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 $K 5G \le B : HCB \& 8(7(,*/.3))$

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.0',3/*31* $\#=(F(G(9 \land a)))Vc$ =UV_eZWZTReZ`_ B`(\$

+,++ 5gV_fV \WeYV 5 \VcZTRd&BVh M\c\&BVh M\c\ #5UUcVdd `W acZ_TZaR] ViVTfeZgV `WWZTVd\$

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BcY^XViZ Wn X]ZX` bVg` 1]Zi]Zg |YhigVci &/']Vh [^aZY Vaa gZedgih gZf j^gZY id WZ [^aZY Wn LZXi^dc /1 dg /3&Y' d[i]Z LZXj g^irZh >mX]Vc\Z : Xi d[/712 Yjg^c\ i]Z egZXZY^c\ /0 $bdci]h \&dg [dg hjX] h]dgiZg eZg^dY i]Vi i]Z gZ \wedge higVci \ 1Vh gZfj^sZY id [^aZ hjX] gZedgih'* VcY \&O']Vh WZZc hjW_ZXi id hjX] [^a^c \setminus gZfj^sZbZcih [dg i]Z eVhi 7. YVnh, RZh ~~Gd$

BcY^XViZ Wn X]ZX` b Vg` 1]Zi]Zg i]Z gZ\^higVci]Vh hjW b^iiZY ZaZXigdc^XVaan ZkZgn BciZgVXi^kZ =ViV ?^aZ gZfj^gZY id WZ hjW b^iiZY ejghjVci id KjaZ 2.3 d[KZ\jaVi^dc L+M &t010,2.3 $d[\ i\]^h\ X]\ VeiZg'\ Yjg^c\ i\]Z\ egZXZY^c\ /\ 0\ b\ dci\]h\ \&dg\ [dg\ hj\ X]\ h]\ dgiZg\ eZg^dY\ i\]Vi\ i\]Z\ gZ\ ^hig\ Vci\ 1\ Vh\ gZf\ j\ ^gZY\ id\ hj\ Wb\ ^i\ hj\ X]\ [^aZh', RZh\ \ \ \ Gd\ \]VeiZg'\ Alg\ Vci\ Al$

 $BcY^XViZ\ Wn\ X]ZX^*\ b\ Vg^*\ 1\]Zi\]Zg\ i\]Z\ gZ^{\circ}\ VC\ XXZaZgViZY\ [^aZg^*\ V\ cdc+VXXZaZgViZY\ [^aZg^*\ V\ h\ b\ VaaZg\ gZedgi^c\ Xd\ b\ eVcn^*\ dg\ Vc\ Zb\ Zg\ ^c\ \setminus gd\ 1\ i\]$

EVg\Z VXXZaZgViZY [^aZg

: XXZaZgViZY [^aZg

Gdc+VXXZaZgViZY [^aZg

Lb VaaZg gZedgi^c \ Xdb eVcn

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B[Vc ZbZg\^c\ \gd1i] XdbeVcn* ^cY^XViZ Wn X]ZX` bVg` ^[i]Z gZ\^higVci]Vh ZaZXiZY cdi id jhZi]Z ZmiZcYZY igVch^i^dc eZg^dY [dg Xdbean^c\ 1^i] Vcn cZ1 dg gZk^hZY [^cVcX^Va $VXXdjci^{c} \wedge hiVcYVgYh egdk^{Y}ZY ejghjVci id LZXi^{d}c /1&V' d[i]Z > mX]Vc \setminus Z : Xi,$

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BcY^XViZ Wn X]ZX` b Vg` 1]Zi]Zg i]Z gZ\^higVci ^h V h]Zaa Xd b e Vcn &Vh YZ[^cZY ^c K jaZ /0W+0 d[i]Z : Xi', RZh

jcYZg LZXi^dc 2.2&W'd[i]Z LVgWVcZh+HmaZn: Xi &/3 N,L,<, 5040&W'' Wni]Z gZ\^hiZgZY ej Wa^X VXXdjci^c\ [^gbi]Vi egZeVgZY dg^hhjZY^ih VjY^i gZedgi,

: h d[=ZXZ b WZg 01* 0.0/* i]Z aVhi W j h^cZhh YVn d[i]Z gZ\^higVci-h bdhi gZXZcian Xd b eaZiZY hZXdcY [^hXVa f j VgiZg* i]Z V\\gZ\ViZ b Vg`Zi kVajZ d[i]Z gZ\^higVci-h <aVhh : <db bdc LidX`* eVg kVajZ ".../ eZg h]VgZ*]ZaY Wn cdc+V[[^a^ViZh 1 Vh Veegdm^b ViZan "6*5./*32.*624* WVhZY jedc i]Z Xadh^c\ eg^XZ d["00,11 eZg h]VgZ Vh fjdiZY dc M]Z GVhYVf LidX` FVg`Zi dc i]Vi $YViZ^* \ VcY \ i \] Z \ V \setminus \ gZ \setminus ViZ \ b \ Vg \ Zi \ kVajZ \ d[\ i] Z \ gZ \setminus higVci-h \\ < d \ b \ dc \ LidX \ ^* e \ Vg \ kVajZ \ ".,./ e \ Zg \ h] \ VgZ^* \] ZaY \ Wn \ cdc+V [\ [\ ^a \land ViZh \ 1 \ Vh \ Veegdm \ ^b \ ViZan \ "0*513*412*537* \ WVhZY \ j \ edc \ i] Z \ Xadh \ ^c \setminus higVci-h \ (a \ ViZh \ V$ $eg^{XZ} d["00,33 eZg h] VgZ Vh fj diZY dc M]Z GVhYVf LidX` FVg^Zi dc i] Vi YViZ,$

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$\mathbf{I}:\mathbf{KM}$ BB			
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		$\geq fj^{n}in LZXjg^{n}i^{n}Zh$	10
	BM > F 4,	<u>TKZhZgkZYU</u>	10
	BM > F 5,	$F \ VcV \setminus Zb \ Zci - h = ^hXj \ hh^dc \ VcY : c \ Vanh^h \ d[\ ?^c \ VcX^Va < dcY^i \wedge dc \ VcY \ KZhj \ aih \ d[\ HeZgVi^h \ dch] $	11
	BM > F 5:	<u>JjVci^iVi^kZVcYJjVa^iVi^kZ=^hXadhjgZh:WdjiFVg^ZiK^h</u>	36
	BM > F 6,	?^cVcX^Va LiViZ bZcih VcY Lj eeaZ bZciVgn =ViV	4/
	BM > F 7,	$ \leq] Vc \setminus Zh \land c \lor cY = ^hV \setminus gZZ \ b \ Zcih \ P \land i] : XXdj \ ci \lor cih \ dc : XXdj \ ci \land c \setminus VcY ? \land cVcX \land Va = ^hX \land dh \ jgZ $	/04
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	BM > F / 2,	<u>Ig^cX^eVa: XXdjciVci ?ZZh VcY LZgk^XZh</u>	/06
I: KM BO			
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 $GZ1h < dgedgVi^{d}c \&i]Z \{ < dbeVcn^{*} | \{GZ1h < dge^{*} | \{1Z^{*} | \{jh^{*} | dg \{djg|'^{h}V \land udWVa Y^{k}Zgh^{^{c}ZY b}ZY^{V}VCY ^{c}[dgbVi^{d}c hZgk^{X}Zh XdbeVcn [dXjhZY dc XgZVi^{c} VcY Y^{hig}^{W}ji^{c}V jj] dg^{i}Vi^{k}Z VcY Zc^{V}^{c} XdciZci VcY di]Zg egdYjXih VcY hZgk^{X}Zh id Xdchj bZgh VcY Wjh^{c}ZhhZh i]gdj \]djii]Z 1 dgaY, M]Z < dbeVcn Xdbeg^{h}Zh Wjh^{c}ZhhZh Vxgdhh V gVc^{Z}d[bZY^{V^{c}}ajY^{c}Y^{^{i}Va}gZVa ZhiViZ hZgk^{X}Zh^{h}jWhXg^{e}a^{i}dc k^{Y}Zd hZgk^{X}Zh^{c}: jhigVa^{V}^{c}cZ1h VcY^{c}[dgbVi^{d}c hZgk^{X}Zh VcY Wdd^{e}jWa^{h}]^{c}^{i}]Vi VgZ Y^{hig}^{W}jiZY jcYZg hdbZd[i]Z 1 dgaY^{h}bdhigZXd^{c}^{0}VWaZ VcY gZheZXiZY WgVcYh^{c}^{c}XajY^{c}DQN GJW C][NN]: X^{W}JU^{*}2J[[XWh^{*}=d1 CdcZh^{*}DQN I^{V}]JU^{W} 8N[JUM C^{W}^{*}DQN C^{W}^{*}DQN DRVN^{V}^{*}AVgeZg^{daa^{c}h}IjWa^{h}]Zgh^{*}?dmiZa^{*}?HQLIHKML: jhigVa^{V}^{*}gZVaZhiViZ,Xdb,Vj^{*}KZVaidg,Xdb^{*}iVa^{L}IHKM^{*}HIBL VcY bVcn di]Zgh,$

 $M]Z < dbeVcn^h Xdbb^ibZci id egZb^jb XdciZci bV`Zh^ih egdeZgi^Zh V egZb^Zg YZhi^cVi^dc [dgcZ1h^*^c[dgbVi^dc^*hedgih^* ZciZgiV^cbZci VcY gZVa ZhiViZ, M]Z < dbeVcn Y^hig^WjiZh^ih XdciZci VcY di]Zg egdYjXih VcY hZgk^XZh id Xdchj bZgh VcY XjhidbZgh VXgdhh Vc VggVn d[Y^\iv_a eaVi[dgbh^cXaj Y^c\ 1ZWh^iZh^* bdW^aZ Veeh^*h bVgi MOh^*hdX^Va bZY^V* Z+Wdd` YZk^XZh VcY higZVb^c\ VjY^d eaVi[dgbh^cXaj Y^c\ 1ZWh^iZh^* bdW^aZ Veeh^*h bVgi MOh^*hdX^Va bZY^V* Z+Wdd` YZk^XZh VcY higZVb^c\ VjY^d eaVi[dgbh^V Vh 1Zaa Vh igVY^i^dcVa eaVi[dgbh hjX] Vh eg^ci* iZaZk^h^dc VcY gVY^d, M]Z < dbeVcn~h [dXjh dcfjVa^in VcY egdYjXi ^ccdkVi^dc] Vh ZcVWaZY ^i id XVe^iVa^oZ dci]Zh]^[i id Y^\iv_a Xdchj bei^dci dYza^kZg ^ih XdciZci VcY di]Zg egdYjXih VcY hZgk^XZh ^c V bdgZ Zc\V\^c*i^b Zan VcY eZghdcVa^oZY bVccZg VcY XgZViZ deedgijc^i^Zh [dg bdgZ Z[[ZXi^kZ bdcZi^oVi^dc*^cXaj Y^c\ cZ1 a^XZch^c\ VcY eVgicZgh]^e VggVc\ZbZcih VcY Y^\iv_a d[[Zg^c\h i]Vi aZkZgV\Z i]Z < dbeVcn-h Zm^hi^c\ XdciZci g^\]ih, M]Z < dbeVcn ^h ejghj^c\ bjai^eaZ higViZ\^Zh id [jgi]Zg Zmead^i i]ZhZ deedgijc^i^Zh*^cXaj Y^c\ aZkZgV\^c\ \adWVa VjY^ZcXZ hXVaZ VcY kVaj VWaZ YViV VcY h]Vg^c\ iZX]cdad\^Zh VcY egVXi^XZh VXgdhh \Zd\gVe]^Zh VcY Wjh^cZhhZh,$

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 $GZ1h < dgedgVi^{h}dc ^{h}V = ZaV1VgZ XdgedgVi^{h}dc dg^{h}^{c}Vaan dg^{c}dc = ZXZbWZg^{/*}0./0^{c}XdccZXi^{h}dc 1^{i}] ^{i}h hZeVgVi^{h}dc [gdbM1Zcin+?^{g}hi < Zcijgn ?dm^{*}BcX,^{*}1]^{x}] 1 Vh XdbeaZiZY dc CjcZ 06^{*}0./1, NcaZhh di]Zg 1^{h}Z^{c}V^{x}ViZY^{*}gZ[ZgZcXZh^{c}i]^{h}: ccjVa KZedgi dc ?dgb/.+D [dgi]Z [^{h}XVa nZVg ZcYZY CjcZ 1.^{*}0.00 &i]Z {:ccjVa KZedgi|'idi]Z {<dbeVcn^{*}| } {GZ1h < dge^{*}| } {1Z^{*}| } {jh^{*}| } dg {djg| bZVch GZ1h < dge^{*}dgVi^{h}dc VcY^{h}hjWh^{Y}^{V}Q^{h}Zh, M]Z < dbeVcn^{+}| } eg^{*}cX^{h}^{e}Va ZmZXji^{h}Zd [[^{h}XZh VgZ adXViZY Vi/0//:kZcjZd[i]Z:bZg^{h}XVh^{*}GZ1 Rdg^{*}GZ1 Rdg^{*}/..14^{*}VcY^{h}iZaZe]dcZcjbWZg^{h}&0/0'2/4+12.., M]Z < dbeVcn^{+}| } eVCY < aVhh: VcY < aVhi: VcY < aVhh: VcY < aVhi: VcY < aVh: VcY < aVhi: VcY < aVh:$

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M]^h YdXj bZci VcY Vcn YdXj bZcih ^cXdgedgViZY Wn gZ[ZgZcXZ ^cid i]^h : ccj Va KZedgi* ^cXaj Y^c \ {BiZb 5, FVcV\ZbZci-h = ^hXjhh^dc VcY : cVanh^h d[?^cVcX^Va < dcY^i^dc VcY KZhjaih d[HeZgVi^dch*| XdciV^c hiViZbZcih i]Vi Xdchi^ijiZ {[dg 1 VgY+add ^c hiViZbZcih| 1^i]^c i]Z bZVc^c \ d[LZXi^dc 0/> d[i]Z >mX] Vc\Z : Xi VcY LZXi^dc 05 : d[i]Z LZXjg^i^Zh : Xi d[/711* Vh V bZcYZY, : aa hiViZbZcih i]Vi VgZ cdi hiViZbZcih d[]^hidg^XVa [VXi VgZ [dg 1 VgY+add ^c hiViZbZcih, M]Z 1 dgYh {ZmeZXi*| { 1 ^aa*| {Zhi^b ViZ*| } } }

 $\{ \text{Vci'X'eViZ'} \mid \{ \text{egZY'Xi'} \mid \{ \text{WZa'ZkZ'} \mid \{ h \} \text{d}j\text{aY} \mid \text{VcY h'b'aVg ZmegZhh'dch VcY kVg'N'i'dch i} \} \\ \text{Zcih, M} \mid \text{ZhZ hiViZ b Zcih VeeZVg'} \land \text{Vcj b WZg d} \mid \text{eaVXZh'c' i} \mid \text{h'h YdXj b Zci VcY 'cXaj YZ hiViZ b Zcih gZ \vgY'c\ i} \mid \text{Z'ciZci'} \text{WZa'Z} \mid \text{dg XjggZci ZmeZXiVi'dch d} \mid \text{i} \mid \text{Z} < \text{db eVcn''h YgZXidgh dg'h H} \mid \text{GEZgVi'dch'} i \mid \text{Z} \mid \text{db eVcn''h higViZ} \mid \text{VcY h$

6 I G=B9GG CJ9FJ=9K

 $M]Z < dbeVcn-hh^m gZedgi^c \land hZ \land bZcih VgZ YZhXg^WZY WZadl,$

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; dd` IjWa^h]^c\	0*/7/	1.4
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· `ceVV WdTRl iVRc V IIVII

8 ZXZeR] FVR] 9 deReV GVcgZTVd

M]Z <d b eVcn \sim h =^\^iVa KZVa >hiViZ LZgk^XZh hZ\ b Zci Xdch^hih d[^ih 4/,2 # ^ciZgZhi ^c K>: @gdje* V ej Wa^Xan+igVYZY Xd b eVcn a^hiZY dc : LQ & : LQ & : LQ & K>: '* VcY ^ih 6. # ^ciZgZhi ^c F dkZ, M]Z gZ b V^c^c\ 0. # ^ciZgZhi ^c F dkZ ^h]ZaY Wn K>: @gdje,

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K>: @gdje^h V b Vg`Zi+aZVY^c\ Y^\^iVa b ZY^V Wjh^cZhh heZX^Va^o^c\ ^c egdeZgin* 1^i] deZgVi^dch [dXjhZY dc egdeZgin VcY egdeZgin+gZaViZY VYkZgi^h^c\ VcY hZgk^XZh* Vh 1 Zaa Vh [^cVcX^Va hZgk^XZh,

@[XYN[]b JWM @[XYN[]b&BNUJ]NM 1M_N[]R\RWP JWM CN[_RLN\

 $K>: @gdje VYkZgi^hZh egdeZgin VcY egdeZgin+gZaViZY hZgk^XZh dc ^ih 1 ZWh^iZh VcY bdW^aZ Veeh VXgdhh : jhigVa^V, K>: @gdje^h : jhigVa^Vc deZgVi^dch ^cXajYZ aZVY^c \ gZh^YZci^Va^* Xdb bZgX^Va VcY h]VgZ egdeZgin 1 ZWh^iZh gZVaZhiViZ,Xdb ,Vj* gZVaXdb bZgX^Va,Xdb ,Vj VcY ?aVi bViZh,Xdb ,Vj * Vh 1 Zaa Vh egdeZgin gZhZVgX] h^iZ 1 gdeZgin,Xdb ,Vj , : YY^i^dcVaan* K>: @gdje deZgViZh bZY^V Y^heaVn VcY YViV hZgk^XZh Wjh^cZhhZh* hZgk^c \ i]Z Y^heaVn bZY^V bVg^Zi VcY bVg^Zih VY_VXZci id egdeZgin* gZheZXi^kZan, ?dg i]Z nZVg ZcYZY CjcZ 1.* 0.00* VkZgV\Z bdci]an k^h^ih id gZVaZhiViZ,Xdb ,Vj 1 ZgZ bdgZ i]Vc /02,/ b^aa^dc, EVjcX]Zh d[i]Z gZVaZhiViZ,Xdb ,Vj Vee ^cXgZVhZY 5 # id 37 b^aa^dc VkZgV\Z bdci]an aVjcX]Zh ^c [^hXVa 0.00 Vh XdbeVgZY id i]Z eg^dg nZVg* 1^i] Xdchj bZgh heZcY^c \ Vabdhi [djg i^bZh adc\Zg dc i]Z Vee i]Vc Vcn di]Zg egdeZgin Vee ^c : jhigVa^V VXXdgY^c \ id G^ZahZc =^\^iVa FZY^V KVi^c \h, KZVaXdb bZgX^Va,Xdb ,Vj gZbV^ch : jhigVa^V-h aZVY^c \ Xdb bZgX^Va egdeZgin h^iZ VXgdhh 1ZWh^iZ VcY Vee, Bc [^hXVa 0.00* i]Z gZVaXdb bZgX^Va,Xdb ,Vj Vee 1 Vh aVjcX]ZY 0.,0 i^bZh bdgZ i]Vc i]Z cZVgZhi Xdb eZi^idg* VcY Xdchj bZgh heZci /7,2 i^bZh adc\Zg dc i]Z gZVaXdb bZgX^Va,Xdb ,Vj Vee WVhZY dc G^ZahZc =^\^iVa FZY^V KVi^c \ h YViV, ?aVi bViZh,Xdb ,Vj ^h i]Z aVg\Zhi h^iZ [dg h]VgZ VXXdb bdYVi^dc ^c : jhigVa^V* 1^i] VkZgV\Z bdci]an k^h^ih d[1,0 b^aa^dc VcY bdgZ i]Vc 14.* . . . cZ 1 bZbWZgh Yjg^c \ [^hXVa 0.00,$

KZVaZhiViZ,Xdb,Vj VcY gZVaXdbbZg^XVa,Xdb,Vj YZg^kZi]Z bV_dg^ind[i]Z^g gZkZcjZ [gdbi]Z^g XdgZ egdeZgin VYkZgi^h^c\a^hi^c\egdYjXih VcY bdci]an VYkZgi^h^c\hjWhXg^ei^dch [gdbgZVaZhiViZ V\Zcih VcY egdeZgin YZkZadeZgh, KZVaZhiViZ,Xdb,Vj VcY gZVaXdbbZgX^Va,Xdb,Vj d[[ZgVegdYjXi]^ZgVgX]n 1]^X] ZcVWaZhgZVa ZhiViZ V\Zcih VcY egdeZgin YZkZadeZgh id je\gVYZ a^hi^c\

 $VykZgi^hZ \ b \ Zcih \ id \ ^cXgZVhZ \ i] \ Z^g \ egd \ b \ ^cZcXZ \ dc \ i] \ Z \ h^iZ^* \ Vh \ 1 \ Zaa \ Vh \ V \ kVg^Zin \ d[\ iVg \ XiIY \ egdYj Xih^* \ ^cXaj Y^c \ b \ ZY^V \ Y^heaVn \ VykZgi^h^c \ egdYj Xih, \ ?aVi \ b \ ViZh, Xd \ b \ ,Vj \ YZg^kZh \ i] \ Z \ b \ V_dg^n \ id \ [^ah \ gZkZcjZ \ [gd \ b \ VykZgi^h^c \ a^hi^c \ egdYj Xih \ VcY \ b \ Z \ b \ WZgh]^e \ [ZZh, M]Z \ b \ ZY^V \ Wjh^cZhh \ d[[Zgh \ j \ c^f \ j \ Z \ VYkZgi^h^c \ deedgij \ c^i^Zh \ dc \ K>: \ @gdje~h \ 1 \ ZWh^iZh \ id \ egdeZgin \ YZkZadeZgh \ VcY \ di \ |Zg \ gZaZkVci \ b \ Vg \ Zih^* \ ^cXaj \ Y^c \ ji^a'i^Zh \ VcY \ iZaZXd \ b \ b \ j \ c^XVi^dch^* \ ^chj \ gVcXZ^* \ [^cVcXZ^* \ Vjid \ b \ di^kZ \ VcY \ gZiV^a, \ K>: \ @gdje \ Vahd \ egdk^YZh \ gZh^YZci^Va \ egdeZgin \ YViV \ hZgk^XZh \ Wjh^cZhh^* \ eg^b \ Vg^an \ dc \ V \ b \ dci \]an \ hj \ WXg^ei^dc \ WVh^h,$

 $K>: @gdje^h ^ciZgcVi^dcVa \ deZgVi^dch \ Xdch^hi \ d[Y^\wedge iVa \ egdeZgin \ VhhZih ^c : h^V* ^cXajY^c \ V \ 1] \ daan+d \ 1 \ cZY \ egdeZgin \ edgiVa ^c <]^cV^* \ V \ 51,1 \# ^ciZgZhi ^c >aVgV \ MZX] \ cdad \ AZh \ IiZ, EiY, \& 1]^X] \ 1 \ Vh \ gZWgVcYZY \ id \ K>: BcY^V'* \ V \ aZVY^c \ Y^\wedge iVa \ gZVa \ ZhiViZ \ hZgk^XZh \ egdk^YZg ^c BcY^V i]Vi \ d \ 1 \ ch \ VcY \ deZgViZh \ IgdeM^\Zg,Xdb \ VcY \ Adjh^c \ Xdb \ &GZ \ 1h \ dge \] \ daYh \ V \ O4,4 \# ^ciZgZhi ^c \ K>: BcY^V'* \ VcY \ V \ /5,3 \# ^ciZgZhi ^c \ IgdeZgin@jgj \ IiZ, EiY,* \ V \ aZVY^c \ Y^\wedge iVa \ egdeZgin \ iZX] \ cdad \ n \ Xdb \ eVcn \ deZgVi^c \ b \ Vg \ ZieaVXZh ^c \ Ldji]ZVhi \ : h^V \ VcY \ a^hiZY \ dc \ i]Z \ GZ \ 1 \ Rdg^ \ LidX^ \ >mX] \ Vc \ Z, \ K>: @gdje^h \ di]Zg \ VhhZih ^cXaj YZ \ V \ 0 . \# ^ciZgZhi ^c \ F \ dkZ* \ Vh \ gZ[ZgZcXZY \ VWdkZ, \ K>: @gdje^h ^ciZgcVi^dcVa \ Wjh^cZhhZh \ YZg^kZ \ i]Z \ b \ V_dg^n in \ d[i]Z^g \ gZkZcjZ \ [gdb \ i]Z^g \ egdeZgin \ VYkZgi^h^c \ a^hi^c \ egdYjXih \ VcY \ b \ dci]an \ VYkZgi^h^c \ h \ jWhXg^ei^h^c \ [gdb \ gZVa \ ZhiViZ \ V \ Zcih \ VcY \ egdeZgin \ YZkZadeZgh,$

6RWJWLRJU CN/_RLN\

 $K>: @gdje^h [^cVcX^Va hZgk^XZh Wjh^cZhh ZcXd b eVhhZh Vc ZcY+id+ZcY Y^\^iVa egdeZgin hZVgX] VcY [^cVcX^c \setminus ZmeZg^ZcXZ VcY bdgi \V \Z Wgd^c \ hZgk^XZh eg^b Vg^an jcYZg^ih Fdgi \V \Z =]d^XZ WgVcY, K>: @gdje]Vh Xdci^cjZY id ZmZXjiZ dc^ih [^cVcX^Va hZgk^XZh higViZ \ n Wn \gd 1^c \ ^ih cVi^dc 1^YZ Wgd^Zg cZi 1 dg^ VcY YZkZade^c \ ^ccdkVi^kZ egdYjXih VcY eVgicZgh]^eh* ^cXaj Y^c \ V Y^\^iVa adVc Veea^XVi^dc 1^i] NWVc^ &V Y^k^h^dc d[GVi^dcVa : jhigVa^V ; Vc^ E^b^iZY', M]Z [^cVcX^Va hZgk^XZh Wjh^cZhh \ZcZgViZh gZkZcjZ eg^b Vg^an i]gdj \] [ZZh VcY Xd b b^hh^dch [gd b aZcYZgh* b dgi \V \Z Wgd^Zgh VcY di]Zg Xjhid b Zgh,$

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 $F \, dkZ \wedge h \, V \, aZVY^c \setminus egdk^YZg \, d[\, Y^\wedge i^i Va \, gZVa \, ZhiViZ \, hZgk^XZh \wedge c \, i\,]Z \, N,L, \, F \, dkZ \, eg^h \, b \, Vg^an \, deZgViZh \, KZVaidg,Xd \, b^* * V \, egZ \, b^*Zg \, gZVa \, ZhiViZ \, h^c [dg \, b \, Vi^n dc^* \, VYkZgi^h^c \setminus \, VcY \, hZgk^XZh \, eaVi[dg \, b^* \, j \, cYZg \, V \, eZgeZi \, j \, Va \, V \, VgZZ \, b \, Zci \, VcY \, igVYZ \, b \, Vg^a \, a^XZchZ \, l^i j \, i\, j\, Z \, GVi^n dc^a \, : \, hhdX^vi^n dc \, d[\, KZVaidgh^k \, gG \, : \, K \, |^i, \, M] \, gd \, j \,] \, KZVaidg,Xd \, b^* * \, Xdch \, j \, b \, Zgh \,] \, VkZ \, VXXZhh \, id \, dkZg \, /23 \, b^aa^a dc \, egdeZgi^Zh \, VXgdhh \, i\,]Z \, N,L,^* \, ^cXa \, j \, Y^c \setminus \, Vc \, ZmiZch^kZ \, XdaaZXi^n \, dc \, d[\,] \, d \, b \, Zh^* \, egdeZgi^nZh \, VcY \, VeVgi \, b \, Zci \, ha^hiZY \, VcY \, Y^heaVnZY \, [dg \, hVaZ \, dg \, [dg \, gZci \, VcY \, V \, aVg \, Z \, YViVWVhZ \, d[\, \{d[[+ \, b \, Vg \, Zi \, | \, egdeZgi^nZh \, VcY \, ih \, gZaViZY \, b \, dW^aZ \, Veeh \, Y^heaVn \, cZVgan \, / \, . \, \, \# \, d[\, Vaa \, F \, j \, ai^aeaZ \, E^hi^ac \, L \, LZgk^XZh \, \& \{\, F \, EL \, | \, +a^hiZY^* \, [dg+hVaZ \, VcY \, gZciVa \, egdeZgi^nZh \, ^c \, i]Z \, N,L,^* \, 1 \,]^xJ \, VgZ \, eg^h \, b \, Vg^an \, hd \, jgXZY \, Y^gZXian \, [gd \, b \, gZaVi^adch]^eh \, 1^ai \,] \, F \, ELh \, VXgdhh \, i]Z \, Xdj \, cign, \, KZVaidg,Xd \, b^* \, Vahd \, hd \, jgXZh \, c\, 2\, 1 \, Xdchigj\,Xi^adc \, VcY \, gZciVa \, a^hi^ac \, XdciZci \, [gd \, b \, V \, kVg^nZin \, d[\, hd \, jgXZh^* \, ^c Xa \, jY^c \, V \, Y^gZXian \, [gd \, b \,] \, db \, ZWj^aYZgh \, VcY \, aVcYadgYh^* \, Vh \, 1 \, Zaa \, Vh \, [gd \, b \, a^hi^ac \, V \, V \, gZ \, Vidgh, \, : \, eegdm^h \, b \, ViZan \, 74 \, \# \, d[\, ^hh \, [dg+hVaZ \, a^hh^ac \, h \, VgZ \, jeYViZY \, Vi \, aZVhi \, ZkZgn \, / \, . \, b^cjiZh^* \, dc \, VkZgV \, Z^* \, 1^ai \, j \,]Z \, gZ \, b \, V^ac^a \, a^hi^ac \, h \, VcY^a \, h \, b \, dW^aZ \, b^az \, h^az \, dc \, VkZgV \, Z^* \, YoY^a \, A^hi^ac \, VkZgV \, Z^* \, YoY^a \, XdciZci \, ViigVXih \, Vay \, VcY^a \, Y^a \, Zvizy \, Z^* \, Z^* \, YoY^a \, YO$

KZVaidg,Xdb \ \ZcZgViZh i]Z b V_dg'in d[\(^i\) gZkZc jZh i]gd j \] i]Z hVaZ d[\(^a\)hi^c \ VYkZgi\hZ bZci VcY \(^aZVY\)ZcZgVi\dc egdY jXih* ^cXajY^c\ <dccZXi^dchLF Iajh* FVg^Zi OBILF*: YkVciV\ZLF Igd VcY LVaZh; j^aYZgLF*Vh 1 Zaa Vh ^ih gZVa ZhiViZ gZ[ZggVa+WVhZY hZgk^XZ KZVYn<dccZXi<dcX^Zg\Z^{LF}, E^hi^c\ VYkZgi^hZ b Zci VcY aZVY\ZcZgVi^dc egdY j Xih Vaad l gZVa ZhiViZ V\Zcih* Wgd`Zgh VcY]dbZWj^ayZgh id Zc]VcXZ* eg^dg^i^oZ VcY XdccZXi 1^i] Xdchj bZgh dc [dg+hVaZ egdeZgin a^hi^c\h 1^i]^c i]Z KZVaidg,Xdb \(^1 ZWh^iZ VcY \) b dW^aZ Veeh, E^hi^c \ VYkZgi^hZ b Zci VcY aZVY \ZcZgVi^dc egdY j Xih VgZ ine^XVaan hdaY dc V h j WhXg^ei^dc WVh^h, M]Z gZVa ZhiViZ gZ[ZggVa+ WVhZY Wjh^cZhh bdYZa* Vh 1 Zaa Vhi]Z FVg`Zi OB1^{LF} aZVY \ZcZgVi^dc egdYjXi* aZkZgV\Z FdkZ~h egdeg^ZiVgn iZX]cdad\n VcY eaVi[dg b id XdccZXi gZVa ZhiViZ egd[Zhh^dcVah VcY di]Zg hZgk^XZ egdk^YZgh* hjX] Vh aZcYZgh VcY ^chjgVcXZ XdbeVc^Zh* id egZ+kZiiZY XdchjbZgh 1]d]VkZ hjWb^iiZY ^c fj^g^Zh k^V i]Z KZVaidg,Xdb \(^1\) 1 ZWh^iZ VcY bdW^aZ Veeh* Vh 1 Zaa Vh di]Zg dca^cZ hdjgXZh, M]Z gZVa ZhiViZ gZ[ZggVa+WVhZY hZgk^XZh i]Vi XdccZXi gZVa ZhiViZ V\Zcih VcY Wgd`Zgh 1^i] i]ZhZ Xdchj bZgh ine^XVaan \ZcZgViZ [ZZh jedc XdbeaZi^dc d[i]Z VhhdX^ViZY gZVa ZhiViZ igVchVXi^dc* 1]^aZ i]Z gZ[ZggVa+WVhZY hZgk^XZh i]Vi \^kZ di]Zg hZgk^XZ egdk^YZgh* ^cXa;Y^c\ aZcYZgh VcY ^chjgVcXZ XdbeVc^Zh* VXXZhh idi]ZhVbZ]^\]an fjVa^[^ZY]dbZh]deeZgh VgZ\ZcZgVaan egdk^YZY dc VhjWhXg^ei^dc WVh^h, KZVaidg,Xdb V Vahd YZg^kZh gZkZcjZ [gdb hVaZh d[cdc+a^hi^c \ VYkZgi^hZ bZci* dg FZY^V* egdYjXih id gZVa ZhiViZ* [^cVcXZ* ^chjgVcXZ*]dbZ^begdkZbZciVcY di]Zg egd[Zhh^dcVah i]ViZcVWaZi]dhZ egd[Zhh^dcVah id XdccZXi 1^i] KZVaidg,Xdb ~~h]^\]an Zc\V\ZY VcY kVaj VWaZ Xdch j b Zg V j Y^ZcXZ, F ZY^V egdY j Xih ^cXa j YZ hedchdgh] ^eh* Y^heaVn VYkZgi^hZ b Zcih* iZmi a^c`h* Y^gZXidg^Zh VcY di] Zg VYkZgi^h^c \ VcY aZVY \ZcZgVi^dc hZgk^XZh, Gdc+a^hi^c \ VYkZgi^hZ bZci eg^X^c \ bdYZah ^cXa j YZ Xdhi eZg i]d jhVcY* Xdhi eZg Xa^X * Xdhi eZg j c^f jZ jhZg VcY h jWhXg^ei^dc+WVhZY hedchdgh]^eh d[heZX^[^X XdciZci VgZVh dg iVg\ZiZY \Zd\gVe]^Zh,

Bc VYY^i^dc id KZVaidg,Xdb ** F dkZ Vahd d[[Zgh dca^cZ iddah VcY hZgk^XZh id Yd+^i+ndjghZa[aVcYadgYh VcY iZcVcih* ^cXajY^c\ : kV^a* V eaVi[dg b i]Vi ^b egdkZh i]Z gZci^c\ ZmeZg^ZcXZ [dg Yd+^i+ndjghZa[aVcYadgYh VcY iZcVcih 1^i] dca^cZ iddah* ZYjXVi^dcVa XdciZci VcY

 $1 dgaY + XaVhh hj eedgi, : kV^a Zb eadhh V kVg^z in d[eg^X^c b dYZah^* ^cXajY^c hj WhXg^ei^dc [ZZh^* Vh 1 Zaa Vh [^mZY + dg kVg^VWaZ + eg^X^c b dYZah,]$

 $M]Z < dbeVcn^h Y^\wedgeiVa gZVa ZhiViZ hZgk^XZh Wjh^cZhhZh deZgViZ ^c]^h]an XdbeZi^i^kZ b Vg^Zih i]Vi VgZ Zkdak^c \ gVe^Yan ^c gZhedchZ id cZ1 iZX]cdad ^Zh^* Wjh^cZhh b dYZah^* egdYjXi VcY hZgk^XZ d[[Zg^c h VcY X]Vc ^c \ Xdchj b Zg VcY Xjhid b Zg egZ[ZgZcXZh, M]Z hj XXZhh d[i]ZhZ Wjh^cZhhZh YZeZcYh dc i]Z^g VW^a^in id egdk^YZ egdYjXih VcY hZgk^XZh i]Vi VgZ jhZ[ja [dg Xdchj b Zgh^* gZVa ZhiViZ^b b dgi \V\Z VcY di]Zg gZaViZY hZgk^XZh egd[Zhh^dcVah^*] d b ZWj^aYZgh VcY aVcYadgYh VcY ViigVXi^kZ id i]Z^g VYkZgi^hZgh^* i]Z WgZVYi]^* YZei] VcY VXXjgVXn d[^c[dg b Vi^dc i]Zn egdk^YZ VcY WgVcY V 1 VgZcZhh VcY gZejiVi^dc, M]ZhZ Wjh^cZhhZh Xd b eZiZ eg^b Vg^an 1 ^i] Xd b eVc^Zh i]Vi egdk^YZ gZVa+ZhiViZ [dXjhZY iZX]cdad \n^* egdYjXih VcY hZgk^XZh ^c i]Z^g gZheZXi^kZ \Zd\gVe]^X b Vg^Zih^* ^cXajY^c \di]Zg gZVa ZhiViZ VcY egdeZgin 1 ZWh^iZh ^c : jhigVa^V*i]Z Nc^iZY LiViZh VcY : h^V,$

