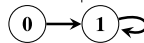
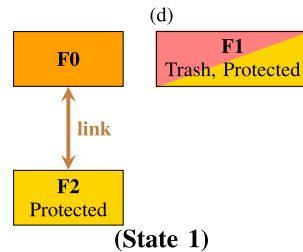
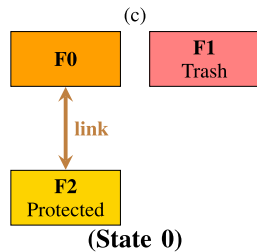


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:Zkf d\ (SoU d\ h d R WfJe d\GV RJZ X 5I _Ze d\c TRd\ UvZTeUJm f RJj !S" R_UXcPaYZRJj !T"o!U%_ 5I _Ze d\c TRd\ YRd h` T^ a` _V_ ed! (" 5 gRj f ReZ`\_#h YZY` f dZ Vd R dTV ReZ #R U!)" 5 T^ ^ R U#h YZY` f dZ Vd eV Wc^ f \$

```
(a)
1. var sig File { var link : lone File }
2. var sig Trash in File {}
3. var sig Protected in File {}
4. pred ProtectedNotTrashed {
5.   no Protected & Trash --incorrect
6.   --always no Protected & Trash --correct
7. }
8. run ProtectedNotTrashed for 3
```

```
(b)
1. val Test1 {
2.   some disj F0, F1, F2: File {
3.     File = F0 + F1 + F2, File' = F0 + F1 + F2
4.     File'' = F0 + F1 + F2
5.     Protected = F2
6.     Protected' = F1 + F2, Protected'' = F1 + F2
7.     Trash = F1
8.     Trash' = F1 + F2, Trash'' = F1 + F2
9.     link = F0->F2 + F2->F0
10.    !ProtectedNotTrashed[]
11.  }}
12. run Test1 for 3 but 2 steps
```



, < " : Rfjg RJ]j ^`UMj`WRtJVdjb^`eRdY TR_R_UWfJedvgVRJZX5I_Ze/cdTRdV

JRdf_Uvc/cd/5_e/cdTRdV aRcdVd ZANV gRjf ReZ _ Zd R gRJZU
Z_dR_TVWc/cVT ^ ^ R_UmHYVcWc/#5I_Ze/cdTRdVdRJ]`h
eVf dVc e` Vi aJZJj TYVt ZNR dAVTz T dTV_RcZ ZdT cVTej
XV_VcRau` cadvgV_eUSj eVWc^ fJRdf_Uvc/cd/hYVXcRaY\$
ZTRJ UvaZTeZ _ Zd hYReeV5_Rj kVch` fJUGZf RJj acdV_ee
eVf dVc ZANV eM f RJ gRjf ReZ _ Z : ZX%S ZdVi Vtf eU%
: `c eV eM f RJ dVcdV\_eReZ \_ #JZVd) \$0` f eZ V eV gRjf \$
ReZ _ f dZ X Vi ZbV_eRj bf R_eT ReZ _ !VRPH` R\_U eV UZd` Ze
`aVRe`c !GLVM` e` Ut_V f_ZbV VjV^ V_e d f dU e` RcdZ_
gRjfVd e` eV dVd` W eV ^` UMj !8LOH#OLQN#?UDVK#R_U
=URWHFWHG`%f T\_gj TYR\_XVd e` ^ f eSJVd e` W eV ^` UMj#
eV acZ` V` aVRe`c !q\_r" Zdf dUHYV acZ` V` aVRe`c RJ]` h dR
f dVc e` dWc e` V eV dV d eV d` WR\_Vi acVdZ`_#A%#Ha cWVd
e` eV gRjf V` W eV dYAU Sj` \_V d eV V/c eV cU h` eV eZ` V\$
JZV_eZ` V(` ` f eZ Vd eV T ^ ^ R_U#h YZY dAVTz Vd eReeV
Wc^ fJRf_Uvc/cdZi eV acVZTReV =URWHFWHG;RW?UDVKHG
R_U eReeV gRjf ReZ _ Zd Vi aVTeU e` SV\_Z gRJZU!q r"%eZ` V
() Zd dV aR eV RJ R_5J]` j T ^ ^ R\_U e` Vi Vtf eV eV e/cdTRdV%
= 5J]` j #d eV \$SRdU dTV\_RcZ d R cV RJ] JRd d#^ VR\_Z` X eRe
eV RJ d eV V eV c` adSRt e` RadVgZ f d eV c` ad e
Z dV V%` c` f c Vi R^ aJ V e/cdTRdV#eVj` a d eV Z d R dV Vj` a
`\_ d eV (#Rd dW\_Z\_eV eZ` VjZ` V` W eV d ReeV S` e e` ^` W
: ZX%#f V_d f dV`\_j eV dV M aJZJj` f eZ VUJRd dZ d eV
SJV#eV M Vtf eZ` T ^ ^ R\_U f dV d R dV aV` W eV (VWHSV%

' ;;>G

5J]` j Z\_e` Uf TVd^ f eReZ _ eV dZ` XWcgVcdZ` _ , %R_UVRcJZc
`W5J]` j) #*` #h YZY Wtf dVd` _ cVReZ_Rj#t c d eV dVc
J` XZ` R_U d eV eV g j %

345-8" 5J]` j , ^ f eRe` aVRe` cd

CaVRe` c	8 VdTrZaeZ`_
ACF	A f eZaJZJj CaVRe` c FVaJRTV^ V_e
ECF	E f R_eZ` Vc CaVRe` c FVaJRTV^ V_e
ECFI	E f R_eZ` Vc CaVRe` c FVaJRTV^ V_eh Z eY I _Rj
ICF	I _Rj CaVRe` c FVaJRTV^ V_e
6CF	6Z_Rj CaVRe` c FVaJRTV^ V_e
@CF	@Z e CaVRe` c FVaJRTV^ V_e
IC=	I _Rj CaVRe` c = dV eZ`_
6C8	6Z_Rj CaVRe` c 8 VjV eZ`_
IC8	I _Rj CaVRe` c 8 VjV eZ`_
@C8	@ XZTRJ CaVRe` U8 VjV eZ`_
D68	D R dXcRaY 6` Uj 8 VjV eZ`_
6C9	6Z_Rj CaVRe` U9i TYR_XV
=9C9	=^ aJj \$9j dV CaVRe` U9i TYR_XV

##" / ED?D: 8?8B4D@ 4?7 4ED@ 4D87 D8D: 8?8B4D@

5J]` j RaaJZd ^ f eReZ \_ `aVRe` cd e` 5J]` j 5GH` _ Uvd%
HYV Tf cV_ej d f aa` c dU^ f eReZ \_ `aVRe` cd TR_SV dV_Z
HPSJV (%FVaJRTV^ V_e^ f eRe` \_ aVRe` cd hZ] ch Ra J` XZTRJ
`aVRe` cd eRe Vj] Z e` eV dR^ V TJRdZ TReZ \_ Z 5J]` j sd
XcR^ ^ R eV V%#cVaJRTZ` X dV eZ` eV cVTeZ`_ q_ 5r hZ eV dV e
f_Z`\_ q\_ 5% GVaR eV j # 9 <? cVaJRTVd Rbf R\_eZ` VUWc\$
^ fJR hZ eV R dV e^ f eZaJZJj Wc^ fJR eReaVj dZTRJj dYRcd
eV dR^ V` aVRe` c dVj]Z` X#V%#q67 D0 4 ^ 5r SVT^ Vd
q67 4% 9i TYR_XV^ f eRe` \_ aVRe` cd hZ] ch Ra eV` dVc` W`
`aVRe` U dWc` J` XZTRJ` aVRe` cd hZ eV ^ f eZaJZJj` aVRe` U dV%#
q# \$r^ f eRe` d eV q# #% = dV eZ` _ ^ f eRe` \_ aVRe` cd hZ]

GVT_U# 5]]j` faURvD - V ZbZX ^fR\_e`avRècd
 cVjReUè f_Rj R_USZ_Rj M adVbZ_dR_UWc`fRd#hYZY
 RTT`f\_eWcè/`a`cRj`avRècdèReteèV`^JU`WacVgZ
 `fclj M ZbZX XcR^`Rc dèfTècVdW`^ 5]]j` , R_UVcRZVc%
 G`^V`WèVdVfaURvDRcVdèRZXèVchRcU#hYVèVèV`fR_e
 `avRèc`_lj _WUd è SV ^RUJ RhRèV`WèV`Vh è/`\$
 a`cRj`avRècd#V%#? 9< Zl ^RUJ RhRèV èRe DOZD\V#
 HYHQWXDOO\#DIWHU#EHIRUH#KLVRULFDoo\#R_U VLQFH
 Wc` Rè/`a`cRj`avRècXc`fa R\_UhYV`_`V Zl V_T f_\$
 èCVU#? 9< d`fJU TcVè/` ^fR_e#`cVa]RTZX èV`cZX_Rj
 f_Rj è/`a`cRj`avRèc hZV Rj]`WèV cV`RZ\_X t gVè/`\$
 a`cRj`avRècd%

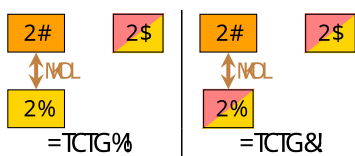
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 _ \$Mof ZpRJV_#hPd eVT f _e/cM R^ aJVh ZJ] T _eRZ UZWV_e
 RdZK ^ V_ eLd 8LOH WcReJVRch` dReVch YZYh ZJ] _lj SV
 a` dZSVWc eVgvcZ \_` W eV^` UJ] eReT _eRZ dR^f eSJV
 8LOH dZ_Ref dV% ZjV_ eV @9 5` c @9 0 `aVdR e#eYzh ZJ]
 VZVc SV eV ^f eR_e^` UJ] `c eV `cZK\_RJ ^` UJ] Sfe_` e
 S` e`hYZlTYVn Rjd JVeId dTR eTY ZVR @9 5` c @9 0 `aVdR e
 YRaaV_d e SV Vbf ZpRJV_#hYZTY T fJU SV a` dZSV Z#Wc
 Z_dR TV#eVcV Rv d ^ V RUUZ`\_RJ T \_d eRZ eLZ eV^` UJ]
 eReV_Uf a dVdZT eX eVSWRgZ c` WR^f eSJV dZ\_Ref dV` c
 dVReZ` d fTY eReZeVWTeZVij TR `eTYR XV%

!! /5<?>A1; G5BC75=5A1G=>

K YV_ eVV Vof ZJRJV_TV TYVT\ dVf c_dRT f_ eVcM R^ aJV#_`e`_j j ZIdV^ f eR_e`\_ Vof ZJRJV\_#eV T f\_ eVcM R^ aJV XV\_ \$ VcRvU TR\_ SV e f\_c VU Z\_e R^ f eR\_ eA ZJZ X eVc TRdV%6 d R dVf]# 5]] j` ZIdRSJV e dZ f]eR_V f dJj XV_VcRv^ f eR_ ed R_U R eVc d f ZV eRe h ZJ RTYZgV R('` ^ f eR\_e`_ dT cV% DcZ c e` 5]] j` #5I _Ze eVc TRdVd`\_j j cVdR`_ VU` gVc R d eR\_eT dTV\_RcZ %K ZY 5]] j` -#dTV_RcZ d TR_` h \_ReZVj SV d eRvWj#h YZY ^ VR\_d eReY` h 5I _Ze d aa` c eV UVT\$ JReR\_e`_ `WR gRj f ReZ`_ _VUd e` SV f aURvU%h YR\_UjV eV Uj \_R^ ZI TYR\_XVd#h V f aURv 5I \_Ze eVc TRdVd e` Z TJf UV TYR_XVdSVh W_ d eRv d` V eV acZ` V` aVcRe cI q r`%h ZJf d e eRe#T`_ dZUc eV WJ]] h Z_X dVX^ V_e W^ eV eM e f Rj eVc TRdV_Z : ZK%51

+& =URWHFWHG 2 8 (,& =URWHFWHG 2 8' \$ 8(% =URWHFWHG 2 8' \$ 8(

HYVZ_ZeRj d eRv ZId` f eZ\_VU\_Z =URWHFWHG#eV dV T`_ U d eRv ZId` f eZ\_VU\_Z =URWHFWHG#a#R\_U eV t`_ Rj]` a d eRv ZId` f eZ_VU_Z =URWHFWHG%6 VTRf dV eV t`\_ Rj ]` a d eRv ZId` f eZ\_VU\_Z e Wc^ Rj Rd` #5I _Ze eVc TRdVd` f eZ\_V\* d eRv d# W h YZY`_j j e h` R cV f`_ Zof V h YV JRe d eRv #eV]` a d eRv #h ZJ Rj h Rj d SV Vof ZJRJV\_e e` d ^ V VcRj Zc d eRv h YV T f_ eVcM R^ aJV SVZ_X T gVcVU h ZJ d eV T J h YZY d eRv e` cV aV eR d eV ]` a d eRv % = RUUZ`\_#h V f aURv eV 5]] j` T ^ ^ R_U eV eM VTRf eV d R eVc TRdV e` V aJ ZJ eJ` f eZ_V Y` h ^ Rj d eRv eR d eZ`_ d R cV acV dV_e f dZ_X eV VWHSV \Vj h` dU h YV ; VWHSV \Vj \$ h` dU eJ] d eV 5_Rj kVc e` dV eR TY Wc dTV\_RcZ d h ZY f a e` ; d eRv eR d eZ`\_ d#Z TJf UZ\_X eV ]` aZ_X eR d eZ`\_ %h YV f dV` W VWHSV ZId_VTV d Rj e` V\_d f cV eRe eV 5I \_Ze eVc TRdV` f eZ_Vd`\_ V d eV T Z dTV\_RcZ R\_U`_ e` f eZaJ V dTV\_RcZ d% 5]] j` #eV UWRf j e`\_ f^ Svc` W d eV adT`\_ dZUcVU ZId(` #h YZY ^ VR_d Wc Rj eVc gRj f ReZ`\_ f eZ\_Z X J V d eR\_ ( ` d eV ad#Z eZ a` d eS J V Wc eV 5\_Rj kVc e` t`\_ U R d eZ V Z X dTV\_RcZ h ZY eV dR^ V d eRv eR d eZ`_ d` f eZ\_VU\_Z eV eV d#S f eR vWc eV` f eZ_VU d eRv eR d eZ`\_ d#T`_ eZ f V`\_ e` eVc eR d eZ`\_ d` e` f eZ\_VU %` c V R^ aJV#Wc`\_ f c eVc TRdV\_Z : ZK%SoU#Z eV 5]] j` V VTRf \$ eZ`\_ T ^ ^ R\_U`_ JZ V() UZ`\_ eT`_ eRZ eV T`\_ d eRZ e q<+< ; " : : .8: r Z`_ Z e dT`\_ aV#eV\_ eV WJ]] h Z\_X TR\_ SV R dTV\_RcZ Wf\_U R d R d J f eZ`_ h YV_ eV T ^ ^ R_U ZId VTRf eV U



h YVcV G eRv * V eV U d eV dTV_RcZ_Z : ZK% h ZY R_ RUUZ eZ`\_ Rj d eRv eR d eZ`_ %j RaaV_UZ_X q<+< ; : : .8: r e` eV V VTRf eZ`_ T ^ ^ R_U #h V VJZ`\_ Z R eV eV a` d eS ZJ eJ`\_ WRTT ZU\_ \$ eRj j ac` U f T Z X dTV_RcZ d eRv W c eV c V eV U eV` f eZ\_VU eVc TRdV\_R\_U V\_d f cV R eVc V VTRf eZ`_ ac` U f TV >=; H e` V aJ ZJ eJ`_ f eZ_VU dTV_RcZ %

