

ARTS1541

±blfcXi Wcfm; fYY_'6

HYfa 'H\fYY''##'&\$&\$

7ci fgY[·]Cj Yfj]Yk

GhJZZ 7 cbhJWh 8 YhJ] `g

7cbj Ybcfg

B Ua Y	9a U]`	5j U]`UV]`] m	@cWUhjcb	D\cbY
9 <i>I</i> fcg]b]*8Y`][]Ubb]	Y"XY`][]Ubb]4 i bgk "YXi "Ui	_		f\$&Ł'-',) &%,

7ci fgY 8YHJ] g

7 fYX]h'Dc]bhg'*

Gi a a UfmcZh\Y 7ci fgY

H\fci [\'h\Y'ghi XmcZh\Y'`Ub[i U[Y'UbX'W\'h fY'mci 'k]```Z fh\Yf'XYj Y`cd'Ub']bZcfa YX'i bXYfghUbX]b['cZ; fYY_'YI dYf]YbW'gž'W\'h fYg']b'[YbYfU`ž'gcW]Yh]Yg'UbX'k cf'X'j]Yk g"'Mci 'k]```\Uj Y'h\Y'cddcfh b]hmhc
Z fh\Yf'XYj Y`cd'`]b[i]gh]Whcc`g'hc'VY'UV'Y'hc'UWei]fY'a cfY'XYhU]YX'Wca a i b]WUh]j Y'g_____hjj Y %

H\fci [\"h\Y"ah

‰ \"'5a'7cf' **b**bfc

la\":5a:7cf'±btfcXi Wtcfmi: fY

1h 'Q

5ggYgga Ybh

 $8YHJ]YX"]bZcfa~UH]cb"UVci~hUggYgga~Ybhk~]```VY"i~d`cUXYX"i~bXYf"3~eeWee_~W~f~;`~Xad_~Sf[a`~cb"A~ccX`Y"'H\Y~fYWca~a~YbXYX"fYZYfYbW]b[~igngHYa~i]g"5D5"$

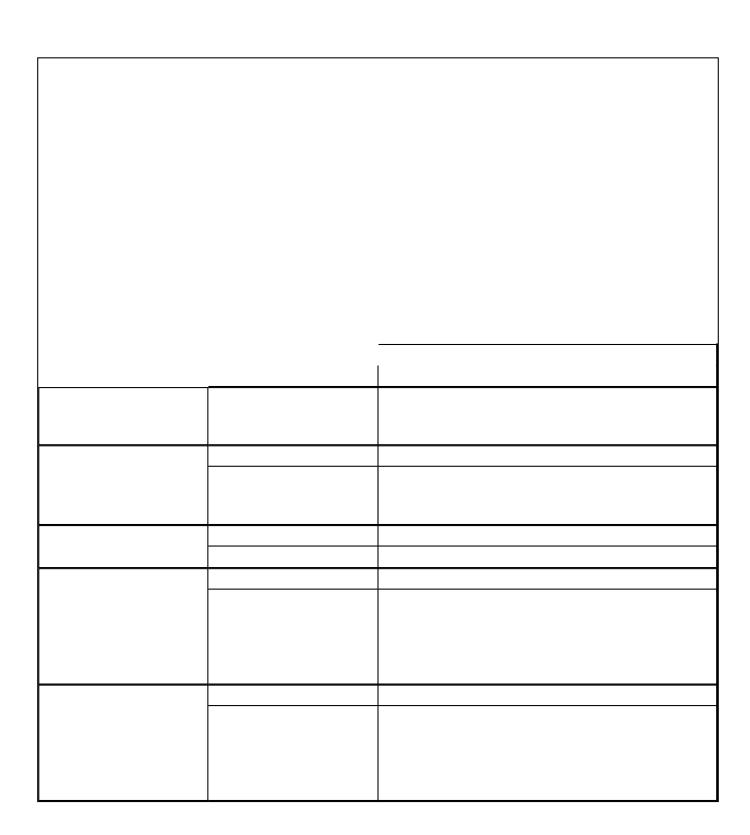
5ggYgga Ybh'HUg_g'

5ggYgga Ybh'hUg_	K Y][\h	8i Y'8UHY	Gh XYbh@YUfb]b[CihWca Yg 5ggYggYX
@]ghYb]b['E i]n'	&\$I	&, #%\$#&\$&\$`\$&.\$\$`DA	&

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

5ggYgga Ybh'' . 'CfU` dfYgYbhJh]cb

GHUfh'XUhY.



FYgci fWyg

DfYgWf]VYX F Ygci fWfg

 $\pm i]g'U'gc''][\mUXj]gUV'Y'h\ Uhimci 'Vi miU'; \ fYY_!9b[`]g\#9b[`]g\!; \ fYY_'X]Wh]cbUfm''H\Y'DcW_YhClZcfX ; fYY_'8]Wh]cbUfm']g'fYWca a YbXYX.$

>"H"Df]b['&\$\$\$" DcW YhCl ZcfX'; fYY '8]Wf]cbUfm" Cl ZcfX. 'Cl ZcfX'l b]j Yfg]lm:DfYgg"

5 hci [\'bchUVgc'i hY`mYggYbhJU'ž'Ug'h\Y'Wci fgY'dfc[fYggYg'mci 'a Um'U`gc'Z]bX'; fYY_'[fUa a UffYgci fWfg'j Yfm\Y`dZ\`'fa mfYWca a YbXYX'gY`YWJcb'k]``'VY'i d`cUXYX'cb'A ccX`Y'i bXYf'3VV[f[a` S^5a` fW f DWeagdJWeŽ9 dWJ] 9 dS__ Sdz''

FYWca a YbXYX FYgci fW/g

• 5XX]h]cbU`FYUX]b[g.