GfSdTclael`_ J ZUV` GVcgZTVd

M1Z

M]ZhZ egdk^YZgh ^cXaj YZ BciZgcZi IgdidXda iZaZk^h^dc* dg BIMO* hjWhXg^ei^dc k^YZd+dc+YZ b VcY* dg LOH=* VcY WgdVYXVhi k^YZd+dc+YZ b VcY* dg ; OH=* hZgk^XZh9 higZV b^c\ hZgk^XZh d[[ZgZY i]gdj\] Y^\^iVa b ZY^V egdk^YZgh9 Vh 1 Zaa Vh egd\gV b b Zgh VcY Y^hig^Wjidgh i]Vi egdk^YZ XdciZci* ^cXaj Y^c\ h b VaaZg* ad 1 Zg+Xdhi dg [gZZ egd\gV b b^c\ eVX`V\Zh* Y^gZXian id Xdchj b Zgh dkZg i]Z ^ciZgcZi, M]Z <dbeVcn WZa^ZkZh i]Vi i]Z ?dmiZa @gdje~h egZ b^j b hZgk^XZ VcY ZmXajh^kZ XdciZci* 1 ^YZ VggVn d[egdYjXih VcY hZgk^XZh* hZi+ide Wdm [ZVijgZh i]Vi ZcVWaZ hjWhXg^WZgh id gZXdgY* gZ 1 ^cY* Y^hXdkZg VcY 1 ViX] XdciZci* ^ih ^ciZ\gVi^dc d[i]^gY+eVgin Veeh VcY ^ih ^ckZhi b Zci ^c Hc = Zb VcY XVeVW^a^in VcY egd\gV b b^c\ ZcVWaZ ^i id d[[Zg hjWhXg^WZgh V Xd b eZaa^c\ VaiZgcVi^kZ id ^ih Xd b eZi^idgh, Bih higZV b^c\ hZgk^XZh* ^cXaj Y^c\ DVnd Ledgih* 29> 75\ ?dmiZa Gd 1 VcY 6UJ\Q* egdk^YZ V Y^kZgh^[^ZY edgi[da^d d[hjWhXg^ei^dc iZaZk^h^dc hZgk^XZh i]Vi Vaad 1 i]Z ?dmiZa @gdje id egdk^YZ hZgk^XZh iVg\ZiZY Vi V 1 ^YZ gVc\Z d[: jhigVa^Vc Xdchj b Zgh,

*TRSQAKIAM 7EVR , HAMMEK

 $: G < \deg_{V} V_{C} V_{C$

- u $2J[[XWh \land 7[X^Y, M]Z ; Vggdc \land @gdje [dXjhZh dc = d1 CdcZh Xdchj b Zg WgVcYh djih^YZ d[M]Z P Vaa LigZZi CdjgcVa [gVcX]^hZ* ^cXajY^c \ 2J[[XWh \ VcY F Vg` Zi P ViX]* V b dc \ di]Zg egdeZgi^Zh,$
 - 2J[[XWh\, 2J[[XWh* 1]^X] ^h VkV^aVWaZ id hj WhXg^WZgh ^c eg^ci* dca^cZ VcY dc bjai^eaZ bdW^aZ YZk^XZh* YZa^kZgh cZ 1 h* VcVanh^h* ^ckZhi^\Vi^kZ gZedgi^c* Xd b eVcn egd[^aZh VcY ^ch^\]i[ja hiVi^hi^Xh [dg ^ckZhidgh VcY di]Zgh ^ciZgZhiZY ^c i]Z ^ckZhi bZci 1 dgaY,
 - $= \underbrace{J[TN]GJ]LQ'} \text{F Vg`Zi P ViX] ^h Vc ^ckZhi^c \ VcY [^cVcX^Va cZ 1 h 1 ZWh^iZ iVg \ Zi^c \ VXi^kZ ^ckZhidgh, Bi Vahd egdk^YZh gZVa+i^b b Z Xd b b ZciVgn VcY ^ckZhi b Zci iddah VcY YViV, I gdY j Xih ^cXa j YZ b dW^aZ Veeh VcY V gZhedch^kZ YZh^\c 1 ZWh^iZ* VcY gZkZcjZ ^h \ZcZgViZY i]gdj \] i]Z hVaZ d[VYkZgi^h^c * Vh 1 Zaa Vh ^ih egZ b^j b Y^\^iVa h j WhXg^ei^dc hZgk^XZ,$
- c 9W_N\]X[h\ 2^\RWN\\ 4JRUb #924\$, B; = egdk^YZh ^ckZhi^c\ XdciZci* VcVani^XVa egdYjXih VcY ZYjXVi^dcVa gZhdjgXZh id hjWhXg^WZgh ^c eg^ci VcY dca^cZ* Vh 1 Zaa Vh i]gdj\] bdW^aZ Veeh VcY k^YZd, B; =~h hZgk^XZh ^cXajYZ i]Z BckZhidgh,Xd b 1ZWh^iZ* i]Z FVg`ZiL b^i] VcY EZVYZg; dVgY bVg`Zi gZhZVgX] VcY VcVanh^h iddah VcY V 1ZZ`an eg^ci ejWa^XVi^dc,
- u $DQN GJUU C][NN] : X^{WJU} 4RPR]JU > N] X[T #GC: 4>$, PLC=G d[[Zgh VYkZgi^hZgh i]Z deedgij c^in id gZVX] = d 1 CdcZh-h VjY^ZcXZ VXgdhh V cj b WZg d[WgVcYh*^cXajY^c \ PLC*; Vggdc-h VcY F Vg Zi P ViX], PLC=G YdZh cdi ^cXajYZ B; =,$
- u <\(\bar{N} \cdot \cdo

 $M]Z [daad 1 ^c \ iVWaZ egdk^YZh ^c[dg b Vi^dc gZ VgY^c \ VkZgV \ Z YV^an hj WhXg^ei^dch \&ZmXaj Y^c \ d[[+eaVi[dg b Y^hig^Wji^dc' Yjg^c \ i]Z]]$

$M]Z=d\ 1\ CdcZh\ hZ\setminus b\ Zci\sim h\ egd[Zhh^dcVa\ ^c[dg\ b\ Vi^dc\ egdYj\ Xih\ i\]Vi\ iVg\setminus Zi\ ZciZgeg^hZ\ Xj\ hid\ b\ Zgh\ Xd\ b\ eZiZ\ 1\ ^i\]\ kVg^dj\ h\ ^c[dg\ b\ Vi^dc\ egdYj\ Xih\ i\]Vi\ iVg\setminus Zi\ ZciZgeg^hZ\ Xj\ hid\ b\ Zgh\ Xd\ b\ eZiZ\ 1\ ^i\]\ kVg^dj\ h\ ^c[dg\ b\ Vi^dc\ egdYj\ Xih\ i\]Vi\ iVg\setminus Zi\ ZciZgeg^hZ\ Xj\ hid\ b\ Zgh\ Xd\ b\ eZiZ\ 1\ ^i\]\ kVg^dj\ h\ ^c[dg\ b\ Vi^dc\ egdYj\ Xih\ i\]Vi\ iVg\setminus Zi\ ZciZgeg^hZ\ Xj\ hid\ b\ Zgh\ Xd\ b\ eZiZ\ 1\ ^i\]\ kVg^dj\ h\ ^c[dg\ b\ Vi^dc\ egdYj\ Xih\ i\]Vi\ iVg\setminus Zi\ ZciZgeg^hZ\ Xj\ hid\ b\ Zgh\ Xd\ b\ eZiZ\ 1\ ^i\]\ kVg^dj\ h\ ^c[dg\ b\ Vi^dc\ egdYj\ Xih\ i\]Vi\ iVg\setminus Zi\ ZciZgeg^hZ\ Xj\ hid\ b\ Zgh\ Xd\ b\ eZiZ\ 1\ ^i\]\ kVg^dj\ h\ ^c[dg\ b\ Vi^dc\ egdYj\ Xih\ i\]Vi\ iVg\setminus Zi\ ZciZgeg^hZ\ Xj\ hid\ b\ Zgh\ Xd\ b\ eZiZ\ 1\ ^i\]\ kVg^dj\ h\ ^c[dg\ b\ Vi^dc\ egdYj\ Xih\ i\]Vi\ iVg\setminus Zi\ ZciZgeg^hZ\ Xj\ hid\ b\ Zgh\ Xd\ b\ eZiZ\ 1\ ^i\]\ kVg^dj\ h\ ^c[dg\ b\ Vi^dc\ egdYj\ Xih\ i\]Vi\ iVg\setminus Zi\ ZciZgeg^hZ\ Xj\ hid\ b\ Zgh\ Xd\ b\ eZiZ\ Xj\ hid\ Ag\ Ag\ Ag\ Ag\ Ag\ Ag\ Ag\ Ag\ Ag\ Ag$

	Dcl_e 5 gVcRXV =dd fV FVRUVcdYla#+\$	DRZU GfSdTcZSVcd ^{#,\$}	A`_eY]j;]`SR] I_ZbfV IdVcd ^{#.5}
$DQN C^{N} \# = XW d CJ \}$	0*0./*	G-:	/43 b^aa^dc
DQN C^W XW C^WMJb	0*0*	G-:	
DQN DRVN # XW d CJ	766*	/30* ⪚^ci' ^{&1} 223* &Y^\^iVa'	G-:
$DQN C^{MMJb} DRVN $	/*310*	/71* ⪚^ci' ^{&1'} 223* &Y^\^iVa'	G-:

- &/' ; VhZY dc I j Wa^h]Zgh : jY^ZcXZ FZVh j gZbZci < d b eVcn & { I : F < d | 'YViV [dg i]Z / 0 b dci]h ZcYZY F VgX] 1/* 0.00,
- &O' :h d[CjcZ 1.* 0.00* WVhZY dc ^ciZgcVa hdjgXZh VcY ^cXajY^c\ hjWhXg^WZgh id i]Z DRVN\ <R]N[J[b C^YYUNVNW] &{MEL|', MdiVa hjWhXg^WZgh VXgdhh DQN DRVN\ VcY DQN C^WMJb DRVN* ^cXajY^c\ MEL* Vh d[CjcZ 1.* 0.00 1 Vh 443*...* ^cXajY^c\ 223*... Xadh^c\ Y^\^iVa hjWhXg^WZgh, MdiVa [^\jgZh VgZ YZ+Yjea^XViZY [dg hjWhXg^WZgh 1]d gZXZ^kZ V eg^ci egdYjXi ZkZgn YVn d[i]Z 17Z^.</p>
- &1' Bc VYY^i^dc id i]Z^g eg^ci VcY Y^\^iVa+dcan egdYjXih* DQN DRVN\ VcY DQN C^WMJb DRVN\ hZaa eg^ci VcY Y^\^iVa egdYjXih WjcYaZY ^cid dcZ hjWhXg^ei^dc* 1]^X] ^h XdjciZY dcan dcXZ* jcYZg {eg^ci*| ^c i]Z iVWaZ VWdkZ,
- &2' BcXajYZh V\\gZ\ViZ jc^fjZ jhZgh VXXZhh^c\ 1 ZWh^iZh VcY bdW^aZ Veeh WVhZY dc @dd\aZ : cVani^Xh YViV [dg i]Z bdci] ZcYZY CjcZ 1.* 0.00, LZZ { IVgi B, ; jh^cZhh z >meaVcVidgn GdiZ KZ\\ygY^c\ <ZgiV^c FZig^Xh, |

7EV @NQJ 9NRS

M]Z

 $g^{\ } [ih id iZaZk^hZ XZgiV^c a^hiZY ZkZcih \& [dg ZmV b eaZ^* i]Z Han b e^hX @V b Zh VcY XZgiV^c : jhigVa^Vc ?ddiWVaa EZV \ jZ VcY Xg^X \ Zi b ViX]Zh' j caZhh V cVi^dcVa dg Xd b b ZgX^Va iZaZk^h^dc WgdVYXVhiZg 1]dhZ iZaZk^h^dc WgdVYXVhi^c \ hZgk^XZh XdkZg b dgZ i]Vc 3 . # d[i]Z : jhigVa^Vc edejaVi^dc]Vh VXfj^gZY i]Z g^\]i id iZaZk^hZ i]Z ZkZci dg hjX] g^\]ih]VkZ cdi WZZc VXfj^gZY 04 1 ZZ h WZ[dgZ i]Z hiVgi d[i]Z gZaZkVci ZkZci VcY Vc ?M : WgdVYXVhiZg]Vh]VY V gZVhdcVWaZ deedgijc^in id VXfj^gZ i]Z g^\]ih id i]Vi ZkZci9 VcY &W' XdciZci gZfj^gZbZcih z i]Z <dbeVcn bjhi Xdbean 1^i] XZgiV^c XdciZci gZfj^gZ bZcih* ^cXajY^c \ gZhig^Xi^dch dc i]Z ^cXajh^dc d[\VbWa^c \ VYkZgi^h^c \ Yjg^c \ a^kZ hedgi^c \ ZkZcih,$

?dmiZa^h Vahd hjW_ZXi id kVg^djh Xdchj bZg egdiZXi^dc gZ\^bZh jcYZg i]Z MZaZXdb bjc^XVi^dch : Xi /775 &<i]'*i]Z MZaZXdb bjc^XVi^dch : Xi /777 &<i]' VcY VhhdX^ViZY <dYZh* 1]^X] Veean id ?dmiZa~h egdk^h^dc d[WgdVYWVcY VcY kd^XZ hZgk^XZh id gZiV^a XjhidbZgh,

M]Z <dbeVcn~h: jhigVa^Vc deZgVi^c\ Wjh^cZhhZh VgZ hjW_ZXi id di]Zg eVgih d[i]Z; gdVYXVhi^c\ LZgk^XZh: Xi i]Vi bVn ^beVXi i]Z <dbeVcn~h d1cZgh]^e higjXijgZ VcY deZgVi^dch VcY gZhig^Xi ^ih VW^a^in id iV`Z VYkVciV\Z d[VXfj^h^i^dc dg ^ckZhibZci deedgijc^i^Zh,

2NWLQVJ[T BNP^UJ]RXW

<ZgiV^c WZcX] b Vg`h egdk^YZY Wn i]Z <d b eVcn-h HIBL Wjh^cZhh VgZ hj W_ZXi id gZ\jaVi^dc ^c i]Z N,D, VcY b Vn WZXd b Z hj W_ZXi id h^b^a\u2 Zkdak^c\ gZ\jaVi^dch ^c di]Zg_jg^hY^Xi^dch ^[* [dg ZmV b eaZ* hj X] WZcX] b Vg`h VgZ jhZY Wn hj eZgk^hZY Zci^i^Zh hj X] Vh igVY^c\ kZcjZh ^c i]Z Veea^XVWaZ_jg^hY^Xi^dc, M]ZhZ gZ\jaVi^dch \ZcZgVaan gZfj^gZ* V b dc\ di]Zg i]^c\h* i]Vi WZcX] b Vg`h WZ egdk^YZY Wn Vc Vji]dg^oZY WZcX] b Vg` VY b^c^higVidg, P]^aZ i]Z <d b eVcn XjggZcian jhZh V i]^gY+eVgin VY b^c^higVidg* i]Z <d b eVcn ^ciZcYh id ZhiVWa^h] ^ih d 1 c WZcX] b Vg` VY b^c^higVidg* 1]^X] 1^aa cZZY id Xd b ean 1^i] V 1^YZ+gVc\^c\ hZi d[gZfj^gZb Zcih gZ\jaVi^c* V b dc\ di]Zg i]^c\h* Xdc[a^Xih d[^ciZgZhi* Xd b eaV^cih]VcYa^c* ^ce ji YViV* WZcX] b Vg` b Zi]dYdad\^Zh VcY di]Zg b ViiZgh, : WZcX] b Vg`</pre>

 $> ck^{\circ}gdc\ b\ ZciVa^{\ast}\ LdX^{\circ}Va\ VcY\ @dkZgcVcXZ\ KZedgi^{\ast}\ VkV^{\circ}aVWaZ\ dc\ i\]Z < d\ b\ eVcn^{-}h\ 1\ ZWh^{\circ}iZ\ \&\ 1\]^{X}]\ ^{h}\ cdi\ ^{c}XdgedgViZY\ Wn\ gZ[ZgZcXZ\]ZgZ^{\circ}c',$

 $: h \ d[\ CjcZ\ 1.*\ 0.00*\ i]Z < d \ b \ eVcn \] VY \ Veegdm^b \ ViZan\ 03*3 \dots Zb \ eadnZZh^* \ d[\ 1\] d \ b \ Veegdm^b \ ViZan\ 7^* \dots 1 ZgZ \ adXViZY\ ^c \ i]Z\ N,D, \ VcY\ 6^* \dots 1 ZgZ \ adXViZY\ ^c \ : j \ higVa^V, \ H[\ i]Z < d \ b \ eVcn^h\ Zb \ eadnZZh^* \ Veegdm^b \ ViZan\ 2^* \dots 1 ZgZ \ adXViZY\ ^c \ : j \ higVa^V, \ H[\ i]Z < d \ b \ eVcn^h\ Zb \ eadnZZh^* \ Veegdm^b \ ViZan\ 2^* \dots 1 ZgZ \ gZegZhZciZY\ Wn\ kVg^djh\ Zb \ eadnZZj \ c^dch, \ M]Z\ XdcigVXih\ 1^i]\ hjX]\ j \ c^dch\ 1^aa \ Zme^gZ\ Yjg^c \ kVg^djh\ i^b \ Zb \ dkZg\ i]Z\ cZmi\ hZkZgVa$

+QNADCARS; TBRCQIBEQ, HTQM

M]Z <dbeVcn XVaXjaViZh; gdVYXVhi LjWhXg^WZg < jjgc [dg ^ih eVn+MO Wjh^cZhh Wn Y^k^Y^c \ i]Z idiVa cj b WZg d[Y^hXdccZXiZY gZh^YZci^Va hjWhXg^WZgh [dg i]Z eZg^dY* cZi d[gZXdccZXih VcY igVch[Zgh* Wn i]Z : kZgV\Z ; gdVYXVhi LjWhXg^WZgh [dg i]Z eZg^dY* XVaXjaViZY Vh YZhXg^WZY VWdkZ, M]^h V b dj ci ^h i]Zc Y^k^YZY Wn i]Z cj b WZg d[YVnh ^c i]Z eZg^dY VcY b jai^ea^ZY Wn 143 YVnh id egZhZci X] jgc dc Vc Vccj Va WVh^h,

9AID; TBRCQIBEQR

 $: eV^{Y} \ hj \ Wh Xg^{W} Zg \ id \ i] Z < db \ eV cn^{-h} \ hig ZV \ b^{c} \setminus hZgk^{X}Zh \ ^{h} \ dc Z \ [dg \ 1]^{X}] \ i] Z < db \ eV cn \ gZXd \setminus c^{o}ZY \ hj \ Wh Xg^{ei^{o}} dc \ gZkZcjZ, : hj \ Wh Xg^{W} Zg \ XZVhZh \ id \ WZ \ V \ eV^{Y} \ hj \ Wh Xg^{W} Zg \ Vh \ d[\ i] Z^{g} \ Z[[ZXi^{k}Z \ XVcXZaaVi^{d}c \ YViZ \ dg \ Vh \ V \ gZhjai \ d[\ V \ [V^{a}ZY \ eV n \ b Zci \ b Zi] dY, \ IV^{Y} \ hj \ Wh Xg^{W} Zgh \ ZmXaj \ YZh \ Xj hid \ b Zgh \ gZXZ^{k^{c}} \setminus hZgk^{X}Z \ [dg \ cd \ X] Vg \setminus Z \ j \ cYZg \ XZgiV^{c} \ cZ \ 1 \ hj \ Wh Xg^{W} Zg \ egd \ b \ di^{d}ch,$

=H9A + 5(F=G?:57HCFG)

 $IX^{\wedge} \setminus QX^{\wedge} UM \ LJ[NO^{\wedge} UUb \ LXW \setminus RMN[\]QN \ OXUUX \ \ RWP \ [R \setminus T \setminus \ JWM \ X]QN[\ RWOX[\ VJ]RXW \ RW \]QR \setminus \ IW$

 $W \setminus '$

b jai^ij YZ d[X]d^XZh* Xdchj b Zgh b Vn eaVXZ \gZViZg kVajZ dc i]Z XdckZc^ZcXZ VcY eg^XZ d[XdciZci VcY di]Zg egdYjXih VcY hZgk^XZh i]Vc i]Zn Yd dc i]Z^g hdjgXZ* fjVa^in dg gZa^VW^a^in, Hca^cZ igV[[^X VcY egdYjXi VcY hZgk^XZ ejgX]VhZh VgZ Vahd Yg^kZc Wn ^ciZgcZi hZVgX] gZhjaih* gZ[ZggVah [gd b hdX^Va b ZY^V VcY di]Zg eaVi[dg b h VcY k^h^W^a^in dc Y^\^iVa b Vg` ZieaVXZ eaVi[dg b h VcY ^c b dW^aZ Vee

M]Z Y^\iva VYkZgi^h^c byg`Zi Vahd Xdci^cjZh id jcYZg\d X]Vc\Zhi]Vi bVn [jgi]Zg ^beVXi Y^\iva VYkZgi^hc gZkZcjZh, Igd\gV b bVi^X Wjn^c\ X]VccZah i]Vi Vaad 1 VYkZgi^hZgh id Wjn VjY^ZcXZh Vi hXVaZ eaVn V h^\c^[^XVci gdaZ ^c i]Z VYkZgi^h^c\ bVg`ZieaVXZ VcY]VkZ XVjhZY VcY bVn Xdci^cjZ id XVjhZ [jgi]Zg Yd I c 1 VgY eg^X^c\ egZhhjgZ VcY i]Z adhh d[V Y^gZXi gZaVi^dch]^e 1^i] bVg`ZiZgh, M]^gY+eVgin YZa^kZgn eaVi[dg bh b Vn Vahd aZVY id adhh d[Y^hig^Wji^dc VcY bdcZi^oVi^dc Xdcigda* adhh d[V Y^gZXi gZaVi^dch]^e 1^i] Xdchj bZgh VcY VYkZghZan V[[ZXi i]Z <dbeVcn-h VW^a^in id jcYZghiVcY ^ih VjY^ZcXZ VcY-dg XdaaZXi VcY Veean YViV [dg iVg\ZiZY VYkZgi^h^c\, M]Z <dbeVcn-h Y^\iva VYkZgi^h^c\ deZgVi^dch Vahd gZan dc V hb Vaa cj bWZg d[h^\c^[^XVci iZX] cdad \^Zh hjX] Vh @dd\aZ-h VY bVcV\Zg 1]^X]* [^ciZggj eiZY dg bZVc^c\[jaan X]Vc\ZY* dg ^[i]Z egdk^YZgh aZkZgV\Z i]Z^g ed 1 Zg id VaiZg i]Z ZXdcd b^X higjXijgZ* XdjaY VYkZghZan ^beVXi VYkZgi^h^c\ gZkZcjZh VcY-dg deZgVi^c\ Xdhih, Bc VYY^i^dc* Zkdak^c\ hivcYVgYh [dg i]Z YZa^kZgn d[Y^\iva VYkZgi^h^c* *V h 1 Zaa Vh i]Z YZkZade bZci VcY ^beaZ bZciVi^dc d[iZX] cdad\n* gZ\jaVi^dch* eda^X*Zh VcY egVXi^XZh i]Vi VYkZgi^h^c* *Wgd 1 h^c* ^cXd\c^id* WadX`^c\ dg YZaZi^c\ Xdd`^Zh VcY BI VYYgZhhZh* i]Z e]VhZ+dj i d[hjeedgi [dg i]^gY eVgin Xdd`^Zh VcY b dW^aZ ^YZci^[^Zgh* Vh 1 Zaa Vh dei+c gZfj^gZ bZcih VcY cZ 1 eg^kVXn gZ\jaVi^dch* bVn Vahd cZ\Vi^kZan ^b eVXi Y^\iva VYkZgi^h^c\ bVg`Zi Xdci^c\ Zdcicj Zh, : h i]Z Y^\iva VYkZgi^h^c\ bVg`Zi Xdci^cj Zh Xdci^cj Zh id ZkdakZ* i]Z <dbeVcn-h VW^a^in id Xd beZiZ hj XXZhh[jaan [dg

 $\begin{array}{l} hZgk^XZh^*i]Zn\ b\ Vn\ WZ\ j\ c\ 1^aa^c\ \backslash\ id\ egdk^YZ\ i]Z\ < d\ b\ eVcn\ 1^i]\ VXXZhh\ id\ XZgiV^c\ XdciZci,\ ?dg\ ZmV\ b\ eaZ^*\ ^c\ XdccZXi^dc\ 1^i]\ i]Z \\ aVj\ cX]\ d[\ =^hcZn)^*\ =^hcZn\ gZ\ b\ dkZY\ ^ih\ =^hcZn+WgVcYZY\ b\ dk^Z\ X]VccZa\ VcY\ ^nYh\ X]VccZah^*\ Vh\ 1\ Zaa\ Vh\ XZgiV^c\ cdc+WgVcYZY\ XdciZci^* [gd\ b\ i]Z\ ?dmiZa\ eaVi[dg\ b\ ,\ <dchda^YVi^dc\ V\ b\ dc\ \backslash\ XdciZci\ egdk^YZgh\ b\ Vn\ gZhjai\ ^c\ VYY^i^adcVa\ XdciZci\ WZXd\ b^c\ \backslash\ j\ cVkV^aVWaZ\ i]Z \\ <db\ eVcn\ VcY-dg\ ^cXgZVhZ\ i]Z\ hXVaZ\ VcY\ aZkZgV\ Z\ d[\ i\]dhZ\ egdk^YZgh\ M]Z\ adhh\ d[\ g^{\ }\]ih\ dg\ Vcn\ VYKZghZ\ X\ Vc\ Xh\ id\ Zm^hi^c\ Vg^{\ }\]ih^* \\ \end{array}$

aVg\Zhi gZhZaaZg d[^ih XVWaZ VcY hViZaa^iZ egdYjXih, : cn Y^hgjei^dc ^c i]Z hjeean d[i]dhZ hZgk^XZh dg V YZXa^cZ ^c MZahigV~h Wjh^cZhh XdjaY gZhjai ^c Y^hgjei^dch id i]Z hjeean d[* VcY-dg gZYjXZ i]Z cj b WZg d[hjWhXg^WZgh [dg* i]Z <d b eVcn~h egdYjXih VcY hZgk^XZh* 1]^X] XdjaY* ^c ijgc* VYkZghZan V[[ZXi ^ih Wjh^cZhh* gZhjaih d[deZgVi^dch VcY [^cVcX^Va XdcY^i^dc,

P]^aZ i]Z <dbeVcn 1^aa hZZ` VaiZgcVi^kZ hdjgXZh [dg i]Z egdYjXih VcY hZgk^XZh YZhXg^WZY VWdkZ 1]ZgZ edhh^WaZ VcY-dg eZg b^hh^WaZ jcYZg Veea^XVWaZ V\gZZ bZcih* ^i bVn cdi WZ VWaZ id YZkZade i]ZhZ VaiZgcVi^kZ hdjgXZh fj^X`an VcY Xdhi+Z[[ZXi^kZan* 1]^X] XdjaY ^b eV^g ^ih VW^a^in id i^bZan YZa^kZg ^ih egdYjXih VcY hZgk^XZh id ^ih hjWhXg^WZgh dg deZgViZ ^ih Wjh^cZhh,

 $1 \ \ Wb \ CRPWRORLJW] \ 9WL[NJ\N RW]QN \ 3X\] \ JX \ @[RW] \ JWM \ 4R\][RK^]N \]QN \ 3XVYJWbh\ 2XXT\ JWM >N \ YJYN[\ X[\ 4R\[^Y]RXW RW]QN \ 3XVYJWbh\ C^YYUb \ 3QJRW X[\ @[RW]RWP \ JWM \ 4R\][RK^]RXW \ 3QJWWNU\ VJb \ 1M_N[\NUb \ 100NL] \]QN \ 3XVYJWbh\ 2^RWN\N BN\N U]\X0 \ ?YN[\ J]RXW\ JWM \ 6RWJWLRJU \ 3XWMR]RXW'$

 $Ig^{ci^{c}} \lor VcY Y^{hig^{N}} i^{d}c Xdhih^{*} \land cXa_{1}Y^{c} \lor i]Z Xdhi d[eVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} Wdd^{Vc} cZ lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} Wdd^{Vc} cZ lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} Wdd^{Vc} cZ lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} Wdd^{Vc} cZ lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} Wdd^{Vc} cZ lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} Wdd^{Vc} cZ lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} Wdd^{Vc} cZ lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} Wdd^{Vc} cZ lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} Wdd^{Vc} cZ lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} Wdd^{Vc} cZ lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} Wdd^{Vc} cZ lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} Wdd^{Vc} cZ lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} Wdd^{Vc} cZ lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} Wdd^{Vc} CZ lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} VgZ V lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} VgZ V lheVeZg^{*} VgZ V h^{c}[\Lambda XVci ZmeZchZ [dgi]Z < dbeVcn^{h} VgZ V lheVeZg^{*} VgZ V lheVeZg^$ ejWa^h]^c\ jc^ih, M]Z eg^XZ d[eVeZg]Vh]^hidg^XVaan WZZc kdaVi^aZ* VcY i]Z <d b eVcn ZmeZXih ^cXgZVhZh ^c i]Z cZVg+iZg b [gd b kVg^djh [VXidgh* ^cXajY^c \ Xdci^cjZY ^cXgZVhZh ^c hjeea^Zg deZgVi^c \ ZmeZchZh YjZ id g^h^c \ gVl b ViZg^Va* ZcZg \n* aVWdg VcY igVchedgiVi^dc VcY di]Zg Y^hig^Wji^dc Xdhih* ^c[aVi^dcVgn egZhhjgZh VcY di]Zg [VXidgh, M]Z <dbeVcn Vahd gZa^Zh dc i]^gY+eVgin hjeea^Zgh [dg YZa^kZg^Zh d[eVeZg VcY dc i]^gY+eVgin eg^ci^c\ VcY Y^hig^Wji^dc eVgicZgh id eg^ci VcY Y^hig^WjiZ ^ih Wdd`h VcY cZ 1 heVeZgh, = j g^c \ [^hXVa 0 . 00* ^c[aVi^dcVgn egZhh j gZh* aVWdg h] dgiV\Zh*]^\]Zg igVchedgiVi^dc Xdhih VcY YZaVnh VcY di]Zg h j eean X]V^c ^hhjZh ^cXgZVhZY i]Z Xdhi id eg^ci VcY Y^hig^WjiZ i]Z <dbeVcn~h Wdd`h VcY cZl heVeZgh* eVgi^XjaVgan bVcj[VXijg^c\ VcY [gZ^\]i Xdhih Vi ^ih Wdd` ejWa^h]^c\ Wjh^cZhh, M]ZhZ VcY di]Zg [VXidgh hjX] Vh [^cVcX^Va egZhhjgZh* ^cYjhign igZcYh dg ZXdcd b^Xh* aVWdg jcgZhi* X]Vc\Zh ^c aV 1 h VcY gZ\jaVi^dch* cVijgVa Y^hVhiZgh* ^cXajY^c\ ZmigZ bZ 1ZVi]Zg &1]^X] bVn dXXjg 1^i] ^cXgZVh^c\ [gZf jZcXn VcY ^ciZch^in'* eVcYZ b ^Xh VcY di]Zg 1 ^YZhegZVY]ZVai] Xg^hZh dg di]Zg X^gX j b hiVcXZh V[[ZXi^c\ i]ZhZ i]^gY+eVgin hjeea^Zgh VcY eg^ci VcY Y^hig^Wji^dc eVgicZgh XdjaY Xdci^cjZ id ^cXgZVhZ i]Z <d b eVcn-h eg^ci^c \ VcY Y^hig^Wji^dc Xdhih VcY XdjaY aZVY id Y^hgjei^dch* gZYjXZY deZgVi^dch dg Xdchda^YVi^dch 1^i]^ci]Z <dbeVcn~h eg^ci^c\ VcY Y^hig^Wji^dc hjeean X]V^ch VcY-dg d[i]^gY+eVgin eg^ci h^iZh VcY-dg Y^hig^Wji^dc gdjiZh, M]Z <dbeVcn bVn cdi WZ VWaZ id YZkZade VaiZgcVi^kZ egdk^YZgh fj^X`an VcY Xdhi+ Z[[ZXi^kZan* 1]^X] XdjaY Y^hgjei eg^ci^c\ VcY Y^hig^Wji^dc deZgVi^dch dg ^cXgZVhZ i]Z Xdhi d[eg^ci^c\ VcY Y^hig^Wji^c\ i]Z <dbevcn~h Wdd`h VcY cZ1heVeZgh, : cn h^\c^[^XVci ^cXgZVhZ ^c i]ZhZ Xdhih* j cYZghjeean dg h^\c^[^XVci Y^hgjei^dch ^c i]Z hjeean X]V^c dg i]Z <dbeVcn~h eg^ci^c \ VcY Y^hig^Wji^dc X]VccZah XdjaY]VkZ Vc VYkZghZ Z[[ZXi dc i]Z <dbeVcn~h Wjh^cZhh* gZhjaih d[deZgVi^dch VcY [^cVcX^Va XdcY^i^dc,

 $DQN \ 3XVYJWbh \ BNY^]J]RXWW \ 3[NMRKRUR]b \ JWM \ 2[JWM \ J[N ; Nb \ 1 \ N] \ JWM \ 3XVYN]R]R_N \ 1M_JW]JPN \ JWM \ R] \ 2^RWN \ JWM \ BN \ U] \ X0 \ 2YN[J]RXW \ VJb \ KN \ 100NL]NM \ Kb \ 8X \ QN \ 3XVYJWb \ R \ @N[LNR_NM']$

 $M]Z < dbeVcn^{h} egdYjXih VcY hZgk^{XZh} VgZ Y^{hig^{W}}jiZY jcYZg hdbZ d[i]Z 1 dgaY^{h} b dhi gZXd \c^{o}VWaZ VcY gZheZXiZY WgVcYh^{*} \cXajY^{c} DQN GJW C][NN] : X^{WJU} VcY egZ b^{Z}g cZ1h WgVcYh^{c} : jhigVa^{N}V VcY i]Z N,D,^{*} = d1 CdcZh^{*} AVgeZg < daa^{c}h IjWa^{h}]Zgh^{*} \cMiZa^{*} gZVaZhiViZ,Xdb,Vj^{*} KZVaidg,Xdb^{**} HIBL VcY b Vcn di]Zgh^{*} VcY i]Z < dbeVcn WZa^{*}ZkZh^{h} hjXXZhh YZeZcYh dc^{h} Xdci^{c}jZY VW^{a}hin id b V^{c}iV^{c} VcY Zc]VcXZ i]ZhZ WgVcYh, M]Z < dbeVcn^{h} WgVcYh^{*} XgZY^{N}a^{h}in VcY gZejiVi^{h}dc XdjaY WZ YV b V\ZY Wn^{c}X^{N}Zcih i]Vi ZgdYZ Xdchj b Zg VcY Xjhid b Zg igjhi dg V eZgXZei^{h}dc i]Vi i]Z < dbeVcn^{h} egdYjXih VcY hZgk^{N}Zh^{*} ^{c}XajY^{c} ^{h}j_{g}cVa^{h}b^{*} egd \gV b b^{c} ^{*} gZVa ZhiViZ ^{c}[dg b Vi^{h}dc^{*} WZcX] b Vg^{*} VcY eg^{N}C^{c} hZgk^{N}Zh VcY di]Zg YViV VcY ^{c}[dg b Vi^{h}dc^{*} VgZ ad1 fjVa^{h}in^{*} jcgZa^{N}WaZ dg [V^{h}a id b V^{c}iV^{c} ^{c}YZeZcYZcXZ VcY ^{c}iZ \g^{h}in, L^{c}^{N}Xci cZ ^{h}in^{*}Zh^{h}b h dg ej Wa^{N}X^{h}in gZ ^{h}VgY^{c} i]Z < dbeVcn^{h}egdYjXih VcY hZgk^{N}XZh eZgV^{h}ach Xjhid b Zg hZgk^{N}Z^{*}b VcV ^{L}ach Zh^{L}ach VYkZgi^{h}Zgh VcY di]Zg Wjh^{L}ach VYgZolh eVgicZgh^{N}Yh^{L}ach YZX^{h}ach hdX^{N}a gZhedch^{M}a^{h}in VcY XjaijgZ b Vn YVb V Z^{h}b WgVcYh dg gZejiVi^{h}dc^{*}ZkZc^{h}ach h d n A d l$

 $\label{eq:hj^ivWaZ} $$ YYY^i^dch\ dg\ gZeaVXZ\ bZcih\ 1^i]dji\ h^\c^{^iXVci}\ Xdhih\ dg\ YZaVnh^*\ eVgi^XjaVgan\ Vh\ ^i\ Xdci^cjZh\ id\ [dXjh\ dc\ ^ih\ Y^^iVa\ egdYjXih\ VcY\ hZgk^XZh,\ M]ZhZ\ g^h^h\]$ VkZ\ WZZC\ ZmVXZgWviZY\ Wn\ gZXZci\ aVWdg\ XdchigV^cih\ VcY\ ^c[aVi^dcVgn\ egZhhjgZh\ dc\ Zb\ eadnZZ\ 1\ V\Zh\ VcY\ WZcZ[^ih^*\ 1\]^X]\ ^cXgZVhZY\ Zb\ eadnZZ\ ij\ gcdkZg\ VcY\ gZXgj^i^i^c\ VcY\ gZiZci^dc\ Xdhih\ ^c\ hd\ bZ\ [j\ cXi^dcVa\ VgZVh\ VcY\ Wj\ h^cZhhZh\ Yjg^c\ VcY\ gZiV^a\ ci\]Z\ eVijgZ\ d[i]Z\ d[[^XZ\ Zck^gdc\ bZci\ VcY\ 1\ dg^^c\ VggVc\ Zb\ Zcih\ b\ Vn^*\ ^c\ hd\ bZ\ ^chiVcXZh^*\ Vahd\ b\ V^Z\ ^i\ b\ dgZ\ Y^[[^Xj\ ai\ id\]^gZ\ VcY\ gZiV^c\ fj\ Va^[^XZY\ Zb\ eadnZZh\ ^[i]Z\ <db\ eVcn^*\ hcZYh\ VgZ\ cdi\ Va^h\ cZY\ 1^i]\ YZ\ b\ VcY\ [dg\ [aZm^W^a^in\ dg\ Vh\ V\ gZhj\ ai\ d[\ 1\ dg\ eaVXZ\ Xj\ ai\ jgZ\ X]\ VaaZc\ Zh\ YjZ\ id\ gZ\ b\ diZ\ 1\ dg\ ^c\ ,\ M]Z\ adhh\ d[\ ^Zn\ Zb\ eadnZZh^*\ i]Z\ [V^ajgZ\ id\ ViigVXi\ VcY\ gZiV^c\ di\]Z\ VW^a^in\ id\ ZmZYjiZ\ ^ih\ Wjh^cZhh^*\ ^cXaj\ Y^c\ i]Z\ VW^a^in\ id\ ZmZXjiZ\ ^ih\ Wjh^cZhh\ higViZ\ n^*\ VcY\ cZ\ Vi^i^kZan\ ^b\ eVXi\ ^ih\ gZhj\ ai\ hd\ [deZgVi^dch,$