6VdZUd ac` U f T Z X R eVc d f ZV eRe h ZJ RTYZgV R('` ^ f eR_e`\_ dT cV#R`_ eVc \Vj SV_Vt e e` XV\_VcR\_eX eVc d` gVc Rj _`\_ Vof ZJRJV\_e` f eR_eZId eRe 5]] j` TR\_` ^` cV UZ eV T eJ YVja eV f dVc V aJ` cV Z eV VZ` ^` UJ ZId Wf j e` %h ZJf d eRv # eV Vof ZJRJV\_TV TYVT\ Wc eV ? 9 5 ^ f eR\_e` f eZ_VU VRcJ Zc Z` GVT e % % h ZJ ac` U f TV eV dTV_RcZ W^ : ZK%SoU#h YZY TR_ eV SV JRSV JUSj eV V_U f dVc RdZ_gRj ZU h YZId eVc TRdV \ZJ d eV ? 9 5 ^ f eR_ #Rd eV eVc TRdV h ZJ SV d eR_eT RSJV Wc eV` cZKZ Rj ^` UJ R_U f`\_ d eR\_eT RSJV Wc eV` f eRv U`\_ UJ % e RUUZ`_ #eV ZId eVc TRdV Rj d` cV gV Rj d e` eV f dVc eV eV eV` ^` UJ ZId Wf j e` #Rd eV V\_U f dVc dV` f J U V aV T e eV eR ac` eV T aV U t J V TR\_ VgVc#R eV dR^ V eZ` V#SV_Z` eV eR dV %` h V gVc#dZ TV eV eVc TRdV WZ d eV` cZKZ Rj ^` UJ # 5]] j` h ZJ RT e f Rj j cV gV Rj e` eV f dVc eV eV eV dV TVaeZ_gRj ZUSV RgZ` c ZId RT e f Rj j Rj j h VU Sj eV Z eT f cV\_e` ^` UJ % h YV f dVc TR\_ eV` f dV eV ^ f eR_e e` YVja U V S f X R\_U T` cV T e eV Wf j e` SV RgZ` e`\_ eV ZId TRdV #eV f dVc TR\_ RaaJj eV ^ f eR\_eZId V e` T` cV T e eV Wf j e` ^` UJ %

!" + DC1G=> G5B9=7

5]] j` JVRgVd 5]] j` s d ^ f eR_e`\_ eVc X ac` TV d dZ` eRT #Rd 5I \_Ze eVc TRdV VTRf eZ`_ #R_U eV f d eV ac` TV d d Wc U eV c`_ Z \$ Z_X Z V R^ f eR_eZId ZJ U U V d`\_ eTYR\_XV U f V e` eV RUUZ`\_ Rj acV dV\_TV` W d eRv S R d U dTV_RcZ d%

! ,: =GB: 3; A A7<;

HYZId VTRf`\_` f eZ_Vd Z` a` eR_e Z` aJ V^ V\_ eR\_eZ`_ U eRj d` W 5]] j` #h YZY ZId V J R d U R d RT ^ ^ R_U JZ V e`\_ ] eV e f`_ d`\_ \_ e a` V eV 5_Rj kVc g % % % %

" + DC1=C>? 5A1G=ABD27A>D? B

5]] j` f dV d 5I \_Ze d a R cV c eV eR eS cV R d U h \_R\_ 5]] j` ^` U \$ VJZ\_X Z e` ZId T` cV cV`_ UZ_X R S d eRT eJ`\_ eR eW! 5 GH`%h YV S f Z eZ`\_ 5]] j` a R cV c T`\_ eR\_eZ`_ d`\_j j` V` f X Y Z Wc^ R eZ`_ e WRT Z eRv R eR d R eZ`\_ W^ 5]] j` s d]` X Z e` R_ Vof ZJRJV_e T`\_ [f`_ T eJ V`\_` c^ Rj Wc^ Wc^ f J R #h YZY ZId_WU Wc eV SRT V_U G S H d J gVc %` h V gVc # e` aVc Wc^ ^ f eR_e`\_ eVc X # h V\_WU ^` cV`\_ f R\_TU Z Wc^ R eZ`_ #A % % eZId SV_Vt T ZJ Wc f d e`\_` h eV eR e q R =URWHFWHG ?UDVKR ZId R f`\_ Rj 6 A` D 1 h YZY h ZJ V g R j f R eV e` V Z eV c eV`_ c V R d V h YZ V q =URWHFWHG ?UDVKR ZId RSZ`\_ Rj 5 G A 5 B 9 = h YZY h ZJ V g R j f R eV e` R d e % K YZ V 5]] j` U Z eZ`_ X f ZId V S V h W_ eV g aV` VTR`_ d eR_eZ`\_ # V aV cV dZ`_ # cWc^ f J R # 5]] j` \_j j` U Z eZ`\_ X f ZId V S V h W\_ eV`_ aVcR e` c R eZ`_ #A % % % =URWHFWHG ?UDVKR h` f J U S V d e` cV R d R S Z`\_ Rj Wc^ f J R dZ` TV q`\_ r ZId R S Z`_ Rj`\_ aVcR e` % 9 RTY`\_` U V g aV Z`\_ 5]] j` s d 5 GH RUUZ`\_ Rj j` d e` cV d Z Wc^ R eZ`_ R S`\_ f e eV X c`_ f a`\_ W aVcR e` cV Wc eV a f c a`\_ dV` W T cV R eZ`\_ X R S R j R TV S V h W\_ eV`_ f ^ Svc`\_ W f eR\_ ed XV\_VcRvU R\_U eV S cV R eV`_ W R a R eZ f J R c^ f eR_e`\_ aVcR e` %`_ c V R^ aJV#

Rf_Rj Wc^fJ]RTR_Zg`JgVR\_j`WwVWj]`hZ_XgRjZJf_Rj
`avcRe cdW^ ^ 5]]`j sdXcR^ ^ Rc1

XQ<S 002 ^ QRW ^ QR ^ ORQH ^ RQH ^ VRPH ^ DOZD\V ^
HYHQWXDOO\ ^ DIWHU ^ EHIRUH ^ KLVWRULFDOO\ ^ RQFH

hYZY Rv Sc`V\_U h\_ Z\_e`eV Wj]`hZ\_X Xc`fad Wc eV
af ca`dV`W f eRZ_ eVdZ_X1

QHJDWLRQ 002 ^ QRW
PXOWLSOLFLLW\ 002 QR ^ ORQH ^ RQH ^ VRPH
WHPSRUDO 002 DOZD\V ^ HYHQWXDOO\ ^ DIWHU ^
EHIRUH ^ KLVWRULFDOO\ ^ RQFH

HYvdXc`fadZ`aRTeY`h ^ f eR\_e`avcRe cdRvRaa]ZU# Ww/
Sj]Z`Z\_X eV dT`aV%`cZ_dR_TV#Wc? 9 <#cVa]RTV^ V_ ed
RcV`\_]] U\_V hZ`avcRe cd W^ ^ eV dR^ V Xc`fa%hYZ
eRUW\$ Ww_d`cVd hV XV\_VcRv/ ^ f eR\_ ed eReT`f]U SV dVRj\$
ZbZT ^ ZbR_Vd R Uvgj`aVc ^ ZYe^ R V#d`TY Rd f dZ_X eV
h c`\_X ^ f ]eajZTj`avcRe c#Z_dRU`WS] RZ\_X eV`f^ \$
Svc`W f eR\_ ed hV XV\_VcRv/ hZ`f]Z Vj ^ ZbR_Vd#d`TY Rd
af eZ_X R ^ f]eajZTj`avcRe c hYV\_ eV Uvgj`aVc d`f]U
YRgVafeR eA`a`cRj`avcRe c%

" + DC1Q=>E9B>A1=4 < DC1Q=>=? 5A1Q>AB

H eRgVcd`gVc eV5 GH\_R\_URaa]j dV]VgR\_e^ f eRZ\_`avc\$
Re cd# 5]]`j f dVd R j ZbZ`c aReVc%:`c VRTY g`aV`W
_UV_V_T`f\_eVU\_Z\_eV 5 GH# 5]]`j sd^ f eRZ_ gZbZ`c
`gVcZVd eV gZbZ`c V eR`U\_R\_U VcA^ Z\_Vd hYZY ^ f eRZ\_`
`avcRe c dVj d e`Z_g`V\_Sj`T`dZVcZ\_X eV g`aV`W`UVR_U
Z_Wc^ RZ`R`f e eV`\_U\_Vd aRcV\_eZ`eV5 GH%`cZ_dR_TV#
ZVR dZ`Rf dV`_UV_Zd V_T`f\_eVU# 5]]`j sd^ f eRZ_`
gZbZ`c Raa]Zd eV 7 9 <# @9 5#R\_U @9 0 ^ f eR\_e`avcR\$
e`c dVj d e`eRe]`TRZ`_% VdZVd ^ R_Z_X UZWV_e`_Uvd
RhRcV`Ww^ a`cRj ^ f eR_ ed# 5]]`j dZ`Z TR_aj TYR_XVd
eV? 9 5`avcRe cRd^ V\_eZ`_VUZ`GVTe%`%`cVd`_UZ_Xj #
5]]`j TYR\_XVd eV T`_UZ`d`f_UVc hYZY eZd`avcRe c
Zd Raa]ZU e`R\_ 5 GH`_UW%_ 5]]`j #eV? 9 5`avcRe c
`\_]] Z`dVcU Tj`d`cV!_ R_U#`R\_U eR`c dV!`" `avcRe cd
`\_R\_j`f_Rj`M acVbZ`_`\_UV\_V\_T`f_eVU#hYZY ^ VR_e eV
dV e^ f]eajZTj`T`dRZ`ed!QR#ORQH#RQH#R_U_VRPH" hVcV
_VgVc Z`dVcU#hYZY h Rd R UvdZ`TY`ZV ^ RUV Wc 5]]`j #
RdZ`dVcZ\_X eV dV e^ f ]eajZTj`T`dRZ`ed U Vd eR V Rf`Rj
M acVbZ`\_R\_U eR`dVc^ d Z_e`R f`Rj`Wc^ f]R#hYZY
WwVf V_aj TR`dVd RT ^ aZ`RZ`\_Vc`c%`hVgVc#`f c M acVc\$
^ V_ ed Wc 5]]`j Wf`_U eReSc`RUV\_Z\_X eV? 9 5`avcRe c
e`YRgVRh ZVc dR\_XV`VZ`dVcZ`_dh RdSV_Vt TZj Wc Uv eT\$
Z_X ^ `cV Wf`j g`\_`Uj d%

" +C/ 9B/ A7<;

K VVgRj f Re/ 5]]`j `gVc h`SV\_TY^ R d% Zc#h VM aj`dV
eV avdWc^ R_TV`gVc RSV\_TY^ R d`Ww^ a`cRj 5]]`j ^`U\$

345-8\$ GZkV`WwRj f ReZ\_`^`Uj d

A`Uj	GZk	FVj	J Rc	7]d	Gta	A
6f Ww	+	)	*(	(' -'	*	(
@RjUc	)	+	-,	) +)	+	(
JQgV_ ed	*	+	.'	*.' ,	+	(
HcRdY	)	'	.	(, +	*	(
HcRZ	.	*	+0	//'	,	-/*
HcRdY	*	(	(0	(0+	*	)#'

Vj dVj VRdU hZ`eV f aURv/ eReRUUj]Z`VRc eA`a`cRj]`XZT
d`aa`ceQ`P%GVT`_U#h VT`\_dZVc RT`j]VTeZ`\_`WwRj\$`c]U
Ww`j g`eA`a`cRj 5]]`j ^`Uj daf]j]U Ww^ 5]]`j +: f`_M Vc\$
TZVd%`j]`j +: f`\_Q`*PZIR`\_`j]Z`VjVRc`_Z`Xa]Rv eA`Wc 5]]`j
hY`dV M VcTZVd YRgV f dVd ReA`ae e`hZ`V acVUZTRv d Wc
gRZ`f d^`Uj d#h YZY Rv TYVT`U VXRZ`d eRSRT`V\_U`dRTjV
d]f eZ`\_%Gf S^ ZbZ`_d e 5]]`j +: f`_YRgV SW`\_R`_j ^ ZkU
R_U^ RUVZ`e`R`\_aV`\$d f cTVSV_TY^ R d QP%`c`f cVgRj f R\$
eZ`\_#h VWTf d`_eV e h`^`Uj dWw^ 5]]`j +: f`_eReZ`Tj f Uv
eA`a`cRj]`XZT!>RCS`_R_U>RCHO`eRe e Xv eVc ac`Uf TV eV
*#-0 d`S^ ZbZ`_d RTc`d d\*. UZWV\_e M VcTZVd1)` acVU\$
TRv d Wc>RCS`\_R\_U(. Wc>RCHO`c`^`eVc#h VcV`gV
R_j Uf ajZTRv d`S^ ZbZ`_d`hYZY dVd`j edZ`\_)#'.>RCS`_`U\$
Vj dR_U`\_/\* Wc>RCHO`^`Uj d%

HRSjV`\*XZgVdR`_gVgZ`h`WwVdZk`WwRTY`^`Uj %`_j\$
f^`\_`=k`Zd eV`_f^`Svc`WdZ`Rf dVd`T`j f^`_`<GmZd eV
f^`Svc`WwRj`\_dR`UT`j f^``: Rcf ZdeV`_f^`Svc`WdVU\$
ZTRv d`\_j f^`_d`:@CR`_R`\_ / M Rv eV`_f^`Svc`WdZ`Rj
gRZ`j]VdR`UTj Rf dVd XV_VcRv U Wc eV G5 H d]gVch YV_ eV
V^ a g`T`^`^`R_U Z d`\_`_`eV`^`Uj %`_j f^`\_`=EQ T`\_gV`d
eV dT`aV f dUjZ`eV VgRj f ReZ`\_%@Rd j`#T`j f^`_`7`dY`h d
Y`h ^ R\_j`^`Uj gRZ`_ed Rv T`\_dZVcU%`_c eV 5]]`j`-
^`Uj d`eVcVd`\_]]`_`\_VgVcZ`_%`c eV 5]]`j +: f`_SV_TY\$
^ R d #eZdZd eV`\_f^`Svc`Wf`_Zf V Wf`j g`d`S^ ZbZ`_d%
K V RUUv d eV Wj]`hZ\_X cVd R cTY b f VdZ`_d1

