c Z g W c` Uf m Y I dY fh]g Y 3 A i gh h\Y m W cbg]X Y f h\Y 'gc W]U``]a dU W ic Z h\Y]f 'g W c` Uf m k cf_']b di V`]g\]b ['cb 'W fhU]b 'ei Y gh]cbg 'Ub X #cf'i g]b['W fhU]b gci f W g 3 'C b W ']h]g 'di V`]g\Y X ž X c' h\Y m V Y Uf' Ub m ch\Y f 'f Y g d cbg]V] h Y g']b 'X Y g W [V]b [']h]b 'di V`]W j Y bi Y g 'gi W 'Ug 'h\Y W ci fh f cca 3
		H\Y'dc]bmYbX'cZgi W\'ei YghJcbg'\Ug'VYYb YI dYf]YbWX'Vm]a dYf]U``\]ghcf]Ubg'k cf_]b['cb ei YghJcbg'cZbUhJj Y'hJhY"'+b'h\]g'WUgg'k Y'k]`` Wcbg]XYf'\]ghcf]Ubgfifc'Yg']b'h\Y'`UbX'`]hJ[UhJcb'WUgYg cZh\Y'% - \$g'UbX'&\$\$\$g'UbX'XYVUhY'\]ghcf]Ubgfi Yh\]WU``fYgdcbg]V]`]hJYg'hc'h\Y]f'gi V'YWgž'Ui X]YbWYgž UbX'dfcZYgg]cbU``Wcaai b]hJYg"
	<ca cf_<="" td="" yk=""><td>7 ci fgY fYUX]b[g]b@Y[Ubhc</td></ca>	7 ci fgY fYUX]b[g]b@Y[Ubhc
K YY_'(.'&%'>i bY'!'&)	< ca Yk cf_	7 ci fgY fYUX]b[g]b @Y[Ubhc
>i bY	GYa]bUf	H\Y'GcW]U`'Hi fbA Ufl]ga<]ghcfmZfca 'VY`ckGcW]U`'\]ghcfm
		#i]g`cZhYb`gU]X`h\Uh'"\]ghcfm]g`k f]hhYb`Vmh\Y k]bbYfg""`Gcž\ck `Xc`k Y`UddfcUW\`\]ghcfmZca `h\Y dYfgdYWhj Y`cZh\cgY`k \c`k YfY`X]gYa dck YfYX`UbX X]gYbZfUbW\]gYX3`< ck `WUb`k Y`i bXYfghUbX`h\Y``]j Yg cZh\Y`gi VU`hYfbg`cZh\Y`dUghžYj Yb`h\ci [\'h\Ym hmd]WU``m`YZhbc`k f]hhYb`fYWcfXg`cZh\Y]f`ck b3
K YY_")."&, ">i bY"!"&">i `r	m GYa]bUf	H\Y'7i `hi fU``Hi fb
		A cbXUm
		 Dcgha cXYfb]ga 'UbX'dcghlghfi Wi fU`]ga : fca 'K ca Ybfg'\]ghcfmhc'; YbXYf'<]ghcfm DcghWc`cb]U``\]ghcfm
		H\i fgXUm': cW g'cb'; YbXYf'UbX''< Yfglcfm



FYgci fWyg

DfYgWf]VYX F Ygci fWYg

 $5 ```fYei] fYX`UbX`fYWc a a YbXYX`fYUX]b[g`Zcf`YUWX`gYa]bUf`k]```VY`dcghYX`hc`@Y[Ubhc"`-$Zh\YfY`UfY`Ubm dfcV`Ya g`UWW`gg]b[`h\Y`fYUX]b[ž`U`Yfha Y`Vm`Ya U]``]a a YX]UhY`m`UbX`=k]```Y]h\Yf`fYWf]Zm`@Y[Ubhc`cf`dcgh`UdXZ]b`A ccX`Y"$

FYWca a YbXYX FYgci fW/g

GYY UVci Y"

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

7 ci fgYgʻUfYʻdYf]cX]WU``mfYj]Yk YXžʻUbXʻghi XYbhgʻfiZYXXVUW_`]gʻi gYXʻhc`]a dfcj Yʻh\Ya "`: YYXVUW_`]g [Uh\YfYXʻZfca ˈghi XYbhgʻi g]b[ˈa m9l dYf]YbWl"'=i]gʻYbWci fU[YXʻghi XYbhgʻWca d`YhYʻh\Y]fʻgi fj YmgʻVm UWWfgg]b[ˈh\Y`dYfgcbU`]nYX`k YV``]b_j]Uʻh\Y`A ccXY`Wci fgY`g]hY'"

: c``ck]b['Zcfa U``UbX']bZcfa U``gh XYbhZYYXVUW_``UghmYUfž'≢jiY'hU_Yb`ghYdg'hc'Ybgi fY'h\Y'fYUX]b['`cUX']g a cfY'a UbU[YUV'Yž'UbX'W\Ub[YX'h\Y'Z]bU``gYa]bUf'gi VYWhc'cbY'h\UhfYZYWhg'a cfY'WYUf`mcb'h\YX]gW]d`]bYfgiZ hi fY"

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 Ybhh\fci [\'Hi fb]h]bz'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'mYUft"'=I'mci
UfY'i bUV'Y'hc'gi Va]hmci f'Ugg][ba YbhXi Y'hc'U'ZJi 'hk]h\'Hi fb]h]b'mci 'a UmUdd'mZcf'Ub'Y! hYbg]cbz'Vi hmci
a i ghfYhJ]b'mci f'h]W_Yhbi a VYf'Zfca '9! hYfbU''Gi ddcfhfU'cb['k]h\'Ubmch\Yf'fY'Yj UbhXcW a Ybhgthc
]bWi XY'Ug'Yj]XYbW' hc'gi ddcfhmci f'Y! hYbg]cb'Udd']\WJh]cb"'=Imci 'Ya U]''9! hYfbU''Gi ddcfhmci 'k]'`
Ui hca Uh]\WJ'`mfYW']j Y'U'h]\W_Yhbi a VYf'ZVi h]Zmci 'hY'Yd\cbY'mci 'k]'`bYYX'hc'gdY\WZ\WJ'`mUg_'Zcf'cbY''
Hi fb]h]b'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)``mij]U'Y]h\Yf'Hi fb]h]b'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`hYfbUhjj Y'gi Va]gg]cb'XYHJ]`g''

cfi]bZcfa Uhjcbicbi\ckihcigi Va]hUgg][ba Ybhgicbi]bYij]UiA ccXiY.i\hdg.#gh XYbhi bgk "YXi "Ui #\ck! gi Va]hUgg][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=hWJbihU_Yia Ubm Zcfa gžZfca iXYi]VYfUhYiWXYUh]b[ihciUWW]XYbhU`mWcdm]b[iZfca iUigci fWYik]h\ci hiUW_bck iYX[Ya Ybh'

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

- i bXYfgHUbX'mci f'f][\hg'UbX'fYgdcbg]V]`]h]Yg'Ug'U'ghi XYbh'Uhi BGK VY'Uk UfY'cZd`U[]Uf]ga ž'Wcdmf][\hž'I BGK 'Ghi XYbh'7cXY'cZ7cbXi Wh'UbX'5VWWdhUV`Y'I gY'cZ IBGK =7 H°F Ygci fW/g°Dc`]Wm