 $M]Z < dbeVcn^h XjhidbZgh eVn [dg ^ih egdYjXih VcY hZgk^XZh jh^c \ V kVg^Zin d[Y^[[ZgZci eVnbZci bZi]dYh^* ^cXajY^c \ XgZY^i VcY YZW^i XVgYh^* egZeV^Y XVgYh^* Y^gZXi YZW^i^* dca^cZ 1 VaaZih VcY i]gdj \] Y^gZXi XVgg^Zg VcY eVgicZg W^aa^c \, M]Z < dbeVcn gZa^Zh dc ^ciZgcVa VcY i]^gY eVgin hnhiZbh id egdXZhh eVnbZci, : XXZeiVcXZ VcY egdXZhh^c \ d[i]ZhZ eVnbZci bZi]dYh VgZ hjW_ZXi id XZgiV^c gjaZh VcY gZ\jaVi^dch VcY gZfj^gZ eVnbZci d[^ciZgX]Vc\Z VcY di]Zg [ZZh, Md i]Z ZmiZci i]ZgZ VgZ ^cXgZVhZh ^c eVnbZci egdXZhh^c \ [ZZh^* bViZg^Va X]Vc\Zh ^c i]Z eVnbZci ZXdhnhiZb * YZaVnh ^c gZXZ^k^c \ eVnbZcih [gd b eVnbZci egdXZhhdgh* Vcn [V^ajgZh id Xd bean 1 ^i]* dg X]Vc\Zh id* gjaZh dg gZ\jaVi^dch XdcXZgc^c \ eVnbZcih* adhh d[eVnbZci dg W^aa^c \ eVgicZgh VcY-dg Y^hgjei^dch dg [V^ajgZh ^c* dg [gVjYjaZci jhZ d[dg VXXZhh id* eVnbZci egdXZhh^c \ hnhiZbh dg eVnbZci egdYjXih* i]Z < dbeVcn-h gZhjaih d[deZgVi^dch XdjaY WZ VYkZghZan ^beVXiZY VcY ^i XdjaY hj[[Zg gZejiVi^dcVa]Vgb, ?jgi]ZgbdgZ* ^[i]Z < dbeVcn ^h jcVWaZ id bV^ciV^c ^ih [gVjY VcY X]Vg\ZWX\ gViZh Vi VXXZeiVwaZ aZkZah* XVgY cZi 1 dg ^h b Vn ^b edhZ [^cZh VcY ^ih XVgY VeegdkVa gViZ b Vn WZ ^b eVXiZY, M]Z iZgb^cVi^dch (di]Z < dbeVcn-h VW^a^in id egdXZhh eVn bZcih dc Vcn bV_dg eVnbZci bZi]dY 1 djaY VYkZghZan V[[ZXi ^ih Wjh^cZhh VcY gZhjaih d[deZgVi^dch,$

 $\langle JKXf \ 4R \ Y^]N \setminus = Jb \ 8J_N \ JW \ 1M_Nf \ N \ 500NL \ XW \ |QN \ 3XVYJWbh \ 2^RWN \ '$

Bc hd b Z d[i]Z <d b eVcn-h Wj h^cZhhZh* ^i Zc \V\Zh i]Z hZgk^XZh d[Z b eadnZZh 1]d VgZ hj W_ZXi id XdaaZXi^kZ WVg\V^c^c\ V\gZZ b Zcih, B[i]Z <d b eVcn ^h j cVWaZ id gZcZ 1 Zme^g^c\ XdaaZXi^kZ WVg\V^c^c\ V\gZZ b Zcih* ^i ^h edhh^WaZ i]Vi i]Z V[[ZXiZY j c^dch XdjaY iV`Z VXi^dc ^c i]Z [dg b d[hig^` Zh dg 1 dg` hideeV\Zh, LjX] VXi^dch* Vh 1 Zaa Vh]^\]Zg Xdhih ^c XdccZXi^dc 1^i] i]ZhZ XdaaZXi^kZ WVg\V^c^c\ V\gZZ b Zcih dg V h^\c^[XVci aVWdg Y^hejiZ* XdjaY] VkZ Vc VYkZghZ Z[[ZXi dc i]Z <d b eVcn-h Wj h^cZhh Wn XVj h^c\ YZaVnh ^c egdYj Xi^dc dg Wn gZYj X^c\ egd[^i b Vg\^ch* VcY i]ZhZ g^h`h b Vn WZ ZmVXZgWViZY Wn gZXZci aVWdg XdchigV^cih VcY ^c[aVi^dcVgn egZhh jgZh dc Z b eadnZZ 1 V\Zh VcY WZcZ[^ih,

ARTc`VT`_`^ZT R_U ARc\Ve FZd\d

 $GNJT\ 4XVN\backslash JRL\ JWM\ 7UXKJU\ 5LXWXVRL\ 3XWMRJRXW\backslash\ JWM\ FXUJJRURJb\ JWM\ 4R\backslash [^YJRXW\ RW\]QN\ 6RWJWLRJU\ JWM\ ?\]QN[\ =J[TN]\backslash\ =Jb\ 1M\ Nf\backslash NUb\ 100NL]\ JON\ 3XVYJWbh\backslash\ 2^\backslash RWN\backslash\ '$

φ X i

 $> kZcih\ V[[ZXi^c \setminus i]Z < d\ b\ eVcn\ h\ hnhiZ\ b\ h\ d\ di]Zg\ iZX]cdad\ ^2K^*\ dg\ i]dhZ\ d[\ i]^gY\ eVgi^zh\ j\ edc\ 1\]^X]\ i]Z < d\ b\ eVcn\ h\ Wj\ h^cZhh\ gZa^zh^*\ hjX]\ Vh\ Xd\ b\ ejiZg\ Xd\ b\ egd\ b\ ^hZh^*\ XnWZg\ i]gZVih\ VcY\ ViiVX^h^*\ Xd\ b\ ejiZg\ k^gjhZh^*\ 1\ dg\ bh\ dg\ di]Zg\ YZhigjXi^kZ\ dg\ Y^hgjei^kZ\ hd[i\ 1\ VgZ^*\ egdXZhh\ WgZV^Yd\ 1\ ch^*\ gVchd\ b\ 1\ VgZ\ VcY\ YZc^Va\ d[\ hZgk^XZ\ ViiVX^h^*\ b\ Va^XA^djh\ hdX^Va\ Zc\ ^cZg^c\ dg\ di]Zg\ b\ Va^XA^djh\ VXi^k^i^zh\ Wn\ ^cY^k^YjVah\ dg\ hiViZ+hedchdgZY\ dg\ di]Zg\ Vgdjeh^*\ dg\ Vcn\ Xd\ b\ W^cVi^dc\ d[\ i]Z\ [dgZ\ d^c\ Vh\ 1\ Zaa\ Vh\ ed\ 1\ Zg\ VcY\ ^ciZgcZi\ djiV\ Zhj^e\ b\ Zci\ [V^ajgZ^*\ cVijgVa\ Y^hVhiZgh^*\ ^cXajY^c\ XajY^c\ XajZb\ Z\ 1\ ZVi]Zg\ d\ 1\]^X]\ b\ Vn\ dXXjg\ 1^i]\ ^cXgZVh^c\ [gZfjZcXn\ VcY\ ^ciZch^in'*\ iZggdg^hi\ VXi^k^i^zh^*\ 1\ Vg^*\]j\ b\ Vc\ dg\ iZX\ cdad\ ^XVa\ Zggdg\ dg\ b\ Va[ZVhVcXZ\ i]Vi\ b\ Vn\ V[[ZXi\ hjX]\ hnhiZb\ h^*\ XdjaY\ gZhjai\ ^c\ Y^hgjei^hc\ d\ [i]Z\ <db\ eVcn\ h\ LZgk^XZh\ VcY\ Wjh^cZhh\ VcY\ Wjh^cZhh\ VcY\ dg\ adhh^*\ Xdggjei^hc\ ^c\ b\ egdeZg\ VXXZhh\ id\ dg\ Y^hXadhjgZ\ d[\ eZghdcVa\ YViV^*\ Wjh^cZhh\ ^c[dg\ b\ Vi^hz\ ^c]\ dg\ VVc$

 $id\ V\ XdkZgZY\ hidX`\]daYZg*\ VgZ\ dg\ b\ Vn\ WZXd\ b\ Z\ hidX`\]daYZgh*\ Y^gZXidgh*\ d[[^XZgh*\ Z\ b\ eadnZZh\ dg\ V\ Zcih\ d[\ ?HQ\ VcY\ XZgiV^c\ d[\ ^ih\ V[[^a^ViZh,\ M]Z\ <d\ b\ eVcn^+\ :\ b\ ZcYZY\ VcY\ KZhiViZY\ ;\ n+aV\ l\ h\ [jgi]Zg\ egdk^YZ\ i]Vi\ Vcn\ hjX]\ dkZgaVee^c\ eZghdc\ l\ ^aa\ cdi\ WZ\ a^VWaZ\ id\ i]Z\ <d\ b\ eVcn^*\ dg\ id\ Vcn\ d[\ ^ih\ hidX`\]daYZgh*\ [dg\ WgZVX]\ d[\ Vcn\ [^YjX^Vgn\ Yjin\ i]Vi\ l\ dj\ aY\ di\]Zg\ l\ ^hZ\ Zm^hi\ WZXVjhZ\ hjX]\ ^cY^kk^YjVa\ Y^gZXih\ V\ XdgedgViZ\ deedgij\ c^in\ \&di\]Zg\ i]Vc\ XZgiV^c\ ineZh\ d[\ gZhig^XiZY\ Wjh^cZhh\ deedgij\ c^ii^Zh\ hZi\ [dgi]\ ^c\ i]Z\ <d\ b\ eVcn^h\ :\ b\ ZcYZY\ VcY\ KZhiViZY\ ;\ n+aV\ l\ h'\ id\ ?HQ\ ^chiZVY\ d[\ i]Z\ <d\ b\ eVcn,\ M]^h\ Xdj\ aY\ gZhjai\ ^c\ Vc\ dkZgaVee^c\ eZghdc\ hj\ Wb\ ^ii^c\ Vcn\ XdgedgViZ\ deedgij\ c^ii^Zh\ di\]Zg\ i]Vc\ gZhig^XiZY\ Wjh^cZhh\ deedgij\ c^ii^Zh\ id\ ?HQ\ ^chiZVY\ d[\ i]Z\ <d\ b\ eVcn,\$

 $3N[]JRW @[X_R\RXW\ X0]QN \ 3XVYJWbh\ BN\]J]NM \ 3N[]RORLJ]N \ X0 \ 9WLX[YX[J]RXW \ JWM \ I VNWMNM \ JWM \ BN\]J]NM \ 2b&UJ`\ JWM \]QN \ ?`WN[\QRY \ X0]QN \ 3XVYJWbh\ 3XVVXW \ C]XLT \ Kb \]QN = ^[MXLQ \ 6JVRUb \ D[^\] = Jb \ 4R\LX^[JPN \ DJTNX_N[\W JWM \]QN \ 3XWLNW][J]RXW \ X0 \ ?`WN[\QRY \ GRUU \ 100NL] \]QN \ FX]RWP \ BN\^U]\ X0 = J]N[\ C^KVR]NM \ 0X[\ C]XLTQXUMN[\ 1YY[X_JU']$

- u V Y j Va XaVhh Xd b b dc Zf j ^in XVe^iVa hig j Xi j gZ9
- u V egd]^W^i^dc dc hidX`]daYZgh iV`^c\ Vcn VXi^dc Wn 1g^iiZc XdchZci 1^i]dji V bZZi^c\9
- $u \quad \text{heZX^Na hidX^*} \] \ daYZgh^c \ b \ ZZi^c \setminus id \ WZ \ XVaaZY \ dcan \ Wn \ i]Z \ ; \ dVgY \ d[\ =^gZXidgh^* \ i]Z <] \ V^g b \ Vc \ dg \ V \ O^XZ \ dg \ = Ze \ j \ in \ <] \ V^g b \ Vc \ d[\ i]Z \ ; \ dVgY \ d[\ =^gZXidgh^* \ dg \ i]Z \] \ daYZgh \ d[\ cdi \ aZhh \ i]Vc \ 0. \ \# \ d[\ i]Z \ kdi^c \setminus \ ed \ l \ Zg \ d[\ i]Z \ <d \ b \ eVcn^h \ dj \ ihiVc Y^c \setminus \ kdi^c \setminus \ hidX^9$
- u i]Z gZfj^gZbZcii]Vi hidX`]daYZgh \^kZi]Z <dbeVcn VYkVcXZ cdi^XZ id cdb^cViZ XVcY^YViZh [dg ZaZXi^dc id i]Z ; dVgY d[=^gZXidgh dg id b V`Z hidX`]daYZg egdedhVah Vi V hidX`]daYZgh~ b ZZi^c\9
- $u \quad i\,]Z\,gZf\,j\,^{a}gZ\,b\,Zci\,d[\,\,Vc\,\,V[[\,^{a}g\,b\,\,Vi\,^{a}kZ\,\,kdiZ\,\,d[\,\,Vi\,\,^{a}ZVhi\,\,43\,\,\#\,\,d[\,\,i\,]Z\,\,kdi\,^{a}c\,\,\backslash\,\,ed\,\,l\,\,Zg\,\,d[\,\,i\,]Z\,\,<\!d\,\,b\,\,e\,\,Vcn\,^{a}h\,\,dj\,\,ihi\,\,Vc\,\,Y\,^{a}c\,\,\backslash\,\,kdi\,^{a}c\,\,\backslash\,\,hid\,\,X\,^{a}id\,\,V\,\,b\,\,Zc\,\,Y\,\,dg\,\,g\,Ze\,\,ZVa\,\,^{a}h\,\,Wn\,+\,a\,\,V\,\,l\,\,h9$
- u kVXVcX^Zh dc i]Z; dVgY d[=^gZXidgh id WZ [^aaZY dcan Wn V b V_dg^in kdiZ d[Y^gZXidgh i]Zc ^c d[[^XZ9
- u $XZgiV^c gZhig^Xi^dch dc i]Z igVch[Zg d[i]Z < dbeVcn~h h]VgZh9 VcY$
- u i]Z; dVgY d[=^gZXidgh id ^hhjZ* 1^i]dji hidX`]daYZg VeegdkVa* IgZ[ZggZY LidX` VcY LZg^Zh <db b dc LidX` 1^i] hjX] iZg b h Vh i]Z; dVgY d[=^gZXidgh b Vn YZiZg b ^cZ,

M]ZhZ egdk^h^dch XdjaY Y^hXdjgV\Z ediZci^Va VXfj^h^i^dc egdedhVah VcY XdjaY YZaVn dg egZkZci V X]Vc\Z ^c Xdcigda d[i]Z <dbeVcn* ZkZc ^c i]Z XVhZ 1]ZgZ V bV_dg^in d[i]Z hidX`]daYZgh bVn Xdch^YZg hjX] egdedhVah* ^[Z[[ZXi^kZ*YZh^gVWaZ,

Bc VYY'i'dc* Vh V gZhjai d[] h VW'a'nin id Veed'ci XZgiV'c bZbWZgh d[i]Z WdVgY d[Y'gZXidgh d[i]Z XdgedgViZ igjhiZZ d[i]Z FjgYdX] $?Vb'an Mgjhi \& F?M'*1]^X] WZcZ['X'Vaan d1ch aZhhi]Vc dcZ eZgXZci d[i]Z < dbeVcn-h djihiVcY'c \ < aVhh : < dbbdc LidX` VcY Veegdm'b ViZan 16,7 # d[i]Z < dbeVcn-h < aVhh; < dbbdc LidX` Vh d[CjcZ 1.* 0.00* D, KjeZgi FjgYdX] b Vn WZ YZZbZY id WZ V WZcZ['X'Va d1cZg d[i]Z h]VgZh WZcZ['X'Vaan d1cZY Wn i]Z F?M, D, KjeZgi FjgYdX]*]d 1 ZkZg* Y'hXaV'b h Vcn WZcZ['X'Va d1cZgh]'e$

 $F?M\ 1\ djaY\ [dg[Z^i\ kdiZh\ id\ i]Z\ ZmiZci\ cZXZhhVgn\ id\ ZchjgZ\ i]Vi\ i]Z\ F?M\ VcY\ i]Z\ FjgYdX]\ [V\ b^an\ XdaaZXi^kZan\ Yd\ cdi\ ZmXZZY\ 22\#d[\ i]Z\ djihiVcY^c\ kdi^c\ ed\ 1\ Zg\ d[\ i]Z\ h]VgZh\ d[\ <aVhh\ ;\ <db\ b\ dc\ LidX^*\ ZmXZei\ 1\]ZgZ\ V\ FjgYdX]\ [V\ b^an\ b\ Zb\ WZg\ kdiZh\ i]Z^g\ d\ 1\ ch]VgZh\ Y^[[ZgZcian\ [gd\ b\ i]Z\ F?M\ dc\ Vcn\ b\ ViiZg,$

=H9A+6(IBF9GC@J98GH5::7CAA9BHG

GdcZ,

=H9A,(DFCD9FH=9G

 $2, \qquad \text{M]Z} < \!\! d\,b\,e\,V\,c\,n\,+\,d\,1\,c\,Z\,Y\,\,e\,g^{\wedge}c\,i\,\,X\,Z\,c\,i\,Z\,g\,\,V\,c\,Y\,\,d\,[\,\lceil^{\wedge}X\,Z\,\,W\,j^{\wedge}a\,Y^{\wedge}c\,\,\backslash\,\,^{\wedge}c\,\,;\,g^{\wedge}h\,W\,V\,c\,Z^{*}\,:\,j\,h\,i\,g\,V\,a^{\wedge}V\,\,V\,i\,\,1\,\,]^{\wedge}X\,]$

=H9A /(A 5F?9H:CFF9; =GHF5BHrG7CAACB9EI=HM&F9@5H98GHC7? < C@89FA5HH9FG5B8 =GGI9FDIF7 < 5G9GC: 9EI=HMG97IF=H=9G

 $GZ\,1\,h\,<dgedgVi^Ac^h\,<a^Vhh\,:\,<db\,b\,dc\,LidX^\ VcY\,<a^Vhh\,;\,<db\,b\,dc\,LidX^\ VgZ\,a^AhiZY\,VcY\,igVYZY\,dc\,M]Z\,GVhYVf\,\,(@adWVa\,LZaZXi\,F\,Vg^\ ia,dgedgVi^Ac^h\,<a^Vhh\,;\,<db\,b\,dc\,LidX^\ VgZ\,a^AhiZY\,VcY\,igVYZY\,dc\,M]Z\,GVhYVf\,\,(@adWVa\,LZaZXi\,F\,Vg^\ ia,dgedgVi^Ac^h\,) \\ &\{G^P\,L^*\,|\,gZheZXi^AkZan,\,<A>LL\,=Zedh^iVgn\,BciZgZhih\, \&\{C^P\,L^*\,|\,gZheZXi^AkZan,\,<A>LL\,=Zedh^iVgn\,BciZgZhih\, \&\{C^P\,L^*\,|\,gZheZhih\, \&\{C^$

- IUIDEMDR

?dg ^c[dg b Vi^dc gZ\VgY^c\ Y^k^YZcYh* hZZ GdiZ /0 z LidX`]daYZghl >f j^in ^c i]Z VXXd b eVcn^c\ <dchda^YViZY ?^cVcX^Va LiViZb Zcih,

2RRTEO 9TOCHARER NF . PTISX ; ECTOISIER

 $\label{topole} \begin{tabular}{l} Hc\ LZeiZ\ b\ WZg\ 00^*\ 0.0/^*\ i]Z\ d\ b\ eVcn\ Vccdj\ cXZY\ V\ cZ1\ hidX\ gZejgX]\ VhZ\ egd\ yV\ V\ ji]\ dg^o^c\ i]Z\ d\ b\ eVcn\ id\ ejgX]\ VhZ\ je\ id\ "/W^aa^dc\ ^c\ i]Z\ V\ gZ\ ViZ\ d[\ 'ih\ dj\ ihiVcY^c\ <aVhh\ :\ d\ b\ dc\ LidX\ VcY\ <aVhh\ ;\ d\ b\ dc\ LidX\ \&i]Z\ \{KZejgX]\ VhZ\ Igd\ yV\ Igd\ yV\$

 $\label{lidx} LidX^* gZejgX]VhZh Xdb bZcXZY dc GdkZbWZg 7*0.0/, =jg^c \ i]Z [^hXVa nZVg ZcYZY CjcZ 1.*0.00*i]Z < dbeVcn gZejgX]VhZY VcY hjWhZfjZcian gZi^gZY 3,6 b^aa^dc h]VgZh d[<aVhh : <dbbdc LidX^ [dg Veegdm^b ViZan "/00 b^aa^dc VcY 0,7 b^aa^dc h]VgZh d[<aVhh : <dbbdc LidX^ [dg Veegdm^b ViZan "4/ b^aa^dc, M]Z <dbeVcn Y^Y cdi ejgX]VhZ Vcn d[^ih <aVhh : dg <aVhh : <dbbdc LidX^ Yjg^c \ i]Z [^hXVa nZVgh ZcYZY CjcZ 1.*0.0/ VcY 0.0.,$

M]Z [daad1 ^c \ iVWaZ YZiV^ah djg bdci]an h]VgZ gZejgX]VhZh Yjg^c \ i]Z i]gZZ bdci]h ZcYZY CjcZ 1.* 0.008

	H`eR] Bf^SVc `W GYRcVd DfcTYRdVU' 7]Rdd 5#8\$	H`eR] Bf^SVc `W GYRcVd DfcTYRdVU' 7]Rdd 6#R\$	5 gVcRXV Dc/TV DR/U DVc GYRcV' 7]Rdd 5 #5\$		5 gVcRXV Dc/TV DR/U DVc GYRcV' 7]Rdd 6#88		H`eR] Bf^SVc`W GYRCVd DfcTYRdVU Rd DRce`W DfS][[T]j 5`f_TVU Dc`XcR^	/RcVd DfcTYRdVU HYRe DRce `W DfS]//T]j DfcTY 5 `f_TVU DfS]//T]	
			#7_	^ Z]]Z`_d&	ViTV	ae aVc dYR	cV R^`f_ed\$		
$FVgX] 06* 0.00 + :eg^{a} 02* 0.00$.,6	.,2	"	0/,50	"	00,.6	/,0	"	626
: eg^a $03*0.00 + FVn 07*0.00$.,1	.,0	"	/6,73	"	/7,/0	.,3	"	615
F Vn 1.* 0.00 + Cjan .1* 0.00	.,6	.,2	"	/3,3.	"	/3,57	/,0	"	6/5
MdiVa	/,7	/,.	"	/6,33	"	/6,6/	0,7		

=H9 A 1(A 5B5; 9 A 9BHrG 8=G7 IGG=CB 5B8 5B5@MG=G C: :=B5B7=5@ 7CB8=H=CB 5B8 F9GI@HG C: CD9F5H=CBG

 $DQR \setminus MR \setminus L^{\RXW} \ JWM \ JWJUb \setminus R \setminus LXW \rfloor JRW \setminus \rfloor JJNVNW \rfloor \setminus QJ \mid LXW \setminus R \mid N \mid f0X[\ J[M&UXXTRWP \]J]NVNW] \setminus g \ R]QRW \mid QN \ VNJWRWP \ X0 \ CNL \mid RXW + *5 \\ X0 \mid QN \ CNL^{R} \mid RN \setminus 5aLQJWPN \ IL] \ X0 \ */ , * * J \setminus JVNWMNM \# \mid QN \mid f5aLQJWPN \ IL] g \mid W \ JWM \ CNL \mid RXW + . 1 \ X0 \mid QN \ CNL^{R} \mid RN \setminus IL] \ X0 \ */ , * * J \setminus JVNWMNM \mid IUU \ JJNVNW] \setminus JQN \setminus IL] \ X0 \ Y/ , * * J \setminus JVNWMNM \mid IUU \ JJNVNW] \setminus JQN \setminus JJNVNW] \setminus JUNVNW \mid VNUM \mid V$

CJ9FJ=9K C: H<9 7CAD5BMrG 6IG=B9GG9G

VYkZghZan V[[ZXi* Wdi] eg^ci X^gXjaVi^dc VcY VYkZgi^h^c\ gZkZcjZh, : YkZgi^h^c*^c eVgi^XjaVg*]Vh WZZc^b eVXiZY Wn adc\+iZg b higj XijgVa b dkZ b Zcih ^c VYkZgi^h^c\ heZcY^c\ [gd b eg^ci id Y^\^iVa, M]Z ^cXgZVh^c\ gVc\Z d[VYkZgi^h^c\ X]d^XZh VcY [dg b Vih]Vh gZhjaiZY ^c VjY^ZcXZ [gV\ b ZciVi^dc VcY ^cXgZVhZY Xd b eZi^i^dc, MZX]cdad\^Zh VcY eda^X^Zh]VkZ Vahd WZZc VcY 1 ^aa Xdci^cjZ id WZ YZkZadeZY VcY ^b eaZ b ZciZY i]Vi b Vn b V`Z ^i b dgZ Y^[[^Xjai id iVg\Zi VcY b ZVhjgZ i]Z Z[[ZXi^kZcZhh d[Y^\^iVa VYkZgi^h^c\ dg Vaad 1 jhZgh id WadX` VYkZgi^h^c\ dc 1 ZWh^iZh VcY b dW^aZ YZk^XZh* 1]^X] b Vn ^b eVXi Y^\^iVa VYkZgi^h^c\ gViZh dg gZkZcjZh, : h V b jai^+ eaVi[dg b cZ 1 h egdk^YZg*i]Z =d 1 CdcZh hZ\ b Zci gZXd\c^oZh i]Z ^b edgiVcXZ d[b Vm^b ^o^c\ gZkZcjZh [gd b V kVg^Zin d[b ZY^V [dg b Vih VcY eaVi[dg bh* Wdi] ^c iZg bh d[eV^Y XdciZci VcY ^c cZ 1 VYkZgi^h^c\ b dYZah* VcY Xdci^cjZh id ^ckZhi ^c ^ih Y^\^iVa VcY di]Zg egdYjXih* 1]^X] gZegZhZci Vc ^cXgZVh^c\an aVg\Zg h]VgZ d[gZkZcjZh Vi ^ih Xdchj b Zg Wjh^cZhh, F dW^aZ YZk^XZh* i]Z^g gZaViZY Veeh VcY di]Zg iZX]cdad\^Zh* egdk^YZ Xdci^cjZY deedgijc^i^Zh [dg i]Z =d 1 CdcZh hZ\ b Zci id b V` Z ^ih XdciZci VkV^aVWaZ id V cZ 1 VjY^ZcXZ d[gZVYZgh* ^cigdYjXZ cZ 1 dg Y^[[ZgZci eg^X^c\ hX]Z b Zh VcY YZkZade ^ih egdYjXih id Xdci^cjZ id ViigVXi VYkZgi^hZgh VcY-dg V[[ZXi i]Z gZaViAch]^e WZi 1 ZZc XdciZci egdk^YZgh VcY Xdchj b Zgh, M]Z =d 1 CdcZh hZ\ b Zci Xdci^cjZ h id YZkZade VcY ^b eaZb Zci higViZ\^Zh id Zmead^i ^ih XdciZci VXgdhh V kVg^Zin d[b ZY^V X]VccZah VcY eaVi[dg b h* ^cXaj Y^c\ aZkZgV\^c\ ^ih XdciZci i]gdj\] a^XZch^c\ VggV\Zb Zcih 1^i] i]^gY+eVgin Y^hig^Wji^dc eaVi[dg bh VcY\ gd 1^c\ ^ih a^kZ _djgcVa^hb ZkZcih Wjh^cZhh,

 $HeZgVi^{\circ} \subset ZmeZchZh \ [dg\ i]Z\ Xdchj\ bZg\ Wjh^{\circ}cZhh\ ^{\circ}cXaj\ YZ\ Xdhih\ gZaViZY\ id\ eVeZg^{\circ}\ egdYj\ Xi^{\circ}dc^{\circ}\ Y^{hig^{\circ}W}ji^{\circ}dc^{\circ}\ i]^{\circ}gY\ eVgin\ eg^{\circ}ci^{\circ}c^{\circ}$ $ZY^{\circ}idg^{\circ}Va\ VcY\ Xd\ b\ b^{\circ}hh^{\circ}dch,\ LZaa^{\circ}c^{\circ}\ \ ZcZgVa\ VcY\ VY\ b^{\circ}c^{\circ}higVi^{\circ}kZ\ ZmeZchZh\ ^{\circ}cXaj\ YZ\ egd\ b\ di^{\circ}dc^{\circ}a\ ZmeZchZh^{\circ}hVaVg^{\circ}Zh^{\ast}\ Z\ b\ eadnZZ\ WZcZ[^{\circ}h^{\ast}\ gZci\ VcY\ di]Zg\ gdji^{\circ}cZ\ dkZg]ZVYh,\ M]Z\ Xdhih\ VhhdX^{\circ}ViZY\ 1^{\circ}i]\ eg^{\circ}ci^{\circ}c^{\circ}\ VcY\ Y^{\circ}hig^{\circ}Wji^{\circ}c^{\circ}\ cZ\ 1\ heVeZgh^{\ast}\ ^{\circ}cXaj\ Y^{\circ}c^{\circ}\ eVeZg\ eg^{\circ}XZh\ VcY\ YZa^{\circ}kZgn\ Xdhih^{\ast}\ VgZ\ ^{\circ}Zn\ deZgVi^{\circ}c^{\circ}\ ZmeZchZh\ 1\]dhZ\ [ajXijVi^{\circ}dch\ XVc\]VkZ\ V\ b\ ViZg^{\circ}Va\ Z[[ZXi\ dc\ i]Z\ gZhjaih\ d[\ i]Z\ =d\ 1\ CdcZh\ hZ\ b\ Zci-h\ Xdchj\ b\ Zg\ Wjh^{\circ}cZhh,\ M]Z\ Xdchj\ b\ Zg\ Wjh^{\circ}cZhh\ ^{\circ}h\ V[[ZXiZY\ Wn\ i]Z\ XnXa^{\circ}XVa\ ^{\circ}cXgZVhZh\ VcY\ YZXgZVhZh\ ^{\circ}c\ i]Z\ eg^{\circ}XZ\ d[\ eVeZg\ VcY\ di]Zg\ [VXidgh\ i]Vi\ b\ Vn\ V[[ZXi\ eVeZg\ eg^{\circ}XZh^{\ast}\ ^{\circ}cXaj\ Y^{\circ}c^{\ast}\ V\ b\ dc^{\circ}d\ i]Z\ gZhig^{\circ}Xi^{\circ}dc^{\ast}h\ j\ eean\ X]V^{\circ}c\ Y^{\circ}hgj\ ei^{\circ}dc^{\ast}VcY\ Vi^{\circ}dc^{\ast}i]Z\ =d\ 1\ CdcZh\ hZ\ b\ Zci\ gZa^{\circ}Zh\ dc\ i]^{\circ}gY\ eVgi^{\circ}Zh\ [dg\ b\ jX]\ d[\ i]Z\ eg^{\circ}ci^{\circ}c^{\circ}VcY\ Y^{\circ}hig^{\circ}Wji^{\circ}dc^{\ast}dc^{\ast}h\ eg^{\circ}Zhh\ eg^{$

FV_dg cZ1 i^iaZ gZaZVhZh gZegZhZci V h^\c^[^XVci edgi^dc d[i]Z; dd` IjWa^h]^c\ hZ\ bZci~h hVaZh i]gdj\]dji i]Z [^hXVa nZVg, Ig^ci+WVhZY Xdchj bZg Wdd`h VgZ \ZcZgVaan hdaY dc V [jaan gZijgcVWaZ WVh^h* gZhjai^c\ ^c i]Z gZijgc d[jchdaY Wdd`h, Bci]Z Yd bZhi^X VcY ^ciZgcVi^dcVa bVg` Zih* i]Z; dd` IjWa^h]^c\ hZ\ bZci ^h hjW_ZXi id \adWVa igZcYh VcY adXVa ZXdcd b^X XdcY^i^dch* ^cXajY^c\ gZXZci ^cXgZVhZh ^c ^c[aVi^dc VcY hjeean X]V^c Y^hgjei^dch* 1]^X] VgZ ZmeZXiZY id Xdci^cjZ id VYkZghZan V[[ZXi Xdhih ^c i]Z cZVg iZg b, HeZgVi^c\ ZmeZchZh [dg i]Z; dd` IjWa^h]^c\ hZ\ bZci ^cXajYZ Xdhih gZaViZY id eVeZg* eg^ci^c* [gZ^\]i* Vji]dgh~ gdnVai^Zh* ZY^idg^Va* egd b di^dcVa* Vgi VcY YZh^\c ZmeZchZh, LZaa^c* \ZcZgVa VcY VY b^c^higVi^kZ ZmeZchZh ^cXajYZ hVaVg^Zh* Z b eadnZZ WZcZ[^ih* gZci VcY di]Zg gdji^cZ dkZg]ZVY Xdhih,

BVhd AVUZR

 $KZkZcjZ\ Vi\ i]Z\ GZ1h\ FZY^V\ hZ\ bZci\ ^h\ YZg^kZY\ eg^b\ Vg^an\ [gd\ b\ i]Z\ hVaZ\ d[\ VYkZgi^h^c\ ^*\ X^gXj\ aVi^dc\ VcY\ hj\ WhXg^ei^dch^*\ Vh\ 1\ Zaa\ Vh\ a^XZch^c\ ,\ :YkZghZ\ X]\ Vc\ Zh\ ^c\ ZcZgVa\ b\ Vg\ Zi\ XdcY^i^dch\ [gd\ VYkZgi^h^c\]\ VkZ\ V[[ZXiZY^*\ VcY\ b\ Vn\ Xdci^cjZ\ id\ V[[ZXi^*\ gZkZcjZh\ ,\ :YkZgi^h^c\ VgZVahd\ hj\ W_ZXi\ id\ hZVhdcVa^in^*\ 1^i]\ gZkZcjZh\ ine^XVaan\ WZ^c\]^\] Zhi\ ^c\ i]Z < d\ b\ eVcn^-h\ hZXdcY\ [^hXVa\ fj\ VgiZg\ YjZ\ id\ i]Z\ ZcY+d[+nZVg\]\ da^YVn\ hZVhdc\ ^c\ ^ih\ b\ V^c\ deZgVi^c\ \ Zd\ ye\]^Zh,\ <^gXj\ aVi^dc\ VcY\ hj\ WhXg^ei^dc\ gZkZcjZh\ XVc\ WZ\ VgZVian\ V[[ZXiZY\ Wn\ X]\ Vc\ Zh\ ^c\ i]Z\ eg^XZh\ d[\ i]Z\ < d\ b\ eVcn^-h\ VcY-dg\ Xd\ b\ eZi^idgh^-\ egdYj\ Xih^*\ Vh\ 1\ Zaa\ Vh\ Wn\ egd\ b\ di^dcVa\ VXi^kA^i^zh\ VcY\ cZ\ 1\ h\ XnXaZh,$

 $\label{eq:hezgvinc} HeZgVi^c \ ZmeZchZh ^cXajYZ \ Xdhih gZaViZY id eVeZg^* egdYjXi^dc^* Y^hig^Wji^dc^* i]^gY eVgin eg^ci^c \ ZY^idg^Va^* Xd b b^hh^dch^* iZX]cdad \ n VcY gVY^d hedgih g^\]ih, LZaa^c \ \ZcZgVa VcY VY b^c^higVi^kZ ZmeZchZh ^cXajYZ egd b di^dcVa ZmeZchZh ^hVaVg^Zh^* Z b eadnZZ WZcZ[^ih^* gZci VcY di]Zg gdji^cZ dkZg]ZVY, M]Z Xdhi d[eVeZg ^h V `Zn deZgVi^c \ ZmeZchZ 1]dhZ [ajXijVi^dch XVc]VkZ V b ViZg^Va Z[[ZXi dc i]Z gZhjaih d[i]Z hZ \ b Zci, M]Z GZ 1 h F ZY^V hZ \ b Zci Xdci^cjZh id WZ ZmedhZY id g^h `h VhhdX^ViZY 1^i] eVeZg jhZY [dg eg^ci^c \, IVeZg ^h V WVh^X Xd b b dY^in VcY ^ih eg^XZ ^h hZch^i^kZ id i]Z WVaVcXZ d[hjeean VcY YZbVcY, M]Z GZ 1 h F ZY^V hZ \ b Zci~h ZmeZchZh VgZ V[[ZXiZY Wn i]Z XnXa^XVa ^cXgZVhZh VcY YZXgZVhZh ^c i]Z eg^XZ d[eVeZg VcY di]Zg [VXidgh i]Vi b Vn V[[ZXi eVeZg eg^XZh^* ^cXaj Y^c \ V b dc \ di]Zg i]^c \h^* ^c[aVi^dc^* hj eean X]V^c Y^hgj ei^dch VcY iVg^[[h,$

M]Z GZ 1 h FZY^V hZ\ bZci~h egdY j Xih Xd b eZiZ [dg gZVYZgh]^e* V j Y^ZcXZ VcY VYkZgi^h^c \ 1 ^i] adXVa VcY cVi^dcVa Xd b eZi^idgh VcY