A "'DUdU_mf[]ci / 'J "'DUbU[]ch]Xci 'f&\$%(t''? `]_'ghJ'9``]b]_U'f7`]W_'cb'; fYY_t''@Yj Y`'5%"'H\YggU'cb]_].
7 YbhY 'Zcf'; fYY_'@Ub[i U[Y'fUj U]`UV'Y'Uhl BGK '`]VfUfmUbX'l BGK 'Vcc_g\cdt''

? "/ : "'5fj Ub]hU_]g"'f&\$\$&`UbX``UhYf`YX]h]cbg\!"'9d]_]bcb]ghY'9``]b]_U'%ff7 ca a i b]\WhY']b'; fYY_'%\!"'5h\Ybg. 8Y`hcg'Di V`]\Wh]cbg`fUj U]`UV`Y`Uh'I BGK ``]\VfUfm'UbX`I BGK \Vcc_g\cd\!"

 $8 \text{ "'Hc`]Ug`YhU`"'f\&\$\%\&"'? gY_]bcbhUg`fGhUff]b[\text{ 'C} Z\&"'5h\Ybg. '< Y``Yb]W5a Yf]WUb`I b]cb`fk]h\'' \text{ 'Ui X]c`78gL}fUj U]`UV`Y`UhI BGK ``]VfUfmUbX`I BGK `Vcc_g\cd\L'''$

• K YVq]hYq.

 $\label{thm:mkkkk} $$ h' = [f\#3]1 YUfb]b["Yb" ca Y fh Y cZ] h' cZh Y < Y`Yb] W5a Yf] WUb'I b] cbžk \] WX'] bWi XYg'UXX] h' cbU`Y`YWfcb] WfYgci fwYg'Zcf'h]g Wci fqYL $$$

`\hd.#k k k"| Ubh\]"]`gd"[f#]`c[#fl]`c[`cgg]U`]g`h\Y`VYghcb`]bY`Wci fgY`Zcf`A cXYfb`; fYY_`VY[]bbYfg`dfcj]XYX`Vmh\Y`=bgh]h hY`Zcf`@Ub[i U[YUbX`GdYYW\`DfcWfqq]b[Ł

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'''=\mathred{Image: Wa Jhmci f'Ugg][ba YbhXi Y'hc'U'ZJi 'hk]h\'Hi fb]h]b'mci 'a UmUdd'm\mathred{Image: Wa Jhmci f'Ugg][ba YbhXi Y'hc'U'ZJi 'hk]h\'Hi fb]h]b'mci 'a UmUdd'm\mathred{Image: Wa Jhmci f'Ugg][ba YbhXi Y'hc'U'ZJi 'hk]h\'Hi fb]h]b'mci 'a UmUdd'm\mathred{Image: Wa Jhmci f'Ub'Y! hYbg]cb\mathred{Image: Wa Jhmci h\Yf'f'Y'j UbhXcW a Ybhg\mathred{Image: Wa Uj''9! hYfbU''Gi ddcfhmci 'k]'`

JbWi XY'Ug'Yj]XYbW' hc'gi ddcfhmci f'Y! hYbg]cb'Udd']\wUh]cb"'\mathred{Image: Wa Uj''9! hYfbU''Gi ddcfhmci 'k]'`

Ui hca Uh]\wU'`mfYW']j Y'U'h]\w_Yhbi a VYf\mathred{Image: hY'Yd\cbY'mci 'k]\tag{Y}\wu''mug_'\mathred{Image: Wa'\mathred{Image: hY}\wu''mug_'\mathred{Image: hY}\wu''mug_'\mathred{Image: hY}\wu''mug_'\mathred{Image: hY'Yd\cbY''mci 'k]\tag{Y}\wu''mug_'\mathred{Image: hY'\mathred{Image: hY'\mathred{I

; 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 bXYfgfUbX mci f'f][\hg'UbX'fYgdcbg]V]`]hJYg'Ug'U'gh XYbhUhl BGK
- VY`Uk UfY`cZd`U[]Uf]ga ž`Wcdmf][\hz'l BGK `Gh XYbh7cXY`cZ7cbXi WhUbX`5VWWdhUV`Y`l gY`cZ I BGK `=\forall H`F Ygci f\W\g`Dc`]\m\m
- VY 'Uk UfY 'cZh\Y 'ghUbXUfXg 'cZVY\Uj]ci f'Yl dYWYX 'cZYj YfmcbY ']b 'h\Y 'l BGK 'Wca a i b]hm
- `cWUHY 'gYfj]WYg'UbX ']bZcfa UH]cb'UVci hI BGK 'UbX'I BGK '@]VfUfm

Gca Y'cZh\YgY'UfYUg'k]``VY'ZJa]`]Uf'hc'mci ž'ch\Yfg'k]``VY'bYk"'; U]b]b['U'gc`]X'i bXYfgHJbX]b['cZU``h\YfY`UhYX'UgdYWng'cZ9@+69'k]``\Y`d'mci 'a U_Y'h\Y'a cghicZmci f'ghi X]Yg'UhI BGK "'\\hd.##qi VYWfi |XYg"`]VfUfm'i bqk "YXi "Ui #\`]qY#JVci hY`]qY