- , ! K YReZdeV`gVcVRU`WwVcWc^ Z_X ^ f eRZ_`eVdZ_X
`Ww^ a`cRj ^`Uj d
- , " <`h`Ww`Rv ^ f eR\_ ed`Ww^ a`cRj ^`Uj d Vb f Zj R\$
jV_e^ f eR_ ed
- , # <`h`Ww`TegV ZIR ^ f eR`eSRdU e`d e d ZV`ReUv eT\$
Z_X Wf`j g`eA`a`cRj ^`Uj d

5]]`M acVc`V_ ed Rv avdWc^ WU`\_`@_fi I Sf`\_f`)' % +
@GHhZ`(%; <k=\_e] Z 7 DI`_R_U(- ; 6 F 5 A %

.- & E5A8514>6`' ;;>G

HRSjV`+`dY`h d 5]]`j sd avdWc^ R_TV%7`j f^`_`7`PFGM
dVUv eV`^`Uj`f`_Uv`VgRj f ReZ`_%:`c eV 5]]`j +: f`\_`
^`Uj d#Rj] Wf`j g`d`S^ ZbZ`_d Wc eV dR^ V acVUZTRv Rv

A`UM	AfR_e; V_VRZ_9E		B`_9E		Hvde		HvVdP		AfRZ_ HvdZ_X		GT`v` HZ_VdP	
	5gX	A Z	A R	5gX	A Z	A R	5gX	A R	A Z	A R	5gX	A Z
. UHGR	)0			0*			() 0%,				('' (+%'	A R
6CFGR	*_'			((,			-(/ %*'				('' +'%'	A R
6G/GOTS	*,(			(.''			0, *%6)				('' 0(%'+	A R
>RCS	(**			+/			(. 98,				('' +%0	A R
>RCS \$	(*	(	*+	(.	(*	0	+%/				('' '%0	(%)
>RCS %	((	(	+*	((	(*	-	+%,				('' '%(	(%)
>RCS &	,	)	/	)-	(0	*+	(%)				('' '%*'	(%+
>RCS '	(+	)	++	**	(/	-	+%0				('' (%/	*%,
>RCS (	((	(	+/	)0	(*	-	*%,				('' (%0	*%/,
>RCS)	(.	(	/'	*+	(*	-	() %/				('' (%/	+%(
>RCS *	.	)	(.	)0	(0	++	(98+				('' '%+	(%'
>RCS +	(,	(	,(	+	(*	-0	(('%)				('' (%/	*98*
>RCS ,	((	)	*)	*)	(-	+	*%,				('' (%+	)-
>RCS #	(-	(	0*	**	(*	-*	. %.				('' (%6	*%/,
>RCS \$	/	)	*/	*)	(.	0	(98*				('' (%'	*%'
>RCS %	'	(	-	+	(*	-*	(- %*'				('' (%0	*98,
>RCS \$	((	(	,)	**	(*	+	(. %-				('' (%/	)%,
>RCS \$'	('	(	,)	*/	(*	+	)%				('' (%,	+%,
>RCS \$(	(*	(	+(	)0	(*	+	)%				('' (%*'	(98,
>RCS \$)	(.	,	+,	*)	(-	,	- %+				('' (%*	)%'
>RCS \$*	)+	(	.*	*_	(*	/'	)' %)				('' (%*'	+%'
>RCS \$+	(,	(	,)	+(	(*	.)	(0%'				('' (%,	+%'
>RCS \$,	(+	,	+0	+	(*	/	(('%				('' (%-	*98+
>RCS %#	0	(	*,	-*	(*	./	++%*'				('' (%98	)%
>RCS	)/	((	(+/	('+	0	()	)' 980				('' (+98/	(/ %,
>RCS %	(.)	((	(+)	('-	0,	((*	(- %+				('' (%'	(. %/
>RCS &	*0	((	)/	(')	0	(+)	((%				('' (+%	((%*'
>RCS	**	((	(0,	('+	0	(*)	((%'				('' (+%	((%)
>RCS	(+	((	.0	(**	0	(+)	)' %)				('' (%*'	((%-
>RCS	(,0	((	),)	('	0	(+)	)' 98				('' (%,	((%0
>RCS*	(*,	(*)	(-0	((*	0*	(.)	(0%0				('' (%'	((%-

A`UJ	Afēē; V_vēēz_ - 9E				B`_ \$E				Hvē				Hvē VēP				Afēēz_ Hvēēz_X Gt' d' - Hvē VēP			
	5gX	A Z	A R	5gX	A Z	A R	5gX	A R	5gX	A Z	A R	5gX	A Z	A R	5gX	A Z	A R	5gX	A Z	A R
>RQO+	(+/ (+*	() + ())	(// (0*	) *0) '0	(/, (/)	)0,) +0	(*. ((/	(0,) +0	(+/ % ,) % (	0. 0-	(0,) +0	(+/ % ,) % (	(- %* () %*	(' - , % + / +/ %0	(' ' + (' ')	(+ %* (/ % (	(* % (* % -	(+ %* (/ % (	(* % (* % -	(* % (* % -
>RQO#	() . (* -	() ((*)	(** (+.	) ' *) ()	(0)) ')	(,) ,)	(' 0 (.	(,) ,)	(, %) - % '	(' - (((	(* () -	(, %) - % '	(+ % () %*	(- % (* % +	(' ' + (' ')	(- % (/ % ,	(+ % (- %	(- % (/ % ,	(+ % (- %	(+ % (- %
>RQO\$	((. (**	((. ((/	((. (+ +	(- .) (.	(- . (0 +	(- .) *)	(0 ((0	(- .) *)	(* %) / %	0. (' ,	(0 (' ,	(* %) / %	(* % (- %	(* % (- %	(' ' + (' ')	(* % (- %	(* % (- %	(* % (- %	(* % (- %	(* % (- %
>RQO&	(+) (* /	() - () ,	(// (. /	) ' *) /	) ' + (0 (	) - ,)) 0	(+ (+	) - ,)) 0	(* %) (%	(+ (' * () ,	(+ (' * () ,	(* %) (%	(- % , - %	(+ ((0 % +	(' ' + (' ')	(+ % (- %	(* % (- %	(+ % (- %	(+ % (- %	(* % (- %
>RQO)	() / (, *	() - ((.	() 0) .	) / (0 .	() (- .	) + +) *)	(* (' /	) + +) *)	(+ , % , - %	(+ (' * () ,	(+ (' * () ,	(* %) (%	(- % , - %	((0 % + (* ' %	(' ' + (' ')	(* % (- %	(* % (- %	(* % (- %	(* % (- %	(* % (- %
>RQO*	(, *) 0 %	((. , - %	() . (' / %*	(0 . (* + %	(- . (0 % /	) *) (, - % +	(' / , + %	(*) (, - % +	(+ , % , - %	0. , * %	(0 (, - % +	(* %) (%	(- % , - %	(* % (* ' %	(' ' + (' ')	(* % (- %	(* % (- %	(* % (- %	(* % (- %	(* % (- %
- VI	/0 % (	, - %*	(' / %*	(* + % (* + %	(0 % / (0 % /	(, - % + (, - % +	. + % , + %	(0 % 0 (0 % 0	(+ , % , - %	, * % , * %	(0 % 0 (0 % 0	(* %) (%	(- % , - %	(* % (* ' %	(' ' + (' ')	(* % (- %	(* % (- %	(* % (- %	(* % (- %	(* % (- %

345-8 & 9bfZrJV_e^fR_edRvd

A`UJ	5]]j 9	\$ C_jj B9	5]]j :f]] B9!d'	B9	FH
. UHCR	.'	-,	+/%	+-%	*(%) +%) /%)
6GFCR	00	//	+.%	++%	)/%))%) *(%)
6GVGOTS	/0	0'	,'%	+/%	)-%))(%) /%)
>RCS	*-	).	+)%	,)%	)*% (-%) ++%
>RCS \$	0	(*	,0%	/')%	,)%) *(%) *-%
>RCS %	(')	)*	-0%	0+%	--%) *.%) +)%)
>RCS &	*	(.	/,%	0'%)	+.% *(%) *,%)
>RCS '	.	(/	.)%	/)%)	*/%) -%) *%*
>RCS (	-	(.	.*%	/+%	+(%)).%) *%*
>RCS)	0	(.	-,%	/(%	*,%) +%) *(%)
>RCS *	*	(-	/+%	/.%	*/%)).%) *(%)
>RCS +	.	)(	.,%	/)%)	*/%) -%) *%*
>RCS ,	,	(/	./%	/+%	*,%) -%))0%
>RCS \$#	/	(/	-0%	/(%	*/%) ,%) *)%
>RCS \$\$	*	(-	/+%	/.%	*(%))%*
>RCS %%	((	)*	-.%	/(%	+(%)).%) *)%
>RCS \$&	('	(/	-+%	.*%	*,%) ,%)).%
>RCS \$'	*	(/	/,%	/-%)	)0%))%))%*
>RCS \$(	.	(.	.'%	/)%)	+(%)).%))0%
>RCS \$)	/	(.	-/%	./%	*,%) ,%) ,%)
>RCS \$*	((	)'	-+%	.,%	*/%) -%) *)%
>RCS \$+	.	)(	.,%	/*%	*,%) ,%))0%
>RCS \$,	-	))	./%	/)%)	*/%)).%) /%)
>RCS %%	,	),	/+%	0'%)	+(%))/%
>RCS \$	*,	+',	(%)	-)%)	)+%) (.%))'%)
>RCS %	*/	++	*,%	-)%)	,%) ,%) (/%))'%)
>RCS &	++	+',	+,%	-(%)	,%) ,%) (.%))'%)
>RCS	+',	+',	,'%	-(%)	)+%) (.%))(%)
>RCS (	+	,	+,%	-+%	)+%) (.%) (0%)
>RCS)	+0	+',	++%	,/%	,%) ,%) (-%))'%)
>RCS *	++	,	*,%	-)%)	).%) (0%))%)
>RCS +	+,	.,	.,%	.*%	)-%) (0%) ,%)
>RCS	+0	,*	,%)	-)%)	)0%))'%) *%*
>RCS #	*/	+-	+,%	.*%	,%) ,%) (/%) (/%)
>RCS \$	++	,*	.,%	.*%	).%))'%))%*
>RCS %	*)	*)	,'%	-(%)	))%) (-%) (-%)
>RCS &	++	-,	,0%	.*%	*(%))%*
>RCS \$	++	-'	.,%	-,%	).%) (0%))'%)
>RCS (	+-	,	,%)	-)%)	)/%) (0%))%)
>RCS)	+(	-.	-)%	-+%	*%*))%) *-%
>RCS *	,-	,)	+/%	,0%	*%*))'%))0%
- VI	)/%	*-%	-)%	.(%)	***%))%*

R_j ^fR_eR_d`e]RSV]VUe^a`dR]HYV]Rde* T]f^_d
 UaZTeaVcTV_`RXd`Wb^a`dR] ^fR\_eR\_d`e`gVcR] ^fR_eR_d
 WcR_f^SvC`WbVcWc^R\_TV^VcZd% Zl`VavcTV_`RXd
 `WbR] ^fR\_eR\_d`eRcV`a`dR]# 81 Zl`VavcTV\_`RXd
 `WR] \_`\$bVZrJV_e^fR_eR_d`eRcV`a`dR]#R_U <>
 Zl`VavcTV\_`RXd`WbV`f`e`V`dV\_eXV\_VcR`X`e^a`dR]
 ^fR_eR_d

HYVcVd]JedZ`UZTR`eR`eR`V`cR`eR`Y`Z`Y`e^a`dR] ^fR_eR_d
 hVcV`bVfZrJV\_e`gVcV`d`_`\$bVZrJV\_e`U`\_`edX`Z`TR`ej
 UZWcT`^aRcU`e`eV`e`R]T`]]VTeZ`\_`W`f`R`e`d`5]]j
 ac`UfTvdR`e`f`XY`e^a`dR]`SRdU`^fR_eR_d`RcV`d`Z`Y`ej`^`cV
]Z`Vj`e`SV`bVfZrJV_e`h`Z]f`d`eR`#R`T`c`d`d`R]`^`U`j`d`#`Wc
 e^a`dR]`SRdU`^fR\_eR\_d`eV`R`gV`R`X`V`aVcTV_`RXd`_`W`X`V`c`\$
 R`e`U`^fR\_eR\_d`eR`cV`_`\$bVfZrJV\_e`Zl`-)%`#`h`Y`Z`V`eV
 aVcTV_`RXd`_`W`f`R`e`d`eR`W`T`f`d`\_`TYR`X`Z`X`d`eR`Z`\_`aVcR`e`d
 ac`UfTvdR`.(%)`\_`\$bVfZrJV_e`cR`e`\_`R`gV`R`X`V`eR`^`cV
 U`eR`Z`V`J`V`g`#`Wc`eV`5]]j`-`^`U`j`d`#`eV`_`\$bVfZrJV_e
 aVcTV_`RXd`Zl`+.%`Wc`e^a`dR]`SRdU`^fR_eR_d`R\_U`+.%
 d`eR`Z`^fR\_eR\_d`%`cR]`eR`d`5]]j`+`f`\_`d`S`^`Z`b`Z`_`d`#`eV`_`\$
 V`bVfZrJV\_e`aVcTV_`RXd`Zl`.\*%`Wc`e^a`dR]`SRdU`^fR_eR_d
 R_U`/\*%`d`eR`Z`^fR\_eR\_d`%`cR]`#`Wc`R]`eR`Z`5]]j`+`f`_`
 d`S`^`Z`b`Z`_`d`#`eV`_`\$bVfZrJV\_e`aVcTV_`RXd`Zl`.\*%`Wc
 e^a`dR]`SRdU`^fR\_eR\_d`R_U`-)%`d`eR`Z`^fR\_eR\_d`%`T`c`d`
 eV`S`R`U`#`a`dR]`SRdU`^fR_eR_d`R`T`f`e`Wc`**%`\_`W`bV
 e`R]`f`^`SvC`\_`W`f`R`e`d`R`U`R`T`f`e`Wc`)/%`\_`W`bV`e`R]
 d`\_`e`V`V`HYVcWc`#`e^a`dR]`SRdU`^fR_eR_d`U`_`edW`^`e`
 Y`R`gV`R`j`R`S`\_`c`R]`Z`aR`T`e`_`eV`_`gVcV`R`U`_`W`X`V`cR`Z`X`R
 ^fR_eR_d`eR]R`cV`%

C`gVcR]`#`h`V`T`_`U`eR`eV`_`f`^`SvC`_`W`bVfZrJV_e`^fR_eR_d
 XV_VcR`e`U`Zl`W`bV`V`\_`ej`R`c`f`_`U`+`\_`W`bV`e`R]`f`^`SvC`\_`W`
 _`\$bVfZrJV\_e`^fR_eR_d`R\_U`V`d`_`edW`^`e`gR]`e`^`f`TY
 S`R`d`U`_`eV`e`aV`_`W`f`R`e`!`e^a`dR]`g`d`d`eR`Z`%`_`R`U`Z`_`#
 eV`XV\_VcR`Z`\_`W`bV`a`dR]`SRdU`^fR\_eR\_d`U`V`d`\_`e`\_`eR]j
 Z`aR`T`e`V`d`_`e`V`\_`gVcV`R`U`\_`W`f`R`e`XV_VcR`Z`_%