CeYVc 6 fdZ_Vdd 8 VgV]`a ^ V_ed

: ZdTR] ,*,,

*CPTIRISINM NF = 0.7ERS

Bc CjcZ 0.00* i]Z <dbeVcn VXfj^gZY NeGZhi* BcX, &{NeGZhi|' [dg Xadh^c\ XVh] Xdch^YZgVi^dc d[Veegdm^b ViZan "23 b^aa^dc* hjW_ZXi id Xjhid b Vgn ejgX]VhZ eg^XZ VY_jhi b Zcih* VcY je id "/3 b^aa^dc ^c [jijgZ XVh] Xdch^YZgVi^dc WVhZY jedc i]Z VX]^ZkZ b Zci d[XZgiV^c eZg[dg b VcXZ dW_ZXi^kZh dkZg i]Z cZmi i l d nZVgh, NeGZhi ^h V gZVa ZhiViZ V\Zci b Vg` ZieaVXZ i]Vi b ViX]Zh]dbZ hZaaZgh VcY WjnZgh l^i] ide adXVa V\Zcih l]d Xd b eZiZ [dg i]Z^g Wjh^cZhh, M]Z NeGZhi VXfj^h^i^dc]Zaeh KZVaidg,Xdb \(^v [jgi]Zg ZmeVcY^ih hZgk^XZh VcY hj eedgi [dg]dbZ hZaaZgh VcY a^hi^c\ V\Zcih VcY Wgd`Zgh, NeGZhi ^h V hjWh^Y^Vgn d[F dkZ* VcY ^ih gZhjaih VgZ ^cXajYZY l^i]^c i]Z =^\^iVa KZVa >hiViZ LZgk^XZh hZ\ b Zci,

*CPTIRISINM NF +ARE , HELICAKR

 $Bc\ Cj\ cZ\ 0\ .00^*\ i]Z\ < d\ b\ eVcn\ VXfj^sZY\ i]Z\ ;\ VhZ<]Z\ b\ ^XVah\ \&gZWgVcYZY<]Z\ b\ ^XVah\ F\ Vg\ Zi\ :\ eVani^Xh^*\ \{< F: |\ Wjh^cZhh\ [gd\ b\ L\ I\ eadWVa\ BcX,\ \&\{L\ I\ |\ [dg\ "073\ b\ ^aa^dc\ ^c\ XVh]^*\ hjW_ZXi\ id\ Xjhid\ b\ Vgn\ ejgX]\ VhZ\ eg^XZ\ VY_jhi\ b\ Zcih,\ < F:\ egdk^YZh\ eg^XZ\ VY_jhi\ b\ Zcih,\ < F:\ Vg\ Zi:\ Yk^hdgn\ VcY\ P\ dgaY:\ eVanh^h\ hZgk^XZh,\ M]Z\ VXfj^h^i^dc\ ZeVWaZh\ = d\ 1\ CdcZh\ dWZXd\ b\ Z\ VaZVY^c\ egdk^YZg\ d[\ WVhZ\ X]Z\ b\ ^XVah\ ^c[dg\ b\ Vi^dc\ VcY\ [jgi]Zgh\ ^ih\ dVa\ d[\ Wj^aY^c\ i\]Z\ aZVY^c\ adWVa\ Wjh^cZhh\ eaVi[dg\ b\ Vi^dc\ eaVi[dg\ b\ [dg\ egd[Zhh^dcVah,\ < F:\ ^h\ deZgViZY\ Wn\ = d\ 1\ CdcZh^*\ VcY\ ^ih\ gZhj\ aih\ VgZ\ ^cXajYZY\ ^c\ i\ Z\ = d\ 1\ CdcZh\ hZ\ b\ Zci,$

<EQL 5NAM * AMD : EUNKUIMG , QEDIS / ACIKISIER

M]Z <d b eVcn ZciZgZY ^cid Vc ^ciZgZhi gViZ h l Ve YZg^kVi^kZ id [^m i]Z [adVi^c\ gViZ ^ciZgZhi Xd b edcZci d[^ih MZg b : EdVch Vi 0, .61 #, LZZ GdiZ // z ?^cVcX^Va Bchigj b Zcih VcY ?V^g OVajZ F ZVhjgZ b Zcih ^c i]Z VXXd b eVcn^c\ <dchda^YViZY ?^cVcX^Va LiViZ b Zcih,

 $M]Z < dbeVcn Wdggd 1 ZY i]Z [jaa Vbdjci d[i]Z MZgb : ?VX^a^in dc FVgX] 1/* 0.00 VcY]VY cdi Wdggd 1 ZY Vcn [jcYh jcYZg i]Z KZkdak^c \ ?VX^a^in Vh d[CjcZ 1.* 0.00,$

*CPTIRISINM NF 892;

Bc ?ZWgjVgn 0.00* i]Z <dbeVcn VXfj^gZY i]Z H^a Ig^XZ Bc[dgbVi^dc LZgk^XZ Wjh^cZhh VcY gZaViZY VhhZih &{HIBL|' [gdb L\$ I VcY

MVWaZ d[<dciZcih

Xd b b ZcX^c\ GdkZ b WZg /3* 0.0/, M]Z cdiZh 1^aa b VijgZ dc F Vn /3* 0.07, M]Z <d b e Vcn jhZY i]Z cZi egdXZZYh [gd b i]Z d[[Zg^c\ [dg \ZcZgVa XdgedgViZ e jgedhZh* 1]^X] ^cXajYZY VXf j^h^i^dch VcY 1 dg`^c\ XVe^iVa,

O NNGKE OAQSMEQRHIO

Bc ?ZWgjVgn 0.0/*i]Z <dbeVcn ZciZgZY ^cid V b jai^+nZVg eVgicZgh]^e 1^i] @dd\aZ id egdk^YZ XdciZci [gdb ^ih cZ l h h^iZh Vgdj cY i]Z l dgaY, M]Z i]gZZ+nZVg V\gZZ bZci Vahd ^cXaj YZh i]Z YZkZade bZci d[V hj WhXg^ei^dc eaVi[dg b*i]Z h]Vg^c\ d[VYkZgi^h^c\ gZkZcjZ k^V @dd\aZ-h VYkZgi^h^c\ iZX]cdad\n hZgk^XZh*i]Z Xjai^kVi^dc d[Vj Y^d _djgcVa^h b VcY bZVc^c\[ja ^ckZhi bZcih ^c k^YZd _djgcVa^h b Wn RdjMjWZ,

. KAQA

 $Bc = ZXZ b WZg \ 0.0.*i]Z < db eVcn VXfj^gZY V Xdcigdaa^c \ ^ciZgZhi ^c > aVgV MZX]cdad ^Zh IiZ, EiY, &gZWgVcYZY K>: BcY^V' i]gdj \ V hjWhXg^ei^dc [dg cZ l an+^hhjZY egZ[ZgZcXZ h]VgZh VcY i]Z Wjndji d[XZgiV^c b^cdg^nn h]VgZ]daYZgh, M]Z idiVa V\\gZ\ViZ ejgX]VhZ eg^XZ VhhdX^ViZY l^i] i]Z VXfj^h^i^dc Vi i]Z Xd b eaZi^dc YViZ ^h "/16 b^aa^dc l]^X] eg^b Vg^an Xdch^hih d["47 b^aa^dc d[XVh]*i]Z [V^g kVajZ d[cdcXdcigdaa^c \ ^ciZgZhih d["15 b^aa^dc VcY i]Z [V^g kVajZ d[i]Z < db eVcn-h egZk^dj han]ZaY Zfj^in ^ciZgZhi ^c K>: BcY^V d["00 b^aa^dc, :h V gZhjai d[i]Z igVchVXi^dch* K>: @gdje-h h]VgZ]daY^c \ ^c K>: BcY^V ^cXgZVhZY [gd b /1,3 # id 37,5 #* l]^aZ GZ l h < dgedgVi^dc-h h]VgZ]daY^c \ ^cXgZVhZY [gd b 00,/ # id 17,. #, = jg^c \ i]Z i]gZZ b dci]h ZcYZY F VgX] l/* 0.0/* K>: @gdje VXfj^gZY Vc VYY^i^dcVa .,6 # ^ciZgZhi ^c K>: BcY^V, K>: @gdje VcY GZ l h < dgedgVi^dc cd l]daY Vaa K>: BcY^V WdVgY hZVih* VcY i]Z < db eVcn WZ\Vc Xdchda^YVi^c \ K>: BcY^V ^c =ZXZb WZg 0.0., M]Z VXfj^h^i^dc d[K>: BcY^V Vaad l h K>: @gdje id WZ Vi i]Z [dgZ[gdci d[adc \+iZg b \ gd l i] deedgij c^i^Zh l^i]^c i]Z = ^\^iVa KZVa >hiViZ LZgk^XZh hZ\ bZci, :h V gZhjai d[i]Z igVchVXi^dch* i]Z < db eVcn-h d l cZgh]^e ^c K>: @gdje 1 Vh Y^ajiZY Wn .,0 # id 4/,2 #, LjWhZfjZci id CjcZ 1.* 0.0/* K>: @gdje egdk^YZY VYY^i^dc-h ^ciZgZhi id 04,4 #,$

*UAIK

Bc =ZXZ b WZg 0.0.* i]Z <d b eVcn VXf j^gZY KZciVaji^dch* BcX, &{ : kV^a|' [dg ^c^i^Va XVh] Xdch^YZgVi^dc d[Veegdm^b ViZan "14 b^aa^dc* cZi d["2 b^aa^dc d[XVh] VXf j^gZY* VcY je id "6 b^aa^dc ^c [jijgZ XVh] Xdch^YZgVi^dc WVhZY jedc i]Z VX]^ZkZ b Zci d[XZgiV^c eZg[dg b VcXZ dW_ZXi^kZh dkZg i]Z cZmi i]gZZ nZVgh, : kV^a ^h V eaVi[dg b i]Vi ^b egdkZh i]Z gZci^c \ ZmeZg^ZcXZ [dg Yd+^i+ ndj ghZa[aVcYadgYh VcY iZcVcih 1^i] dca^cZ iddah* ZYjXVi^dcVa XdciZci VcY 1 dgaY+XaVhh hj eedgi, M]Z VXf j^h^i^dc] Zaeh KZVaidg,Xd b V [jgi]Zg ZmeVcY ^cid i]Z gZciVa heVXZ* ZmiZcY ^ih hj eedgi [dg aVcYadgYh* Vj \ b Zci XjggZci gZciVa a^hi^c \ XdciZci* \ gd 1 ^ih VjY^ZcXZ VcY Wj^aY WgVcY V[[^c^in VcY adc \+iZg b gZaVi^dch]^eh 1^i] gZciZgh, : kV^a ^h V hjWh^Y^Vgn d[F dkZ* VcY ^ih gZhjaih VgZ ^cXajYZY 1^i]^c i]Z =^\^iVa KZVa >hiViZ LZgk^XZh hZ\ b Zci,

LZZ GdiZ 2 z : Xf j^h^i^dch* = hedhVah VcY Hi]Zg MgVchVXi^dch ^c i]Z VXXd b eVcn^c\ <dchda^YViZY ?^cVcX^Va LiViZ b Zcih [dg [jgi]Zg Y^hXjhh^dc d[i]Z VXf j^h^i^dch VcY Y^hedh^i^dch Y^hXjhhZY VWdkZ,

: ERTKSR NF 8 OEQASINMR [/ IRCAK (&((UEQRTR / IRCAK (&('

 $\label{eq:market} \mbox{M]Z [daad 1^c \ iVWaZ hZih [dgi] i]Z < dbeVcn-h deZgVi^c \ gZhjaih [dg [^hXVa 0.00 Vh XdbeVgZY id [^hXVa 0.0/, and beVgZY id [^hXVa 0.0/, beVgZY id [^hXVa$

		: $c \text{ eYV } \text{WZdTR} \text{ j } \text{VRcd } \text{V}_{\text{UVU}} > f_{\text{V}} - \text{*} \text{t}$					
	,*,,	,*,+	7 YR_XV	" 7YR_XV			
#L_ ^ Z]]Z`_d& ViTVae ''\$			6VeeVc)#	K`cdV\$			
KZkZcjZh8							
<^gXjaVi^dc VcY hjWhXg^ei^dc	" 2*203	" 2*0.4	" 0/7	3 #			
: YkZgi^h^c \	/*60/	/*372	005	/2 #			
<dchj bzg<="" td=""><td>$0^*/.4$</td><td>/*7.6</td><td>/76</td><td>/. #</td></dchj>	$0^*/.4$	/*7.6	/76	/. #			
KZVa ZhiViZ	/*125	/*/31	/72	/5 #			
Hi]Zg	464	275	/67	16 #			
MdiVa KZkZc j Zh	/.*163	7*136	/*.05	// #			
$HeZgVi^{\wedge}c \setminus ZmeZchZh$	&3*/02'	&2*61/'	&071'	&4' #			
LZaa^c*\ZcZgVa VcY VY b^c^higVi^kZ	å1*370'	&1*032'	å116'	&/.'#			
=ZegZX^Vi^dc VcY Vbdgi^oVi^dc	&466'	&46.'	å6'	&/'#			
$BbeV^gbZciVcYgZhigjXijg^c\X]Vg\Zh$	&/.7'	&/46'	37	13 #			
$>$ f j ^in adhhZh d[V[[^aa^ViZh]	&/1'	&43'	30	6. #			
BciZgZhi ZmeZchZ* cZi	&77 '	&31'	&24'	&65' #			
Hi]Zg* cZi	30	/21	&7/'	&42' #			
=_T` ^V SVW`cV Z_T` ^V eRi ViaV_dV	2+,	./*	-0,	2* "			
BcXd bZ iVm ZmeZchZ	å30'	&4/'	7	/3 #			
GZi ^cXd b Z	54.	167	15/	73 #			

; EXKIMG\$ GEMEQAK AMD ADLIMIR\$QA\$IUE z LZaa^c*\ZcZgVa VcY VY b^c^higVi^kZ^cXgZVhZY "116 b^aa^dc* dg / . #* [dg i]Z [^hXVa nZVg ZcYZY Cj cZ 1 .* 0 .00 Vh Xd b eVgZY id [^hXVa 0 .0/, M]Z ^cXgZVhZ ^c LZaa^c*\ZcZgVa VcY VY b^c^higVi^kZ [dg i]Z [^hXVa nZVg ZcYZY Cj cZ 1 .* 0 .00 1 Vh eg^b Vg^an YjZ id ^cXgZVhZY ZmeZchZh Vi i]Z =^\^iVa KZVa >hiViZ LZgk^XZh hZ\ b Zci Yg^kZc Wn i]Z VXf j^h^i^dch d[F dgi\V\Z <]d^XZ VcY K> : BcY^V*]^\]Zg Zb eadnZZ Xdhih Vi Wdi] F dkZ VcY K> : @gdje VcY ^cXgZVhZY b Vg`Zi^c\ ZmeZchZh Vi F dkZ, M]Z ^cXgZVhZ 1 Vh Vahd Yg^kZc Wn]^\]Zg Xdhih Vi i]Z =d 1 CdcZh hZ\ b Zci YjZ id i]Z ^b eVXi d[gZXZci VXf j^h^i^dch* ^cXaj Y^c\ V "03 b^aa^dc ^b eVXi [gd b HIBL VcY < F : +gZaViZY igVchVXi^dc Xdhih* ^cXgZVhZY Zb eadnZZ Xdhih VcY ^cXgZVhZY hVaZh VcY b Vg`Zi^c\ Xdhih, M]Z ^cXgZVhZ 1 Vh eVgi^Vaan d[[hZi Wn ad 1 Zg Xdhih d["45 b^aa^dc ^c i]Z Hi]Zg hZ\ b Zci* eg^b Vg^an Yg^kZc Wn ad 1 Zg Zf j^in+ WVhZY Xd b eZchVi^dc Xdhih aVg\Zan gZaViZY id hidX` eg^XZ eZg[dg b VcXZ VcY ad 1 Zg dcZ+i^b Z aZ\ Va hZiiaZ b Zci Xdhih, M]Z ^b eVXi d[[dgZ^\c XjggZcXn [aj Xij Vi^dch d[i]Z N,L, YdaaVg V\V^chi adXVa XjggZcX^Zh gZhjaiZY ^c V LZaa^c*\ ZcZgVa VcY VY b^c^higVi^kZ YZXgZVhZ d["4/ b^aa^dc* dg 0 #* [dg i]Z [^hXVa nZVg ZcYZY Cj cZ 1 .* 0 .00 Vh Xd b eVgZY id [^hXVa 0 .0/,

- EOQECIASINM AMD A L NQSIYASINM z = ZegZX^Vi^dc VcY V b dgi^oVi^dc ZmeZchZ ^cXgZVhZY "6 b^aa^dc* dg / #* [dg i]Z [^hXVa nZVg ZcYZY CjcZ 1.* 0.00 Vh Xd b eVgZY id [^hXVa 0.0/, ?dg i]Z [^hXVa nZVg ZcYZY CjcZ 1.* 0.00* "06 b^aa^dc d[]^\]Zg V b dgi^oVi^dc ZmeZchZ [gd b ^ciVc\^WaZ VhhZih Yg^kZc Wn i]Z <dbeVcn~h gZXZci VXfj^h^i^dch 1 Vh eVgi^Vaan d[[hZi Wn "0. b^aa^dc d[ad 1 Zg YZegZX^Vi^dc ZmeZchZ Yg^kZc Wn i]Z igVch^i^dc id Y^\^iVa VcY dei^b^oVi^dc d[i]Z <dbeVcn~h eg^ci^c\ deZgVi^dch, M]Z ^beVXi d[[dgZ^\c XjggZcXn [ajXijVi^dch d[i]Z N,L, YdaaVg V\Vchi adXVa XjggZcX^Zh gZhjaiZY ^c V YZegZX^Vi^dc VcY V b dgi^oVi^dc ZmeZchZ YZXgZVhZ d["/1 b^aa^dc* dg 0 #* [dg i]Z [^hXVa nZVg ZcYZY CjcZ 1.* 0.00 Vh Xd b eVgZY id [^hXVa 0.0/,

2LOAIQLEMS AMD QERSQTCSTQIMG CHAQGER $z = jg^c \setminus i]Z$ [^hXVa nZVgh ZcYZY Cj cZ 1.* 0.00 VcY 0.0/* i]Z <dbeVcn gZXdgYZY gZhigjXijg^c \ X]Vg\Zh d["72 b^aa^dc VcY "/46 b^aa^dc* gZheZXi^kZan,

 $= j\,g^{\wedge}c \setminus i\,]Z\,\left[^{\wedge}hXVa\,\,nZVg\,\,Zc\,YZY\,\,C\,j\,\,cZ\,\,1\,.^{*}\,\,0\,.\,00^{*}\,i\,]Z\,<\,d\,b\,e\,Vcn\,\,gZXd\,\setminus\,c^{\wedge}oZY\,\,cdc\,+XVh\,\right]\,^{\wedge}b\,e\,V^{\wedge}g\,\,b\,\,Zc\,i\,\,X\,]\,Vg\,\setminus Zh\,\,d\left[\,\,''/3\,\,b^{\wedge}aa^{\wedge}dc\,\,gZa\,ViZY\,\,id\,\,i\,]Z\,\,d\,\,b\,\,e\,Vc\,Vc\,i^{\wedge}X^{\wedge}e\,ViZY\,\,h\,VaZ\,\,d\left[\,\,XZg\,i\,V^{\wedge}c\,\,N,L\,,\,\,eg^{\wedge}c\,i^{\wedge}c\,\setminus\,\,\left[\,VX^{\wedge}a^{\wedge}i^{\wedge}Zh\,\,Vi\,\,i\,\,\right]Z\,=\,d\,\,l\,\,Cdc\,Zh\,\,h\,Z\,\setminus\,b\,\,Zc\,i\,,$

LZZ GdiZ 3 z KZhigjXijg^c\ Igd\gV b h VcY GdiZ 5 z IgdeZgin* IaVci VcY >fj^e b Zci ^c i]Z VXXd b eVcn^c\ <dchda^YViZY ?^cVcX^Va LiViZ b Zcih,

. PTISX KNRRER NF AFFIKIASER $z > fj^nin adhhZh d[V[[^a^ViZh YZXgZVhZY Wn "30 b^aa^dc [dg i]Z [^hXVa nZVg ZcYZY CjcZ 1.* 0.00 Vh Xd b eVgZY id [^hXVa 0.0/* eg^b Vg^an YjZ id i]Z VWhZcXZ d[i]Z "32 b^aa^dc cdc+XVh] 1g^iZ+Yd1c d[i]Z ?dmiZa @gdje~h^ckZhibZci^c i]Z G^X^2adYZdc : jhigVa^V Cd^ci OZcijgZ ^c i]Z [djgi] fjVgiZg d[[^hXVa 0.0/, LZZ GdiZ 4 z BckZhibZcih^c i]Z VXXdbeVcn^c < dchda^YViZY ?^cVcX^Va LiViZbZcih,$

2MSEQERS EWOEMRE\$ ME\$ z BciZgZhi ZmeZchZ* cZi [dg i]Z [^hXVa nZVg ZcYZY Cj cZ 1 .* 0 .00 ^cXgZVhZY "24 b^aa^dc Vh Xd b eVgZY id [^hXVa 0 .0/* eg^b Vg^an Yg^kZc Wn i]Z ^hhj VcXZ d[i]Z 0 .0/ VcY 0 .00 LZc^dg GdiZh ^c : eg^a 0 .0/ VcY ?ZWgj Vgn 0 .00* gZheZXi^kZan* VcY i]Z ^cXj ggZcXZ d[i]Z MZg b : EdVch ^c FVgX] 0 .00, LZZ GdiZ 7 z ; dggd l ^c \h ^c i]Z VXXd b eVcn^c \ <dchda^YViZY ?^cVcX^Va LiViZ b Zcih,

8 SHEQ\$ MES z Hi]Zg* cZi YZXgZVhZY "7/ b^aa^dc [dg i]Z [^hXVa nZVg ZcYZY Cj cZ 1.* 0.00 Vh Xd b eVgZY id [^hXVa 0.0/, LZZ GdiZ 0/ z : YY^i^dcVa ?^cVcX^Va Bc[dg b Vi^dc ^c i]Z VXXd b eVcn^c \ <dchda^YViZY ?^cVcX^Va LiViZb Zcih,

?dg i]Z [^hXVa nZVg ZcYZY Cj cZ 1.* 0.00* i]Z <dbeVcn gZXdgYZY ^cXdbZ iVm ZmeZchZ d["30 b ^aa^dc dc egZ+iVm XVa nZVZ G^X` ZadYZ

MVWaZ d[<dciZcih

Vaad I VcXZh WZ^c\ gZXdgYZY V\V^chi iVm WZcZ[^ih ^c XZgiV^c [dgZ^\c _jg^hY^Xi^dch 1^i] deZgVi^c\ adhhZh VcY Wn i]Z ^beVXi d[[dgZ^\c deZgVi^dch 1]^X] VgZ hj W_ZXi id]^\]Zg iVm gViZh* d[[hZi Wn V gZaZVhZ d[kVaj Vi^dc Vaad I VcXZh d["42 b^aa^dc gZaViZY id XZgiV^c N,L, YZ[ZggZY iVm VhhZih i]Vi VgZ b dgZ a^ Zan i]Vc cdi id WZ gZVa^oZY VcY i]Z gZ b ZVhj gZ b Zci d[YZ[ZggZY iVmZh ^c i]Z N,D,

 $F\ VcV \ Zb\ Zci\ VhhZhhZh\ VkV^aVWaZ\ Zk^YZcXZ\ id\ YZiZg\ b^cZ\ 1\]Zi\]Zg\ hj\ [[^X^Zci\ [jijgZ\ iVmVWaZ\ ^cXd\ bZ\ 1\ ^aa\ WZ\ \ZcZgViZY\ id\ eZg\ b^i\ i\]Z\ jhZ\ d[\ Zm^hi^c\ YZ[ZggZY\ iVm\ VhhZih,\ ;VhZY\ dc\ b\ VcV \ Zb\ Zci~h\ VhhZhh\ b\ Zci\ d[\ VkV^aVWaZ\ Zk^YZcXZ^*\ ^i\]Vh\ WZZc\ YZiZg\ b^cZY\ i\]Vi\ ^i\ ^h\ b\ dgZ\ a^`\ Zan\ i\]Vc\ cdi\ i\]Vi\ YZ[ZggZY\ iVm\ VhhZih\ ^c\ XZgiV^c\ [dgZ^\c\ _jg^hY^Xi^dch\ b\ Vn\ cdi\ WZ\ gZVa^oZY\ VcY\ i\]ZgZ[dgZ^*\ V\ kVaj\ Vi^dc\ Vaad\ l\ VcXZ\]Vh\ WZZc\ ZhiVWa^h\]ZY\ V\ V^chi\ i\]dhZ\ iVm\ VhhZih,$

 $7ES\ IMCNLE\ z\ GZi\ ^cXd\ bZ\ 1\ Vh\ "54.\ b\ ^aa^dc\ [dg\ i]Z\ [^hXVa\ nZVg\ ZcYZY\ Cj\ cZ\ 1.*\ 0.00^*\ Vh\ Xd\ b\ eVgZY\ id\ "167\ b\ ^aa^dc\ [dg\ i]Z\ [^hXVa\ nZVg\ ZcYZY\ Cj\ cZ\ 1.*\ 0.00^*\ Vh\ Xd\ b\ eVgZY\ id\ "167\ b\ ^aa^dc\ [dg\ i]Z\ [^hXVa\ nZVg\ ZcYZY\ Cj\ cZ\ 1.*\ 0.00^*\ Vh\ Xd\ b\ eVgZY\ id\ "167\ b\ ^aa^dc\ [dg\ i]Z\ [^hXVa\ nZVg\ ZcYZY\ Cj\ cZ\ 1.*\ 0.00^*\ Vh\ Xd\ b\ eVgZY\ id\ "167\ b\ ^aa^dc\ [dg\ i]Z\ [^hXVa\ nZVg\ ZcYZY\ Cj\ cZ\ 1.*\ 0.00^*\ Vh\ Xd\ b\ eVgZY\ id\ "167\ b\ ^aa^dc\ [dg\ i]Z\ [^hXVa\ nZVg\ ZcYZY\ Cj\ cZ\ 1.*\ 0.00^*\ Vh\ Xd\ b\ eVgZY\ id\ "167\ b\ ^aa^dc\ [dg\ i]Z\ [^hXVa\ nZVg\ Ad\ 1Zg\ Ad\ 1$

7 ES IMCN LE ASSQIBTSABKE SN MNMCNMSQNKKIMG IMSEQERSR z GZi ^cXd b Z Viig^WjiVWaZ id cdcXdcigdaa^c \ ^ciZgZhih 1 Vh "/15 b^aa^dc [dg i]Z [^hXVa nZVg ZcYZY CjcZ 1.* 0.00* Vh Xd b e VgZY id cZi ^cXd b Z Viig^WjiVWaZ id cdcXdcigdaa^c \ ^ciZgZhih d["37 b^aa^dc [dg i]Z [^hXVa nZVg ZcYZY CjcZ 1.* 0.0/* eg^b Vg^an Yg^kZc Wn ^cXgZVhZY ZVgc^c h Vi K>: @gdje* 1]^X] ^cXaj YZY i]Z "/.5 b^aa^dc \V^c [gd b i]Z Y^hedh^i^dc d[^ih Zci^i^Zh ^c F VaVnh^V VcY M] V^aVcY,

; EGLEMS *MAKXRIR

 $LZ \ b\ Zci>; BM=: \ ^h\ YZ[\ ^cZY\ Vh\ gZkZcjZh\ aZhh\ deZgVi^c\ ZmeZchZh\ VcY\ hZaa^c\ ^ \ ZcZgVa\ VcY\ VY\ b^c^higVi^kZ\ ZmeZchZh,\ LZ \ b\ Zci>; BM=: \ YdZh\ cdi\ ^cXajYZ8\ YZegZX^Vi^dc\ VcY\ V\ b\ dgi^oVi^dc^*\ ^b\ eV^g\ b\ Zci\ VcY\ gZhigjXijg^c\ X]\ Vg\ Zh^*\ Zfj^in\ adhhZh\ d[\ V[[\ ^a^ViZh^*\ ^ciZgZhi\ \&ZmeZchZ'\ ^cXd\ b\ Z^*\ cZi^*\ di\]Zg^*\ cZi\ VcY\ ^cXd\ b\ Z\ iVm\ \&ZmeZchZ'\ WZcZ[^i,\ LZ\ b\ Zci>; BM=: \ b\ Vn\ cdi\ WZ\ Xd\ b\ eVgVWaZ\ id\ h^b\ ^aVgan\ i^iaZY\ b\ ZVhjgZh\ gZedgiZY\ Wn\ di\]Zg\ Xd\ b\ eVc^Zh^*\ h^cXZ\ Xd\ b\ eVc^Zh\ VcY\ ^ckZhidgh\ b\ Vn\ Y^[[Zg\ Vh\ id\ 1\]Vi\ ^iZbh\ h\]dj\ aY\ WZ\ ^cXaj\ YZY\ ^c\ i\]Z\ XVaXjaVi^dc\ d[\ LZ\ b\ Zci>; BM=: ,$

LZ\ bZci >; BM=: ^h i]Z eg^b Vgn bZVhjgZ jhZY Wn i]Z <dbeVcn~h X]^Z[deZgVi^c\ YZX^h^dc bV`Zg id ZkVajViZ i]Z eZg[dg bVcXZ d[* VcY VaadXViZ gZhdjgXZh 1^i]^c* i]Z <dbeVcn~h Wjh^cZhhZh, LZ\ bZci >; BM=: egdk^YZh bVcV\ZbZci* ^ckZhidgh VcY Zfj^in VcVanhih 1^i] V bZVhjgZ id VcVanoZ i]Z deZgVi^c\ eZg[dg bVcXZ d[ZVX] d[i]Z <dbeVcn~h Wjh^cZhh hZ\ bZcih VcY ^ih ZciZgeg^hZ kVajZ V\V^chi]^hidg^XVa YViV VcY Xd beZi^idgh~ YViV* Vai]dj\]]^hidg^XVa gZhjaih bVn cdi WZ ^cY^XVi^kZ d[[jijgZ gZhjaih &Vh deZgVi^c\ eZg[dg bVcXZ ^h]^\] an Xdci^c\Zci dc bVcn [VXidgh* ^cXajY^c\ XjhidbZg iVhiZh VcY egZ[ZgZcXZh',

M]Z [daad 1 °c \ iVWaZ gZXdcX°aZh GZi °cXd b Z id MdiVa LZ\ b Zci > ; BM=: [dg i]Z [°hXVa nZVgh ZcYZY CjcZ 1.*0.00 VcY 0.0/8

	:`c eYV WZdTR] jVRcd V_U >f_V -*₺			V_UVU
		,*,,		,*,+
#L_ ^ Z]]Z`_d\$				
GZi ^cXd bZ	"	54.	"	167
: YY8				
BcXdbZiVmZmeZchZ		30		4/
Hi]Zg* cZi		å30'		&/21'
BciZgZhi ZmeZchZ* cZi		77		31
>fj^in adhhZh d[V[[^a^ViZh		/1		43
BbeV^gbZciVcYgZhigjXijg^c\X]Vg\Zh		/.7		/46
$= ZegZX^{\circ}Vi^{\circ}dc VcY Vb dgi^{\circ}oVi^{\circ}dc$		466		46.
H`eR] GVX ^ V_e 96=H85	!	+1003	!	+&,1-

M]Z [daad 1 ^c \ iVWaZ hZih [dgi] i]Z <d b eVcn~h KZkZcjZh VcY LZ\ bZci >; BM= : Wn gZedgiVWaZ hZ\ bZci [dg i]Z [^hXVa nZVgh ZcYZY CjcZ 1.* 0.00 VcY 0.0/8

	:`c eYV \\ZdTR] j\\Rcd \V_U\\U > f_\\ -*\\						
	,;	^k ,,	,,,	·,+			
#Z_ ^Z]]Z`_d\$	FVgV_fVd	GVX ^ V_e 9 6=H 8 5	FVgV_fVd	GVX ^ V_e 9 6=H 8 5			
=^\^iVa KZVa >hiViZ LZgk^XZh	" /*52/	" 352	" /*171	" 3/2			
LjWhXg^ei^dc O^YZd LZgk^XZh	0*.04	14.	0*.50	137			
=d1 CdcZh	0*2	211	/*5.0	110			
; dd` I j Wa^h]^c \	0*/7/	1.4	/*763	1.1			
GZ1h FZY^V	0*201	0/5	0*0.3	30			
Hi]Zg	z	&OO/'	/	&065'			
H`eR]	! +*&-2/	! +\d003	! 31-/2	! +8,1-			

- IGISAK : EAK . RSASE ; EQUICER #/5 # VcY /3 # d[i]Z < d b eVcn~h Xdchda^YViZY gZkZcjZh ^c [^hXVa 0.00 VcY 0.0/* gZheZXi^kZan'

		: `c eYV \\ZdTR] j\\Rcd \V_U\VU > f_\V -*\\						
		,*,,		,*,+		7 YR_XV	" 7YR_XV	
#L_ ^ Z]]Z`_d& ViTVae ''\$						6 VeeVc)# K	`cdV\$	
KZkZcjZh8								
<^gXjaVi^dc VcY hjWhXg^ei^dc	"	/1	"	03	"	&/O'	&26' #	
: YkZgi^h^c \		/13		/04		7	5 #	
KZVa ZhiViZ		/*125		/*/31		/72	/5 #	
Hi]Zg		024		67		/35	((
H`eR] FVgV_fVd		+&1.+		+1-3-		2	,/ ''	
$HeZgVi^{c} \setminus ZmeZchZh$		å0.6'		&/60'		&04'	&/2' #	
LZaa^c* \ZcZgVa VcY VY b ^c^higVi^kZ		&737'		&475'		&040'	&16' #	
GVX ^ V_e 9 6=H 8 5	!	/1.	!	/+.	!	0*	+, "	

((cdi bZVc^c\[ja

?dg i]Z [^hXVa nZVg ZcYZY CjcZ 1.* 0.00* gZkZcjZh Vi i]Z =^\^iVa KZVa >hiViZ LZgk^XZh hZ\ bZci ^cXgZVhZY "126 b^aa^dc* dg 03 #* Vh Xd b eVgZY id [^hXVa 0.0/, :i K>: @gdje* gZkZcjZh ^cXgZVhZY "055 b^aa^dc* dg 15 #* id "/*.07 b^aa^dc [dg i]Z [^hXVa nZVg ZcYZY CjcZ 1.* 0.00 [gd b "530 b^aa^dc ^c [^hXVa 0.0/* eg^b Vg^an YjZ id i]Z "/21 b^aa^dc Xdcig^Wji^dc [gd b i]Z VXfj^h^i^dc d[F dgi\V\Z <]d^XZ ^c i]Z [djgi] fjVgiZg d[[^hXVa 0.0/* vc ^cXgZVhZ ^c : jhigVa^Vc YZei] gZkZcjZ Yg^kZc Wn]^\]Zg eVi^dcVa a^hi^c\h VcY eg^XZ ^cXgZVhZh VcY Vc "/6 b^aa^dc ^cXgZVhZ [gd b i]Z VXfj^h^i^dc d[K> : BcY^V ^c i]Z hZXdcY fjVgiZg d[[^hXVa 0.0/* eVgi^Vaan d[[hZi Wn i]Z "07 b^aa^dc cZ\Vi^kZ ^b eVXi [gd b V kVaj Vi^dc VY_jhi bZci gZaViZY id ZmeZXiZY igV^a Xd b b^hh^dch Vi ^ih [^cVcX^Va hZgk^XZh Wjh^cZhh, KZkZcjZh Vi F dkZ ^cXgZVhZY "5/ b^aa^dc* dg // #* id "5/0

:`c eYV WZdTR] jVRcd V_UVU >f_V -*& " 7 YR_XV ,*,, ,*,+ 7 YR_XV #Z_ ^ Z]]Z`_d& ViTVae ''\$ 6VeeVc)#K`cdV\$ <^gXjaVi^dc VcY hjWhXg^ei^dc gZkZcjZh8</pre> <^gXjaVi^dc VcY di]Zg /0. 715 6/5 " /3 # Igd[Zhh^dcVa ^c[dg b Vi^dc Wjh^cZhh 357 257 /.__ 0/# H`eR] TZcTf]ReZ`_ R_U dfSdTcZaeZ`_ cVgV_fVd +1 " ! +\(\lambda/+0\)! +1,30! ,,*

<^gXjaVi^dc VcY hjWhXg^ei^dc gZkZcjZh ^cXgZVhZY "00. b^aa^dc</pre>

CNPVNW] 529D41

 $? dg i]Z [^hXVa nZVg ZcYZY CjcZ 1.* 0.00* LZ \ bZci > ; BM=: Vi i]Z = d1 CdcZh hZ \ bZci ^cXgZVhZY "/./ b^aa^dc^* dg 1. \#* Vh Xd beVgZY id [^hXVa 0.0/* ^cXaj Y^c \ i]Z "/7 b^aa^dc VcY "/5 b^aa^dc ^b eVXih [gd b i]Z VXf j^h^i^dch d[B ; = VcY HIBL* gZheZXi^kZan* eg^b Vg^an YjZ id i]Z ^cXgZVhZ ^c gZkZcjZh Y^hXjhhZY VWdkZ* eVgi^Vaan d[[hZi Wn ^cXgZVhZY ZbeadnZZ Xdhih* i]Z "03 b^aa^dc ^b eVXi [gd b HIBL VcY < F : +gZaViZY igVchVXi^dc Xdhih VcY ^cXgZVhZY hVaZh VcY bVg^Zi^c \ Xdhih,$

+NNJ 9 TBNIRHIMG &0/# d[i]Z <dbeVcn~h Xdchda^YViZY gZkZcjZh ^c Wdi] [^hXVa 0.00 VcY 0.0/'

 $\label{eq:control_co$

 $?dg\ i]Z\ [^hXVa\ nZVg\ ZcYZY\ Cj\ cZ\ 1.*\ 0.00*\ LZ\ bZci\ >;\ BM=:\ Vi\ i]Z\ GZ\ 1h\ FZY^V\ hZ\ bZci\ ^b\ egdkZY\ Wn\ ''/43\ b^aa^dc\ Vh\ Xd\ beVgZY\ id\ [^hXVa\ 0.0/*\ eg^b\ Vg^an\ YjZ\ id\]^\]Zg\ Xdcig^Wji^dch\ [gd\ b\ GZ\ 1h\ <dge\ :\ jhigVa^V\ d[\ ''/.7\ b^aa^dc\ VcY\ GZ\ 1h\ ND\ d[\ ''32\ b^aa^dc\ bV^acan\ Yg^kZc\ Wn\ i]Z\]^\]Zg\ gZkZcjZh\ YZhXg^WZY\ VWdkZ^*\ Vh\ 1\ Zaa\ Vh\ ^cXgZVhZY\ Xdcig^Wji^dch\ d[\ ''/6\ b^aa^dc\ VcY\ ''/4\ b^aa^dc\ [gd\ b\ P^gZaZhh\ @gdj\ e\ VcY\ i]Z\ >N\ `IX[T\ @X\]^*\ gZheZXi^kZan^*\ eVgi^Vaan\ d[[hZi\ Wn\ ^cXgZVhZY\ Xdhih\ VhhdX^ViZY\ 1^i]\ MVa\ MO,$

$>N \ \ 3X/Y 1^{\ }JURJ$

 $KZkZcjZh\ 1ZgZ\ "/*.66\ b^aa^dc\ [dg\ i]Z\ [^hXVa\ nZVg\ ZcYZY\ CjcZ\ 1.*\ 0.00^*\ Vc\ ^cXgZVhZ\ d[\ "'7/\ b^aa^dc^*\ dg\ 7\#*\ Vh\ Xd\ b\ eVgZY\ id\ [^hXVa\ 0.0/\ gZkZcjZh\ d[\ "'7/\ b^aa^dc,\ c^agXj\ aVi^dc\ VcY\ hj\ WhXg^ei^dc\ gZkZcjZh\ ^cXgZVhZY\ "'22\ b^aa^dc^*\ eg^b\ Vg^an\ Yg^kZc\ Wn\]^\]Zg\ XdciZci\ a^XZch^c\ gZkZcjZh\ Y^\^iVa\ hj\ WhXg^WZg\ \ gd\ li\ VcY\ i]Z\ edh^i^kZ\ ^b\ eVXi\ d[\ i]Z\ 31gY\ 1ZZ^*\ eVgi^Vaan\ d[[hZi\ Wn\ i]Z\ "/2\ b^aa^dc\ cZ\Vi^kZ\ ^b\ eVXi\ d[\ i]Z\ 31gY\ 1ZZ^*\ eVgi^Vaan\ d[[hZi\ Wn\ i]Z\ "/2\ b^aa^dc\ eg^b\ Vg^an\ YjZ\ id\]^\]Zg\ h^eXgZvhZY\ "'0/\ b^aa^dc^*\ eg^b\ Vg^an\ YjZ\ id\]^\]Zg\ h^eZgZvhZy\ "'0/\ b^aa^dc\ eZ\Vi^kZ\ b^eVXi\ d[\ i]Z\ 31gY\ 1ZZ^*\ eVgi^Vaan\ d[[hZi\ Wn\ i]Z\ "'/2\ b^aa^dc\ cZ\Vi^kZ\ ^b\ eVXi\ d[\ i]Z\ 31gY\ 1ZZ^*\ eVgi^Vaan\ YjZ\ id\]^\]Zg\ i]^gY+eVgin\ eg^ci^c\ VcY\ di]Zg\ hZgk^Xzh\ gZkZcjZh,\ M]Z\ b\ eVXi\ d[\ i]Z\ 31gY\ 1ZZ^*\ c\ [^hXVa\ 0.00\ gZhj\ aiZY\ ^c\ V\ gZkZcjZ\ ^cXgZVhZ\ d[\ Veegdm^b\ ViZan\ "'/3\ b^aa^dc,$

$>N \setminus E$;

KZkZcjZh 1ZgZ "/*..5 b^aa^dc [dg i]Z [^hXVa nZVg ZcYZY CjcZ 1.* 0.00* Vc ^cXgZVhZ d["43 b^aa^dc* dg 5 # * Vh Xd b eVgZY id [^hXVa 0.0/ gZkZcjZh d["720 b^aa^dc, : YkZgj^h^c\ gZkZcjZh ^cXgZVhZY "4/ b^aa^dc* eg^bVg^an YjZ id]^\]Zg Y^\^iVa VYkZgj^h^c\ gZkZcjZh>h ^ ^

 $j\,c\,Y^hig^Wj\,i\,ZY\,\left[dgZ^\wedge\,c\,ZVgc^\wedgec\,h\,\,1\,ZgZ\,\,Xdch^YZgZY\,\,e\,Zg\,b\,Vc\,Zcian\,\,gZ^\wedgeckZhiZY\,\,Vc\,Y\,\,vh\,\,hj\,X\,\right]^*\,Nc^hiZY\,\,LiViZh\,\left[ZYZgVa\,\,Vc\,Y\,\,hiViZ\,^cXd\,\,b\,\,Z\,\,iVmZh\,\,1\,ZgZ\,\,cdi\,\,e\,gZk^\wedge d\,j\,han\,\,gZXdg\,YZY\,\,dc\,\,i\,]\,ZhZ\,\,ZVgc^\wedgec\,\,h\,\,;\,\,h\,\,V\,\,gZhj\,\,ai\,\,d\,[\,i\,]Z\,\,MVm\,\,:\,\,Xi^*\,\,hj\,WhiVci^Naan\,\,Vaa\,\,d\,[\,i\,]Z\,\,<d\,\,b\,\,e\,Vcn^-h\,\,ZVgc^\wedgec\,\,h\,\,^c\,\,[\,dgZ^\wedge\,c\,\,h\,\,yWh^Y^Vg^\wedge Zh\,\,Vc\,Zc\,\,gZeViZY\,\,eg^\wedge d\,\,i\,\,i\,]\,Z\,\,ZVXi\,\,b\,\,Zci\,\,d\,[\,i\,]Z\,\,MVm\,\,:\,\,Xi\,\,1\,ZgZ\,\,YZZ\,\,b\,\,ZY\,\,i\,\,d\,\,]\,VkZ\,\,WZZc\,\,gZeVig^\wedge ViZY\,\,Vc\,Y\,\,iVmZY\,\,VXXdg\,Y^\wedgec\,\,an,\,\,;\,\,h\,\,d\,[\,\,C\,j\,c\,\,Z\,\,1\,.\,^*\,\,O\,\,.\,O0^*\,\,i\,]\,Z\,\,<d\,\,b\,\,e\,Vcn\,\,]\,Vh\,\,Veegdm^\wedge\,b\,\,ViZan\,\,^{\,\,7}\,.\,\,.\,\,b\,\,^{\,\,\alpha}a^\Lambda dc\,\,d\,\,[\,\,j\,c\,Y^hig^NW\,j\,iZY\,\,[\,dgZ^\wedge\,\backslash\,c\,\,ZVge^\wedgec\,\,h\,\,i\,]\,Vi\,\,^\Lambda\,i\,\,^\Lambda ciZc\,Yh\,\,i\,\,g\,Z^\wedge c\,\,XZhi\,\,e\,Zg\,\,b\,\,Vc\,Zcian,\,Bi\,\,^\Lambda\,h\,\,cdi\,\,e\,g\,VXi^\Lambda XVWaZ\,\,i\,d\,\,Zhi^\Lambda\,b\,\,ViZ\,\,i\,]\,Z\,\,V\,\,b\,\,d\,\,j\,\,ci\,\,d\,\,[\,\,i\,Vm\,\,i\,]\,Vi\,\,b\,\,^\Lambda\,]\,\,i\,\,WZ\,\,e\,Vn\,VWaZ\,\,^\Lambda\,[\,\,i\,]\,ZhZ\,\,ZVge^\wedgec\,\,h\,\,1\,ZgZ\,\,gZe\,Vig^\Lambda ViZY,\,\,M\,]\,Z\,\,<d\,\,b\,\,e\,Vcn\,\,b\,\,Vn\,\,gZe\,Vig^\Lambda ViZ\,\,[\,j\,i\,j\,g\,\,Z\,\,Vge^\wedgec\,\,h\,\,d\,\,[\,XZgiV^\wedgec\,\,[\,dgZ^\wedge\,\backslash\,c\,\,h\,j\,Wh^\Lambda Y^\Lambda Vg^\Lambda Zh\,\,^\Lambda\,c\,\,1\,\,]\,^\Lambda X]\,\,XVhZ\,\,i\,]\,Z\,\,<d\,\,b\,\,e\,Vcn\,\,b\,\,Vn\,\,WZ\,\,gZf\,\,j\,^\Lambda gZY\,\,id\,\,VXXg\,\,j\,Z\,\,Vc\,Y\,\,e\,Vn\,\,VYY^\Lambda i^\Lambda c\,Va\,\,i\,\,VmZh\,\,^\Lambda\,c\,\,Xa\,\,j\,Y^\Lambda c\,\,V\,cn\,\,Veea^\Lambda XVWaZ\,\,[\,dgZ^\Lambda\,\backslash\,c\,\,1\,\Lambda\,i\,\,]\,\,]\,d\,\,a\,\,Y^\Lambda c\,\,V\,\,Vn\,\,VY^\Lambda i^\Lambda c\,\,U\,\,u\,\,VMZh\,\,,$

 $M]Z \ [daad \ 1 \ ^c \setminus iVWaZ \ egZhZcih \ V \ gZXdcX \ ^a \ ^Vi \ ^dc \ d[\ cZi \ XVh] \ egdk \ ^YZY \ Wn \ deZgVi \ ^c \setminus VXi \ ^k \ ^i \ ^Zh \ id \ [gZZ \ XVh] \ [ad \ 1 \ VkV \ ^a VWaZ \ id \ GZ \ 1 \ h \ \\ < dgedgVi \ ^dc \ VXi \ ^k \ ^i \ ^Zh \ id \ [gZZ \ XVh] \ [ad \ 1 \ VkV \ ^a VWaZ \ id \ GZ \ 1 \ h \]$

		dTR] jVRcd V_UVU •f_V -*¼
	,*,,	,*,+
	#7_	^ Z]]Z`_d\$
GZi XVh] egdk^YZY Wn deZgVi^c\ VXi^k^i^Zh	" /*13	2 " /*015
EZhh8 < Ve^iVa ZmeZcY^ijgZh	&27	7' &17.'
	63	3 625
EZhh8 K>: @gdje [gZZ XVh] [adl	&O5	7' &/63'
Iajh8 < Vh] Y^k^YZcYh gZXZ^kZY [gdb K>: @gdje	6	5 47
?gZZ XVh] [ad 1 VkV^aVWaZ id GZ 1 h <dgedgvi^dc< td=""><td>" 44</td><td>1 " 51/</td></dgedgvi^dc<>	" 44	1 " 51/
·		

 $?gZZ XVh] [ad 1 VkV^aVWaZ id GZ 1h < dgedgVi^dc YZXgZVhZY "46 b^aa^dc ^c i]Z [^hXVa nZVg ZcYZY CjcZ 1.* 0.00 id "441 b^aa^dc [gdb "51/ b^aa^dc ^c [^hXVa 0.0/* eg^b Vg^an YjZ id]^\]Zg XVe^iVa ZmeZcY^ijgZh VcY]^\]Zg K>: @gdje [gZZ XVh] [ad 1* eVgi^Vaan d[[hZi Wn]^\]Zg cZi XVh] egdk^YZY Wn deZgVi^c\ VXi^k^i^Zh Vh Y^hXjhhZY VWdkZ VcY]^\]Zg Y^k^YZcYh gZXZ^kZY [gd b K>: @gdje,$

6 cc hl_Xd

$>N \ \ \ 3X/YX/JRXW 2X//X \ RWP$

: h d[CjcZ 1.* 0.00* i]Z <d b eVcn]VY &^' Wdggd 1 ^c \h d["/*757 b ^aa^dc* Xdch^hi^c \ d[^ih djihiVcY^c \ 0.0 / LZc^dg GdiZh* 0.00 LZc^dg GdiZh VcY MZg b : EdVch VcY &^^' "53. b ^aa^dc d[jcYgV 1 c Xd b b^ib Zcih VkV^aVWaZ jcYZg i]Z KZkdak^c \ ?VX^a^in,

Bcc/ZWgZNgn O.QQ(Y)Z % abbevon ^hhjZY "3.. b ^aa^dc d[hZc^dg cdiZE[Yi]X O.jt@c M]Z O.OO LZc^dg GdiZh WZVg ^ciZgZhi Vi V [^mZY gViZ d[3,/03 # eZg Vccj b * eVnVWaZ ^c XVh] hZ b ^+Vccj Vaan dc ?ZWgj Vgn /3 VcY : j\jhi /3 d[ZVX] nZVg* Xd b bZcX^c\ dc : j\jhi /3* 0.00, M]Z cdiZh 1 ^aa b VijgZ dc ?ZWgj Vgn /3* 0.10,

$DN[V < XJW 1 JWM BN_XU_RWP 3[NMR] 6JLRUR]RN \setminus$

 $\label{eq:control_c$

dc Vcn jcYgV1c WVaVcXZ jcYZgi]Z KZkdak^c\ ?VX^a^in VcY* 1^i] gZheZXi id Vcn djihiVcY^c\ Wdggd1^c\h jcYZgi]Z ?VX^a^i^Zh* Vc Veea^XVWaZ b Vg\^c d[

					5d \W >f	_V -*k ,*,	,			
	DRj ^V_ed 8 fV Sj DVcl^U									
		@Vdd eYR_ + H`eR] jVRc		+'- jVRcd		-'/ jVRcd		A	A`cV eYR_ / jVRcd	
					#1_ ^	Z]]Z`_ d\$				
$IjgX]VhZdWa^{Vi}dch^{\ell V'}$	"	71.	"	247	"	106	"	47	"	42
Ledgih egd\gV b b^c\ $g^{\}$] ih ^{εW'}		/*5.6		24.		573		16/		50
$Igd \gV b b^c \Xdhih^{tX'}$		346		040		050		1.		2
HeZgVi^c∖ aZVhZh ^{&Y'}										
MgVch b ^hh^dc Xdhih ^{&Z'}		/5.		04		24		13		41
EVcY VcY Wj^aY^c\h		/*/04		/17		023		0/5		303
IaVci VcY b VX]^cZgn		//		3		3		/		Z
?^cVcXZ aZVhZh										
MgVch b ^hh^dc Xdhih ^{MZ'}		5.		07		2/		Z		Z
; $dggd 1 ^c h^{\ell l'}$		1*.05		05/		461		261		/*37.
BciZgZhi eVn bZcih dc Wdggd l ^c \h*\'		5/.		//6		0.4		/55		0.7
MdiVa Xdb b^ibZcih VcY XdcigVXijVa dWa^\Vi^dch	"	6*10.	"	/*557	"	0*40/	"	/*171	"	0*305

- åV' M]Z <dbeVcn]Vh Xdb b^i b Zcih j cYZg e j gX]VhZ dWa^\Vi^dch gZaViZY id b^c^b j b h j WhXg^WZg \ j VgVciZZh [dg a^XZchZ [ZZh* eg^ci^c \ XdcigVXih* XVe^iVa egd_ZXih* b Vg`Zi^c \ V\gZZ b Zcih* egdY j Xi^dc hZgk^XZh VcY di]Zg aZ\Vaan W^cY^c \ Xd b b^i b Zcih,
- &W' M]Z <d b eVcn]Vh hedgih egd\gV b b^c\ g^\]ih Xd b b^i b Zcih 1^i] i]Z GVi^dcVa Kj\Wn EZV\jZ*: jhigVa^Vc ?ddiWVaa EZV\jZ VcY <g^X\Zi: jhigVa^V* Vh 1 Zaa Vh XZgiV^c di]Zg WgdVYXVhi g^\]ih 1]^X] VgZ eVnVWaZ i]gdj\] [^hXVa 0.06,
- &X' M]Z <dbeVcn]Vh egd\gV b b^c\ g^\]ih Xd b b^i b Zcih 1^i] kVg^djh hjeea\Zgh [dg egd\gV b b^c\ XdciZci,
- &Z' M]Z <dbeVcn]Vh XdcigVXijVa Xdb b^ibZcih [dg hViZaa^iZ igVch b^hh^dc hZgk^XZh, M]Z <dbeVcn~h hViZaa^iZ igVchedcYZg hZgk^XZh VggVc\ZbZcih ZmiZcY i]gdj\] [^hXVa O . 10 VcY VgZ VXXdjciZY [dg Vh deZgVi^c\ dg [^cVcXZ aZVhZh* WVhZY dc i]Z jcYZgan^c\ iZg bh d[i]dhZ VggVc\ZbZcih,</p>
- &[' LZZ GdiZ 7 z ; dggd 1 ^c \ h ^c i] Z VXXd b eVcn^c \ <dchda^YViZY ?^cVcX^Va LiViZ b Zcih,

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[dg ^b eV^g b Zci, Ad 1 ZkZg* ^[i]Z <d b eVcn XdcXaj YZh di]Zg 1 ^hZ dg ZaZXih cdi id eZg[dg b i]Z fj Va^iVi^kZ VhhZhh b Zci* i]Zc ^i ^h gZfj ^gZY id eZg[dg b V fj Vci^iVi^kZ VcVanh^h id YZiZg b ^cZ i]Z [V^g kVaj Z d[i]Z gZedgi^c \ j c^i* VcY Xd b eVgZ i]Z XVaXj aViZY [V^g kVaj Z d[V gZedgi^c \ j c^i* VcY Xd b eVgZ i]Z XVaXj aViZY [V^g kVaj Z d[V gZedgi^c \ j c^i* VcY Xd b eVgZ i]Z XVaXj aViZY [V^g kVaj Z d[V gZedgi^c \ j c^i* VcY Xd b eVgZ i]Z XVaXj aViZY [V^g kVaj Z d[V gZedgi^c \ j c^i* eg^b Vg^an Wn jh^c \ Wdi] V Y^hXdj ciZY XVh] [ad 1 VcVanh^h VcY b Vg`Zi+WVhZY kVaj Vi^dc VeegdVX],

: h d[CjcZ 1.* 0.00* i]ZgZ 1ZgZ cd gZedgi^c\ j c^ih 1^i] \ddY 1^aa Vi+g^h\ [dg [jijgZ ^b eV^g bZci, M]Z < d b eVcn 1^aa Xdci^c jZ id b dc^idg ^ih \ddY 1^aa [dg edhh^WaZ [jijgZ ^b eV^g bZci,

90NG0ALLIMG, NRSR

 $< d h ih ^c X j g g Z Y ^c V X f j ^c ^c \setminus g \wedge J ih V g Z V X X d j c i Z Y [d g ^c V X X d g Y V c X Z 1 ^i] : L < 70.* \\ > c i Z g i V c b Z c i z ; g d V Y X V h i Z g Z X V Z Y V h i Z V Z g Z X Z Y Z Y V i i Z \ g d h V b d j c i d [i] Z a ^V W ^a ^i ^Z h 1] Z c i] Z a ^X Z c h Z e Z g ^d Y] V h W Z \ j c ^* i] Z X d h i d [i] Z e g d \ g V b ^h Y Z i Z g b ^c V W a Z V c Y i] Z e g d \ g V b ^h V X X Z c i Z Y V c Y V K V ^a V W a Z [d g V ^c \ , I g d \ g V b b ^c \ X d h ih V g Z V b d g i ^o Z Y W V X Z c i] Z e g d \ g V b ^h V X X Z c i Z Y V c Y V K V ^a V W a Z [d g V ^c \ , I g d \ g V b b ^c \ X d h ih V g Z V b d g i ^o Z Y W V X Z c i] Z a ^X X C h Z e Z g ^d Y d g Z m e Z X i Z Y j h Z [j a a ^f Z d [Z V X] e g d \ g V b * 1] ^X] g Z f j ^c Z h h ^c C [^a X V c i] Y \ b Z c i, M] Z e V i i Z g d [X d c h j b e i ^d c ^h W V h Z Y e g ^b V g ^a n d c X d c h j b Z g k ^Z 1 Z g h] ^e ^c C [d g b V i ^d c V h 1 Z a V h d i] Z g [V X i d h, C ^i A V A V ^c C h V g Z Z m e Z X i Z Y i d \ Z c Z g V i Z] ^h \] Z g K ^Z 1 Z g h] ^e * V c V X X Z a Z g V i Z Y b Z i] d Y d [V b d g i ^o V i ^d c ^h j h Z Y, M] Z < d b e V c n b d c ^i d h e g d \ g V b b ^c \ V b d g i ^o V i ^d c e d a ^X n d c V c d d ^c \ W V h ^h V c Y V c n ^b e V X i V g ^h ^c \ [g d b X] V c \ Z h i d i] Z e d a ^X n 1 d j a Y W Z g Z X d \ c ^o Z Y e g d h e Z X i ^k Z a n, M] Z < d b e V c n g Z \ j a V g an g Z k ^Z 1 h ^i h e g d \ g V b b ^c \ V h h Z i h d Z c j Z i d Z Z a Z X i [V ^c g k V a j Z, <] V c \ Z h ^c X ^c X ^c X j b h i V c X Z h c V 1 g ^i Z + Y d 1 c d [i] Z V h Z i d [V ^c g k V a j Z, M] Z < d b e V c n Y h ^c \ a Z V c Y b j a i ^+ n Z V g X d c i g V X h Z Y c Y b Z Y ^c Z Y e Z$

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 $M]Z < db \, eV cn \, ^hhjW_ZXi \, id \, ^cXd \, bZ \, iVmZh \, ^c \, i]Z \, N,L, \, VcY \, kVg^djh \, [dgZ^\backslash c \, _jg^hY^Xi^dch \, ^c \, 1 \,]^X] \, ^i \, deZgViZh \, VcY \, gZXdgYh \, ^ih \, iVm \, egdk^h^dc \, [dg \, i]Z \, Vci^X^eViZY \, iVm \, XdchZfjZcXZh \, ^c \, ^ih \, gZedgiZY \, gZhjaih \, d[\, deZgVi^dch, \, MVm \, aV \, 1 \, h \, VgZ \, Xd \, b \, eaZm \, VcY \, hjW_ZXi \, id \, Y^[[ZgZci \, ^ciZgegZiVi^dch \, Wn \, i]Z \, iVmeVnZg \, VcY \, gZheZXi^kZ \, \ dkZgc \, b \, ZciVa \, iVm^c \, Vji] \, dg^i^Zh, \, L^\backslash c^[^XVci \, _jY \setminus bZci \, ^h \, gZfj^gZY \, ^c \, YZiZg \, b^c^c \, \ i]Z \, < d \, b \, eVcn~h \, iVm \, ZmeZchZ \, VcY \, ^c \, ZkVaj \, Vi^c \, \wedge \, ^ih \, iVm \, edh^i^dch \, ^cXaj \, Y^c \, ZkVaj \, Vi^c \, \ j \, cXZgiV^ci^Zh \, Vh \, egd \, b \, j \, a \, ViZY \, j \, cYZg \, : \, L < \, 52 \, . \, ^* \, \{BcXd \, bZ \, MVmZh, |$

 $i]Z < dchda^{Y}ViZY ?^{c}VcX^{V}a \ LiViZb Zcih [gdb hjX] = dh^{i}^dch \ VgZ i]Zc b ZVhjgZY WVhZY dc i]Z a^{V}g \ ZVi \ WZcZ[^i i]Vi]Vh V \ gZViZg i]Vc \\ 3. \# a^{\lambda}Za^{d}dY d[WZ^{\lambda}c \ gZVa^{\lambda}cY j edc jai^{b}ViZ hZiiaZb Zci, L^{\lambda}c^{[\lambda Vci b}VcV \ ZbZci _jY \ bZci ^h gZf j^{g}ZY id YZiZg b^{\lambda}cZ 1]Zi]Zg i]Z gZXd \ c^{i}dc i]gZh]daY]Vh WZZc bZi VcY* ^[hd* i]Z Veegdeg^{V}iZ V bdjci d[jcgZXd \ c^{\lambda}ZY iVm WZcZ[^ih id WZ gZXdgYZY ^c i]Z \\ < dchda^{Y}ViZY ?^{\lambda}Va LiViZb Zcih, F VcV \ ZbZci gZ+ZkVaj ViZh iVm edh^{i}dch ZVX] eZg^{d}Y^{\lambda}c 1]^{\lambda}Z cZ1 ^{c}[dg b Vi^{\lambda}C VWdji gZXd \ c^{i}dc dg bZVhjgZbZci WZXdbZh VkV^{a}VWaZ, M]Z < dbeVcn-h eda^{X}N ^h id gZXd \ c^{\lambda}Z^{\lambda} 1]Zc Veea^{X}VWaZ^{\lambda} ^{c}iZgZhi VcY eZcVai^{Z}h dc jcgZXd \ c^{\lambda}ZY ^{c}XdbZ iVm WZcZ[^ih Vh eVgi d[BcXdbZ iVm &ZmeZchZ' WZcZ[^i,$

 $LZZ \ GdiZ \ /7 \ z \ BcXd \ b \ Z \ MVmZh \ ^c \ i \]Z \ VXXd \ b \ eVcn^c \setminus \\ < dchda^YViZY \ ?^cVcX^Va \ LiViZ \ b \ Zcih \ [dg \ [jgi] \ Zg \ YZiV^ah \ gZ \setminus VgY^c \setminus i \]ZhZ \ Zhi^b \ ViZh \ VcY \ Vhhj \ b \ ei^dch \ VcY \ X \]Vc \setminus Zh \ Xd \ b \ eVgZY \ id \ eg^dg \ [^hXVa \ nZVgh,]$

: ESIQE LEMS +EMEFIS 8 BKIGASINMR

 $M]Z < db \, eV cn \, 1^{aa} \, jhZ \, V \, 1Z^{\ \ \ } jiZY \, VkZgV \setminus Z \, adc \setminus iZg \, b \, gViZ \, d[\, gZijgc \, d[\, 2,1 \, \# \, [dg \, [^hXVa \, 0.01 \, WVhZY \, eg^cX^eVaan \, dc \, V \, Xd \, b \, W^cVi^dc \, d[\, XjggZci \, VhhZi \, b^m \, VcY \, Vc \, ZmeZXiVi^dc \, d[\, [jijgZ \, adc \setminus iZg \, b \, ^ckZhi \, b \, Zci \, gZijgch, \, M]Z \, VXXj \, b \, jaViZY \, cZi \, egZ+iVm \, adhhZh \, dc \, i]Z < d \, b \, eVcn-h \, eZch^dc \, eaVch \, Vh \, d[\, CjcZ \, 1.* \, 0.00 \, 1\, ZgZ \, Veegdm^b \, ViZan \, "237 \, b^aa^dc \, 1 \,]^nX] \, YZXgZVhZY \, [gd \, b \, Veegdm^b \, ViZan \, "320 \, b^aa^dc \, [dg \, i]Z < d \, b \, eVcn-h \, eZch^dc \, eaVch \, Vh \, d[\, CjcZ \, 1.* \, 0.0/, \, M]^h \, cZi \, YZXgZVhZ \, d[\, "61 \, b^aa^dc \, 1 \, Vh \, eg^b \, b \, Vg^an \, YjZ \, id \, XjggZcXn \, b \, dkZ \, b \, Zcih \, VcY \, j \, cgZXd \setminus c^oZY \, adhhZh \, V \, b \, dgi^oZY \, Yjg^c \setminus \, [^hXVa \, 0.00, \, Ed \, 1 \, Zg \, Y^hXdj \, ci \, gViZh \, ^cXgZVhZ \, egZhZci \, kVajZh \, d[\, WZcZ[^i \, dWa^V, Vi^dch \, VcY \, ^cXgZVhZ \, i]Z \, egZhZci \, kVajZh \, d[\, WZcZ[^i \, i \, dWa^V, Vi^dch \, VcY \, gZYjXZ \, i]Z \, < d \, b \, eVcn-h \, VXXj \, b \, j \, aViZY \, cZi \, adhh \, VcY \, YZXgZVhZ \, hj \, WhZf \, j \, Zci+nZVg \, WZcZ[^i \, Xdhih, \, M]ZhZ \, YZ[ZggZY \, AdhhZh \, VcY \, YZXgZYhZ \, i]Z \, < d \, b \, eVcn-h \, VXXj \, b \, j \, aViZY \, cZi \, adhh \, VcY \, YZXgZVhZ \, hj \, WhZf \, j \, Zci+nZVg \, WZcZ[^i \, Xdhih, \, M]ZhZ \, YZ[ZggZY \, Xdhih, \, M]ZhZ \, YZ[ZgZY \, Xdhih, \,$

gZfj^gZbZcih* [jcY^c\ ^c i]Z Veegdeg^ViZ adXVa XjggZcX^Zh ^h b VYZ VkV^aVWaZ [gdb ^ciZgXdbeVcn XVe^iVa, M]Z <dbeVcn YdZh cdi]ZY\Z ^ih ^ckZhi b Zcih ^c i]Z cZi VhhZih d[^ih : jhigVa^Vc VcY N,D, deZgVi^dch,

	B `e <i>l</i>		: RIc	JR]fV	₩c 5 Ug +* 7 YR_ :`c 9 i TY	VcdV · '' _XV I	GV_dZ Wc` 5Ug' +* 7YR_ =_eV FR	VcdV '' XV I_ cVde
?dgZ^\c XjggZcXn YZg^kVi^kZh	NL"	0/	NL"	/	NL"	&O'		c-V
<gdhh+xjggzcxn 1="" ^cizgzhi="" gviz="" h="" td="" veh<=""><td>NL"</td><td>13.</td><td>NL"</td><td>76</td><td>NL"</td><td>&17'</td><td>NL"</td><td>Z</td></gdhh+xjggzcxn>	NL"	13.	NL"	76	NL"	&17'	NL"	Z
BciZgZhi gViZ YZg^kVi^kZh	: "	13.	NL"	7		c-V	NL"	&/'
BciZgZhi gViZ YZg^kVi^kZh	NL"	3	NL"	/3		c-V	NL"	&O'

: cn gZhjai^c\ X]Vc\Zh ^c i]Z [V^g kVajZ d[i]Z YZg^kVi^kZ [^cVcX^Va ^chigj b Zcih b Vn WZ eVgi^Vaan d[[hZi Wn X]Vc\Zh ^c i]Z [V^g kVajZ d[XZgiV^c WVaVcXZ h]ZZi edh^i^dch &eg^ b Vg^an N,L, YdaaVg YZcd b ^cViZY a^VW^a^i^Zh' ^ b eVXiZY Wn i]Z X]Vc\Z ^c i]Z [dgZ^\c ZmX]Vc\Z gViZh, M]Z VW^a^in id gZYjXZ i]Z ^ b eVXi d[XjggZcXn [ajXijVi^dch dc ZVgc^c\h YZeZcYh dc i]Z b V\c^ijYZ d[i]Z YZg^kVi^kZh Xd b eVgZY id i]Z WVaVcXZ h]ZZi edh^i^dch Yjg^c\ ZVX] gZedgi^c\ XnXaZ,

=_eVcVde FReV FZd\

M]Z <dbeVcn-h XjggZci [^cVcX^c \ VggVc \ ZbZcih VcY [VX^a^i^Zh ^cXaj YZ "O*.41 b^aa^dc d[djihiVcY^c \ [^mZY+gViZ YZWi VcY "717 b^aa^dc d[djihiVcY^c \ kVg^VWaZ+gViZ WVc ` [VX^a^i^Zh* WZ[dgZ VY_jhi b Zcih [dg j cV b dgi^oZY Y^hXdj ci VcY YZWi ^hhj VcXZ Xdhih &LZZ GdiZ 7 z ; dggd 1 ^c \h ^c i]Z VXXd b eVcn^c \ <dchda^yYiZY ?^cVcX^Va LiViZ b Zcih ', ?^mZY VcY kVg^VWaZ+gViZ YZWih VgZ ^b eVXiZY Y^[[ZgZcian Wn X]Vc \ Zh ^c ^ciZgZhi gViZh, : X]Vc \ Z ^c i]Z b Vg ` Zi ^ciZgZhi gViZ dg n^ZaY d[[^mZY+gViZ YZWi 1 ^aa dcan ^beVXi i]Z [V^g b Vg ` Zi kVaj Z d[hj X] YZWi* 1]^aZ V X]Vc \ Z ^c i]Z b Vg ` Zi ^ciZgZhi gViZ d[kVg^VWaZ+gViZ YZWi 1 ^aa ^beVXi ^ciZgZhi ZmeZchZ* Vh 1 Zaa Vh i]Z Vb dj ci d[XVh] gZf j ^gZY id hZgk^XZ hj X] YZWi, Be XdccZXi^dc 1 ^i] i]ZhZ Wdggd 1 ^c \h* GZ 1 h <dgedgVi^dc] Vh ZciZgZY ^cid Vc ^ciZgZhi gViZ h 1 Ve XVh] [ad 1] ZY \ Z id [^m i]Z [adVi^c \ gViZ ^ciZgZhi Xd b edcZci d[^ih MZg b : EdVch VcY i]Z ?dmiZa @gd je] Vh ji^a\^oZY XZgiV^c YZg^kVi^kZ ^chigj b Zcih id h 1 Ve N,L, YdaaVg YZcd b ^cViZY [^mZY gViZ ^ciZgZhi eVn b Zcih [dg : jhigVa^Vc YdaaVg YZcd b ^cViZY kVg^VWaZ gViZ eVn b Zcih, : h Y^hXjhhZY VWdkZ* i]Z ?dmiZa @gd je ji^a^oZh Xgdhh+XjggZcXn ^ciZgZhi gViZ h 1 Veh id] ZY \ Z V edgi^dc d[i]Z ^ciZgZhi gViZ g^h * gZaViZY id ^ciZgZhi VcY eg^cX^eVa eVn b Zcih dc ^ih N,L, YdaaVg YZcd b ^cViZY YZWi, M]Z ?dmiZa @gd je] Vh Vahd ji^a^oZY XZgiV^c YZg^kVi^kZ ^chigj b Zcih id h 1 Ve : jhigVa^Vc YdaaVg YZcd b ^cViZY kVg^VWaZ ^ciZgZhi gViZ eVn b Zcih [dg : jhigVa^Vc YdaaVg YZcd b ^cViZY kVg^VWaZ ^ciZgZhi gViZ eVn b Zcih [dg : jhigVa^Vc YdaaVg YZcd b ^cViZY kVg^VWaZ ^ciZgZhi gViZ eVn b Zcih [dg : jhigVa^Vc YdaaVg YZcd b ^cViZY kVg^VWaZ ^ciZgZhi gViZ eVn b Zcih [dg : jhigVa^Vc YdaaVg YZcd b ^cViZY kVg^VWaZ ^ciZgZhi gViZ h 1 Ve XdcigVXih djihiVcY^c \ 1 Vh Veegdm^b ViZan : "13. b ^aa^dc VcY "3.. b ^aa^dc [dg ?dmiZa @gd je VcY GZ 1 h <dbedychack Wdggd 1 ^c\h* gZheZXi^kZan, KZ[Zg id GdiZ // z ?^cVcX^Va Bchig b Zcih VcY ?Vog OVa iZ FZVh iZ EVh j Z EVh j Z EVi Ya,

Ge`T\ DcZTVd

M]Z <dbeVcn]Vh Xdb bdc hidX` ^ckZhi bZcih ^c ejWa^Xan igVYZY XdbeVc^Zh i]Vi VgZ hjW_ZXi id bVg`Zi eg^XZ kdaVi^a^in, M]ZhZ ^ckZhi bZcih]VY Vc V\\gZ\ViZ [V^g kVajZ d[Veegdm^bViZan "/.7 b^aa^dc Vh d[CjcZ 1.*0.00, :]nedi]Zi^XVa YZXgZVhZ ^c i]Z bVg`Zi eg^XZ d[i]ZhZ ^ckZhi bZcih d[/. # 1 djaY gZhjai ^c V YZXgZVhZ ^c ^cXdbZ d[Veegdm^bViZan "// b^aa^dc WZ[dgZ iVm,

7 cVUle Fld\

<Vh] VcY XVh] Zfj^kVaZcih VgZ bV^ciV^cZY 1^i] bjai^eaZ [^cVcX^Va ^chi^iji^dch, =Zedh^ih]ZaY 1^i] WVc`h bVn ZmXZZY i]Z Vbdjci d[
^chjgVcXZ egdk^YZY dc hjX] YZedh^ih, @ZcZgVaan* i]ZhZ YZedh^ih bVn WZ gZYZZbZY jedc YZbVcY VcY VgZ bV^ciV^cZY 1^i] [^cVcX^Va
^chi^iji^dch d[gZejiVWaZ XgZY^i VcY* i]ZgZ[dgZ* WZVg b^c^bVa XgZY^i g^h`,</pre>

M]Z <d b eVcn-h gZXZ^kVWaZh Y^Y cdi gZegZhZci h^\c^[^XVci XdcXZcigVi^dch d[XgZY^i g^h\ Vh d[CjcZ 1.* 0.00 dg CjcZ 1.* 0.0/ YjZ id i]Z 1^YZ kVg^Zin d[Xjhid b Zgh* b Vg^Zih VcY \Zd\gVe]^X VgZVh id 1]^X] i]Z <d b eVcn-h egdYjXih VcY hZgk^XZh VgZ hdaY,