#! . - ! & 663CE5=5BB>661D;C45C3C9=>

K`V`T`^`a`R`cV`h`_`U`Z`W`cV`e`d`eR`Z`X`d`Wc`5]]j`%`_`c`T`\_`\$
 t`X`f`d`eR`Z`_`q`P`U`Q`C`I`#`eV`U`M`R`J`e`d`S`X`c`f`a`d`R`cV`R`a`a`Z`U`e
 eV`^fR\_eR\_d`_`XV\_VcR`Z`\_`ac`T`v`d`#`V`%`%`?`9`<`h`Z]`T`_`d`Z`U`c
 f`\_`R`j`e^a`dR]`_`aVcR`e`c`d`d`a`R`cV`R`W`^`f`\_`R`j`d`e`_`aVcR`e`c`d`%
 :`\_`c`T`_`t`X`f`d`eR`Z`\_`q`P`N`D`I`O`G`#`eV`d`S`X`c`f`a`d`R`cV`Z`\_`c`U`#
 R`\_`U`eV`^fR_eR_d`\_`XV_VcR`Z`_`ac`T`v`d`T`_`d`Z`U`c`d`R]`a`d`b`Z`V
 `aVcR`e`c`d`#`%`%`?`9`<`h`Z]`d`a`R`T`V`f`\_`R`j`e^a`dR]`R`\_`U`f`_`R`j
 d`e`_`aVcR`e`c`d`Z`_`d`c`TYR`X`V`R]j`%`HYV]R`e`c`T`_`t`X`f`d`eR`Z`\_`Zl`eV
 g`Z`h`a`_`Z`e`R`V`\_`S`j`H`5`F`#

345-8' 7^ ^ arZd _` W5Z4j è Uv&reMf1edZ ^` Ujd

A`UJ	;`cfazX				7^ ^ SZVU				8 ZM7 \$;			
	Afe	HVd	HZ^V	8	H	Dfe	Afe	HVd	HZ^V	8	Dfe	Dfe
>RCS \$	)0	(.	+%/	(*	)(	-(`0)	*)	(.	,%	(*	-(`0)	'%
>RCS %	*0	)	+%.	/0	('+	/,%/	+~	)	,%+	/0	/,%/	'%
>RCS &	*	-)	(%)	*	+	.,%	++	-)	(%+	*	.,%	'%
>RCS '	, (	**	+%0	-/	0	.+0%*	- (	*+	,%	-/	.+0%*	'%
>RCS (	+	)0	*%,	))	).	/`%-	+	*+	*0%-	))	/`%-	'%
>RCS)	,	**	()%/	)	))	0*%,	-,	*+	(+%,	)	0*%,	'%
>RCS *	++	)0	(`0+	)*	*)	.(`%/	,	*+	)%	)*	.(`%/	'%
>RCS +	, /	+	((%)	(,	)0	0/%.	.+	+(	(,%.	(,	0/%.	'%
>RCS ,	, (	*)	*%,	-.	-0	0.%'	-)	*)	+00/	-.	0.%'	'%
>RCS \$#	,)	**	.%	)	)(	0+%)	-*	**	0%*	)	0+%)	'%
>RCS \$\$	,)	*)	(`0*	((	((	0/%*	-0	**	)00	((	00%)	88
>RCS \$%	-)	+(	(-)%*	* (	*(	0-%/	.,	+	)' %*	*)	0-%/	'
>RCS \$&	,)	**	(.%-	*,	*/	0)%(	-+	*+	)*0+	*,	0)%(	'
>RCS \$'	- (	*/	)%.	0'	0	0/`0	./	*0	*00	0	(('`%'	#88
>RCS \$(	+	)0	)%	*/	+(	0)/	+	)0	*%0	+	0.%-	'
>RCS \$)	+0	*)	-%+	/	/-	0.%	- (	*+	0%/	/	0.%.	'
>RCS \$*	, .	*.	)' %)	/.	0*	0*%,	.)	*.	)+%)	/.	0*%,	'
>RCS \$+	- (	+(	(0%	(-+	(-	00%0	.,	+	)00	(-+	00%0	'
>RCS \$,	, 0	+	((%	+	-	0-%*	.(	+	(+%(	+	0-%*	'
>RCS %#	- *	++	++0%*	-)	-*	0/%(	.,	+	,(%-	-)	0/%(	'
>RCS \$	(0	('+	)' `00	*,	++	/(%'	),*	((0	*)%*	*,	/(%'	'
>RCS 0%	(0	('-	(-`0+	+~	-+	.(`%/	),*	(')	),%0	+~	.(`%/	'
>RCS 0&	(0'	(')	))%	((0	(,	.0%*	),-	((.	*+0%+	((0	.0%*	'
>RCS 0	(/0	('+	))%	+~	- (	.,`%/	),+	((/	**0%/	+~	.,`%/	'
>RCS 0'	),*	(**	)(%(	((	)0	0*%'	*)-	(,	*.%'	(	0*%'	'
>RCS 0)	(0.	(',	)' `0)	-)	/'	..%'	)-,	(')	**0%'	-)	..%'	'
>RCS 0*	)'+	((*	(0%0	**	**	(('`%'	),+	((/	*+%'	**	(('`%'	'
>RCS 0+	)*0	(*.	(+/%-	)0	*(	0*%,	**)	(-'	)/.0%+	)0	0*%,	'


```

: `c` f c a R U R U e R Z ` ^ ` U j d W c e v S J ] j + : f _ U e R d v #
h V M e R T a U R d f S d v e ` W f f e R e d e R e q T c v T e W f j g d f S ^ Z d $
d Z _ ^ ` U j d b f U v e c ^ Z V Z W ^ f e R e c v a c d v _ e d R T c v T e Z _ #
h V R a a v _ U U e v ` d R T j v d j f e _ W c R _ v i c T Z v e e v ^ f e R U
^ ` U j _ R _ U e v _ T y v t v U Z v e v f d v s d f S ^ Z e U W c ^ f j R Z d
v b f z j R j v _ e e e v ` d R T j v d j f e _ % v d # h v u R x x U e v ^ f e R e
R d > A 5 3 9 = 7 % H Z j j f d e R e ` f c a c ` T v d # S v j ` h Z d R d f S ^ Z d $
d Z _ e e v T R C j _ v i c T Z v # h Y Z Y Z d e v d R ^ v M v c T Z v R d ` f c
v i R ^ a j v Z _ : X % S f e U a Z e d R U Z W c v _ e v f j g ^ ` U j % @ Z v d
+ $ R c v Y Z U v _ W ^ e v f d v c R _ U U a Z e e v S R T v _ U ` d R T j v
d j f e _ R U e v T y v t _ W c T c v T e v d b %

```

```

1. var sig File { var link : lone File }
2. sig Trash in File {}
3. var sig Protected in File {}
4. pred prop9 {
5.   always all p : Protected | p !in Trash'
6. }

```

(a)

, < \$ A f e _ e d e R e T c c V t e R _ 5]] ' j + : f _ d f S ^ z h z _

345:8(B f ^ S v c ` W f e \_ e d e R e T c c V t e S j ` a v R e c

Ca	>RCS : Z	DTe	HdRZ : Z	DTe
7 9<	/+.	*' %()	),(	+%-
; 9<	+(	(%0	, *	' %'
; 9<?	'	' %'	'	' %'
? 9<	() /	+%-	. *(	() %0
. 9<	- '	) %/	(' ,	(%/
69<	(	' %+	)	' %*
? 95	,) -	(0 % *	+) 0	. (%'
. 90	*0	(%)	+ (-	. %,
? 90	*0	(%)	.	' %)
690	(*	' %.	*	' %,
: . 0	'	' %'	'	' %'
. 91	)(	' %-	,	' %/
5191	'	' %'	'	' %'
@95	'	' %'	'	' %'
@90	0*(	**%.	0+	(%0
: 95	..	) %'	)	' %*
: 90	) -	' %,	'	' %'
>PTCM	). +0	(' ' %'	, / 0/	(' ' %'

```

' % !!897;.;- /24. 2: *; 67;25. :.6; ;7;1. ;9*:1
( % 89.- SURS/ ]
) % *44 S 0 =URWHFWHG ^ *4>*?: S 26 ?UDVK _
* % !! ( 80% 8)
+ % 89.- SURS/R ] *4>*?: 67 =URWHFWHG ?UDVK _
, % ,1.,3 SURS/<N ]
- % !SURS/ *6- 67; SURS/R" 25842.: !SURS/R 2/ SURS/"
. % _

```

: Zxf c v * d r h d h ` T c c V t e X ^ f e _ e d W c e Z d W f j g d f S \$
^ z h z _ 1 ! R ' z i R @ 9 0 T c c V t e X ^ f e _ e R _ U ! S " z i R ? 9 0
T c c V t e X ^ f e _ e h U a c ^ Z V e R e : Z % R R _ U S d r h d T c \$
c V t e X ^ f e _ e h v R a a V _ U a d U T R a / S U R S / R R _ U V i V i f e /
e V S U R S / < N T Y V i T ^ ^ R _ U _ e V ^ f e R a U ^ ^ U j % G Z _ T V
_ T f _ e c M R ^ a j V z i W f _ U ^ g v c e v d v ^ f e _ e h v u R X e V
^ f e _ e d R d T c c V t e X % K Y q V R _ V _ U f d v c ` W 5]] ' h z]
_ e Y R g V R _ _ h _ ` d R T j V W c ^ f j R e T ^ a R c v h z e # T c c V t e X
^ f e _ e d R c v d v g V j U e e v f d v c e c f X Y e V z T c c V e _ U z X
W q Z X e v c T R d v % R q Z X e v c d U v z j U W ^ ^ f e _ e d S ^ e T _ \$
g j e V W f j g S V R g z c Z e V V T R a d f j R a U T f _ e c M R ^ a j #
S f e R j d u R X R U z V t e T Y R _ X V # e V ^ f e _ e R e T f j U S V R T c \$
c V t e _ e e V ^ ^ U j % ` c Z d e T V # e V ? 9 0 ^ f e _ e z : Z % S
z i R U z V t e t i e e V W f j g W c ^ f j R %

```

1. var sig File { var link : lone File }
2. var sig Trash in File {}
3. var sig Protected in File {}
4. pred prop9 {
5.   always all p : Protected | p !in Trash
6. }

```

(b)

\$, E5AE95F >63>A53C9-7 < DC1=CB

HRSJV . XZgVd R _ ` gVgZ h ` W e V _ f ^ S v c ` W T c c V t e X
^ f e _ e d S c ` V _ U h _ S j ^ ^ U j ! > R C S j R _ U > R C O ' R _ U
^ f e _ e ` a v R e c ! 9 Q ' % ` c e V e R d Y ^ ^ U j d # W c V R T Y ^ f e _ e
` a v R e d # T j f ^ \_ d ) R \_ U \* d r h e V \_ f ^ S v c ` W f e _ e d e R e
T c c V t e R ^ ^ U j ! 2 K " R _ U e V a v c T V _ e R X V e R e _ f ^ S v c z i f e
` W e V e e R j \_ f ^ S v c ` W T c c V t e X ^ f e _ e d ! : E T % H Y z i d r ^ V
Z W c ^ R e z _ z i X z j V _ W ^ e V e R z ^ ^ U j d z T j f ^ _ d + R _ U
, %

CW f c) - / # + * ^ f e _ e d # / - + . ! * % (" R c V R S j V e T c \$
c V t e R W f j g ^ ^ U j % G ^ V ^ ^ U j d Y R g V ^ f j e a j V T c c V t e X
^ f e _ e # ^ V R _ Z _ X ^ ^ c v e R _ _ V t i T f j U S V R a a j Z U % 6]]
e j U # W ^ e V d / # + . T c c V t e X ^ f e _ e d # (# + / ! + / % " W
` f c 5]] j + : f _ ^ ^ U j d Y R g V R t c d \$ d V c ^ f e _ e T c c V t e _ \$
((* * e R d Y ^ ^ U j d ! + 0 % " R _ U * (, e R z ^ ^ U j d ! + - % %
K Y q V e V a v c T V _ e R X V ` W ^ ^ U j d h z e T c c V t e _ d z a j z i d
` f c t c d \$ d V c ^ f e _ e d U ^ z Z T R t e R j ^ z h R V d # G V t e % %
R _ U - % h z j Y Z X Y Z Y e h Y j d ^ V ` W e V d V T c c V t e X ^ f e _ e d
^ R j _ _ e R t e R j j S V U c z R S j V T Y R _ X v d # S f e T R _ d e j R z j _
U S f X X z _ X %

= e c ^ d ` W T c c V t e \_ d # e V W f c ^ R z ^ f e \_ e ` a v R e c d
e R e T c c V e ^ ^ U j d R c V ? 9 5 ! , + % 0 " # 7 9 < ! () % " # @ 9 0
! ((% , " # R _ U ? 9 < ! 0 % * " % H Y V Y Z Y c R a ` W e i v d S j e V
? 9 5 ^ f e _ e ` a v R e c z i R c d f j e V z d v e z _ d ^ R U V z e V W R t e
W c ^ f j R d ` W e V e R z ^ ^ U j d # h Y Z Y h V j ` ` T j d V j R e z
G V t e % % _ R U z z _ # e V c V R c v d v g V c j ^ f e _ e ` a v R e c d e R e
U _ _ e j V R U e R T c c V t e _ # ^ R j _ ` W h Y Z Y ^ R V d v d V z j V _
e V _ R e f c v ` W e V 5]] j + : f _ ^ ^ U j d ! : . 0 Z g j g v d U j V e z X
e V a c U z T R a / S _ U j # R _ U _ _ V ` W e V V i V c t z i d R c v V o f z j R V _ e
e R g R T f ` f d j e f V W c ^ f j R # R _ U ^ V R _ h Y q V # @ 9 5 ^ f e _ e d
^ R V R d z _ R e f c v ` c v j R e z \_ ^ f e S j V e R e h R d \_ e ` c z k _ R j j 2
Y h V g v e # R j j d z _ R e f c v R _ U c v j R e z _ d z e V 5]] j + : f _ ^ ^ U j d
Y R g V e V z T c c V e ^ f e S j z j R d v e U % 6 T T c z X j # ^ R z X
R c R e z d z _ R e f c v U j _ R ^ z R j h R j d ^ R v d e V ^ ^ U j e ` a v c \$
^ z h z j %

\$ (> A53C9-7 < DC1=CB9 B97=1DA5B

5 d ^ V _ e z _ V U z G V t e % # d z _ R e f c v a R c R c R a Y d Z e U f T V
_ R ^ V U d v e d R _ U T R _ R U z z _ R j j f d v c v j R e z _ d e ` f e z V e V
c v j R e z _ d y z a j V ^ V _ e d ` W R d v e d f j U Y R g v h z e z e V ^ d j g v d
` c e ` e V c g a v d ` W e V d H Y c W ` W f c ^ f e _ e ` a v R e c d e R e
^ R V T Y R _ X v d e e V d z _ R e f c v c v j R e z _ d # @ 9 0 # 7 9 < # R _ U