 $M]Z < db \, eV cn \, b \, dc^{i}dgh \, ^{i}h \, edh^{i} \, ^{i}dch \, 1 \, ^{i}] * \, VcY \, i]Z \, XgZY^{i} \, fj \, Va^{i}n \, d[^{*}i]Z \, [^{c}VcX^{A}Va \, ^{c}hi^{i}ji^{A}dch \, 1 \,]^{X}] \, \, VgZ \, Xdj \, ciZgeVgi^{A}Zh \, id \, ^{i}h \, [^{c}VcX^{A}Va \, ^{c}higj \, b \, Zcih, \, M]Z < db \, eV cn \, ^{h}Z \, medhZY \, id \, XgZY^{i} \, adhh \, ^{c}c \, i]Z \, ZkZci \, d[\, cdceZg[dg \, b \, VcXZ \, Wn \, i]Z \, Xdj \, ciZgeVgi^{A}Zh \, id \, i]Z \, V \ gZZ \, b \, Zcih, \, : h \, d[\, Cj \, cZ \, 1 \, .^{*} \, 0 \, .00^{*} \, i]Z < db \, eV cn \, Y^{A}Y \, cdi \, Vci^{A}X^{e}ViZ \, cdceZg[dg \, b \, VcXZ \, Wn \, Vcn \, d[\, i]Z \, Xdj \, ciZgeVgi^{A}Zh, \,$

$AR_RXV^V_erd FVa^ce^- = eVc_R 7^ec^- CgVc : I_R_TIR FVa^ceI_X V^c > f_V -* V_*,$

 $F\ VcV \setminus Zb\ Zci\ d[\ GZ\ 1\ h\ deedg\ Vi^dc\ ^h\ gZhedch^WaZ\ [dg\ ZhiVWa^h]^c\setminus VcY\ b\ V^ciV^c^c\setminus VYZfj\ ViZ\ ^ciZgcVa\ Xdcigda\ dkZg\ [^cVcX^Va\ gZedgi^c\setminus Vh\ YZ[^cZY\ ^c\ KjaZh\ /1V+/3\&['\ VcY\ /3Y+/3\&['\ jcYZg\ i]Z\ LZXjg^i^Zh\ >mX]Vc\setminus Z\ : Xi\ d[\ /712^*\ Vh\ Vb\ ZcYZY^*\ VcY\ [dg\ i]Z\ VhhZhh\ b\ Zci\ d[\ i]Z\ Z[[ZXi^kZcZhh\ d[\ ^ciZgcVa\ Xdcigda\ dkZg\ [^cVcX^Va\ gZedgi^c\setminus ,\ GZ\ 1\ h\ dgedgVi^dc\ ^h\ ^ciZgcVa\ Xdcigda\ dkZg\ [^cVcX^Va\ gZedgi^c\setminus ,\ GZ\ 1\ h\ dgedgVi^dc\ ^h\ ^ciZgcVa\ Xdcigda\ dkZg\ [^cVcX^Va\ gZedgi^c\setminus ,\ GZ\ 1\ h\ d[\ ^cVcX^Va\ gZedgi^c\setminus VcY\ i]Z\ gZa^VVW^a^nin\ d[\ [^cVcX^Va\ gZedgi^c\setminus VcY\ i]Z\ egZeVgVi^dc\ d[\ [^cVcX^Va\ hiViZ\ b\ Zcih\ [dg\ ZmiZgcVa\ ejgedhZh\ ^c\ VXXdgYVcXZ\ 1\ ^i]\ VXXdj\ ci^c\setminus eg^cX^eaZh\ VzCzZgVaan\ VXXZeiZY\ ^c\ i]Z\ Nc^iZY\ LiViZh\ d[\ :\ b\ Zg^XV,\ M]Z\ <db\ eVcn\ ^h\ ^ciZgcVa\ Xdcigda\ dkZg\ [^cVcX^Va\ gZedgi^c\setminus ^cXa_i\ YZh\ i\]dhZ\ eda^XYZh\ VcY\ egdXZYjgZh\ i\]Vi8$

- u eZgiV^c id i]Z b V^ciZcVcXZ d[gZXdgYh i]Vi* ^c gZVhdcVWaZ YZiV^a* VXXjgViZan VcY [V^gan gZ[aZXi i]Z igVchVXi^dch VcY Y^hedh^i^dch d[i]Z VhhZih d[GZ l h <dgedgVi^dc9
- u egdk^YZ gZVhdcVWaZ VhhjgVcXZ i]Vi igVchVXi^dch VgZ gZXdgYZY Vh cZXZhhVgn id eZg b^i egZeVgVi^dc d[[^cVcX^Va hiViZ b Zcih ^c VXXdgYVcXZ 1^i] VXXdjci^c\ eg^cX^eaZh \ZcZgVaan VXXZeiZY ^c i]Z Nc^iZY LiViZh d[: bZg^XV9
- u egdk^YZ gZVhdcVWaZ VhhjgVcXZ i]Vi gZXZ^eih VcY ZmeZcY^ijgZh d[GZ l h <dgedgVi^dc VgZ WZ^c\ b VYZ dcan ^c VXXdgYVcXZ l^i] Vji]dg^oVi^dch d[b VcV\Z b Zci VcY Y^gZXidgh d[GZ l h <dgedgVi^dc9 VcY
- u egdk^YZ gZVhdcVWaZ VhhjgVcXZ gZ\VgY^c\ egZkZci^dc dg i^bZan YZiZXi^dc d[jcVji]dg^oZY VXfj^h^i^dc* jhZ dg Y^hedh^i^dc d[VhhZih i]Vi XdjaY]VkZ V bViZg^Va Z[[ZXi dc i]Z Xdchda^YYiZY [^cVcX^Va hiViZbZcih,

BciZgcVa Xdcigda dkZg [^cVcX^Va gZedgi^c\ ^cXaj YZh i]Z Xdcigdah i]Z b hZakZh* b dc^idg^c\ VcY ^ciZgcVa Vj Y^i^c\ egVXi^XZh VcY VXi^dch iV`Zc id XdggZXi YZ[^X^ZcX^Zh Vh ^YZci^[^ZY,

; ZXVjhZ d[^ih^c]ZgZci a^b^iVi^dch* ^ciZgcVa Xdcigda dkZg [^cVcX^Va gZedgi^c* cd b ViiZg]dl l Zaa YZh^\cZY* b Vn cdi egZkZci dg YZiZXi b^hhiViZ b Zcih, : XXdgY^c\an* ZkZc Z[[ZXi^kZ ^ciZgcVa Xdcigda dkZg [^cVcX^Va gZedgi^c\ XVc egdk^YZ dcan gZVhdcVWaZ VhhjgVcXZ l^i] gZheZXi id [^cVcX^Va hiViZ b Zci egZeVgVi^dc, : ahd* i]Z VhhZhh b Zci d[i]Z Z[[ZXi^kZcZhh d[^ciZgcVa Xdcigda dkZg [^cVcX^Va gZedgi^c\ l Vh b VYZ Vh d[V heZX^[^X YViZ, Igd_ZXi^dch d[Vcn ZkVaj Vi^dc d[Z[[ZXi^kZcZhh id [jijgZ eZg^dYh VgZ hjW_ZXi id i]Z g^h\` i]Vi Xdcigdah b Vn WZXd b Z ^cVYZfjViZ WZXVjhZ d[X]Vc\Zh ^c XdcY^i^dch* dg i]Vi i]Z YZ\gZZ d[Xd b ea^VcXZ l^i] i]Z eda^XX^Zh dg egdXZYjgZh b Vn YZiZg^dgViZ,

 $F \ VcV \ Zb \ Zci^* \ ^c \ Xaj \ Y^c \ | \ i] \ Z < db \ eV cn^+ \ eg^c \ X^e \ Va \ ZmZX ji^k \ Zd[[^X \ Xdc \ Ye^v \ eg^c \ X^e \ Va \ [^c \ VcX^v \ a \ d[[^X \ Xdc \ Yj \ XiZY \ Vc \ VhhZhh b \ Zci \ d[\ i] \ Z \ Z[[ZXi^k \ ZcZhh \ d[\ GZ \ 1 \ .^* \ 0 \ .00^* \ WVhZY \ decX \ Xdcigda \ dk \ Zg[^c \ Xdcigda \ dk \ Zg]^e \ ZY[ZXi' \ ZNL \ Acigda \ dk \ Zg[^c \ Xdcigda \ dk \ Zg]^e \ Yzh \ Xg^WZY \ ^c \ i] \ Z \ 0 \ . \ /1 \ \{ \ Bei \ ZgeVa \ < deigda \ z \ Bei \ Z \ Yvi \ Y \ ? \ ?$

FVa'ce 'W = UVaV UV e FVXZdeVcVU DfSZT 5TT' f eZ X : Zc^

 $Mdi]Z; dVgYd[= ^gZXidgh VcY LidX`]daYZghd[GZ1h < dgedgVi^dc8]$

$CaI_I^- - eYV : I_R_TZR GeReV^V_ed$

 $PZ\]VkZ\ Vj\ Y^iZY\ i]Z\ VXXd\ b\ eVcn^c\setminus Xdchda^YViZY\ WVaVcXZ\ h]ZZih\ d[\ GZ\ 1\ +\ dgedg\ Vi^dc\ \&i]Z\ <d\ b\ eVcn'\ Vh\ d[\ Cj\ cZ\ 1\ .\ ^0\ .00\ VcY\ 0\ .0/^*\ i]Z\ gZaViZY\ Xdchda^YViZY\ hiViZ\ b\ Zcih\ d[\ deZgVi^dch^*\ Xd\ b\ egZ]Zch^kZ\ ^cXd\ b\ Z\ \&adhh'^*\ Zfj^nin^*\ VcY\ XVh]\ [ad\ 1\ h\ [dg\ ZVX]\ d[\ i]Z\ i]gZZ\ nZVgh\ ^c\ i]Z\ eZg^dY\ ZcYZY\ Cj\ cZ\ 1\ .\ ^0\ .00^*\ VcY\ i]Z\ gZaViZY\ cdiZh\ \&XdaaZXi^kZan\ gZ[ZggZY\ id\ Vh\ i]Z\ \{Xdchda^YViZY\ [^cVcX^Va\ hiViZ\ b\ Zcih\ |\ ',\ Bc\ dj\ g\ de^c^dc^*\ i]Z\ Xdchda^YViZY\ [^cVcX^Va\ hiViZ\ b\ Zcih\ |\ ',\ Bc\ dj\ g\ de^c^dc^*\ i]Z\ Xdchda^YViZY\ [^cVcX^Va\ hiViZ\ b\ Zcih\ |\ ',\ Bc\ dj\ g\ de^c^dc^*\ i]Z\ eZg^dY\ a\ d[\ i]Z\ i]Z\ nZVgh\ ^c\ i]Z\ eZg^dY\ ZcYZY\ Cj\ cZ\ 1\ .\ ^0\ .00^*\ ^c\ Xdc[dg\ b\ 'n\ 1\ 'i]\ N,L,\ ZcZgVaan\ VXXZeiZY\ VXXdj\ ci^c\ eg^cX^eaZh,$

6RdZd W`c Cal l`

 $M]ZhZ [^cVcX^Va hiViZbZcih VgZ i]Z gZhedch^W^a^in d[GZlh < dgedgVi^dc^h b VcV \setminus ZbZci, Hjg gZhedch^W^a^in ^h id ZmegZhh Vc de^c^dc dc i]Z < dbeVcn-h [^cVcX^Va hiViZbZcih WVhZY dc djg VjY^ih, PZ VgZ V ej Wa^X VXXdjci^c \setminus [^gb gZ \setminus hiZgZY l^i] i]Z I < : H; VcY VgZ gZfj^gZY id WZ ^cYZeZcYZci l^i] gZheZXi id i]Z < dbeVcn ^c VXXdgYVcXZ l^i] i]Z N,L, [ZYZgVa hZXjg^i^Zh aV lh VcY i]Z Veea^XVWaZ gjaZh VcY gZ \jaVi^dch d[i]Z LZXjg^i^XD VcY > mX]Vc \Z < dbb^hh^dc VcY i]Z I < : H;,$

PZ XdcYjXiZY djg VjY^ih ^c VXXdgYVcXZ 1^i] i]Z hiVcYVgYh d[i]Z I<: H;, M]dhZ hiVcYVgYh gZfj^gZi]Vi 1Z eaVc VcY eZg[dg b i]Z VjY^i id dWiV^c gZVhdcVWaZ VhhjgVcXZ VWdji 1]Zi]Zg i]Z [^cVcX^Va hiViZbZcih VgZ [gZZ d[b ViZg^Va b^hhiViZbZci* 1]Zi]Zg YjZ id Zggdg dg [gVjY, Hjg VjY^ih ^cXajYZY eZg[dg b^c\ egdXZYjgZh id VhhZhh i]Z g^h`h d[b ViZg^Va b^hhiViZbZci d[i]Z [^cVcX^Va hiViZbZcih* 1]Zi]Zg YjZ id Zggdg dg [gVjY* VcY eZg[dg b^c\ egdXZYjgZh i]Vi gZhedcY id i]dhZ g^h`h, LjX] egdXZYjgZh ^cXajYZY ZmV b^c^c* dc V iZhi WVh^h* Zk^YZcXZ gZ\VgY^c\ i]Z Vbdjcih VcY Y^hXadhjgZh ^c i]Z [^cVcX^Va hiViZbZcih, Hjg VjY^ih Vahd ^cXajYZY ZkVajVi^c\ i]Z VXXdjci^c\ eg^cX^eaZh jhZY VcY h^\c^[^XVci Zhi^b ViZh b VYZ Wn b VcV\ZbZci* Vh 1 Zaa Vh ZkVajVi^c\ i]Z dkZgVaa egZhZciVi^dc d[i]Z [^cVcX^Va hiViZbZcih, PZ WZa^ZkZ i]Vi djg VjY^ih egdk^YZ V gZVhdcVWaZ WVh^h [dg djg de^c^dc,

7 clelTR] 5 fUle A ReeVcd

 $M]Z Xg^{i}^{i}XVa Vj Y^{i} b ViiZgh Xd b b j c^{X}ViZY WZad 1 VgZ b ViiZgh Vg^{h}^{c} \left[gd b i \right]Z XjggZci eZg^{d}Y Vj Y^{i} d[i]Z [^{c}VcX^{V}a hiViZb Zcih i]Vi 1 ZgZ Xd b b j c^{X}ViZY dg gZf j^{g}ZY id WZ Xd b b j c^{X}ViZY id i]Z Vj Y^{i} Xd b b^{i}iZZ VcY i]Vi8 &/ gZaViZ id VXXd j cih dg Y^{h}Xadh j gZh i]Vi VgZ b ViZg^{V}a id i]Z [^{c}VcX^{V}a hiViZb Zcih VcY &O' ^{c}dakZY dj g ZheZX^{V}aan X]VaaZc ^{c} hj W_ZXi^{k}Z^{*} dg Xd b eaZm_j Y b Zcih, M]Z Xd b b j c^{X}Vi^{d}c d[Xg^{i}XVa Vj Y^{i} b ViiZgh YdZh cdi VaiZg ^{c} Vcn 1 Vn dj g de^{c}dc dc i]Z [^{c}VcX^{V}a hiViZb Zcih^{*}iV^{*}Zc Vh V 1]daZ^{*} VcY 1 Z VgZ cdi^{*} Wn Xd b b j c^{X}Vi^{c} b ViiZgh WZad 1 * egdk^{Y}^{c} hZeVgViZ de^{c}dch dc i]Z Xg^{i}XVa Vj Y^{i} b ViiZgh dg dc i]Z VXXdj cih dg Y^{h}Xadh j gZh id 1]^{X} i]Zn gZaViZ,$

$JR[fReZ`_`WX``UhZ]] R_U Z_UVWZ_ZeV']ZgVU Z_eR_XZS]V RddVed$

 $4N \setminus L[RY]RXW X0]QN$ = J]]N[$: h\ gZ[aZXiZY\ ^\circ c\ i\]Z< d\ b\ eV\ cn\ ^\circ h\ Xd\ chda\ ^\circ YviZY\ [^\circ cV\ cX^Va\ hiViZ\ b\ Zcih^*\ Vi\ Cj\ cZ\ 1\ .^*\ 0\ .00^*\ i\]Z< d\ b\ eV\ cn\ ^\circ h\ ddY\ 1\ ^\circ aa\ 1\ Vh\ "3,/5\ W^aa^dc\ VcY\ ^cYZ[^\circ c^iZ+a^kZY\ ^ciVc\ ^WaZ\ VhhZih\ 1\ ZgZ\ "/,.1\ W^aa^dc\ ,: h\ Y^hXadhZY\ ^c\ GdiZ\ 6\ id\ i\]Z\ Xd\ chda^\circ YViZY\ [^\circ cV\ cX^Va\ hiViZ\ b\ Zcih^*\ \ ddY\ 1\ ^\circ aa\ VcY\ ^cYZ[^\circ c^iZ+a^kZY\ ^ciVc\ ^WaZ\ VhhZih\ VgZ\ iZhiZY\ [dg\ ^b\ eV^g\ b\ Zci\ Vi\ aZVhi\ Vccj\ Vaan\ dg\ b\ dgZ\ [gZfjZcian\ ^[\ ^cY^NVidgh\ d[\ ^b\ eV^g\ b\ Zci\ gZfj^gZ\ i\]Z\ eZg[dg\ b\ VcXZ\ d[\ Vc\ ^ciZg^b\ b\ ^b\ eV^g\ b\ Zci\ VhhZhh\ b\ Zci,$

 $: jY^{i}^{c} \setminus bVcV \setminus ZbZci^{a} \wedge beV^{a}gbZci iZhih d[\setminus ddY 1^{a}a VcY ^{c}YZ[^{c}^{i}Z+a^{k}ZY ^{c}iVc \setminus WaZ VhhZih 1 Vh XdbeaZm VcY]^{]an _jY \setminus bZciVa YjZ id i]Z h^{c}[XVci bZVhjgZbZci jcXZgiV^{c}in ^{c}YZiZgb^{c}c \setminus i]Z [V^{a}gkVajZh d[i]Z gZedgi^{c} jc^{i}h VcY ^{c}YZ[^{c}^{i}Z+a^{k}ZY ^{c}iVc \setminus WaZ VhhZih, Bc eVgi^{x}Ja^{y}e^{i}]Z [V^{a}gkVajZ Zhi^{b}ViZh d[i]Z gZedgi^{c} jc^{i}h 1ZgZ hZch^{i}^{k}Z id X]Vc \setminus h^{c}h^{c}[^{x}Vci Vhhj bei^{d}ch hjX] Vh Y^{h}Xdjci gViZh^{z}ZmeZXiZY [jijgZ XVh] [ad 1 h^{z}adc +iZgb \gd 1 i] gViZh VcY XdbeVgVWaZ XdbeVcn ZVgc^{c}h bjai^{e}aZh, M]Z [V^{a}gkVajZ Zhi^{b}ViZh [dg ^{c}YZ[^{c}^{i}Z+a^{k}ZY ^{c}iVc \setminus WaZ VhhZih 1ZgZ hZch^{i}^{k}Z id h^{c}^{(x}Vci Vhhj bei^{d}ch hjX] Vh Y^{h}Xdjci gViZh^{z}ZmeZXiZY [jijgZ XVh] [ad 1 h^{z}gdnVain gViZh^{z}VcY iZgb^{c}a \gd 1 i] gViZh, M]ZhZ Vhhj bei^{d}ch VgZ V[[ZXiZY Wn ZmeZXiZY [jijgZ bVg^{z}i dg ZXdcdb^{x}XdcY^{i}^{d}ch,]$

 $\begin{array}{l} 8X `GN 1MM[N \setminus NM] \\ QN = J]N[RW ?^[\\ 1^MR] \end{array}$

MVWaZ d[<dciZcih

 $8X \ GN \ 1MM[N \setminus NM]$ $QN = J]]N[RW \ ? \ [$ $1^MR]$

PZdWiV^cZY VcjcYZghiVcY^c*ZkVajViZYi]ZYZh^\cVcYiZhiZYi]ZdeZgVi^c\Z[[ZXi^kZcZhhd[i]ZXdcigdahdkZgi]Z <dbeVcn~hVXXdjci^c\[dgi]ZWjh^cZhhXdbW^cVi^dc, ?dgZmVbeaZ*1ZiZhiZYXdcigdahdkZgi]ZkVajVi^dcd[i]ZXjhidbZggZaVi^dch]^eh^ciVc\^WaZVhhZi*^cXajY^c\bVcV\ZbZci~hgZk^Zld[i]Zh^\c^[^XVciVhhjbei^dc^cZhi^bVi^c\i]Z[V^gkVajZd[i]ZXjhidbZggZaVi^dch]^eh^ciVc\^WaZVhhZi,

-h->gchi \$ Rdjc\ EEI
PZ]VkZ hZgkZY Vhi]Z <dbeVcn~h VjY^idg h^cXZ 0./0,
GZ1 Rdg^*GZ1 Rdg^
: j\jhi/0*0.00

B9KG7CFDCF5H=CB

7 CBGC@=85H98 GH5H9A9BHG C: CD9F5H=CBG #=BA=@@=CBGk9L79DHD9FG<5F95ACIBHG\$

B9KG7CFDCF5H=CB

B9KG7CFDCF5H=CB

7CBGC@=85H9865@5B79G<99HG #=B A=@@=CBG&9L79DHG<5F95B8D9FG<5F95ACIBHG\$

7 CBGC@=8 5H9 8 GH5H9 A 9BHG C: 9E I=HM #=B A=@@=CBG\$

	7]Rd 7`^^`_		7]R 7`^^`		5 UUZeZ`_R] DRZU'Z	5TTf^f]ReVU	5TT f ^ f]ReVU CeYVc 7`^acVYV_dlgV	H`eR] BVhd 7`ca`cReZ`_	B`_T`_ec`]] <i>I</i> _X	H`eR]
	GYRcVd	5 ^ ` f_e	GYRcVd	5 ^ `f_e	7 RaZeR]	8 VWZTZe	@`dd	9bf/lej _	=_eVcVded	9bf/lej
; VaVcXZ* CjcZ 1.* 0./7	164	" 2	0	" 0	" /0*021	" &/*757'	" &/*/04'	" 7*/22	" /*/45	" /.*1//
<j [gdb<br="" bjavi^kz^bevxi="">VYdei^dc d[cZl VXXdjci^c\hiVcYVgYh</j>	z	Z	Z	z	z	4	1	7	Z	7
GZi adhh	z	z	z	z	z	&/*047'	z	&/*047'	&054'	&/*323'
Hi]Zg Xd b egZ]Zch^kZ adhh	Z	z	Z	z	z	z	å0.6'	&0.6'	&21'	&03/'
$=^{h}k^{y}ZcYh$	z	z	Z	Z	&//5'	Z	Z	&//5'	&2/'	&/36'
Hi]Zg	1	z	z	z	00	/	z	01	Z	01
; VaVcXZ* CjcZ 1.* 0.0.	167	2	0	0	/0*/26	&1*02/'	&/*11/'	5*360	6.5	6*167
GZi ^cXd b Z	z	z	z	z	z	11.	z	11.	37	167
Hi]Zg XdbegZ]Zch^kZ ^cXdbZ	Z	z	Z	Z	Z	Z	17.	17.	56	246
$=^{h}k^{y}ZcYh$	z	Z	z	z	&//6'	z	z	&//6'	&23'	&/41'
Hi]Zg	0	Z	z	z	05	z	Z	05	14	41
; VaVcXZ* CjcZ 1.* 0.0/	17/	2	0	0	/0*.35	&O*7//'	&72/'	6*0//	713	7*/24
GZi ^cXd b Z	z	z	Z	z	z	401	z	401	/15	54.
$Hi\]Zg\ Xd\ b\ egZ\]Zch^kZ$ adhh	Z	z	Z	Z	Z	z	&107'	&107'	&75'	&204'
$=^{h}k^{y}ZcYh$	Z	Z	Z	Z	&//6'	Z	Z	&//6'	&35'	&/53'
L]VgZ gZejgX]VhZh	&4'	Z	&1'	Z	&/56'	&3'	Z	&/61'	Z	&/61'
Hi]Zg	1	Z	Z	Z	/6	Z	Z	/6	1	0/
; VaVcXZ* CjcZ 1.* 0.00	166	2	/75	0	/ /*557	&O*071'	&/*05.'	6*000	70/	7*/21

M]Z VXXd b eVcn^c\ cdiZh VgZ Vc ^ciZ\gVa eVgi d[i]ZhZ Vj Y^iZY Xdchda^YViZY [^cVcX^Va hiViZ b Zcih,

BCH9 +(89G7F=DH=CB C: 61G=B9GG 5B8 65G=G C: DF9G9BH5H=CB

 $GZ1h < dgedgVi^dc \&id \setminus Zi \mid Zg \mid 1^i \mid ^ih hj Wh^Y^Vg^Zh^* \\ \{GZ1h < dgedgVi^dc^* \mid \{GZ1h < dge^* \mid i \mid Z \mid (dbeVcn^* \mid \{1Z \mid dg \{jh \mid ' ^h V \setminus adWVaY^kZgh^[^ZY \mid bZY^V \lor CY \land c \mid gb Vi^dc hZgk^XZh Xd \mid beVcn Xd \mid ge^hZY \mid (Wjh^cZhhZh VXgdhh V gVc \setminus Zd \mid bZY^V^* \land cXaj Y^c \setminus 8 Y^\wedge \land iVa gZVaZhiViZ hZgk^XZh^* hj WhXg^ei^dc k^YZd hZgk^XZh ^c : jhigVa^V^* cZlh VcY ^c \mid gb Vi^dc hZgk^XZh VcY Wdd ^ej Wa^h]^c \setminus (gVc)^2 + (gVc$

+ARIR NF OQEREMSASINM

 $M]Z\ VXXd\ b\ eVcn^c\setminus Xdchda^YViZY\ [^cVcX^Va\ hiViZ\ b\ Zcih\ d[\ i\]Z\ < d\ b\ eVcn^*\ 1\]^X]\ VgZ\ gZ[ZggZY\ id\]ZgZ^c\ Vh\ i\]Z\ \{< dchda^YViZY\ ?^cVcX^Va\ LiViZ\ b\ Zcih^*|\]VkZ\ WZZc\ egZeVgZY\ ^c\ VXXdgYVcXZ\ 1^i]\ \ \ \ \ \ \ \ VXXZeiZY\ VXXdj\ ci^c\setminus\ eg^cX^eaZh\ ^c\ i\]Z\ Nc^iZY\ LiViZh\ d[\ :\ b\ Zg^XV\ \&\{@::I|',M]Z\ < d\ b\ eVcn^h\ [^cVcX^Va\ hiViZ\ b\ Zcih\ Vh\ d[\ VcY\ [dg\ i\]Z\ [^hXVa\ nZVgh\ ZcYZY\ CjcZ\ 1.*0.00*0.0/\ VcY\ 0.0.\ VgZ\ egZhZciZY\ dc\ VXdchda^YViZY\ WVh^h,$

 $M]Z \ Xdchda^{\gamma}YiZY \ hiViZbZcih \ d[\ deZgVi^{\circ}dch \ VgZ \ gZ[ZggZY \ id\]ZgZ^{\circ}c \ Vh \ i]Z \ \{LiViZbZcih \ d[\ HeZgVi^{\circ}dch, |\ M]Z \ Xdchda^{\gamma}YViZY \ WVaVcXZ \ h]ZZih \ VgZ \ gZ[ZggZY \ id\]ZgZ^{\circ}c \ Vh \ i]Z \ \{LiViZbZcih \ d[\ XVh] \ [ad \ l \ h \ VgZ \ gZ[ZggZY \ id\]ZgZ^{\circ}c \ Vh \ i]Z \ \{LiViZbZcih \ d[\ Vh] \ ?ad \ l \ h, |\ VaVcXZ \ L]ZZih, |\ M]Z \ Xdchda^{\gamma}YViZY \ hiViZbZcih \ d[\ XVh] \ [ad \ l \ h \ VgZ \ gZ[ZggZY \ id\]ZgZ^{\circ}c \ Vh \ i]Z \ \{LiViZbZcih \ d[\ Vh] \ ?ad \ l \ h, |\ VaVcXZ \ L]ZZih, |\ M]Z \ Xdchda^{\gamma}YViZY \ hiViZbZcih \ d[\ XVh] \ [ad \ l \ h \ VgZ \ gZ[ZggZY \ id\]ZgZ^{\circ}c \ Vh \ i]Z \ \{LiViZbZcih \ d[\ XVh] \ ?ad \ l \ h, |\ VaVcXZ \ L]ZZih, |\ M]Z \ Xdchda^{\gamma}YViZY \ hiViZbZcih \ d[\ XVh] \ [ad \ l \ h \ VgZ \ gZ[ZggZY \ id\]ZgZ^{\circ}c \ Vh \ i]Z \ \{LiViZbZcih \ d[\ XVh] \ ?ad \ l \ h, |\ VaVcXZ \ L]ZZih, |\ M]Z \ Xdchda^{\gamma}YViZY \ hiViZbZcih \ d[\ XVh] \ [\ XVh] \ [\ XVh] \ [\ XVh] \ YaVcXZ \ L]ZZih, |\ M]Z \ Xdchda^{\gamma}YViZY \ hiViZbZcih \ d[\ XVh] \ [\ XVh] \ [\ XVh] \ [\ XVh] \ YaVcXZ \ L]ZZih, |\ M]Z \ Xdchda^{\gamma}YViZY \ hiViZbZcih \ d[\ XVh] \ [\ XVh] \ [\ XVh] \ YaVcXZ \ L]ZZih, |\ M]Z \ Xdchda^{\gamma}YViZY \ hiViZbZcih \ d[\ XVh] \ [\ XVh] \ [\ XVh] \ YaVcXZ \ L]ZZih, |\ M]Z \ Xdchda^{\gamma}YViZY \ hiViZbZ \ hiViZbZcih \ d[\ XVh] \ [\ XVh] \ YaVcXZ \ L]ZZih, |\ M]Z \ Xdchda^{\gamma}YViZY \ hiViZbZ \ hiV$

M]Z <dbeVcn b V^ciV^ch V 30+31 1ZZ` [^hXVa nZVg ZcY^c\ dc i]Z LjcYVn XadhZhi id CjcZ 1. ^c ZVX] nZVg, ?^hXVa 0.00* [^hXVa 0.0/VcY [^hXVa 0.0. ^cXajYZY 31* 30 VcY 30 1ZZ` h* gZheZXi^kZan, : aa gZ[ZgZcXZh id i]Z [^hXVa nZVgh ZcYZY CjcZ 1.* 0.00* 0.0/VcY 0.0. gZaViZ id i]Z [^hXVa nZVgh ZcYZY Cjan 1* 0.00* CjcZ 05* 0.0/VcY CjcZ 06* 0.0.* gZheZXi^kZan, ?dg XdckZc^ZcXZ ejgedhZh* i]Z <dbeVcn Xdci^cjZh id YViZ ^ih Xdchda^YViZY [^cVcX^Va hiViZbZcih Vh d[CjcZ 1.,

BCH9, (GIAA5FMC: G=; B=:=75BH577CIBH=B; DC@=7=9G

9QIMCIOKER NF CNMRNKIDASINM

M]Z <dchda^YViZY ?^cVcX^Va LiViZbZcih ^cXajYZi]Z VXXdjcih d[Vaa bV_dg^in+dlcZY VcY XdcigdaaZY hjWh^Y^Vg^Zh, Bc VYY^i^dc*i]Z

, NMCEMSQASINM NF CQEDIS QIR**J**

 $<\!d\,b\,e\,V\,c\,n\,\sim\!h\,h\,]\,V\,g\,Z\,d\,[\,i\,]\,Z\,\,^{\wedge}c\,k\,Z\,h\,i\,Z\,Z\,h\,\sim\,Z\,V\,g\,c\,^{\wedge}c\,\,\backslash\,h\,\,\&\,a\,d\,h\,h\,Z\,h\,^{'}\,\,V\,c\,Y\,\,i\,]\,Z\,<\!d\,b\,e\,V\,c\,n\,\sim\!h\,\,L\,i\,V\,i\,Z\,b\,\,Z\,c\,i\,h\,\,d\,[\,<\!V\,h\,]\,\,\,?\,a\,d\,\,l\,\,h\,\,^{\wedge}c\,X\,a\,j\,\,Y\,Z\,\,V\,a\,a\,\,X\,V\,h\,]\,\,g\,Z\,X\,Z\,^{\wedge}k\,Z\,Y\,\,[\,g\,d\,\,b\,\,d\,g\,\,e\,V\,^{\wedge}\,Y\,\,i\,d\,\,i\,]\,Z\,\,^{\wedge}c\,k\,Z\,h\,i\,Z\,Z\,,$

 $: XXj\ b\ jaViZY\ di\]Zg\ Xd\ b\ egZ\]Zch^kZ\ adhh\ VgZ\ gZXd\ c^oZY\ ^c\ i\]Z\ LiViZ\ b\ Zcih\ d[\ HeZgVi^dch\ 1\]Zc\ i\]Z\ [dgZXVhiZY\ igVchVXi^dc\ ^b\ eVXih\ ^cXd\ b\ Z\ dg\ ^[\ i\]Z\ [dgZXVhiZY\ igVchVXi^dc\ ^h\ cd\ adc\ Zg\ ZmeZXiZY\ id\ dXXj\ g,$

 $Nedc\ VYdei^dc\ d[\ : XXdj\ ci^c\setminus\ LiVcYVgYh\ NeYViZ\ \&\{\ : LN\ |\ '0./5+/0\ ^c\ [^hXVa\ 0.0.^*\ i\]Z< d\ b\ eVcn\ gZXaVhh^[^ZY\ "3\ b\ ^aa^dc\ ^c\ \ V^ch\ [gd\ b\ : XXj\ b\ jaViZY\ YZ[^X^i\ id\ : XXj\ b\ jaViZY\ di\]Zg\ Xd\ b\ egZ]Zch^kZ\ adhh\ gZaViZY\ id\ V\ b\ dj\ cih\ egZk^dj\ han\ gZXdgYZY\ [dg\ i\]Z\ ^cZ[[ZXi^kZ]Zch^kZ]Zch^kZ\ adhh\ gZaViZY\ id\ V\ b\ dj\ cih\ egZk^dj\ han\ gZXdgYZY\ [dg\ i\]Z\ ^cZ[[ZXi^kZ]Zch^kZ]Zch^kZ\ adhh\ gZaViZY\ id\ V\ b\ dj\ cih\ egZk^dj\ han\ gZXdgYZY\ [dg\ i\]Z\ ^cZ[[ZXi^kZ]Zch^kZ]Zch^kZ\ adhh\ gZaViZY\ id\ V\ b\ dj\ cih\ egZk^dj\ han\ gZXdgYZY\ [dg\ i\]Z\ ^cZ[[ZXi^kZ]Zch^kZ]Zch^kZ\ adhh\ gZaViZY\ id\ V\ b\ dj\ cih\ egZk^dj\ han\ gZXdgYZY\ [dg\ i\]Z\ ^cZ[[ZXi^kZ]Zch^kZ]Zch^kZ\ adhh\ gZaViZY\ id\ V\ b\ dj\ cih\ egZk^dj\ han\ gZXdgYZY\ [dg\ i\]Z\ ^cZ[[ZXi^kZ]Zch^kZ]Zch^kZ\ adhh\ gZxViZY\ [dg\ i\]Z\ ^cZ[[ZXi^kZ]Zch^kZ]Zch^kZ\ adhh\ gZxVZ\ adhh\$

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5EARER

EZVhZh VgZ XaVhh^[ZY Vh Z^i]Zg [^cVcXZ aZVhZh dg deZgVi^c\ aZVhZh, : aZVhZ ^h XaVhh^[^ZY Vh V [^cVcXZ aZVhZ ^[Vcn dcZ d[i]Z [daad 1 ^c\ Xg^iZg^V VgZ b Zi8 i]Z aZVhZ igVch[Zgh d 1 cZgh]^e d[i]Z VhhZi Wn i]Z ZcY d[i]Z aZVhZ iZg b* i]Z aZVhZ XdciV^ch Vc dei^dc id ejgX]VhZ i]Z VhhZi i]Vi ^h gZVhdcVWan XZgiV^c id WZ ZmZgX^hZY* i]Z aZVhZ iZg b ^h [dg V b V_dg eVgi d[i]Z gZ b V^c^c\ jhZ[ja a^[Z d[i]Z VhhZi dg i]Z egZhZci kVajZ d[i]Z aZVhZ eVn b Zcih Zfj Vah dg ZmXZZYh hj WhiVci^Vaan Vaa d[i]Z [V^g kVajZ d[i]Z VhhZi, : aZVhZ ^h XaVhh^[^ZY Vh Vc deZgVi^c\ aZVhZ ^[^i YdZh cdi b ZZi Vcn dcZ d[i]ZhZ Xg^iZg^V, M]Z <db eVcn-h deZgVi^c\ aZVhZh eg^b Vg^an Xdch^hi d[gZVa ZhiViZ* ^cXajY^c\ d[[^XZ heVXZ* 1 VgZ]djhZ heVXZ VcY eg^ci^c\ [VX^a^i^Zh* VcY hViZaa^iZ igVchedcYZgh [dg ejgedhZh d[egdk^Y^c\ ^ih hjWhXg^ei^dc k^YZd hZgk^XZh id Xdch j b Zgh VcY ^ih [^cVcXZ aZVhZh Xdch^hi d[hViZaa^iZ igVchedcYZgh,

?dg deZgVi^c\ aZVhZh* b^c^bj b aZVhZ eVn bZcih* ^cXajY^c\ b^c^bj b hX]ZYjaZY gZci ^cXgZVhZh* VgZ gZXd\c^oZY Vh gZci ZmeZchZ dc V higV^\]i+a^cZ WVh^h dkZg i]Z Veea^XVVWaZ aZVhZ iZg bh, ?dg [^cVcXZ aZVhZh* aZVhZ zmeZchZ Xdch^hih d[i]Z YZegZX^Vi^dc d[i]Z g^\]i+d[+jhZ VhhZi* Vh 1 Zaa Vh ^ciZgZhi ZmeZchZ gZXd\c^oZY dc i]Z aZVhZ a^VW^a^in WVhZY dc i]Z Z[[ZXi^kZ ^ciZgZhi bZi]dY jh^c\ i]Z gViZ ^bea^XX^i ^c i]Z aZVhZ dg i]Z <dbeVcn\h^cXgZ bZciVa Wdggd 1^c\ gViZ, : aZVhZ\h iZg b WZ\^ch dc i]Z YViZ i]Vi i]Z <dbeVcn dWiV^ch edhhZhh^dc d[i]Z aZVhZY egZ b^hZh VcY \dZh i]gdj\]i]Z ZmeZXiZY aZVhZ iZg b^cVi^dc YViZ, LZZ GdiZ /. z EZVhZh,

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KdnVain VYkVcXZh VgZ ^c^i^Vaan XVe^iVa^oZY VcY hjWhZfjZcian ZmeZchZY Vh gZaViZY gZkZcjZh VgZ ZVgcZY dg 1]Zc i]Z <dbeVcn YZiZgb^cZh [jijgZ gZXdkZgn^h cdi egdWVWaZ, M]Z <dbeVcn]Vh V adc\]^hidgn d[egdk^Y^c\ Vji]dgh 1^i] gdnVain VYkVcXZh* VcY ^i igVX`h ZVX] VYkVcXZ ZVgcZY 1^i] gZheZXi id i]Z hVaZ d[i]Z gZaViZY ejWa^XVi^dc, A^hidg^XVaan*i]Z adc\Zg i]Z jcZVgcZY edgi^dc d[i]Z VYkVcXZ gZbV^ch djihiVcY^c*i]Z aZhh a^`Zan ^i ^h i]Vi i]Z <dbeVcn 1^aa gZXdkZg i]Z VYkVcXZ i]gdj\] i]Z hVaZ d[i]Z ejWa^XVi^dc, M]Z <dbeVcn Veea^Zh i]^h]^hidg^XVa ZmeZg^ZcXZ id ^ih Zm^hi^c\ djihiVcY^c\ gdnVain VYkVcXZh id Zhi^bViZ i]Z a^`Za^]ddY d[gZXdkZgn VcY V egdk^h^dc ^h ZhiVWa^h]ZY id 1 g^iZ+d[[i]Z jcZVgcZY VYkVcXZ*jhjVaan WZi 1 ZZc /O VcY O2 bdci]h V[iZg ^c^ivVa ejWa^XVi^dc d[i]Z [^ghi [dg b Vi, : YY^i^dcVaan*i]Z <dbeVcn gZk^Z l h ^ih edgi[da^d d[gdnVain VYkVcXZh [dg jcejWa^h]ZY i^iaZh id YZiZg b^cZ ^[^cY^k^YjVa gdnVain VYkVcXZh VgZ cdi gZXdkZgVWaZ [dg Y^hXgZiZ gZVhdch*hjX] Vh i]Z YZVi] d[Vc Vji]dg eg^dg id Xd beaZi^dc d[V i^iaZ dg i^iaZh* V <dbeVcn YZX^h^dc id cdi ejWa^h] V i^iaZ* eddg b Vg`Zi YZ b VcY dg di]Zg gZaZkVci [VXidgh i]Vi XdjaY ^beVXi gZXdkZgVW^a^in, ; VhZY dc i]^h ^c[dg b Vi^dc*i]Z edgi^dc d[Vcn VYkVcXZ i]Vi i]Z <dbeVcn WZa^ZkZh ^h cdi gZXdkZgVWaZ ^h ZmeZchZY,

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 $M]Z \ ejgX]\ VXfj^h^i^c C \ ^hViig^NijZY \ id \ i]Z \ VhhZih \ VXfj^gZY \ VcY \ a^NVW^a^i^Zh \ Vhhj \ b \ ZY \ WVhZY \ dc \ i]Z^g \ [V^g kVajZh \ Vi \ i]Z \ YViZ \ d[\ VXfj^h^i^c C^* \ 1^i] \ XZgiV^c \ ZmXZei^dc^c \ ^c \ VXXdgYVcXZ \ 1^i] \ @:: I, =ZiZg b^c^c c \ i]Z \ [V^g kVajZ \ d[\ VhhZih \ VXfj^gZY \ VcY \ a^NVW^a^i^Zh \ Vhhj \ b \ ZY \ ^ckdakZh \ i]Z \ jhZ \ d[\ h^\c^[^XVci _jY\ b \ Zcih^* \ ^cXaj \ Y^c \ _jY\ b \ Zcih \ VWdji \ Veegdeg^ViZ \ Y^hXdjci \ gViZh^* \ Viig^i^dc \ gViZh^* \ gdn \ Vain \ gViZh \ VcY \ [jijgZ \ XVh] \ [ad 1 h, M]Z \ ZmXZhh \ ejgX]\ VhZ \ eg^XZ \ dkZg \ i]Z \ [V^g kVajZ \ d[\ cZi \ iVc\ ^waZ \ VcY \ ^YZci^[^VWaZ \ ^ciVc\ ^waZ \ VhhZih \ VXfj^gZY \ ^h \ gZXdgYZY \ Vh \ ddY \ 1^aa \ VcY \ ^h \ Vhh^\cZY \ id \ i]Z \ gZedgi^c \ jc^i \ i]Vi \ ^h \ ZmeZXiZY \ id \ WZcZ[^i \ [gd b \ i]Z \ Wjh^cZhh \ Xd \ b \ W^cVi^dc \ Vh \ d[\ i]Z \ VXfj^h^i^dc \ YViZ,$

ONNOVIKK AMD IMSAMGIBKE ARRESR

Bc VXXdgYVcXZ 1^i] : L< 13.* ^c VhhZhh^c\ \ddY 1^aa [dg ^b eV^g b Zci* i] Z < d b eVcn]Vh i] Z dei^dc id [^ghi eZg[dg b V fjVa^iVi^kZ VhhZhh b Zci id YZiZg b^cZ 1]Zi]Zg ZkZcih dg X^gXj b hiVcXZh Zm^hi i]Vi aZVY id V YZiZg b^cVi^dc i]Vi ^i ^h b dgZ a^ Zan i]Vc cdi i]Vi i]Z [V^g kVajZ d[V gZedgi^c\ j c^i ^h aZhh i]Vc ^ih XVggn^c\ V b dj ci, B[i]Z < d b eVcn YZiZg b^cZh i]Vi ^i ^h cdi b dgZ a^ Zan i]Vc cdi i]Vi i]Z

 $[V^{\circ}g \ kVajZ \ d[\ V \ gZedgi^{\circ}c \setminus j \ c^{i} \ ^{\circ}h \ aZhh \ i]Vc \ ^{\circ}h \ XVggn^{\circ}c \setminus V \ b \ dj \ ci^{*}i]Z < d \ b \ eVcn \ ^{h} \ cdi \ gZfj^{\circ}gZY \ id \ eZg[dg \ b \ Vcn \ VYY^{i}^{\circ}dcVa \ iZhih ^{c} V \ hAZhh^{\circ}c \setminus dY \ l^{\circ}aa \ [dg \ ^{b} \ eV^{\circ}g \ b \ Zci, \ Ad \ l \ ZkZg^{*} \ ^{[}i]Z < d \ b \ eVcn \ XdcXaj \ YZh \ di \]Zg \ l^{\circ}hZ \ dg \ ZaZXih \ cdi \ id \ eZg[dg \ b \ i]Z \ fj \ Va^{\circ}iVi^{\circ}kZ \ V \ hAZhh \ b \ Zci^{*}i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ c^{i} \ ^{*}VcY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ c^{i} \ ^{*}VcY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ c^{i} \ ^{*}VcY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ c^{i} \ ^{*}VcY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ c^{i} \ ^{*}VcY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ c^{i} \ ^{*}VcY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ c^{i} \ ^{*}VcY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ c^{i} \ ^{*}VcY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ c^{i} \ ^{*}VcY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ C^{\circ}g \ VCY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ C^{\circ}g \ VCY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ C^{\circ}g \ VCY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ C^{\circ}g \ VCY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ C^{\circ}g \ VCY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ C^{\circ}g \ VCY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ d[\ i]Z \ gZedgi^{\circ}c \setminus j \ C^{\circ}g \ VCY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ kVajZ \ G[\ i]Z \ V^{\circ}g \ VCY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ VCY \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ VCY \ Xd \ b \ eVgZ \ Xd \ b \ eVgZ \ Xd \ b \ eVgZ \ i]Z \ [V^{\circ}g \ VCY \ Xd \ b \ eVgZ \ Xd \ b \ eVgZ \ Xd \ b \$

 $di\,]Zg\,\,cdc+hZgk^XZ\,\,Xdhi\,\,Xd\,b\,\,edc\,Zcih\,\,d[\,\,cZi\,\,eZg^dY^X\,\,WZcZ[^i\,\,\&^cXd\,b\,Z'\,\,Xdhi\,\,^cHi\,]Zg^*\,\,cZi\,\,^c\,\,i\,]Z\,\,LiViZ\,b\,Zcih\,\,d[\,\,HeZgVi^dch,\,\,LZZ\,\,GdiZ\,\,/5\,\,z\,\,KZi^gZ\,b\,Zci\,\,;\,\,ZcZ[^i\,\,HWa^\setminus Vi^dch,\,\,LZZ\,\,GdiZ\,\,/2\,\,ZcZ[^i\,\,Wa^2]\,\,A$

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 $\label{thm:condition} $$hjWhXg^ei^dch\ hdaY^*\ VcY\ i]Z\ VhhdX^ViZY\ gViZh\ X]Vg\ ZY\ id\ i]Z\ Xjhid\ b\ Zgh,\ L^c\ aZ+Xden\ gZkZcjZ\ ^h\ gZXd\ c^oZY\ Vi\ V\ ed^ci\ ^c\ i^b\ Z\ dc\ i]Z\ YViZ\ i]Z\ cZl\ h\ egdYjXih\ VgZ\ hdaY\ id\ Y^hig^Wji^dc\ djiaZih^*\ cZi\ d[\ egdk^h^dch\ [dg\ gZaViZY\ gZij\ gch,$

 $KZkZcjZh [gdb]dbZYZa^kZgn VcY Y^^iVa hjWhXg^ei^dch VgZ gZXd\\c^oZY dkZg i]Z hjWhXg^ei^dc iZg b Vh i]Z cZ l h egdYjXih VcY-dg Y^^iVa hjWhXg^ei^dch VgZ YZa^kZgZY, Bc[dgbVi^dchZgk^XZh hjWhXg^ei^dc gZkZcjZh VgZ gZXd\\c^oZY dkZg i^bZ Vh i]Z hjWhXg^ei^dch VgZ YZa^kZgZY, IVnbZcih [gdb hjWhXg^WZgh VgZ \ZcZgVaan YjZ Vi i]Z WZ\^cc^c d[i]Z bdci] VcY VgZ gZXdgYZY Vh YZ[ZggZY gZkZcjZ, LjX]$

? |QN| | |N_NW^N \

Hi]Zg gZkZcjZh VgZ gZXd\c^oZY 1]Zci]Z gZaViZY hZgk^XZh VgZ eZg[dg b ZY dg i]Z egdYjXi]Vh WZZc YZa^kZgZY,

3XW][JL]\ `R]Q V^U]RYUN YN[OX[VJWLN XKURPJ]RXW\

M]Z <dbeVcn]Vh XZgiV^c gZkZcjZ XdcigVXih 1]^X] XdciV^c bjai^eaZ eZg[dgbVcXZ dWa^\Vi^dch hjX] Vh eg^ci VcY Y^\iva VYkZgi^h^c \ WjcYaZh* Y^\iva VcY eg^ci cZ l heVeZg hj WhXg^ei^dc WjcYaZh VcY WjcYaZY k^YZd hZgk^XZ hj WhXg^ei^dch, KZkZcjZh YZg^kZY [gdb hVaZh XdcigVXih i]Vi XdciV^c bjai^eaZ egdYjXih VcY hZgk^XZh VgZ VaadXViZY WVhZY dc i]Z gZaVi^kZ hiVcYVadcZ hZaa^c \ eg^XZ d[ZVX] eZg[dgbVcXZ dWa^\Vi^dc id WZ YZa^kZgZY, LiVcYVadcZ hZaa^c \ eg^XZ ^h ine^XVaan YZiZgb^cZY WVhZY dc eg^XZh X]Vg\ZY id XjhidbZgh [dg i]Z hVbZ dg h^b^aVg \ddYh dg hZgk^XZh dc V hiVcYVadcZ WVh^h, B[dWhZgkVWaZ hiVcYVadcZ eg^XZh VgZ cdi VkV^aVWaZ* i]Z <dbeVcn Zhi^b b ViZh hiVcYVadcZ hZaa^c \ eg^XZ Wn b Vm^b^o^c \ i]Z jhZ d[dWhZgkVWaZ ^cejih id b dhi VXXjgViZan gZ[aZXi i]Z eg^XZ d[ZVX] ^cY^k^yjVa eZg[dgbVcXZ dWa^\Vi^dc, KZkZcjZ ^h gZXd \c^oZY Vh ZVX] eZg[dgbVcXZ dWa^\Vi^dc ^cXajYZY ^c i]Z XdcigVXi ^h hVi^h[^ZY,

9MNW]RORLJ]RXW X0 J L^\]XVN[JWM P[X\\ _N[\^\ WN] [N_NW^N [NLXPWR]RXW

Bc i]Z cdg b Va XdjghZ d[Wjh^cZhh* i]Z <dbeVcn VXih Vh dg jhZh Vc ^ciZg b ZY^Vgn dg V\Zci ^c ZmZXji^c\ igVchVXi^dch 1 ^i] i]^gY eVgi^Zh, P]Zc i]Z ^ciZg b ZY^Vgn dg V\Zci ^h YZiZg b ^cZY id WZ i]Z <dbeVcn-h Xjhid b Zg* i]Z <dbeVcn gZXdgYh gZkZcjZ WVhZY dc i]Z Vb dj ci ^i ZmeZXih id gZXZ^kZ [gd b i]Z V\Zci dg ^ciZg b ZY^Vgn,

 $CJUN\setminus [N]^{M}$

 $< ZgiV^{\land} c \ d[\ i]Z < db \ eVcn^{\land} egdYjXih^{\ast} hjX] \ Vh \ Wdd^{\backprime} h \ VcY \ cZ \ l \ heVeZgh^{\ast} \ VgZ \ hdaY \ l^{\i} i] \ i]Z \ g^{\land} \ ji \ d[\ gZijgc, \ M]Z < db \ eVcn \ gZXdgYh \ i]Z \ Zhi^{\backprime} b \ ViZY \ ^b \ eVXi \ d[\ hjX] \ gZijgch \ Vh \ V \ gZYjXi^{d}c \ d[\ gZkZcjZ, \ Md \ Zhi^{\backprime} b \ ViZ \ egdYjXih \ hVaZh \ i]Vi \ l^{\land} aa \ WZ \ gZijgcZY \ VcY \ i]Z \ gZaViZY \ egdYjXih \ i]Vi \ VgZ \ ZmeZXiZY \ id \ WZ \ eaVXZY \ WVX \ ^{cid} \ ^{ckZcidgn^{\ast}} i]Z < db \ eVcn \ VcVanoZh \ l^{\land} hidg^{\Lambda}XVa \ gZijgch^{\ast} \ XjggZci \ ZXdcd \ b^{\Lambda}X \ igZcYh^{\ast} \ X]Vc \ Xjhidb \ Zg \ YZb \ VcY \ VxXZeiVcXZ \ d[\ i]Z < db \ eVcn^{\land} h \ egdYjXih, \ ; VhZY \ dc \ i]^{\land} h^{\circ} c[dg \ b \ Vi^{\land} dc^{\ast} i]Z < db \ eVcn \ gZhZgkZh \ V \ eZgXZciV \ Z \ d[\ ZVX] \ YdaaVg \ d[\ egdYjXih \ hVaZh \ i]Vi \ egdk^{\land}YZ \ i]Z \ Xjhidb \ Zg \ l^{\land}i] \ i]Z \ g^{\land}i]i \ d[\ gZijgc,$

; TBRCOIBEO ACPTIRISINM CNRSR

<dhih gZaViZY id i]Z VXfj^h^i^dc d[hjWhXg^ei^dc k^YZd hZgk^XZ Xjhid b Zgh eg^b Vg^an Xdch^hi d[Vbdjcih eV^Y [dg i]^gY+eVgin Xjhid b Zg VXfj^h^i^dch* 1]^X] Xdch^hi d[i]Z Xdhi d[Xdbb^hh^dch eV^Y id Vji]dg^oZY gZiV^aZgh VcY YZVaZgh [dg hjWhXg^WZgh VYYZY i]gdj\] i]Z^g gZheZXi^kZ Y^hig^Wji^dc X]VccZah VcY i]Z Xdhi d[]VgY 1 VgZ VcY ^chiVaaVi^dc hjWh^Y^Zh [dg hjWhXg^WZgh, : aa Xdhih* ^cXajY^c\]]VgY 1 VgZ* ^chiVaaVi^dc VcY Xdbb^hh^dch* VgZ ZmeZchZY jedc VXi^kVi^dc* ZmXZei 1]ZgZ aZ\Va d1cZgh]^e d[i]Z Zfj^ebZci ^h gZiV^cZY* ^c 1]^X] XVhZ i]Z Xdhi d[i]Z Zfj^ebZci VcY YgZXi VcY ^cY^gZXi ^chiVaaVi^dc Xdhih VgZ XVe^iVa^oZY VcY YZegZX^ViZY dkZg i]Z gZheZXi^kZ jhZ[jaa^[Z,</p>

*DUEQSIRIMG EWOEMRER

 $M]Z < dbeVcn ZmeZchZh VYkZgi^h^c \setminus Xdhih Vh ^cXjggZY ^c VXXdgYVcXZ 1^i] : L < 50.+13^* \{Hi]Zg > meZchZh z : YkZgi^h^c \setminus <dhi, | : YkZgi^h^c \setminus VcY egd b di^dcVa ZmeZchZh gZXd \setminus c^oZY idiVaZY "374 b ^aa^dc* "33. b ^aa^dc VcY "303 b ^aa^dc [dg i]Z [^hXVa nZVgh ZcYZY CjcZ 1.* 0.00* 0.0 / VcY 0.0.* gZheZXi^kZan,$

; HIOOIMG AMD HAMDKIMG

 $< dhih ^cX j g g Z Y [dg h] ^e e^c \setminus V c Y] V c Y a^c \setminus V g Z g Z [a Z X i Z Y X i Z Y i] Z c Y ^$

 $: XXj \ b \ jaViZY \ di]Zg \ Xd \ b \ egZ]Zch^kZ \ adhh, \ @V^ch \ VcY \ adhhZh \ [gd \ b \ [dgZ^\c XjggZcXn \ igVchVXi^dch \ VgZ \ \ZcZgVaan \ ^cXajYZY \ ^c \ ^cXd \ b Z \ [dg \ i]Z \ eZg^dY,$

2MCNLE SAWER

BCH9 -(F9J9BI9G

- IRAGGQEGASED QEUEMTE



$B51 \ 7[X^Y \setminus JUN X0 = JUJb \setminus RJ \ JWM \ DQJRUJWM \ K^\setminus RWN \setminus N \setminus N$

 $Bc: j \mid jhi \ 0.0/* \ K>: @gdje \ VXfj^gZY \ Vc \ /6\# \ ^ciZgZhi \ \&/4,4\# \ dc \ V \ ^ajiZY \ WVh^h' \ ^c \ IgdeZgin@jgj \ IiZ, EiY, \ \&\{ IgdeZgin@jgj \ | \ ^* \ VaZVY^c \setminus Y^^iVa \ egdeZgin \ iZX \} \ cdad \ NXd b \ eVcn \ deZgVi^c \setminus b \ Vg^ZieaVXZh \ ^c \ Ldji]ZVhi: h^V* \ ^c \ ZmX \} \ Vc \setminus Z \ [dg \ Vaa \ h] \ VgZh \ d[K>: @gdje \ Aci^i^2h \ ^c \ F \ VaVnh^V \ Vc Y \ M] \ V^aVc Y, \ M]Z \ igVchVXi^dc \ 1 \ Vh \ Xd b \ eaZiZY \ V[iZg \ K>: @gdje \ ZciZgZY \ ^cid \ Vc \ V \ gZZ b \ Zcii \ id \ hZaa \ ^ih \ O5\# \ ^ciZgZhi \ ^c \ ^ih \ Zm^hi^c \setminus kZcijgZ \ 1^i] \ 77, Xd, \ M]Z \ igVchVXi^dc \ XgZViZh \ V \ aZVY^c \setminus Y^^iVa \ gZVa \ ZhiViZ \ hZgk^XZh \ Xd \ b \ eVcn \ ^c \ Ldji]ZVhi: h^V* \ cZ \ 1 \ deedgijc^i^2h \ [dg \ XdaaVWdgVi^dc \ VcY \ VXXZhh \ id \ V \ YZZeZg \ edda \ d[ZmeZgi^hZ*iZX] \ cdad \ N \ VcY \ ^ckZhi \ b \ Zci \ ^c \ i]Z \ gZ \ ^dc, \ K>: @gdje \ gZXZ^kZY \ dcZ \ hZVi \ dc \ i]Z \ WdVgY \ d[Y^gZXidgh \ d[IgdeZgin@jgj \ Vh \ eVgi \ d[i]Z \ igVchVXi^dc, \]$

 $Bc FVgX] \ 0.00^* \ IgdeZgin@jgj \ Xd b eaZiZY ^ih b Zg \ Zg 1^i] \ ; g^Y \ Zid 1c 0 \ AdaY^c \ E^b^iZY, \ : h V gZhjai d[i]Z b Zg \ VcY hjWhZfjZci ^ckZhi b Zcih b VYZ ^c XdccZXi^dc 1^i] i]Z igVchVXi^dc* K>: @gdje~h d 1 cZgh]^e ^ciZgZhi ^c IgdeZgin@jgj 1 Vh /5,3 # VcY V \V^c d[Veegdm^b ViZan "/3 b^aa^dc 1 Vh gZXdgYZY ^c Hi]Zg* cZi,$

 $2J \setminus N 3QNVRLJU \setminus$

Veegdm^b ViZan "/2/ b^aa^dc d[^YZci^[^VWaZ ^ciVc \^WaZ VhhZih* Xdch^hi^c\ eg^b Vg^an d["/.2 b^aa^dc d[ej Wa^h]^c\ g^\]in [dg WVX`a^hi i^iaZh 1^i] V jhZ[ja a^[Z d[c^cZ nZVgh VcY "10 b^aa^dc d[ej Wa^h]^c\ a^XZchZh 1^i] V jhZ[ja a^[Z d[c^cZ nZVgh, Bc VXXdgYVcXZ 1^i] : L<13.* i] Z ZmXZhh d[i] Z idiVa Xdch^YZgVi^dc dkZg i] Z [V^g kVajZh d[i] Z cZi iVc\^WaZ VcY ^ciVc\^WaZ VhhZih d[Veegdm^b ViZan "/03 b^aa^dc 1 Vh gZXdgYZY Vh \ddY 1^aa dc i] Z igVchVXi^dc,

=X[PJPN 3QXRLN]

 $Bc\ Cj\ cZ\ 0.0/*\ K>:\ @gdje\ VXfj^gZY\ F\ dgi\ V\ Z<]d^XZ\ E^b\ b^iZY\ \&\{F\ dgi\ V\ Z<]d^XZ\ |\ [dg\ Veegdm^b\ ViZan\ :\ "022\ b^aa^dc\ ^c\ XVh] \ \&Veegdm^b\ ViZan\ NL''/61\ b^aa^dc\ WVhZY\ dc\ ZmX]\ Vc\ Z\ gViZh\ Vh\ d[i]Z\ Xadh^c\ YViZ'*\ [j\ cYZY\ Wn\ Vc\ ^cXgZVhZ\ ^c\ K>:\ @gdje^h\ YZWi\ [VX^a^i^Zh,\ <dcigda\ 1\ Vh\ igVch[ZggZY\ VcY\ i]Z\ VXfj^h^i^dc\ WZXV\ bZ\ Z[[ZXi^kZ\ VcY\ W^cY^c\ dc\ F\ dgi\ V\ Z<]d^XZ\ h]\ VgZ]\ daYZgh\ dc\ Cj\ cZ\ /6^* \ 0.0/\ j\ edc\ Xdjgi\ VeegdkVa,\ F\ dgi\ V\ Z<]d^XZ\ ^h\ V\ aZVY^c\ :\ j\ higVa^Vc\ b\ dgi\ V\ Z\ W\ X\ Zm\ d[\ ^YZci^[VWaZ\ ^ciVcX\ d\ c\ VV]\ d\ c\ VX \ d\ c\ C\ d\ c\ VX \ d\ c\ C\ d\ c\ VX \ d\ c\ VX \ d\ c\ VX \ d\ c\ C\ d\ c\ C\$

BCH9G HC H<9 7CBGC@=85H98 :=B5B7=5@ GH5H9A9BHG

BCH9 1(DFCD9FHM&D@5BH 5B8 9EI=DA9BH

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; j^aY^c\h VcY aZVhZ]daYh	1 id 3. nZVgh	/*256	/*470
=^\^iVa hZi ide j c^ih VcY ^chiVaaVi^dch	3 id / . nZVgh	/*/.7	/*/3/
FVX]^cZgn VcY Zfj^e bZci	0 id 0. nZVgh	/*056	/*6.7
<ve^iva^ozy 1="" hd[i="" td="" vgz<=""><td>0 id / 3 nZVgh</td><td>/*5.5</td><td>/*410</td></ve^iva^ozy>	0 id / 3 nZVgh	/*5.5	/*410
$?^c V c X Z a Z V h Z g^{\setminus}] i + d[+j h Z V h h Z i h$	/3 nZVgh	/02	/16
		3*6/4	4*331
EZhh8 VXXj b jaViZY YZegZX^Vi^dc VcY V b dgi^oVi^dc ^{&V'}		&1*711'	&2*24 . '
		/*661	0*.71
<dchigjxi^dc ^c="" egd\gzhh<="" td=""><td></td><td>00.</td><td>/57</td></dchigjxi^dc>		00.	/57
MdiVa IgdeZgin* eaVci VcY Zfj^ebZci* cZi		" 0*/.1	" 0*050

=ZegZX^Vi^dc VcY V b dgi^oVi^dc gZaViZY id egdeZgin* eaVci VcY Zfj^e b Zci 1 Vh "326 b ^aa^dc* "346 b ^aa^dc VcY "315 b ^aa^dc [dg i]Z [^hXVa nZVgh ZcYZY Cj cZ 1.* 0.00* 0.0/ VcY 0.0.* gZheZXi^kZan, M]^h ^cXajYZh V b dgi^oVi^dc d[XVe^iVa^oZY hd[i 1 VgZ d["041 b ^aa^dc* "03. b ^aa^dc VcY "01/ b ^aa^dc [dg i]Z [^hXVa nZVgh ZcYZY Cj cZ 1.* 0.00* 0.0/ VcY 0.0.* gZheZXi^kZan,

$6RaNM \ 1 \setminus N \mid 9VYJR \mid VNW \mid \setminus$

BcXajYZh VXXj bjaViZY V bdgi^oVi^dc d[XVe^iVa^oZY hd[i 1 VgZ d[Veegdm^ b ViZan "/*/13 b^aa^dc VcY "/*/... b^aa^dc Vh d[CjcZ 1.* 0.00 VcY 0.0/* gZheZXi^kZan,

BCH9 2(; CC8 K=@@ 5B8 CH<9F =BH5B; =6@9 5GG9HG

iZg b \gdli] gViZh &gVc\^c\ [gdb.,.# id 1,.#' VcY gdnVain gViZh &gVc\^c\ [gdb.,03# id 4,.#', L^\c^[^XVci jcdWhZgkVWaZ ^cejih ji^a^oZY ^ci]Z b Vg`Zi VeegdVX] kVaj Vi^dc bZi]dY 1ZgZ >; BM=: b jai^eaZh [gdb \j^YZa^cZ ej Wa^X Xd b eVc^Zh deZgVi^c\ ^c h^b^aVg ^cYjhig^Zh VcY Xdcigda egZ b^j bh &gVc\^c\ [gdb 3,.# id /.,.#', L^\c^[^XVci ^cXgZVhZh &YZXgZVhZh' ^c gdnVain gViZh* \gd 1i] gViZh* Xdcigda egZ b^j bh VcY b jai^eaZh* Vhhj b^c\ cd X]Vc\Z^c Y^hXdj ci gViZh* 1 djaY gZhjai ^c V h^\c^[^XVcian]^\]Zg &ad 1 Zg' [V^g kVajZ bZVhjgZ bZci, L^\c^[^XVci YZXgZVhZh &^cXgZVhZh' ^c Y^hXdj ci gViZh* Vhhj b^c\ cd X]Vc\Zh^c gdnVain gViZh* \gd 1i] gViZh* Xdcigda egZ b^j bh VcY b jai^eaZh* 1 djaY gZhjai ^c V h^\c^[^XVcian]^\]Zg &ad 1 Zg' [V^g kVajZ bZVhjgZ bZci,

 $\label{eq:locality} $$ / NWSEN = jg^c \ i]Z i]^gY fjVgiZg d[[^hXVa 0.0.* i]Z < dbeVcn gZXd \ c^oZY cdc+XVh] ^b eV^g bZci X]Vg \ ThidiVa^c \ "71/b^aa^dc gZaViZY id i]Z \ dY1^aa VcY ^cYZ[^c^iZ+a^kZY ^ciVc \ VaZ VhhZih Vi ^ih ?dmiZa gZedgi^c \ jc^i, = jZ id i]Z ^b eVXi d[VYkZghZ igZcYh gZNjai^c \ [gd b ad 1 Zg ZmeZXiZY WgdVYXVhi hjWhXg^WZgh VcY i]Z ^b eVXi i]Vi < HOB=+/7 1 Vh ZmeZXiZY id]VkZ dc VYkZgi^h^c \ higZV b^c \ VcY Xd b b ZgX^Va hjWhXg^WZg gZkZcjZh ^c i]Z cZVg iZg b*i]Z < dbeVcn gZk^hZY ^ih [jijgZ djiadd \ 1]^X] gZhjaiZY ^c V gZYjXi^dc ^c ZmeZXiZY [jijgZ XVh] [ad 1 h d[i]Z Wjh^cZhh, : h V gZhjai*i]Z < dbeVcn YZiZg b^cZY i]Vi i]Z [V^g kVajZ d[i]Z gZedgi^c \ jc^i 1 Vh aZhh i]Vc ^ih XVggn^c \ kVajZ VcY gZXdgYZY cdc+XVh] ^b eV^g bZci X]Vg \ d["660 b^aa^dc id \ ddY 1^aa VcY "27 b^aa^dc id ^cYZ[^c^iZ+a^kZY ^ciVc ^WaZ VhhZih, M]Z Vhhj b ei^dch ji^a^oZY ^c i]Z ^cXd bZ VeegdVX] kVajVi^dc bZi]dY [dg ?dmiZa 1ZgZ Y^hXdj ci gViZh gVc \^c \ [gd b /.,3 # id //,3 #* V adc \ +iZg b \ gd 1i] gViZ d[0,. # VcY V gdnVain gViZ d[/,3 #, M]Z Vhhj b ei^dch ji^a^oZY ^c i]Z b Vg `Zi VeegdVX] kVajVi^dc bZi]dY 1ZgZ >; BM=: b jai^eaZh [gd b \ j^YZa^cZ ej Wa^X Xd b eVc^Zh deZgVi^c \ ^c h^b b^aVg ^cYjhig^Zh VcY V Xdcigda egZ b^j b d[/.,. #,$

BCH9 3(6CFFCK=B;G

 $\label{eq:market} $$M]Z<dbeVcn-hidiVa\ Wdggd\ 1\ ^c\ h\ Xdch^hi\ d[\ i\]Z\ [daad\ 1\ ^c\ \ \)$$

	=_eVcVde cReV Re >f_V -**	A Refclej Re >f_V -*! ,*,,	5 d `W > f_V -*&	5d`\\>f_V-*\\ ,*,+
			#7_ ^ 7]	
BVhd 7`ca`cRel`_				
0.00 MZg b adVc:	1,307 #	FVg 1/*0.05	3	Z
0.00 LZc^dg cdiZh	3,/03 #	?ZW /3* 0.10	270	Z
0.0/ LZc^dg cdiZh	1,653 #	$F\text{Vn}/3^{*}0.07$	765	763
:`ieV]; c`fa #8\$				
$0.7 < gZY^i [VX^a^i n^{aW'}]$	2,// #	FVn 1/* 0.02	46	010
0./7 MZg b adVc [VX^a^in	4,03 #	Gdk 00* 0.02	/5/	/7.
0./5 Pdg^^c\ XVe^iVa [VX^a^in &w'	2,// #	FVn 1/* 0.02	Z	Z
MZahigV [VX^a^in	6,/4 #	=ZX 00* 0.05	7.	4.
0./0 NL eg^kViZ eaVXZbZci z NL= edgi^dc z igVcX]Z 0 aX	2,05 #			

BCH9G HC H<9 7CBGC@=85H98 :=B5B7=5@ GH5H9A9BHG

eVnVWaZ ^c XVh] hZb^+VccjVaan dc ?ZWgjVgn /3 VcY : j\jhi /3 d[ZVX] nZVg* Xdb bZcX^c\ dc : j\jhi /3* 0.00, M]Z cdiZh 1 ^aa bVijgZ dc ?ZWgjVgn /3* 0.10,

 $M]Z\ LZc^dg\ GdiZh\ VgZ\ i]Z\ hZc^dg\ jchZXjgZY\ dWa^\Vi^dch\ d[\ i]Z\ <d\ b\ eVcn\ VcY\ gVc\ ZfjVaan\ ^c\ g^{\ l}\ id[\ eVn\ bZci\ 1^i]\ i]Z\ <d\ b\ eVcn^h\ Zm^hi^c\ VcY\ [jijgZ\ hZc^dg\ YZWi^*\ ^cXajY^c\ i]Z\ di]Z\ gLZc^dg\ GdiZh\ VcY\ Wdggd\ 1^c\ h\ j\ eYZg\ ^ih\ MZg\ b\ :\ VcY\ KZkdak^c\ ?VX^a^i^Zh\ \&Vh\ YZ[^cZY\ WZad\ 1',\ M]Z\ <d\ b\ eVcn\ b\ Vn\ gZYZZ\ b\ Vaa\ dg\ V\ eVgi\ d[\ i]Z\ LZc^dg\ GdiZh\ j\ edc\ eVn\ b\ Zci\ d[\ i]Z\ gZYZ\ b\ ei^dc\ eg^XZh\ VcY\ Veea^XXVWaZ\ eg^XZh\ VcY\ Veea^XXVWaZ\ LZc^dg\ GdiZh\ &XdaaZXi^kZan\ i]Z\ {BcYZcijgZh}\ '*\ eajh\ Vcn\ VXXgjZY\ VcY\ j\ ceV^Y\ ^ciZgZhi,\ Bc\ VYY^i^dc^*\ Vi\ Vcn\ i^bZ\ eg^dg\ id\ heZX^[^ZY\ YViZh\ ^c\ 0\ .02\ VcY\ 0\ .03^*\ i]Z\ <d\ b\ eVcn\ b\ Vn\ gZYZZb\ j\ e\ id\ 2\ .\ \#\ d[\ i]Z\ V\ gZYZD\ b\ e\ a^XVWaZ\ LZc^dg\ GdiZh\ 1^i]\ i]Z\ cZi\ XVh]\ egdXZZYh\ d[\ XZgiV^c\ Zfj^in\ d[[Zg^c\ h\ Vi\ i]Z\ gZYZb\ ei^dc\ eg^XZ\ hZi\ [dgi]\ ^c\ i]Z\ Veea^XVWaZ\ BcYZcijgZ^*\ eajh\ Vcn\ VXXgjZY\ VcY\ j\ ceV^Y\ ^ciZgZhi,\ Bc\ i]Z\ ZkZci\ d[\ heZX^[^ZY\ X]Vc\ ZfjVa\ id\ /\ ./\ \#\ d[\ i]Z\ eg^cX^eVa\ V\ b\ dj\ ci^*\ eajh\ Vcn\ VXXgjZY\ VcY\ j\ ceV^Y\ ^ciZgZhi,\$

 $M]ZgZ VgZ cd [^cVcX^Va bV^ciZcVcXZ XdkZcVcih 1^i] gZheZXi id i]Z LZc^dg GdiZh, M]Z BcYZcij gZh XdciV^c di]Zg XdkZcVcih i]Vi* \\ Vbdc \ di]Zg i]^c \ hVcY hjW_ZXi id XZgiV^c ZmXZei^dch* \&^' a^b^i i]Z < dbeVcn~h VW^a^in VcY i]Z VW^a^in d[^ih hj Wh^Y^Vg^Zh id ^cXjg Vcn a^Zch hZXjg^c \ ^cYZWiZYcZhh [dg Wdggd 1 ZY bdcZn VcY &^' a^b^i i]Z < dbeVcn~h VW^a^in id Xdchda^YYiZ dg bZg\Z 1^i] dg ^cid Vcdi]Zg eZghdc dg hZaa dg di]Zg 1^hZ Y^hedhZ d[Vaa dg hj WhiVci^Vaan Vaa d[i]Z VhhZih d[i]Z < dbeVcn VcY ^ih hj Wh^Y^Vg^Zh &iV^Zc Vh V 1]daZ',$