? 9 < #RcVhZYZ_ eVè a Wf cac` Uf TVcd` W f eR_e` aVcRè cd
 èReT` cVTe5 JJ` j +: f_ ^` Ujd#HYV @9 0 ` aVcRè c` R VdR
 ^ f eRJV dX_ Ref dV` c cVJRèZ\_ dRèZ#h YZV eV 7 9 < ` aVc\$
 Rè c TYR_XVd eV` f j eZaJZTj\_ UVTJRèZ\_ ` VR dX_ Ref dV R_U
 eV? 9 < ` aVcRè c cVajRTVdf\_Rj\_ ` aVcRè cdhZè` eVc` aVc\$
 Rè cd` WèV dR` V XcR` ^ R TjRdZè TRèZ\_ #R d f SdVe` Wh YZY
 Z TJf Uvd TYR_XZ_X eV` f j eZaJZTj\_ UVTJRèZ\_ ` WèVJRèZ_ d%

I _Wcf_ReJj #XZjV_ eV dVf a Wc5 JJ` j +: f\_ ^` Ujd#eV
 dX_ Ref dV dZ_ eV dV Wf jg_ ^` Ujd Rcv` \` h\_ è SV T` cVTe#
 R_U eV` ^ ZèR V RTè RJj\_ jZd Z\_ eV f dV chZèV\_ Wc` f JR
 hZèZ_ RXZjV_ acUJTRèV` HYV WcV` #h YZV acVgRJV_eRd qT` c\$
 cVTeZ_ d# eV dV` f eR\_ ed Rcv\_ ` egRJZU ti Vd Wc eV dV Wf jg_
 ^` Ujd%` h VgV#dX_ Ref dV SRdU` f eR_ ed TR_ dèZ] SV f dV\$
 WJ_ Z_ dVgRJZ_X ZèV dV hZèZ_ eV` ^` Uj s d acUJTRèV d%

0+(< D1=CB K YV_ R @9 0 ` aVcRè c T` cVTe d R` ^` Uj#
 eV_ eV f dV dV` f jUT\_ dZUc eV Re eV ZèV VZl\_ ` eèReR dX\$
 Ref dV Zl` f eRJV h YV\_ ZèV` f jU ` eSV#Sf eR eVc eV Re eV Zè
 Wc` f JR` ^ RJ_ SV T` cVTe` gVc R dRèZ_ ^` Uj#Sf eZl JRT` Z_X
 ac` aVc eV` a` dRJ T\_ dèRZ\_ ed%7 R dV\_ Z\_ a` Zè#,(%(` ` WèV
 èV` #h YV\_ R @9 0 ` aVcRè c T` cVTe d R` f eR_ eR T` cVTeZ_X
 ^ f eR_ eZl RJd` Wf\_ UhZèZ\_ eV f dV dV` S` ZèU Wc` f JR` RdZl
 eV TR dV_ Z_ : Z%6RR_US h YV eV eV @9 0 ` f eR\_ eZ\_ !R` ZlR_
 Z UZTRè c eV Re eV cV Zl d` ^ VèZ\_X h c` _X hZè eV Wc` f JR d
 eV` a` dRJ cVRe` V\_e` VR ?UDVKVSV dVèR_U eV? 9 0 ` f eR_ e
 Z_ !S` TYR\_XVd eV eV` a` dRJ T_ dèRZ_ ed cVJRèUè ?UDVKVSV
 Z_ eV acUJTRèV` 5 dR\_ ` eVc V R` aJW#T` dZUc eV WJ]` h\$
 Z_X Wf jg_ Wc` f JR Wc TRC%h YZY R dV eV f dV dè V\_T` U
 qE5AHB7=1; F 9; 5E5=CD1;;H253<5 7A55=r1

.=.6;<*44? *44 V0 >LJQDO ^ V 26 9UHHQ

= eZl TR dV` #R @9 0 ` f eR_ eèRe` R Vd>LJQDO f_ ^ f eRJV
 T` cVTe d eZl Wf jg\_ Wc` f JR` HYZl` aJZl d eV Re eV Tf cV_ ef dV
 ` W` YHQWXDOO` cVJRèUè >LJQDO WèZè RTYZgV eV UvdZU
 WWTèR_U` ^ RJ\_ WUè SV cVajRTU` cRaaJZU UZ WcV_ èj %` c
 èZl Wc` f JR` #HYHQWXDOO` dV` f jU Raajj_ è eV dV SWc` f JR
 R_U_Z_ aRèZTf JR è VRTY dX_Rj B Z UZgZf RJj %HYV eV Zl R
 T` cVcb` _UZ_X? 9 5 T` cVTeZ\_X` f eR_ eèRe TR eV dV dèZl

.=.6;<*44? *44 V0 >LJQDO ^ .=.6;<*44? V 26 9UHHQ

=UVRJj #eV JVRUZ_X HYHQWXDOO` h` f jURjd` SV dV` gVU
 RdZèZl_ ` e\_WUJ%K VSVJZgV eV Re eV Zl Zl R` ^` U` a` aJReV
 Wc R_Vh t cV\$ dVc` f eR\_e` aVcRè c eV Re af dV dV eV eV` \$
 a` dRJ j XZ` W` ^ eV dV SWc` f JR` VR bf R\_ è VU Wc` f JR è
 ` f eZU` WèV bf R_ è VU Wc` f JR` c gZV gVcR` #ZV` #RI HE 9
 qf_Rj eV` a` dRJ bf R_ è Vc V TYR_XV` ^ f eR\_e` aVcRè c%` c
 eV Wf jg_ Wc` f JR` eZl` f eR\_e` aVcRè ch` f jU UZVTèj ac` \$
 Uf TV eV WJ]` hZ_X1

*44 V0 >LJQDO ^ .=.6;<*44? V 26 9UHHQ

<` h VgV#d` ^ VèZ` Vd` _Jj R @9 0 ` f eR\_e T` cVTe d eV
 ^` Uj %` c ZèR TV` eV WJ]` hZ_X TRCS, Wf jg_ ReV` aè

345-8) Bf^SVc` W f j eZaJZTj\_ T` cVTeZ_X` f eR\_ ed Sj` dèV Tf dV

Gef Te	A f j eZ	Bf ^	DTe
=K	9 OG	) ++	(, %'
=K	6 POG	(*+	/ %-
=K	=PNG	*0	) %-
=K "GKT	9 OG	+, 0	) / %0
=K "GKT	6 POG	()	' %-
=K "GKT	=PNG	(/)	((%0
=K "SUD	9 OG	(/	(%+
=K "SUD	6 POG	,	' %)
=K "SUD	=PNG	,	' %)
< GM	9 OG	,,,	(- %'
< GM	6 POG	(	' %-
< GM	=PNG	)*	(+ %)
> PTCM		\$(+'	\$###%#

*44 S 0 =URWHEFWHG ^ *4>*?: S 26 ?UDVK

YRd R T` cVTeZ\_X @9 0 ` f eR_e eV Re` R Vd eV dX_ Ref dV
 =URWHEFWHGVS f_ ^ f eRJV` Sfe` _` eVc` f eR_e T` cVTe d eV
 ^ ZèR V%` h VgV#VgV\_ RJ\_ `V#èZl` f eR\_e Zl R` R c` hZ_X
 TJf V` R d eV f dV` _h` \_` h d eV Re eV J_ WUè f aUè eV eV` \$
 a` dRJ T\_ dèRZ\_ ed cVJRèUè Re JR dè` _V` WèV V i acV dZ_ !d'
 eV Re dV dV_ ` gVc eV dV eV` Vèc` eV TèU t jV dV` ^` dV gVc eV f dV
 TR_ Z_ Wc eV Re eV Zè Tf cV_ ef dV` WèV qoZD` V` ^` aVcRè c U Vd
 ` eV` WèV eV Zè RTè RJ WU d R_U dV` f jU SV TYR\_XU\_Z\_ d` ^ V
 h RJ %HYV d jf eZ_ eV f dV ch` f jU SV RZ` Z_X Wc Zl eV WJ]` h\$
 Z_X1

4>?: *44 S 0 =URWHEFWHG ^ S 26 ?UDVK

HYZl TYR_XVZl RdV T` \_U\$ dVc` f eR_ e#h YZY Zl_ ` edf aa` cèU
 Sj_ 5 JJ` j 1t cèR? 9 0 RTèZ\_ è Uj VèV qoZD` V` R_U eV
 R? 9 5 RTèZ_ è Z_ dVcè R JVRUZ_X qoZD` V` %` <` h VgV#èZl
 TYR_XV h` f jU SV T` gVcU Sj_ ` f c\_ Vh Jj\_ ac` a` dU` ^ f eR_e
 ` aVcRè c I HE 9` A` dV gVc eV Zl V R` aJ VYZY jZY eV` h eV
 I HE 9` aVcRè c YR d eV a` eV_ èRj è TcVReV T` cVTeZ\_X` f eR_ ed
 hZèZ_ eV f dV cV acUJTRèV h YV_ eV cV` eV chZèV h` f jU SV
 _` _V%

@9 0 T` cVTeZ\_X` f eR_ ed UZVTèj a` Zè` f eV YZY dVèd
 Rcv JRT` Z\_X eV` a` dRJ T\_ dèRZ\_ ed dV dV dV` f jU Wf d
 ` \_ TYR\_XZ\_X eV eV` a` dRJ dèV Tè T` T_ dèRZ_ ed dV dV
 c` f \_UZ\_X eV dV dV èV hZèZ\_ eV Zè Wc` f JR %

*+- /+- < D1=CB HYV` eVc` f eR_e cVJRèUè dX_ R\$
 eV dV dV è TYR_XV eV` f j eZaJZTj\_ ` WèZ_ Ref dV dV! 7 9 < "R_U
 cVJRèZ_ d! dV SdVe` WèV? 9 < ^ f eR_ ed %R SJV / UZè RJ d eV
 g` aVd` W` f j eZaJZTj\_ TYR\_XV d! è RQH#ORQH#` c VRPH` eV Re

`Ttf c Wc dX Ref dVd !SK "#M a/_dZ_d dX Ref dVd !SK GKT"#
df SdVedX Ref dVd !SK SUD`#R_U dVJReZ_d !RGV%qVhwr ^ f]e\$
ajZTj TYR_XVd Rv ^ ZbU#Rd _` T cVTeZ_X ^ f_eR _ed ^ RUV
eZdTYR_XV%

5 gRde ^ R cZj !-(%) " `WwVdV Z\_g` jgV ^ R_Z_X eV
^ ^ Uj ^ ^ dV dVdZTgV Sj TYR_XZ_X eV ^ f]eajZTj e RQH%
@XVj #eVf dVcZd _` eV aVTeZ\_X e ^ ^ Uj \_` _j _` V_8LOHVS
Z Rq dV ^ `c \_` V ?UDFN ReR eRZ dReZ _` %HYVWVc#eVdV
T cVTeZ_X ^ f_eR _ed Rv _` e eV TYR\_XVd eV f dVc h` f]UhR_e
e ^ R_V%< `h VgV#eZd g aV ` Wt cVTeZ _` Z` ajZd eRe eV
f dVcWc ^ f]Rd Rv T cVTeH YV_ R dZ_XjV dVJgR_eVjV ^ V_e
ZladVd_e#SfeSVYRgV_Z T cVTej hYV _` dVjV ^ V_e#R_U
Z eCRTeZ_dRcVa` dZSJ%6 dR\_M R^ ajV#T \_dZUc eVWj]` h\$
Z_X T cVTeZ_X ^ f_eR_eWcR ^ ^ Uj Wc eV TRC%M VcTzVd!

76. : 20 >LJQDO]_
. =. 6; <*44? >LJQDO 26 9UHHQ

HYVZ ajZTReZ _` W ^ eZdT cVTeZ_X ^ f_eR_eZd eRe eVWc\$
^ f]RZd _` \_j T cVTeH YV\_ eVcVZdM RTej \_` V>LJQDO%HYZ
ZdUfV e eV WTe eReZM f]eajV >LJQDO Re ^ dRv adVd _` #
eV Wf]g Wc ^ f]RdVb fZVd eVcV e SVRWf dV dReV_Z hYTY
1;; >LJQDO Re ^ dRvXcV_ Re eV dR^ V eZ V%HYZ SVYRgZ c
YRaaV_d SVTR dV eV f dVc Z_g` \Vd eV d SdV!LQ" ` aVdRe c
` gVc eV V\_ eV >LJQDO dVeZ dV RU` WbVc VRTY_Z UZjZf RJ dX\$
RJ% XV_VdRJ#7 9 < T cVTeZ_X ^ f_eR _ed Ue RZdUfV e
eZd g aV ` Wt ZRaa jZTReZ \_` hYVcV Ra c aVgZ dTYVt VUWc
` cRdVcUe` Sc RUj RTc dR_V_ eZV dV%

H T cVTe eZd#eV f dVc TR_ f dV R bf R_ eZ VU Wc ^ f]R#
Sfe 5]] j U Vd _` e Tf cV_ e j YRgV R t cV dVc ^ f_eR_e
` aVdRe c eRe eR_dVc^ d R dVJReZ_Rj Wc ^ f]R_Z e R t cV\$
` dVc`] XZ Wc ^ f]R%< `h VgV# 5]] j Tf cV\_ e j d`aa` c d
R qf R_ eZ Vc CaVdRe c FVa jRTV^ V_eh ZY I _Rj r ` aVdRe c%
5 _ZgVcZ_d` aVdRe c qf _Rj CaVdRe c FVa jRTV^ V_eh ZY
E fR_ eZ Vt f]USV RUJU eReh` f]U eR_dVc^ eV Wf]g
Wc ^ f]R_Z e 1

*44 V 0 >LJQDO ^ . =. 6; <*44? V 26 9UHHQ

7 9 < T cVTeZ_X ^ f_eR _ed Z UTR eV Re eV f dVc dWc\$
^ f]RZd e j Z_X e TYVt Wc `c Raa j RT \_d eRZ e e`
Sc RUj %HYV f dVc dV f]UT _dZUc ZbVf R_ eZ TRZ _` Z
Raac acZ e V acVd eV T _d eRZ e aVc Z UZjZf RJ
Re ^ d%

5 Wc RQH#eV VRPH ^ f]eajZTj RTT f _ed Wc)/%0 `W
eV ^ f]eajZTj TYR_XVd%HYVd ^ f_eR _ed W_ dVgV RJ RgVj
d SdV ZbV h ZY eV f dVc dWc ^ f]R HYV Wc ^ f]R U Vd _` e
ac aVdj YR_UjV YRgZ_X _` VjV ^ V_e d WbV XZjV dVc C W_
eZ Vd#eVdV T cVTeZ_X ^ f_eR _ed W_ dVgVj eRe eV Wc ^ f]R
U Vd _` eac aVdj dV jgV eV V5<?CHZ dR TV#^ VR_Z_X eVcV
Rv _` Re ^ d Re RJ%6 dR\_M R^ ajV#T \_dZUc eV Wj]` h_Z_X

7 9 < ^ f_eR_eWc eV TRC\$ %M VcTzV#h YTY R dV d eV f dVc
e h cZV RWc ^ f]R eReV acVdV dV c991;; H C5A5 1A5 => I; 5B
2DCB<5 1A5 9< 5491 C; H3A51 C4r1

=*9 : 75. : 20 8LOH]=*9 OLQNO 476. 8LOH _
89.- SURS(] 67 8LOH *6- . =. 6; <*44? : 75. 8LOH _

HYZ 7 9 < ^ f_eR_eVgVj d eV f dVc dWc ^ f]R RJ` h dWc
^ f]eajV ^ a g dRe dZ R c h SWVc eVcV Z dR dRe eReYRd
Rt jV#h YTY U Vd _` e^ ReY eV qZ ^ V UTR e j r SVYRgZ c%

7` cVTeZ_X ^ f_eR _ed eRe TYR_XV R d eT f dV ^ f]eajZT\$
Zj e VRPH Z UTR eV Re d ^ Vh YVcV_Z eV f dVc d
Wc ^ f]R eV Z T _d eRZ eU Vd _` eYR_UjVR_V ^ a g dV e
dV dV eT cVTej %

I _Wc f _Re j #7 9 < T cVTeZ_X ^ f_eR _ed dVJReU e eV
VRPH ^ f]eajZTj TR_SV eZjZ RJ U _` eV j aVj %H Z j f dRe #
T _dZUc eV Wj]` h_Z_X ^ f_eR_eWc R TRC\$ % ^ ^ Uj 1

=*9 : 75. : 20 8LOH]=*9 OLQNO 476. 8LOH _
89.- SURS(] 67 8LOH _
89.- SURS(R] 67 8LOH *6- : 75. 8LOH _

HYZ ^ f_eR_e^ R Vd eV Wc ^ f]R eZjZ RJ f _d eZT RSj VUf V
e eV Wc ^ f]R dVb fZ_Z X kV` t jVdR_U eV dX Ref dV d eT f dV
dVb fZ_Z X Re jR d e _Vt jV e M Z b H YV` dRT jV Wc ^ f]R Z d j d
eZjZ RJ f _d eZT RSj V Wc eV dR^ V dV d _%6 d R dV d j#eZ d
7 9 < ^ f_eR_eV d eR X VU R dT cVTeZ_X %K YZjVh V WbV V_e j
dRh eZ d h ZY VRPH 7 9 < T cVTeZ_X ^ f_eR _ed #eZ d Z d R cZ
Wc RJ ^ f]eajZTj \$R dVUT cVTeZ_X ^ f_eR _ed Z dX Ref dVd%

A f]eajZTj TYR_XVd e dX Ref dVd R_U dVJReZ_d TR_
^ R V Wc ^ f]R d eZjZ RJ f _d eZT RSj V R_U eV dV ^ f_eR _ed
Rv jZ Vj ` VjZ e V e \_` gRJ f V Wc U S f X Z_X a f c a` dVd%

\$! (>A53C9=7 < DC1=CB9= 613CB

: RT eZ 5]] j ^ ^ Uj dRv Wc ^ f]R d eRe ^ f d eSV e f V Wc R j
gRJZU dTV_RcZ Wf_U` gVc R ^ ^ Uj #ZcV X R d j V d d` WbV T ^ \$
^ R_U V f eU %HYV eRZ ^ ^ Uj YR d eV j R c V WTea R d R c aY
dV h _` Z : Z%R#R\_U R ^ R cZj ` WbV T cVTeZ_X ^ f_eR _ed
Wc eV eRZ ^ ^ Uj !/- " T ^ V W ^ ^ f_eR_Z eV WTea R d \$
X d aY %6 S d V R U h _` WbV U Z Wc V TV S V h W_ T cVTeZ_X
^ f_eR _ed Z eV WTe d` WbV eRZ ^ ^ Uj R\_U eV dVc` WbV
^ ^ Uj TR_SV dW_Z : Z%5%K YZjV R U ^ Z R_e f ^ S v ` W
eRZ s dT cVTeZ_X ^ f_eR _ed # _j 0, ` WbV*(, !*% - " eRZ
^ ^ Uj d eRe YRgV T cVTeZ_d _` _j YRgV T cVTeZ_d_Z eV
WTe d% ZjV_eV T _eM e` WbV 5]] j +: f \_UR dV# \_` _V` W
eV WTe \$R dVUT cVTeZ_X ^ f_eR _ed Rv gRJZU t i Vd#R d RJ Wf j ed

(a)

(b)

H j`\\ ReEzIT] d\\#HRSJ[V(acdV_eEeV_f^ Svc^ Wt^ \$
 dVtZ_X^ f_e_ ad! 9 EE" R_UeV Rdt TZAUaVtV_ dXV!: ET"
 e'ReEzIdvacdV_e\\h ZV T Jf^ _6>6 UZch]R_Z_X eV d_d#
 CRtY UZch]R_Z_X ZAEV]e` aVdRe` c Wc^ d Rf_ Rj` ` c SZ Rj
 Wc^ fJR#R_U9 QUZch]R_Z_X eV]e` aVdRe` % dM aVtAU#eV
 `aVdRe` c DOZD\\V Zdf dUz +, % `\\eV/V cVtZ_ d#h YZV

345-8* 8 VÉRZd` W@H@` aVcRè cðZ_ T` cðVtē_X^ f eR_ ed

Ca	@H@Ca	CTT	DTe
? 9 5	. GHPRG	('	(%/
? 9 5	4 ISTRPRCINW	0+	() %+
? 9 5	9 CEG	+/	- %,
? 9 5	- IMCYS	) **	) 0%*
? 9 5	1 VGTUCINW	() -	(- %*
? 9 5	- HGR	, -	. %.
? 9 0	. GHPRG	-	' %.
? 9 0	- IMCYS	).	*%.
? 9 0	1 VGTUCINW	-	' %.
? 9 0	- HGR	,	' %+
? 9 <	A GHPRGB, ISTRPRCINWB	-	' %.
? 9 <	A GHPRGBPOCEB	/	(%)
? 9 <	A4 ISTRPRCINWBAGHPRGB	(	' %*
? 9 <	A4 ISTRPRCINWBAPCEB	(	' %*
? 9 <	A4 ISTRPRCINWBACIMCYSB	(	' %*
? 9 <	A9 CEGB, ISTRPRCINWB	(	' %*
? 9 <	A9 CEGBACIMCYSB	)	' %.
? 9 <	A IMCYSBAGHPRGB	(	' %*
? 9 <	A IMCYSB, ISTRPRCINWB	) +	*%.
? 9 <	A IMCYSBPOCEB	(-	) %.
? 9 <	A IMCYSBAG/GOTUCINWB	*(	*%.
? 9 <	A IMCYSBAGHGRB	(	' %*
? 9 <	A1 VGTUCINWB, ISTRPRCINWB	)	' %.
? 9 <	A1 VGTUCINWBAPCEB	)	' %.
? 9 <	A1 VGTUCINWBACIMCYSB	(-	) %.
? 9 <	A1 VGTUCINWBAGHGRB	,	' %+
? 9 <	A HGRB, ISTRPRCINWB	+	' %.
? 9 <	A HGRBPOCEB	)	' %.
? 9 <	A HGRBACIMCYSB	*	' %/
? 9 <	A HGRBAG/GOTUCINWB	(	' %*
. 9 0	=ICEG	(	' %*
. 9 0	? OTKM	)	' %.
. 9 <	A=ICEGBAGGVCSCB	(	' %*
. 9 <	A? OTKM=ICEGB	(	' %*
. 9 <	A? OTKM=AGVCSCB	*	' %/
. 9 <	A= GVCSCB=ICEGB	)	' %.
. 9 <	A= GVCSCBATH I GRGF B	(	' %*
. 9 1	=ICEG	)	' %.
. 9 1	? OTKM	)	' %.
. 9 1	< GVCSCB	(	' %*
: 9 0	AZB	) -	*%*
	>PTCM	**+\$	\$##

345-8"! CTTf cðV_TV` W@H@` aVcRè cðZ_ T` cðVtē_X^ f eR_ ed

@H@	5 cZj	Ca	CTT	DTe
: CST	? OCRY	. GHPRG	) -	*%*
: CST	? OCRY	4 ISTRPRCINW	(*+	(. %.
: CST	? OCRY	9 CEG	..	0%.
2 UTURG	? OCRY	- IMCYS	*, ,	+, %,
2 UTURG	? OCRY	1 VGTUCINW	(/ 0	) +%'
2 UTURG	? OCRY	- HGR	..	0%.
2 UTURG	? OCRY	Z	) -	*%*
: CST	. ICORY	=ICEG	.	' %'
: CST	. ICORY	>RRI GRGF	(	' %*
2 UTURG	. ICORY	? OTKM	/	(%)
2 UTURG	DICORY	< GVCSCB	/	(%)

HYHQWXDOO\ Zlf dVUZ_) +% ' R_U_KLVWRULFD00\ Zlf dVUZ_
 (. %- %HYV d^ RZ_ZX f_Rj e^ a^ dRj ` aVcRè cd! EHIRUH#
 RQFH#R_U DIWHU" R dV dZj] WZCj] dVadVd_ eRZgV ` Wf dVc ^ ZB\$
 eR Vd#^ ` dZj Rd? 9 5^ f eR\_ ed% ` h VgVc#SZ_Rj ` aVcRè cdRcV
 _ ` e` WZV_ dV]RdUè dZ^ a]VT` cðVtēRSJV^ ZB R Vd%

=Waj ZX è dUfTV èV_f^ Svc` W^ f eR_ ed#R_U è f d
 jZ Vj] èV_f^ Svc` W^ d dRf dVc h` f jU_WUè jRSV]#
 èV_T j eVZX è^ a^ dRj ^ f eR_e` aVcRè cdè Wf d` _
 DOZD\ V#HYHQWXDOO\ #R_U_KLVWRULFD00\ ZljZ Vj] è
 dZj] dVgVRj ^ ` d eWf j e d% ` h VgVc#adVcVgZX Rj] f_Rj
 jè ` aVcRè cdè XV_VcRè? 9 5^ f eR_ ed ZljZ Vj] gRj f \$
 RSjV%

; ZgV_ èRe]è ` aVcRè cd R cV UzjZMUZ_ è aRdeR_U Wf dV
 ` aVcRè cd#h Vh VcVRUJZ_ Rj] Tf cZ f dZV dVcdRTf Rj] Z_ èVc\$
 TYR_XV aRdeR_U Wf dV ` aVcRè cd#H\_ Vi a]` dV èZ#HRSjV((
 UzBjRj d èV cRèV Reh YZTY UzWV_ eè aVd` Vjè ` aVcRè cd R cV
 f dMUSj R^ f eRè _ ` aVcRè cHYVc` h dQcSTR_UHUTURGRcVR
 d^ ^ Rè _ ` WèV dV]VgR_eZ_ dVcè _ #UjVèZ_ #R_U Vi TYR_XV
 ^ f eR_e` aVcRè cdHYV\_Vi eWf cè h dRcVRd^ ^ Rè \_ ` WèV
 dV]VgR_e dV]RTV^ V_e^ f eR_e` aVcRè cd%

Cgvch YV^ Z_X#ZMR t cd\$ dVc ^ f eR_e UzVTèj TRaè dVd
 R f dVc ^ ZB R V#èV ^ ZB R V h Zj] SV_Z_ dV]Rè _ è Z_ dVcèZ_X#
 UjVèZ_X ` c Vi TYR\_XZ\_X ` aVcR_Ud j` TRèZ_ Wc Wf dV èZ^ V
 ` aVcRè cd#h YZTY T^ acZV ` W- (% . ` WèV T` cðVtē _ d%
 K YZjV dV]RTV^ V_ ed R cV jVcd dVadVd_ èU#f dVcd U_Z_ èVc^ Z
 aRdeR_U Wf dV ` aVcRè cd#è aZTRj] Sj\_Z\_T` cðVtèj f dZ_X R
 Wf dV èZ^ V ` aVcRè cZ\_ dèRU` VRaRdeZ^ V ` aVcRè c% ` h VgVc#
 h YZjV RaRdeZ^ V ` aVcRè c^ Rj T` cðVtèV^ ^ Uj# WZ_ èZ^ Vd#
 èV_Z_T` cðVtèf dV` WR Wf dV èZ^ V ` aVcRè cZ\_ a]RTV` WR aRde
 èZ^ V ` aVcRè c Zj dV]j] èV dVd j e` W_VcèU è^ a^ dRj ` aVcR\$
 è cdTcVèZ_X dèZèVcèR_ _VTcdRj Wc^ f jRd% dR_ Vi R^ a]V#
 T_ dVc èV Wj]` h\_Z\_X Wf jè TRCSj' ^ ^ Uj\_R\_U T` cðVtē_X
 ^ f eR_ ed

345-8"" Hj aV`W@H@]`XTZ`T`cVTeZ`X^fE`ed

@H@	CTT	DTe
: CST	(-)	)' %()
2UTURG	+/+	-(%.
: CST"QCST	(.	) %/
: CST"HUTURG	+	' %()
2UTURG"QCST	.,	. %+
2UTURG"HUTURG	-'	. %/
>PTCM	*+\$	\$###/##

4>: . =. 6; <*44? : 75. ?UDVK
 12.; 792, *44? . =. 6; <*44? : 75. ?UDVK

HYVAc`^ aeWcTRCSJ`' ZlqB<5I;5F9;5E5=01;;H25B5=C
 C> C85 C@B8% HYV f dVsd Z`T`cVTe f dV`W DOZD\ V`V`WcTVd
 eReYRgZ`X`T`Jvd Z`eV eRdV SVT`^ Vd aVc`R`V`ej efV%
 eZd TRd`#cVaJRTZ`X DOZD\ V`h ZY KLVWRULFD00\`^ R`Vd eV
 Z`ZdR`e`a`a`dR`j`aVdRe`c`d`aVt`TZ`e`e`V`Wc`f`J`Rd`Vg`R`f`\$
 ReZ`\_%`Rd`Z`a`Z`e`R`e`e`Vc`T`cVTeZ`X`^f`E`eZ`e`d`a`j
 UjVd eV DOZD\ V`aVdRe`c`%

I dV`^ ZHR`Vd Rv SVde cVadV`eU`h`Z`Y`^f`E`ed`gVc`Wf`cV`aVdRe`c`h`VgV`#`dVd`U`qZ`e`CTYR`XV`
 aReR`U`adV`e`aVdRe`c`W`R`d`R`dV`e`W`ef`U`adR`U`Z`e`V`Z`aR`Te`V`V`d`B`U`a`a`d`j`aVdRe`c`
 `c`Y`h`R`a`a`d`j`aVdRe`c`R`j`SV`e`V`c`W`d`V`S`j`T`gV`e`Z`e`V`T`c`d`e`R`e`%

\$. 6?3/ A@A` C/ 92 7E

; ZjV`eV`dZV`W`eV`5]]`j`+: f`_`SV`TY`^`R`a`!`\*`--`0`^`U`\$
 Vjd`T`^`aR`cV`U`e`\_`f`^`Sv`c`W`^`U`jd`cV`J`R`d`U`h`Z`Y`5]]`j`-
 !`+`#`R`gV`d`R`V`d`R`U`d`f`^`^`R`c`Z`R`eZ`_`cV`f`j`e`d`Z`\_`G`V`T`e`%`TR`_`SV`
 d`V`h`W`U`e`h`R`d`U`e`V`S`V`R`g`Z`c`W`eV`5]]`j`+: f`\_`SV`TY`^`R`a`%
 :`c`Z`dR`TV`#`Z`\_`G`V`T`e`%`#`eV`5]]`j`+: f`_`^`U`jd`Y`R`g`V`R`\_`_`\$
 Vof`Z`j`R`V`e`d`R`eV`W`0`%`R`U`-`%`#`S`f`e`eV`5]]`j`-`^`U`jd`
 `\_`j`Y`R`g`V`R`d`R`eV`W`^`%`%`H`Y`V`g`V`d`R`j`R`g`V`d`R`X`#`-`/`%`#`Z`
 Y`R`g`Z`j`Z`_`U`f`V`T`V`d`S`j`eV`5]]`j`+: f`\_`f`^`Sv`c`%`5]]`W`f`c`
 eR`S`j`V`d`Z`j`T`f`U`V`R`S`c`V`R`U`h`_`e`R`e`d`V`a`R`c`R`eV`d`f`e`eV`5]]`j`-
 cV`J`R`d`V`^`^`U`jd`#`d`e`R`e`5]]`j`sd`aV`d`W`c`^`R`\_`TV`TR`_`dZ`j`SV`
 Z`\_`d`aV`T`e`U`Z`_`d`^`^`R`eZ`_`R`d`h`V`j`R`d`R`T`c`d`e`V`U`Z`W`c`V`e`T`j`\$
 jV`T`eZ`\_`W`^`U`jd`c`%

HYV5]]`j`+: f`\_`SV`TY`^`R`a`Z`d`S`e`d`V`a`d`V`_`e`R`g`V`W`Z`\$
 eR`V`d`e`R`e`_`g`Z`V`5]]`j`f`d`V`d`h`^`f`j`U`^`R`\_`V`R`_`U`d`V`a`d`V`\_`e`R`g`V`
 5]]`j`sd`SV`R`g`Z`c`W`c`a`d`U`Z`R`eV`d`e`R`eV`_`T`R`a`d`j`R`eV`R`d`Z`X`j`V`
 T`\_`TV`a`e`K`Y`Z`V`5]]`j`Z`d`Z`e`U`U`e`SV`\_`V`t`eR`j`5]]`j`f`d`V`c`#`
 h`V`S`V`j`Z`g`V`e`R`e`\_`g`Z`V`f`d`V`d`R`V`^`^`c`V`j`V`j`e`d`M`^`f`e`eV`
 f`d`V`W`5]]`j`e`S`f`Z`U`T`_`t`U`\_`TV`Z`e`V`R`T`f`c`R`T`j`\_`W`eV`Z`
 ^`^`U`j`%`\_`R`U`Z`Z`_`#`h`Y`Z`V`>R`C`S`j`TR`\_`S`V`g`Z`h`V`U`R`d`R`e`j`^`^`U`j`#`
 >R`C`O`Z`d`R`_`e`Z`M`R`S`j`^`^`c`V`c`S`f`d`e`^`U`j`e`R`e`Z`d`U`c`Z`j`U`W`^`
 c`V`R`j`h`^`d`j`U`e`R`Z`_`d`d`a`^`d`Z`5]]`j`Q`*`P`H`Y`V`c`W`c`#`e`Z`d`Z`R`
 X`^`U`g`R`c`Z`j`_`W`T`^`a`j`V`Z`j`\_`W`a`c`V`U`Z`R`eV`W`c`^`f`J`d`e`c`f`X`Y`\$

`f`e`eV`5]]`j`+: f`\_`SV`TY`^`R`a`%`f`c`TR`d`V`d`f`U`_`U`V`d`W`T`f`d`
 V`j`T`f`d`Z`j`j`_`\_`^`^`U`jd`W`^`eV`5]]`j`+: f`_`SV`TY`^`R`a`#`S`f`e`
 eV`\_`S`d`V`g`R`eZ`_`d`R`S`_`f`e`eV`Z`^`a`R`T`e`_`W`eV`j`_`T`R`eZ`_`\_`W`T`_`c`V`T`e`\$
 Z`\_`X`^`f`E`_`e`d`R`cV`\_`e`f`_`Z`f`V`e`R`_`j`_`R`c`aV`T`e`d`\_`W`eV`5]]`j`+: f`\_`
 U`R`e`d`V`e`%

% - 39' A32 D<?8

% /5B9=7 1=4 452D779=7 1;;>G< >45;B

HYV`^`d`e`T`j`d`V`j`\_`cV`J`R`eV`h`^`d`e`5]]`j`Z`d`H`F`#`R`
 ^`f`e`R`eZ`\_`\$`cV`_`eU`cV`aR`Z`e`TY`\_`Z`f`V`e`R`e`Z`d`R`Z`_`V`U`R`e`d`V`aR`Z`Z`X`
 5]]`j`+: f`\_`^`^`U`jd`cV`H`Y`V`c`V`R`cV`e`c`W`^`R`Z`_`U`Z`W`cV`\_`TV`d`%`Z`d`#`
 SV`TR`f`d`V`\_`W`eV`V`i`V`T`f`eZ`_`V`_`g`Z`\_`^`V`_`e`W`c`5]]`j`+: f`\_`#`H`F`
 U`V`d`\_`e`U`T`\_`V`R`_`j`_`^`f`e`R`eZ`_`\_`aV`d`R`e`c`d`_`g`V`c`d`Z`_`R`e`f`c`V`d`\_`c`
 cV`J`R`eZ`_`d`%`d`R`c`V`d`j`#`H`F`TR`\_`d`Z`_`a`j`\_`f`d`e`V`S`Z`_`\_`U`Z`Z`\_`R`j`
 `aV`d`R`e`c`h`Y`V`\_`TY`V`T`\_`Z`X`_`V`d`f`Z`j`R`V`_`TV`%`G`V`T`_`U`#`H`F`\_`g`Z`h`d`
 ^`f`e`R`e`\_`aV`d`R`e`c`d`R`e`Y`Z`Y`V`c`X`c`R`_`f`J`R`Z`j`_`e`R`\_`5]]`j`_`%`_`c`
 Z`\_`d`R`_`TV`#`W`c`R`S`Z`_`R`j`\_`W`c`^`f`J`R`#`eV`S`Z`_`R`j`\_`j`\_`X`Z`R`j`_`aV`d`R`e`c`d`
 R`cV`T`^`S`Z`_`V`U`e`X`V`eV`c`Z`e`_`\_`V`^`f`e`R`\_`e`\_`aV`d`R`e`c`X`c`f`a`%`G`Z`TV`
 H`F`_`\_`j`\_`_`j`_`^`f`e`R`a`d`V`W`f`j`g`_`j`_`T`R`eZ`_`d`R`\_`U`U`V`d`_`e`X`V`_`V`eV`R`j`
 a`\_`d`Z`j`V`t`c`d`\$`d`V`c`^`f`e`R`\_`e`#`H`F`TR`\_`R`W`d`U`e`^`R`V`e`Z`d`
 e`R`U`\$`_`W`Z`\_`X`c`R`\_`f`J`R`Z`j`\_`%`e`R`d`j`\_`#`H`F`U`V`d`_`e`aV`d`W`c`^`^`f`e`R`\$
 eZ`\_`_`e`d`Z`X`S`f`e`Z`\_`d`e`R`U`R`a`j`Z`d`TY`R`\_`d`^`f`e`R`\_`e`d`e`R`_`W`f`j`g`
 j`\_`T`R`eZ`\_`_`d`R`c`TY`Z`X`W`c`R`g`R`j`Z`U`a`R`e`Y`%`d`R`c`V`d`j`#`H`F`S`d`M`V`\$
 T`f`eZ`\_`_`Z`d`eZ`_`d`U`e`_`d`e`R`e`X`Z`R`j`j`_`X`V`\_`V`eV`R`Y`Z`Y`V`c`R`\_`U`Y`Z`Y`V`c`
 `d`U`c`d`\_`W`^`f`e`R`\_`e`d`f`\_`eZ`\_`R`a`R`e`Y`Z`d`W`f`\_`U`%`_`T`^`a`R`c`Z`d`_`#`
 5]]`j`_`X`V`\_`V`eV`d`R`j`j`a`\_`d`Z`j`V`t`c`d`\$`d`V`c`^`f`e`R`\_`e`#`aV`d`W`c`^`d`
 e`R`U`Z`_`R`j`\_`^`f`e`R`eZ`\_`_`e`d`Z`X`#`R`\_`U`Z`_`a`_`c`R`\_`e`j`_`#`a`c`_`U`f`V`d`R`eV`d`e`
 d`Z`V`e`R`e`h`Z`j`\_`R`Y`Z`g`V`R`('`\_`^`f`e`R`_`e`d`T`_`c`V`%`G`Z`TV`H`F`S`d`
 ^`f`e`R`_`e`d`R`cV`R`d`S`d`e`_`W`5]]`j`_`sd`^`f`e`R`_`e`#`h`V`U`Z`\_`_`e`U`\_`R`
 U`Z`V`T`e`T`^`a`R`c`Z`d`_`\_`W`^`f`e`R`\_`e`\_`aV`d`R`e`c`d`%`\_`h`V`g`V`#`\_`f`c`T`^`\$
 S`Z`_`V`U`T`_`t`X`f`e`R`eZ`\_`_`e`R`\_`V`d`H`F`S`d`aV`c`b`V`T`eZ`j`V`W`c`X`c`f`a`Z`X`
 ^`f`e`R`_`e`_`aV`d`R`e`c`d`%

6V`d`Z`U`d`5]]`j`\_`R`\_`U`H`F`#`eV`cV`R`cV`d`g`V`d`R`j`_`S`_`U`Z`d`_`W`
 h`^`d`e`R`e`W`T`f`d`_`\_`e`d`Z`X`R`\_`U`U`S`f`X`X`Z`X`5]]`j`_`^`^`U`jd`c`%
 H`Y`c`W`^`R`_`V`f`d`V`\_`W`5I`_`Z`e`%`5]]`j`:_`@`Z`d`R`Y`j`S`c`Z`U`W`f`j`e`j`_`T`R`j`\$
 Z`k`R`eZ`_`\_`e`TY`_`Z`f`V`e`R`e`e`R`\_`V`d`R`\_`W`f`j`g`5]]`j`_`^`^`U`j`\_`R`\_`U`R`_`
 5I`\_`Z`e`e`d`e`c`f`Z`V`R`_`U`c`V`f`c`_`d`R`c`R`\_`_`V`U`j`Z`e`_`W`f`c`b`Z`Z`f`d`j`_`T`R`\$
 eZ`\_`d`\_`_`P`%`F`V`aR`Z`\_`Z`d`R`\_`X`V`_`V`d`R`_`\_`U`\_`g`R`j`Z`R`eV`_`R`f`e`^`R`e`U`
 cV`aR`Z`e`TY`\_`Z`f`V`e`R`e`f`d`V`d`5I`\_`Z`e`e`d`e`T`R`d`V`d`e`\_`f`e`Z`\_`V`M`_`aV`T`e`U`
 S`V`R`g`Z`c`O`\_`P`%`7`9`6`5`F`\_`V`i`e`\_`U`d`5`F`V`aR`Z`e`_`R`U`Z`Z`\_`_`R`j`j`_`T`_`\$
 d`Z`U`c`S`f`Z`eZ`_`5]]`j`\_`R`c`d`V`eZ`\_`d`e`_`X`f`Z`U`\_`eV`cV`aR`Z`_`\_`U`TY`V`T`
 TR`\_`U`Z`R`eV`_`a`R`e`Y`V`d`\_`Q`\_`P`H`Y`V`c`V`R`cV`R`j`d`\_`d`g`V`d`R`j`_`U`S`f`X`X`Z`X`
 e`TY`_`Z`f`V`d`W`c`5]]`j`\_`e`R`e`U`_`\_`e`f`e`Z`Z`V`5I`\_`Z`e`e`d`e`d`%`H`F`
 Z`d`R`\_`5]]`j`_`cV`aR`Z`e`TY`_`Z`f`V`e`R`e`e`Z`d`e`\_`t`\_`U`a`R`e`Y`V`d`S`R`d`U`
 `\_`_`R`a`c`V`d`e`\_`f`^`S`V`c`\_`W`e`^`a`j`R`a`d`R`\_`U`f`d`V`d`5]]`j`\_`R`c`d`V`eZ`\_`_`d`R`d`
 R`\_`_`c`R`T`j`V`%`V`5`:\_`Z`\_`Z`d`R`\_`R`f`e`^`R`e`U`cV`aR`Z`e`TY`_`Z`f`V`e`R`e`f`d`V`d`
 R`S`_`f`_`U`U`\_`V`i`Y`R`f`c`Z`j`V`d`V`R`c`TY`_`O`P`%`_`@`5`?`_`Z`d`R`_`W`f`j`e`j`_`T`R`j`\$
 Z`k`R`eZ`_`\_`e`TY`_`Z`f`V`e`R`e`j`_`T`R`eV`d`W`f`j`e`d`S`j`_`f`c`Z`X`R`a`R`c`Z`j`\_`^`R`i`
 c`R`e`e`_`j`d`e`e`\_`T`^`a`R`cV`eV`U`Z`W`c`V`\_`TV`S`V`h`W`\_`R`\_`d`R`e`Z`M`j`Z`X`
 Z`\_`d`R`_`TV`_`W`R`a`c`V`U`Z`R`eV`R`\_`U`R`T`\_`f`\_`e`c`V`R`_`a`j`V`W`^`^`R`_`R`c`d`V`c`\$

```
eZ_`gVcYReacMUTRe/G(PHYNVdVtY_ZbfVdWtFdyYRgZj
`_fcdXZPcbVcz`_#SfeRcbVcz`_dYRgVèSVHczV_Z`_tcd$
`dUvc`]XZT_R_UTC_SV_Z`T`ccVTej`daVTZVU/B`_V`WèVdV
WR`Vh`d`d`d`aa`cee^`a`cRl`]XZT%
```

% + DC109 = 65897

A f eRz _ e/dz X Q + # (. PZIR RTaZv dVdRcTY RvR Q0P eRz
Zih VJ] dF UZUWcZ^ aVdRzVJR_Xf RXdSf eZj] VdVcVi a]` dVU
WcUWJRdRzVJR_Xf RXdOP7]` dVj dVJRuH` d Z e` Uf TVd
^ f eRz _ e/dz X Wc^` Uj TYVt Vcd Q # #). P#h YZY dVd _
` gVc jZ VRc e^ a` dRj` XZ Sf e eV Rf e^ RvUR_Rij dZ dZ UZV
WcV_eCfch` d Wtf dVd` _ S`f _ UUDTV_RcZ V_f^ VcRz _ #
h YZV^` Uj TYVt Vcd aVdWc^ R\_ Vi YRf dZV dVcTY` WvV
dRv dRtV#h YZY dVd j e dZ eV Vi Vtf eZ _ R_ UTYVt Z_X` W
^ f eRz _ dCvof ZZ_X UZWcV_eRjX` cZ^` Z Raac` RTYVdPc W_ #
^ f eRz _ e/dz X WcUWJRdRzVJR_Xf RXdWtf dVd` _ ^ f eRz
Z_X dAVtZ TRz _ dWcZ^ aVdRzVt U#` W_ h ZY^ f eRz _ d
Raa]ZRSjV e` S` e` eV dAVtZ TRz \_ R\_ UeVZ^ aVdRzVt U#`
Cfch` d` _ ^ f eRz _ e/dz X Wc5 j]` j ZjT] dVcZ dAZe e
GZgR_R_Z V eRjP` ( PhY` Ut_ V^ f eRz _` aVdR e dWc7 GD
dAVtZ TRz _ dh cZV_f dZ X: 8 F) g _ eR Q0P% ZYVc_ZR_ U
GRjRd Q P U t _ V dAVtZ TRz _ ^ f eRz _ WcC7 @R_ U Raa]j Ze
e` acV` dSf _ UeZ _ dAVtZ TRz _ dWcT _ dRZ` dSdUe/dS
Z_X% = RUeZ _ #A f 7 YVt Z e` Uf TVd ^ f eRz _ e/dz X Wc
< Rd Vj Q) P% VtV_eh` d Rj d` j` \` d e TcRv @H^ f eRz _ d
h ZY Z Wc^ f jRd SVZ_X R_Rij kU Sj Bf GA j #6 jRt #5 Rj e#
R_ U d @H^ Q (P% H V X Rj` WvZi h` d Z d e` j` \` Wc Sf Xd
h ZY Z @H^ d j gVd eV^ d j gVd dRv e` R_ Sf Xd h ZY Z eV
Wc^ f jRd eV^ d j gVd %

&* < ; 19B@7* ;

5]]]j - Z`e' UfTVd ]Z VRc A^ a' dR ]`XZT e 5]]]j #^ R_XZ
5]]]j R^` d' gVcRZV^` U_M]Z_X]R_XfRX%`- hVgV#eZ
Z_TcVRdUM acvdZSZq T^` VdReRT dclHYVcVRcV^` d'hRj d
fVcdTR_ZT cVtqj dVtZVVRac^` aVq% 5]]]j ZlR^` fReZ_
e/dZ_XWR^` Vh^` d Wc5]]]j , R_UVRqZVc% 5]]]j S^` e' aVc\$
Wc^` d^` fReZ_ e/dZ_X R_UYRd eV TRaRSZq `WV_VReZ_X
R^` fReZ\_ qZ]Z\_X e/dcfZ V^`HYZl aRavC Z`e' UfTVd 5]]]j #
hYZTYM aR_Ud 5]]]j e' aVcWc^` ^` fReZ_ e/dZ_X^` gVcA^` \$
a' dR]^` U_M]d% 5]]]j Rjd faURv/d5I_Ze' Ut_VhYReR
e^` a' dR e/dcTRdV ]^` d]Z V%o i aVcZ V_Rj dVcfjedd^` h e'Re
5]]]j YRdR^` Z^` c' gVcVVRUR_UeV e/dcfZ d'ac' UfTVUSj
5]]]j RcvVWVtZgVReVgVRjZ_X dVgVcRj VVfj edZ dVRjSh^` c]U
VVfj e' e^` a' dR ]^` U_M]d%A^` d' gVc# 5]]]j `aV_d eV U^` c
e' faURv/5]]]j :@R_U5FVarZ e' YR_UjVeV_Vh e^` a' dR
T^` dcfTcd%

- 34B?3; 13@

(%5ZYVC_Z#%5%#@cSVg%#BZn`gZf#%H-Z`VWc^fR`ed#`UJ\$
SRdU^fR`eZ`_e/cZ`XhZy`eZ`VURf`e`aR`e%1HvcdR`UDC`WdI
.e'`=e/c`ReZ`\_Rj7`_WcV_TV`#5D)`(*#6fURaVd#f`\_XRqj`#f`_V
(-\$)`#Dc`TWUz`Xd.`aa%)`o\*/%GacZ`Xvc!`)'`*"
)%5ZYVC_Z#%5%#GRjRd#%5%#HvcdRdV`XV`VcR`\_Sj`C7@`a`f`R`e\$
eZ`\_R`UT`\_d#fZ`ed`Igz`X%6`1E`G=7`aa%`+o.(!)''`"
*%5`YRh`V#8`%6`Rc#`#5`%@R`#D#`%A`ZfVj]`#`%G`_X#8`%H`h`RdUd
RWc`a`Rj`Wf`_UReZ`\_`Vh`VS`dVf`cZ`%_1)`(')`*dU`999`7`^`af`e/c
GVf`cZ`:`f`_UReZ`\_dG`a`a`dZ`a`aa%)`0`o`\*`+!)`('`"
+%5`j`j`:`dR`^`a`V`F`WcV`TV`YeedRj]`j`e`[d#c`X`dVf`%e`!])`+`
`%5`Rj]`j`+:`f`_6`V`TV`^`R`1`YeedRj]`\_U`%`X`dVf`\_d`B`-`-`+`(*`!`))`"
-`%6`RXYVC_Z#`%6`R`\_X`#9`%A`RjV`#G#`-R`T`d`\_#8`%5`Wc`a`Rj`Raac`RTY
Wc`Uv`eZ`\_`WdVf`cZ`%_uRh`d`Z`eV`R`Uc`ZJ`avc`Z`hZ`_`g`d`a`%
`=1:`c`a`Rj`5`dVf`eZ`_W`^`af`eZ`X`aa%`++!)`('`/"`
`%6`Vj]`Z#`%#`-R`T`#C`%8`Vj]R`R`aV`a`R`U`Z`^`\_`V`d`e`T`g`v`c`R`V`%G`Vh`%
HvcdR`\_V`Z`W`f`Vj]ZS`+(!`"#,`o+.`!(`00`)"`
/%6`jR]`#D#`%C`f`\_#j`%HvcdR`R`H`a`f`R`eZ`\_`W`a`_`Uj`TYV`T`V`c`dVf`\$
Z`TReZ`_d`Wc`e/c`X`V`VcR`_`R`_U`V`g`Rj`f`R`eZ`\_`%A`f`R`eZ`_`e/c`Z`\_`X`Wc
eV`\_`Vh`TV`_`e`g`aa%`+o`!)`('`)"`
0%6`ZUR`R`G`%#`F`Z`Z#`%#N`Y`_X`#`%6`RXYVC\_Z#`%B`Xf`j`V`_-#`#5`Xf`Zc`#
B`%#`cZ`R`#A`%`%6`f`_`U`U`M`V`Y`f`d`z`g`v`d`R`c`T`\_`WRj]`j`_`dVf`Z`\_`TReZ`
`cV`a`Z``eZ`_`=7`G`!)`('`)"`
(`%6`d`\_`Vj]`#`%7`Y`a`f`Z`#8`%7`f`_Y`R`#5`%A`RTVU`\_#B`%H`V`V`Vj]T`e`f`_`a`R`R`\$
j]`Kv`c`1`^`\_`Uj`TYV`T`\_`Z`\_`X`c`Vj]R`eZ`_`Rj]`t`c`d`\$`_`d`Wc`e`a`a`_`a`_`c`d`j`dVf`Z`_`TReZ`_`d`%
`=1`)'`(/`**`dU`999`&`7`A`_`=e/c`ReZ`\_`Rj7`\_`WcV`TV`_`\_`5`f`e`a`R`eU
G`\_`Vh`RcV`9`\_`XZ`\_`WcZ`\_`X`15`G`)"`aa%`/`+o`/`.)`('`/`%`YeedRj]`\_`Z`%`X`&
(`%`(+`&`)*`/`(+`&`)+`+`.)`
(`%7`R`g`Rj]`\_`#`@`#8`V`Z`\_`g`V`TV`\_`Z`F`%7`\_`d`j`_`#A`_`%5`Xf`Zc`#`B`%#`@`_`H`c`R`_`\_`#
M`d`P`a`R`U`R`\_`Z`#A`_`%#`G`a`V`I`S`T`W`k`k`1`:`f`k`Z`_`X`@`H`e`d`I`g`V`a`d`h`Z`Y`S`\_`f`\_`URj
T`\_`UReZ`\_`d`%e`_`1`Dc`TWUz`Xd`\_`W`e`V`999`&`7`A`\_`+`e`_`=e/c`ReZ`\_`Rj
7`\_`WcV`TV`_`\_`G`\_`Vh`RcV`9`\_`XZ`\_`WcZ`\_`X`%e`7`G`)_`+`#5`d`i`T`ReZ`\_`_`Wc
7`^`af`eZ`X`A`RTY`Z`Vj`\_`#B`Vh`_`M`d`\_`#B`M`#I`\_`G`S`!`)'`+`%`YeedRj]`\_`Z`%
`\_`X`&`%`(+`&`,`0`,`_`,`_`%#`_`\*`_`0`_`/`_`\_`#`
(`%7`V`d`f`V`Z`R`#`%7`f`\_Y`R`#5`%A`RTVU`_#B`%H`Z`\_`Vj]`\_`dVf`Z`_`TReZ`_`\_`cV`a`Z`\_`
Wc`Rj]`_`j`_`-%e`_`1`G`\_`Vh`RcV`9`\_`XZ`\_`WcZ`\_`X`\_`R`\_`U`\_`_`\_`c`a`Rj`A`V`e`R`\_`U`b`aa%`
)`//`o`\*`_`\*`!`))`)"`
(`%\*`7`f`_Y`R`#5`%A`RTVU`\_#B`%j`\_`Rj]`\_`UReZ`\_`X`e`V`Yj`_`S`Z`U`F`H`A`\_`G`S`H`7`G`j]`V`g`Vj
`\*`T`\_`T`v`a`e`h`Z`Y`Vj]T`e`f``a`%e`\_`e`%`%6`\_`Vh`%h`_`\_`j`d`H`V`Y`\_`_`j`%h`c`R`\_`d`W`e`%`*`#`
)`//`o`(`o`\_`!`))`)"`
(`+`%8`V`A`\_`Zj`\_`#`%#`%#`@`e`\_`_`#`%#`%G`Rj`\_`h`R`d`\_`#`%`%`\_`Z`\_`e`d`_`\_`e/c`d`U`R`d`\_`Vj]T`\$
eZ`\_`1`Y`Vj]`A`Wc`eV`a`c`R`T`eZ`\_`Z`\_`X`a`c`\_`X`c`R`a`^`\_`V`c`%`\_`^`\_`af`e/c`!`(!`"#`+`o`+`
!`(`0`.)`"
(`%8`Z`\_`Z`B`%#M`Vj`_`#7`%5`\_`j`c`R`Z`_`#N`%R`f`_`j`_`R`c`\_`Z`#5`%R`\_`Y`f`c`d`Z`\_`#G`%?`_`\_`c`R`\$
5`D`=1`R`W`R`_`Vh`_`\_`d`\_`e`\_`V`\_`R`\_`TV`?`_`\_`c`R`e`\_`S`V`e`c`d`\_`a`a`_`\_`e`d`eZ`\_`X`\_`R`\_`U
c`Vj]Z`S`Z`j]`\_`e`TY`_`Z`f`V`d`%e`_`1`G`S`7`)'`('`/"`
(`-`%`:`f`e`d`c`v`k`6`cZUR`_`Z`#`F`V`Z`Z#`%#N`Y`\_`X`#`%6`RXYVC\_Z#`%B`Xf`j`V`_-#`#5`Xf`Zc`#`B`%#
5`Xf`Zc`#`B`%#`cZ`R`#A`\_`%`7`9`6`5`F`1`\_`W`U`S`R`T`\_`\$`\_`cZ`jV`_`\_`eV`c`R`eZ`_`V`F`V`a`R`Z`
`W`5`j]`j`\_``G`a`Vf`Z`\_`TReZ`\_`_`d`%`d`i`T`ReZ`\_`_`Wc`7`^`af`eZ`X`A`RTY`Z`Vj`\_`#
B`Vh`_`M`d`\_`#B`M`#I`\_`G`S`!`)'`)"`*"
(`%`<`R`_`j]V`e`f`%`%`Hvcd`X`a`c`_`X`c`R`a`\_`d`h`Z`Y`eV`R`Z`\_`_`W`R`T`_`^`a`Z`V`c`%`999`
H`c`R`\_`d`\_`Vh`\_`%9`\_`_`X`&`\_`+`#`.)`0`o`!`(`0`.)`%`YeedRj]`\_`Z`%`X`&`%`(+`&`\_`0`&
H`G`9`%0`.)`%`*`(`+`&`
(`/`%`>`R`T`d`\_`_`#8`%G`\_`Vh`RcV`R`S`d`e`R`eZ`_`\_`d`i`j`\_`X`Z`#j]R`\_`X`f`R`X`W`#R`_`\_`U`R`_`Rj]`_`d`Z`B`
H`Y`V`A`_`\_`H`D`c`b`#I`\_`G`S`!`)'`-`"
(`0`%`>`Z`#M`#`\_`R`c`a`\_`R`\_`#A`\_`%5`\_`_`R`_`Rj]`_`d`Z`R`_`U`d`f`c`g`j`\_`_`W`e`V`U`g`Vj`\_`a`^`_`V`_`e`_`W
`a`f`R`eZ`\_``e/c`Z`\_`%`999`H`R`_`d`_`G`_`Vh`_`%9`_`\_`X`&`!`\_`_`#`_`+`o`-`_`/`!`)'`((`%`
YeedRj]`\_`Z`%`X`&`%`(+`&`\_`0`&`H`G`9`%`)'`%`
)`%`>`gR`_`\_`g`Z`#5`%G`f`j]Z`jR`\_`_`#5`%A`f`R`eZ`_`\_`e/c`Z`_`X`Wc`e`a`a`_`a`_`c`d`j`_`Rj]`_`j`
`^``Uj]`d`%e`_`1`-`\_`e`\_`5`7`A`\_`&`999`_`\_`=e/c`ReZ`_`\_`Rj7`\_`_`WcV`TV`\_`_`\_`A`\_`_`Uj]
8`\_`cZ`jV`_`9`_`XZ`_`WcZ`_`X`@`\_`Xf`R`X`V`d`R`_`U`G`\_`d`a`_`d`#A`\_`C`8`9`@`G`aa%)`/`o`
)`\*/`!`))`)"`*"
(`%`@`V`6`V`c`d`#8`%#D`R`c`R`Z`_`\_`#5`%H`V`V`_`R`e`+`j]Z`S`Rj`\_`_`c`Vj]R`d`V`\_`_`%`%`%`G`R`eZ`\_`_`W`