$DN/V < XJW 1 JWM BN_XU_RWP 3 [NMR] 6JLRUR]RN$

 $Hc \ F\ VgX] \ 07^*\ 0.00^*\ i]Z < db\ eV\ cn\ iZg\ b^cViZY\ ^ih\ Zm^hi^c\ \ j\ chZXjgZY\ "53.\ b^aa^dc\ gZkdak^c\ XgZY^i\ [VX^a^in\ VcY\ ZciZgZY\ ^cid\ V\ cZ\ 1 XgZY^i\ V\ VgZZ\ b\ Zci\ |\ i]Vi\ egdk^YZh\ [dg\ "/*03.\ b^aa^dc\ d[\ j\ chZXjgZY\ XgZY^i\ [VX^a^in\ VcY\ Xd\ b\ eg^hZY\ d[\ V\ "3..\ b^aa^dc\ j\ chZXjgZY\ iZg\ b\ adVc\ :\ XgZY^i\ [VX^a^in\ \&i]Z\ \{MZg\ b\ :\ ?VX^a^in\ |\ VcY\ i]Z\ adVch\ j\ cYZg\ i]Z\ MZg\ b\ :\ ?VX^a^in\ VgZ\ XdaaZXi^kZan\ gZ[ZggZY\ id\ Vh\ \{MZg\ b\ :\ 2VX^a^in\ |\ VcY\ |\ 13.\ b^aa^dc\ j\ chZXjgZY\ gZkdak^c\ XgZY^i\ [VX^a^in\ \&i]Z\ \{KZkdak^c\ ?VX^a^in\ |\ VcY^*\ id\ Zi]Zg\ 1^ii\ i]Z\ MZg\ b\ :\ ?VX^a^in^i\ i]Z\ \{?VX^a^in\ |\ VcY^*\ id\ Zi]Zg\ 1^ii\ i]Z\ XZcZgVa\ XdgedgViZ\ ejgedhZh,\ M]Z\ KZkdak^c\ ?VX^a^in\]Vh\ V\ hjWa^b\ b'id\ ["/...\ b^aa^dc\ VkV^aVwaZ\ [dg\ ^hhj\ VcXZh\ d[\ aZiiZgh\ d[\ XgZY^i,\ NcYZg\ i]Z\ 0.00\ <gZY^i\ :\ \ gZZb\ Zci^*\ i]Z\ <d\ b\ eVcn\ b\ Vn\ gZfjZhi\ ^cXgZVhZh\ 1^ii\ gZheZXi\ id\ Z^i]Zg\ ?VX^a^in\ ^c\ Vc\ V\ \ gZ\ ViZ\ eg^cX^eVa\ V\ b\ d\ id\ ZmXZZY\ "03.\ b^aa^dc\ ,$

 $\label{eq:model} $$MZgb: EdVch $1^aa Vbdgi^oZ ^c ZfjVa fjVgiZgan ^chiVaa bZcih ^c Vc V\gZ\ViZ VccjVa Vbdjci ZfjVa id .,. #* 0,3 #* 0,3 #* 3,. # VcY 3,. #* gZheZXi^kZan* d[i]Z dg^\^cVa eg^cX^eVa Vbdjci d[i]Z MZgb: ?VX^a^in [dg ZVX] /0+bdci] eZg^dY Xdb bZcX^c \ dc CjcZ 1.* 0.00, M]Z adVch jcYZg i]Z KZkdak^c \ ?VX^a^in $1^aa cdi Vbdgi^oZ, :aa djihiVcY^c \ Vbdjcih jcYZg i]Z 0.00 <gZY^i: \gZZbZci 1^i] gZheZXi id i]Z ?VX^a^iZh VgZ YjZ dc F VgX] 1/* 0.05* jcaZhh ZVga^Zg iZg b^cViZY ^c i]Z X^gXj bhiVcXZh hZi [dgi] ^c i]Z 0.00 <gZY^i: \gZZbZci, M]Z <dbeVcn b Vn gZfjZhi i]Vi i]Z b Vijg^in YViZ d[i]Z MZgb: ?VX^a^in WZ ZmiZcYZY jcYZg XZgiV^c X^gXj bhiVcXZh Vh hZi [dgi] ^c i]Z 0.00 <gZY^i: \gZZbZci Wn Vi aZVhi dcZ nZVg, M]Z <dbeVcn b Vn Vahd gZfjZhi i]Vi i]Z b Vijg^in YViZ d[i]Z gZkdak^c \ XgZY^i Xdb b^i bZcih jcYZg i]Z KZkdak^c \ ?VX^a^in WZ ZmiZcYZY jcYZg XZgiV^c X^gXj bhiVcXZh Vh hZi [dgi] ^c i]Z 0.00 <gZY^i: \gZZbZci [dg je id i 1 d VYY^i^dcVa dcZ+nZVg eZg^dYh, $$$

M]Z <d b e V cn Wdggd 1 ZY i]Z [jaa V b dj ci d[i]Z MZg b : ?VX^a^in dc F VgX] 1/* 0.00 VcY]VY cdi Wdggd 1 ZY V cn [j c Yh j c YZg i]Z KZkdak^c\ ?VX^a^in Vh d[Cj c Z 1.* 0.00,

/NWSEK OQNTO +NQQNVIMGR

 $M]Z ? dmiZa @gdje] Vh Wdggd 1 ^c h jcYZg i]Z [daad 1 ^c h jcYZg$

- u : c : "4/. b^aa^dc 0./7 gZkdak^c\ XgZY^i [VX^a^in VcY : "2. b^aa^dc 0./5 ldg`^c\ XVe^iVa [VX^a^in, ;dgdl^c\h jcYZg i]ZhZ [VX^a^i^Zh WZVg ^ciZgZhi Vi V [adVi^c\ gViZ d[i]Z : jhigVa^Vc ;;LR eajh Vc Veea^XVWaZ bVg\^c d[WZi l ZZc 0,..# VcY 1,03 # eZg Vccj b* YZeZcY^c\ dc i]Z ?dmiZa = ZWi @gdje~h cZi aZkZgV\Z gVi^d, M]Z ?dmiZa = ZWi @gdje eVnh V Xd b b^i b Zci [ZZ d[23 # d[i]Z Veea^XVWaZ bVg\^c [dg Vcn jcYgV l c V b djcih jcYZg i]ZhZ [VX^a^i^Zh,
- u : [jaan YgV l c : "03. b ^aa^dc iZg b adVc [VX^a^in, ; dggd l ^c\h j cYZg i]^h [VX^a^in WZVg ^ciZgZhi Vi V [^mZY gViZ d[4,03 # eZg

BCH9G HC H<9 7CBGC@=85H98 :=B5B7=5@ GH5H9A9BHG

1 V^kZY* Vcn jceV^Y V b djcih jcYZg i]Z Veea^XVWaZ YZWi V\gZZ b Zcih b Vn WZ YZXaVgZY ^b b ZY^ViZan YjZ VcY eVnVWaZ, M]Z <dbeVcn 1 Vh ^c Xd b ea^VcXZ 1 ^i] Vaa hjX] XdkZcVcih Vi CjcZ 1.* 0.00,

: fefcV ^ RefclelVd

 $M]Z [daad 1^c \setminus iVWaZ hj b b Vg^oZh i]Z < dbeVcn^h YZWi b Vijg^iAZh^* ZmXajY^c \setminus YZWi ^hhjVcXZ Xdhih VcY [^cVcXZ aZVhZ a^VVW^a^iAZh^* Vh d[CjcZ 1.* 0.008]] \\$

	5d`\ >f_V -*\
	#Z_ ^Z]]Z`_d\$
?^hXVa 0 . 01	" 05/
?^hXVa O . O2	6/
?^hXVa 0.03	4.0
?^hXVa O . O4	11
?^hXVa 0.05	23.
M]ZgZV[iZg	/*37.

BCH9 +*(@95G9G

Hc Cjan /* 0. /7* i]Z <d b eVcn VYdeiZY: LN 0. /4+.0 dc V b dY^[^ZY gZigdheZXi^kZ WVh^h VcY gZXd\c^oZY V "7 b ^aa^dc Xj b jaVi^kZ+Z[[ZXi VY_jhi b Zci id i]Z deZc^c\ WVaVcXZ d[: XXj b jaViZY YZ[^X^i gZaViZY id egZk^d]h hVaZ aZVhZWVX` igVchVXi^dch,

$C^VVJ[b X0 UNJ \setminus N]$

 $M]Z < dbeVcnh deZgVi^c \ aZVhZh eg^b Vg^an Xdch^hi d[gZVa ZhiViZ^* ^cXaj Y^c \ d[[^XZ heVXZ^* 1 VgZ] dj hZ heVXZ VcY eg^ci^c \ [VX^a^i^Zh^* VcY hViZaa^iZ igVchedcYZgh, = j g^c \ i]Z [dj gi] fj VgiZg d[[^hXVa 0.0.*i]Z < dbeVcn b dY^[^ZY ^ih XdcigVXi gZaViZY id ^ih hViZaa^iZ igVchedcYZgh 1]^X] gZhj aiZY ^c XZgiV^c igVchedcYZgh WZ^c \ XaVhh^[^ZY Vh [^cVcXZ aZVhZh, <ZgiV^c aZVhZh [dg hViZaa^iZ igVchedcYZgh 1 ZgZ YZiZg b^cZY id WZ deZgVi^c \ aZVhZh ^c VXXdgYVcXZ 1^i] : LN 0./4+.0, M]Z < dbeVcn~h deZgVi^c \ aZVhZh \ ZcZgVaan ^cXaj YZ dei^dch id ZmiZcY i]Z aZVhZ iZg b ^cViZ i]Z aZVhZ, LjX] dei^dch Yd cdi ^beVXi i]Z < dbeVcn~h aZVhZ iZg b VhhZhh bZci jci^a i]Z < dbeVcn~h gZVhdcVWan XZgiV^c i]Vi i]Z dei^dc 1^aa WZ ZmZgX^hZY,$

<ZgiV^c d[i]Z <dbeVcn-h aZVhZh ^cXajYZ gZci VY_jhibZcih 1]^X] b Vn WZ ^cYZmZY id kVg^djh bZig^Xh* ^cXajY^c\ i]Z Xdchj bZg eg^XZ ^cYZm dg di]Zg ^c[aVi^dcVgn ^cYZmZh, :h V \ZcZgVa bViiZg* i]Z <dbeVcn-h gZVa ZhiViZ aZVhZ VggVc\ZbZcih ine^XVaan gZfj^gZ VY_jhibZcih gZhjai^c\ [gd b X]Vc\Zh ^c gZVa ZhiViZ iVmZh VcY di]Zg Xdhih id deZgViZ i]Z aZVhZY VhhZi,

? JQN[[NZ^R[NM UNJ\N MR\LUX\^[N\

M]Z idiVa aZVhZ Xdhi [dg deZgVi^c\ VcY [^cVcXZ aZVhZh ^cXa j YZY ^c i]Z LiViZ b Zcih d[HeZgVi^dch 1 Vh Vh [daad 1 h8

		:`c eYV WZdTR] jVRcd V_UVU >f_V -*&			å		
		,*,	,*,, ,*,+			,*,*	
	=_T` ^ V GeReV ^ V_e @ `TReL` _		#Z_ ^	Z]]Z`_d\$			
HeZgVi^c∖ aZVhZ Xdhih	LZaa^c * \ZcZgVa VcY VY b ^c^higVi^kZ	"	/03	"	/13	"	/17
HeZgVi^c∖ aZVhZ Xdhih	HeZgVi^c\ ZmeZchZh		14		15		42
?^cVcXZ aZVhZ Xdhih	=ZegZX^Vi^dc VcY Vbdgi^oVi^dc		05		05		4
?^cVcXZ aZVhZ Xdhih	BciZgZhi ZmeZchZ* cZi		1		2		/
L]dgi iZgb aZVhZ Xdhih	$HeZgVi^{c} \setminus ZmeZchZh$		/0		/3		7
OVg^VWaZ aZVhZ Xdhih	LZaa^c * \ZcZgVa VcY VY b ^c^higVi^kZ		02		06		2/
MdiVa aZVhZ Xdhih		"	005	"	024	"	04.

$: YY^{i} \wedge dc \forall a \wedge c [dg \ b \ \forall i \wedge dc \ gZa \forall iZY \ id \ i \]Z < d \ b \ e \forall cn \ h \ de Zg \forall i \wedge c \setminus \ \forall cY \ [\wedge c \forall cXZ \ aZ \forall hZh \ j \ cYZg \ : LN \ 0 \ . \ / \ 4 + \ . \ 0 \& A + \ . \ A + \ . \ A + \ . \ A + \ . \ A + \ . \ A + \ . \ A + \ . \ A + \ . \ A + \ . \ A + \ . \ A + \ . \ A + \ . \ A + \ . \ A + \ . \ A + \ . \ A + \ . \ A + \ . \ A + \ . \$

	5d \W>f_V	5d`W>f_V -*¼ ,*,,		-*k ,*,+
	CaVcReZ_X @VRdVd	: Z_R_TV @VRdVd	CaVcReZ_X @VRdVd	: 7_R_TV @VRdVd
$P\:Z^{\wedge}\setminus]\:iZY+VkZgV\setminus Z\:gZ\:b\:V^{\wedge}c^{\wedge}c\setminus \:aZVhZ\:iZg\:b$	//,. nZVgh	0,6 nZVgh	//,6 nZVgh	1,5 nZVgh
$PZ^{\land}\setminus \exists iZY+VkZgV\setminus Z \ ^{c}XgZ \ b \ ZciVa \ Wdggd \ 1 \ ^{c}\setminus \ gViZ$	1,34 #	1,42 #	1,32 #	1,42 #
		:`c	eYV WZdTR] jVRcd V_	_UVU >f_V -*&
			,*,,	,*,+
			#Z_ ^Z]]Z`_	d\$
$<$ Vh] eV^Y + HeZgVi^c\ aZVhZ a^VW^a^i^Zh		"	/60 "	/62
$<$ Vh] eV^Y + ?^cVcXZ aZVhZ a^VW^a^i^Zh + eg^cX^eVa				

$8 \text{VclgRelgV} = \text{decf} ^V\text{ed}$

 $u \qquad [dgZ^{\wedge} c XjggZcXn ZmX] Vc \setminus Z gViZ g^{\wedge} \delta Vg^{\wedge} c \setminus eg^{\wedge} b Vg^{\wedge} an \ i] gdj \setminus] \ ?dmiZa = ZWi @gdje Wdggd 1 ^{c} h YZcd b ^{c} ViZY ^{c} N,L,$

		5d`W>f_V-*k		
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; dggd 1 ^c \h8		#Z_ ^ Z]]Z`_d\$		
<vggn^c \="" \zy=""]zy="" ^iz="" b="" b<="" ci="" d="" d[="" j="" td="" v=""><td>"</td><td>46 "</td><td>5/</td></vggn^c>	"	46 "	5/	
<jbjavi^kz]zy\^c\="" ^c="" ^cxajyzy="" i]z="" td="" vbdjci<="" vy_jhibzcih="" xvggn^c\=""><td></td><td>0</td><td>3</td></jbjavi^kz>		0	3	

B`_cVTfccl_X : RLc JR]fV A VRdfcV ^ V_ed

Bc VYY^i^dc id VhhZih VcY a^VW^a^i^Zh i]Vi VgZ gZ b ZVhj gZY Vi [V^g kVajZ dc V gZXj gg^c\ WVh^h* i]Z <d b eVcn]Vh XZgiV^c VhhZih* eg^b Vg^an \ddY l^aa* ^ciVc\^WaZ VhhZih* Zfj^in b Zi]dY ^ckZhi b Zcih VcY egdeZgin* eaVci VcY Zfj^e b Zci* i]Vi VgZ cdi gZfj^gZY id WZ gZ b ZVhj gZY id [V^g kVajZ Vi i]Z ZcY d[ZVX] gZedgi^c\ eZg^dY, Hc Vc dc\d^c\ WVh^h* i]Z <d b eVcn b dc^idgh l]Zi]Zg ZkZcih dXXjg dg X^gXj b hiVcXZh X]Vc\Zi]Vi l djaY b dgZ a^ Zan i]Vc cdi gZYjXZ i]Z [V^g kVajZh d[i]ZhZ VhhZih WZad l i]Z^g XVggn^c\ Vb djcih, B[i]Z <d b eVcn YZiZg b ^cZh i]Vi i]ZhZ VhhZih VgZ ^b eV^gZY* i]Z <d b eVcn l djaY lg^iZ Yd l c i]ZhZ VhhZih id [V^g kVajZ, M]ZhZ cdcgZXjgg^c\ [V^g kVajZ b ZVhjgZ b Zcih VgZ Xdch^YZgZY id WZ EZkZa l ^c i]Z [V^g kVajZ]^ZgVgX]n,

- = jg^c\ i]Z [djgi] fjVgiZg d[[^hXVa 0.0.* i]Z <dbeVcn gZXd\c^oZY cdc+XVh] ^b eV^g bZci X]Vg\Zh d["0.1 b^aa^dc gZaViZY id [^mZY VhhZih ^c i]Z N,D, VcY: jhigVa^V, M]Z XVggn^c\ kVajZh d[egdeZgin* eaVci VcY Zfj^e bZci hjWhZfjZci id i]Z ^b eV^g bZci X]Vg\Zh Vi i]Z: jhigVa^Vc VcY N,D, cZlheVeZgh gZedgi^c\ jc^ih lZgZ "013 b^aa^dc VcY "0.5 b^aa^dc* gZheZXi^kZan, LZZ GdiZ 5 z IgdeZgin* IaVci VcY > fj^e bZci,
- = jg^c\ i]Z i]^gY fjVgiZg d[[^hXVa 0.0.* i]Z <d b eVcn gZXd\c^oZY cdc+XVh] ^b eV^g b Zci X]Vg\Zh d["660 b^aa^dc VcY "27 b^aa^dc gZaViZY id \ddY 1 ^aa VcY ^cYZ[^c^iZ+a^kZY ^ciVc\^WaZ VhhZih* gZheZXi^kZan* Vi ^ih ?dmiZa gZedgi^c\ jc^i, M]Z XVggn^c\ kVajZ d[\ddY 1 ^aa Vi ?dmiZa YZXgZVhZY [gd b "/*446 b^aa^dc id "564 b^aa^dc VcY i]Z kVajZ d[^cYZ[^c^iZ+a^kZY ^ciVc\^WaZ VhhZih YZXgZVhZY [gd b "/67 b^aa^dc id "/2. b^aa^dc, LZZ GdiZ 6 z @ddY 1 ^aa VcY Hi]Zg BciVc\^WaZ : hhZih,
- $=jg^{c} \ i]Z \ [^{hht fj VgiZg} \ d[\ [^{hht Va} \ 0.0.^{*}i]Z < db eVcn \ gZXd \ c^{o}ZY \ cdc+XVh] \ ^{b} eV^{g} b \ Zci \ X] Vg \ d[\ ''/00 \ b^{aa}dc \ VcY \ ''//1 \ b^{aa}dc \ gZaViZY \ id \ dY \ 1^{aa} \ VcY \ ^{c}YZ[^{c}iZ+a^{k}ZY \ ^{c}iVc \ ^{WaZ} \ VhhZih^{*} \ gZheZXi^{k}Zan^{*} \ Vi \ i]Z \ GZ \ 1 \ h \ : bZg^{XV} \ F \ Vg^{Zi^{c}} \ gZedgi^{c} \ jc^{i}, \ M]Z \ XVggn^{c} \ kVajZ \ d[\ dY \ 1^{aa} \ Vi \ GZ \ 1 \ h \ : bZg^{XV} \ F \ Vg^{Zi^{c}} \ YZXgZVhZY \ [gd b \ ''/00 \ b^{aa}dc \ id \ c^{a} \ VcY \ i]Z \ kVajZ \ d[\ ^{c}YZ[^{c}iZ+a^{k}ZY \ ^{c}iVc \ ^{WaZ} \ VhhZih \ YZXgZVhZY \ [gd b \ ''/13 \ b^{aa}dc, \ LZZ \ GdiZ \ 6 \ z \ @ddY \ 1^{aa} \ VcY \ Hi]Zg \ BciVc \ ^{WaZ} \ : hhZih,$

CeYVc : RZc JR]fV AVRdfcV^V ed

: h d[Cj cZ 1 .* 0 .00G]Z XVggn^c\ kVajZ d[i]Z <d b &\Xan;H.ZZihiVcY^c\ Wdggd 1 ^c\h Veegdm^b ViZh i]Z [V^g kVajZ, M]Z 0 .00 LZc^dg GdiZh* 0 .0 / LZc^dg GdiZh VcY N,L, eg^kViZ eaVXZbZci Wdggd 1 ^c\h VgZ XaVhh^[^ZY Vh EZkZa 0 VcY i]Z gZbV^c^c\ Wdggd 1 ^c\h VgZ XaVhh^[^ZY Vh EZkZa 1 ^c i]Z [V^g kVajZ]^ZgVgX]n,

BCH9+,

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L]\VgZh|'* dg 1 dja\Y ^c\XgZVhZ i]Z F ?M-h kdi^c\ ed 1 Zg Wn b dgZ i]\Vc /,53 # ^c \Vcn gdaa^c\ i 1 ZakZ+b dci] eZg^dY, M]Z F ?M 1 dja\Y [dg[Z^i kdiZh ^c \XdccZXi^dc 1^i] \Vc \Vccj\Va dg heZX^\Va <d b e\Vcn hid\X`]da\YZgh b\ZZi^c\ id i]Z\ZmiZci c\ZXZhh\Vgn id\ZchjgZ i]\Vi i]Z F ?M \Vc\Y i]Z F jg\Yd\X] [V b^an \Xdaa\ZXi^k\Zan \Yd cdi \Zm\XZZY 22 # d[i]Z djihi\Vc\Y^c\ kdi^c\ ed 1 \Zg d[i]Z <a\Vhh; L]\VgZh \Vi hj\X] b\ZZi^c*\ Zm\XZei 1]\ZgZ \V F jg\Yd\X] [V b^an b\Zb\WZg \kdiZh i]\Z^g d 1 c h]\VgZh \Y^[[ZgZcian [gd b i]Z F ?M dc \Vcn b\Vi\Zg, M]Z Lid\X`]\day\Zgh : \g\ZZb\Zci 1^aa i\Zg b^c\Vi\Z jedc i]\Z F ?M-h \Y^hig^\Wji^dc d[\Vaa dg hj\Whi\Vci^\Vaan \Vaa d[^i \ <a\Vhh; \L]\VgZh,

BCH9 +- (9EI=HM'65G987CAD9BG5H=CB

 $> b \ eadn ZZh^* = \ ^e_ZXidgh \ VcY \ di \]Zg \ hZgk^XZ \ egdk^YZgh \ d[i]Z < db \ eVcn \ \&\{eVgi^XA^eVcih|'VgZ \ Za^A^WaZ \ id \ eVgi^XA^eViZ \ ^c \ i]Z \ GZ \ l \ h \\ < dgedgVi^dc \ 0./1 \ Edc \ +MZgb \ BcXZci^kZ \ IaVc \ \&Vh \ Vb ZcYZY \ VcY \ gZhiViZY^*i \]Z \ \{0./1 \ EMBI \ |'*1 \]^X] \ egdk^YZh \ [dg Zfj^in+WVhZY \ Xd b \ eZchVi^dc \ ^cXaj Y^c \ eZg[dg b \ VcXZ \ hidX \ j c^ih \ \&\{ILNh|'*gZhig^XiZY \ hidX \ j c^ih \ \&\{KLNh|' VcY \ di \]Zg \ ineZh \ d[V 1 \ VgYh, M]Z \ < db \ eVcn \]Vh \ i]Z \ VW^a^in \ id \ V 1 \ VgY \ je \ id \ 3. \ b^aa^dc \ h] \ VgZh \ d[<aVhh : <db \ bdc \ LidX \ j cYZg \ i]Z \ iZg \ bh \ d[i]Z \ 0./1 \ EMBI \ WZXd \ bZ \ VkV^aVWaZ \ [dg \ [JijgZ \ VgVcih, \]$

M]Z [daad 1 °c \ iVWaZ h j b b Vg°oZh i]Z <d b eVcn-h Zf j ^in+WVhZY Xd b eZchVi^dc ZmeZchZ gZedgiZY °c i]Z LiViZ b Zcih d[HeZgVi^dch8

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: h d[CicZ 1.* 0.00

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?dg [^hXVa 0.0.* ^cXajYZh .,2 b^aa^dc d[iVg\Zi ILNh VcY .,5 b^aa^dc KLNh XVcXZaaZY VcY V eVndji VY_jhi bZci d[.,2 b^aa^dc ILNh YjZ id i]Z VXij Va eZg[dg b VcXZ aZkZa VX]^ZkZY [dg ILNh \gVciZY ^c [^hXVa 0./5 i]Vi kZhiZY Yjg^c\ [^hXVa 0.0.,

BCH9 +. (95FB=B; G #@CGG\$ D9F G<5F9

 $M]Z [daad 1^c \ iVWaZh hZi [dgi] i] Z XdbejiVi^dcd[WVh^X VcY Y^ajiZY ZVgc^c \ h \&adhh' eZgh] VgZ jcYZg : L < 04.* \\ \{>Vgc^c \ h eZgL] VgZ | 8$

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$P\:Z^{\wedge}\setminus]\:iZY+VkZgV\setminus Z\:c\:j\:b\:WZg\:d[\:h\:]\:VgZh\:d[\:Xd\:b\:b\:dc\:hidX^{}\:d\:j\:ihiVcY^{\wedge}c\setminus\:z\:WVh^{\wedge}X$		367,3		37.,2		365,7	
=^aji^kZ Z[[ZXi d[Zfj^in V l VgYh ^{&V'}		1,.		1,.		Z	
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Bc i]Z dgY^cVgn XdjghZ d[Wjh^cZhh*i]Z <dbeVcn ZciZgh ^cid igVchVXi^dch 1^i] gZaViZY eVgi^Zh id ejgX]VhZ VcY-dg hZaa VYkZgi^h^c \ VcY VY b^c^higVi^kZ hZgk^XZh, M]Z <dbeVcn]Vh Vahd egZk^djhan ZciZgZY ^cid igVchVXi^dch 1^i] gZaViZY eVgi^Zh id hZaa XZgiV^c WgdVYXVhi g^\]ih,

M]Z [daad 1 °c \ iVWaZ hZih [dgi] i]Z cZi gZkZc jZ [gd b gZaViZY eVgi^Zh ^cXa j YZY ^c i]Z LiViZ bZcih d[HeZgVi^dch8

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KZaViZY eVgin gZkZcjZ &ZmeZchZ'* cZi	"	&/.'	"	&13' '	,	&47'

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M]Z Y^aji^kZ ^beVXi d[i]Z <dbeVcn~h ILNh* KLNh VcY hidX` dei^dch]Vh WZZc ZmXajYZY [gdbi]Z XVaXjaVi^dc d[Y^ajiZY adhh eZg h]VgZ [dgi]Z [^hXVa nZVg ZcYZY CjcZ 1.* 0.0. WZXVjhZi]Z^g ^cXajh^dc ldjaY]VkZ Vc Vci^Y^aji^kZ Z[[ZXi dci]Z cZi adhh eZg h]VgZ,

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 $M]Z < dbeVcn] Vh Xdb b^ibZcih jcYZg XZgiV^c [^{g}b XdcigVXijVa VggVc \ZbZcih \& \{[^{g}b Xdb b^ibZcih|' id bV^Z [jijgZ eVnbZcih, M]ZhZ [^{g}b Xdb b^ibZcih hZXjgZ i]Z XjggZci VcY [jijgZ g^\]ih id kVg^djh VhhZih VcY hZgk^XZh id WZ jhZY ^c i]Z cdg bVa XdjghZ d[deZgVi^dch, M]Z [daad l ^c \ iVWaZ hj b bVg^oZh i]Z <math>< dbeVcn^h$ b ViZg^Va [^{g}b Xdb b^ibZcih Vh d[CjcZ 1.* 0.008

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$>N \ \ \ \ 1 \ VN/RLJ = J/TN/RWP$

 $Bc FVn 0.0.*i]Z < dbeVcn hdaY ^ih GZ1h : bZg^XV FVg^Zi^c Vjh^cZhh, Bci]Z = ^hedh^i^dc^*i]Z < dbeVcn gZiV^cZY XZgiV^c a^VVW^a^i^Zh^* ^cXajY^c i]dhZ Vg^h^c [gdbi]Z aZ Va egdXZZY^c h 1^i] Bch^\c^V VcY OVaVhh^h YZhXg^WZY WZad1,$

9W\RPWR**J** Cb\INV\% 9WL'

Bc Cjan O. /7* Bch\c^V [^aZY V Xd b eaV^ci ^c i]Z N,L, =^hig^Xi <djgi [dg i]Z =^hig^Xi d[F^ccZhdiV V\V^chi GZ 1 h : bZg^XV F Vg`Zi^c\ ?LB E,E,<, &{G: F?LB|'* GZ 1 h : bZg^XV F Vg`Zi^c\ Bc+LidgZ LZgk^XZh E,E,<, &{G: FBc+LidgZ|' VcY GZ 1 h <dgedgVi^dc &id\Zi]Zg* i]Z {G: F IVgi^Zh|' VaaZ\^c\ k^daVi^dch d[[ZYZgVa VcY hiViZ Vci^igjhi aV 1 h VcY Xd b bdc aV 1 Wjh^cZhh idgih, M]Z Xd b eaV^ci hdj\]i igZWaZ YV b V\Zh* ^c_j cXi^kZ gZa^Z[VcY ViidgcZnh~ [ZZh VcY Xdhih, Bc Cjan O.00* i]Z eVgi^Zh V\gZZY id hZiiaZ i]Z a^i^\Vi^dc VcY Bch^\c^V~h XaV^b h 1ZgZ Y^h b^hhZY 1^i] egZ_j Y^XZ,

$FJUJ\setminus R\setminus 3XVV^WRLJRXW\setminus 9WL'$

Bc GdkZbWZg 0./1* OVaVhh^h [^aZY V Xd b eaV^ci ^c i]Z N,L, =^hig^Xi <djgi [dg i]Z >VhiZgc =^hig^Xi d[F^X]^\Vc V\V^chi i]Z G: F I Vgi^Zh VcY GZ 1 h: b Zg^XV BcXdgedgViZY* 1]^X] 1 Vh hj WhZfjZcian igVch[ZggZY id i]Z N,L, =^hig^Xi <djgi [dg i]Z Ldji]Zgc =^hig^Xi d[GZ 1 Rdg`&i]Z {G,R, =^hig^Xi <djgi|', M]Z Xd b eaV^ci VaaZ\ZY k^daVi^dch d[[ZYZgVa VcY hiViZ Vci^igjhi aV 1 h VcY Xd b bdc aV 1 Wjh^cZhh idgih VcY hdj\]i igZWaZ YV b V\Zh*^c_j cXi^kZ gZa^Z[VcY ViidgcZnh~ [ZZh VcY Xdhih, M]Z ig^Va WZ\Vc dc CjcZ 07* 0.0/* VcY ^c Cjan 0.0/* i]Z eVgi^Zh V\gZZY id hZiiaZ i]Z a^i^\Vi^dc VcY OVaVhh^h-h XaV^bh 1 ZgZ Y^h b^hhZY 1^i] egZ_j Y^XZ,

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; Z\^cc^c\ ^c ?ZWgjVgn 0.0/* V cj bWZg d[ejgedgiZY XaVhh VXi^dc Xd beaV^cih] VkZ WZZc [^aZY ^c i]Z G,R, =^hig^Xi <djgi V\V^chi : bVodc,Xd b* BcX, &{: bVodc|' VcY XZgiV^c ej Wa^h]Zgh* ^cXaj Y^c\ i]Z <d beVcn~h hj Wh^Y^Vgn* AVgeZg <daa^ch Ij Wa^h]Zgh* E,E,<, &{AVgeZg < daa^ch| VcY id\Zi]Zg 1^i] i]Z di]Zg ej Wa^h]Zgh* i]Z {Ij Wa^h]Zgh|'* VaaZ\^c\ k^daVi^dch d[Vci^igjhi VcY Xd beZi^i^dc aV 1 h, M]Z Xd beaV^cih hZZ` igZWaZ YV b V\Zh* ^c_i cXi^kZ gZa^Z[VcY ViidgcZnh~ [ZZh VcY Xdhih, Bc LZeiZ b WZg 0.0/* : b Vodc VcY i]Z

: XXj b jaViZY eZch^dc WZcZ[^i dWa^\Vi^dch Vh d[Cj cZ 1.* 0.00 VeY 0.0/ 1ZgZ "/*.// b^aa^dc VeY "/*235 b^aa^dc* gZheZXi^kZan, ; Zad l ^h ^c[dg b Vi^dc VWdji [jcYZY VeY jc[jcYZY eZch^dc eaVch8

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>meZXiZY gZijgc dc eaVc VhhZih	&/3'	&/1'	&/4'	&14'	&15'	&21'						

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 $M]Z < db e V cn^h ^c kZhi b Z ci hig ViZ \setminus n [dg ^ih e Z ch^d c ea V ch ^h id b V m^h b ^o Z i]Z a d c \\ +i Z g b g ViZ d[gZijg c dc ea V c VhhZih 1 ^i] ^c V c VXXZei VWaZ a Z kZa d[g^h ` ^c dg Y Z g id b ^c ^h b ^o Z i]Z X dhi d[eg dk ^Y ^c \ e Z ch^d c W Z c Z [^ih 1] ^a Z b V ^c i V ^c ^c \ VYZ f j ViZ [j c Y ^c \ a Z k Z a h, M]Z < db e V cn ^h eg VXi ^XZ ^h id X d c Y j Xi V e Z g ^d Y ^X hig V i Z | X g Z k ^Z 1 d[^ih V h h Z i Vaad X V i ^d c, M]Z < db e V cn ^h X j g Z c i W g d V Y hig V i Z | X i V g Z i d] V k Z V e Z ch^d c V h h Z i e d g i [da ^d X d b e g ^h Z Y d[/5 # Z f j ^in h Z X j g ^i ^2 h ^5 4 # [^m Z Y ^c X d b Z h Z X j g ^i ^2 h V c Y 5 # ^c X V h] V c Y d i] Z g ^c k Z h i b Z c ih, B c Y Z k Z a d e ^c \ i] Z Z m e Z X i Z Y a d c \ +i Z g b g V i Z d[gZ i j g c * i] Z < d b e V c n X d ch^Y Y Z g Y i] Z e Z ch^d c V h h Z i e d g i [da ^d -h e V h i V k Z g V \ Z g V i Z d[gZ i j g c Z m e Z X i V i ^d c h [i] Z k V g ^d j h V h N i X a V h h Z h, : e d g i ^d c d[i] Z d i] Z V a d X V i ^d c ^h g Z h Z g k Z Y ^c X V h] i d e g d k ^Y Z [d g Z m e Z X i Z Y w c z Z [^ih i d W Z e V ^ c i] Z h] d g i i Z g b, M] Z < d b e V c n ~h Z f j ^in e d g i [da ^d h V g Z b V c V Z Y ^c h j X] V 1 V n V h i d V X | ^Z k Z d e i ^b b Y a Y k Z g h ^in, M] Z < d b e V c n ~h [^m Z Y ^c X d b Z e d g i [da ^d ^h ^c k Z h i b Z c i \ g V Y Z ^c i] Z V \ \ g Z \ V i Z, M] Z < d b e V c n Y d Z h c d i b V c V \ Z V c n V h h Z ih ^c i Z g V V a n, A z d b e V c n Y d Z h c d i b V c V Z V c n V h h Z ih ^c i Z e V a n, A z d b e V c n Y d Z h c d i z d i Z e V v Z V c n V h Z h c i Z e V v Z V c n V h Z h c i Z e V v Z V c n V h Z h z d i z e V c V Z V c n V h Z h z d i z e V c V Z V c n V h Z h z d i z e V c V Z V c n V h Z h z d i z e V c V Z V c n V h Z h z d i z e V c V Z V c n V h Z h z d i z e V c V Z V c n V h Z h z d i z e V c V z v c n V h Z h z d i z e V c V z v c v d z z e V c v z v d z z e V c v z v z d z e V c v z v z d z e V c v z v z v z v z z e V$

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 $M]Z < dbeVcn] Vh cdc+fjVa^{A}ZY YZ[ZggZY XdbeZchVi^dc eaVch [dg i]Z WZcZ[^i d[XZgiV^c bVcV \ZbZci ZbeadnZZh, M]Z ^ckZhi bZci [j cYh d[[ZgZY id i]Z eVgi^X^eVcih \ZcZgVaan XdggZhedcY id i]Z [j cYh d[[ZgZY ^c i]Z < dbeVcn~h 2./&`' eaVc* VcY i]Z VXXdj ci WVaVcXZ [ajXijViZh 1^i] i]Z ^ckZhi bZci gZijgch dc i]dhZ [j cYh, M]Z j c[j cYZY dWa^\Vi^dch d[i]Z eaVch ^cXajYZY ^c Hi]Zg a^VW^a^i^Zh Vh d[CjcZ 1.* 0.00 VcY 0.0/ 1ZgZ "26 b^aa^dc VcY "3/ b^aa^dc* gZheZXi^kZan* VcY i]Z bV_dg^in d[i]ZhZ eaVch VgZ XadhZY id cZ 1 ZbeadnZZh,$

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 $BcXdbZiVmZhVgZgZXd\c^oZY[dgi]ZVbdjcid[iVmZheVnVWaZ[dgi]ZXjggZcinZVgVcY[dgi]Z^beVXid[YZ[ZggZYiVmVhhZihVcYa^VVW^a^ir^Zh^1]^X]gZegZhZci[jijgZiVmXdchZfjZcXZhd[ZkZcihi]Vi]VkZWZZcgZXd\c^oZYY^[[ZgZcian^ci]Z[^cVcX^VahiViZbZcihi]VcZhVW^a^ir^Zh^1]^X \\$

M]Z gZXdcX^a^Vi^dc WZi 1 ZZc i]Z <d 1="" ?zyzgva="" [daad="" ^cxd="" b="" evcn~h="" gviz="" h8<="" hivi="" i]z="" idgn="" ivm="" j="" n,l,="" th="" va="" vcy="" vh="" vxi="" z="" z[[zxi^kz=""></d>

 $\label{eq:main_problem} \texttt{M]Z h^{\chickshape h} \chickshape Lorentz Lorentz$

: jhigVa^Vc GHEh d["1/ b^aa^dc i]Vi VgZ bdgZ a^ Zan i]Vc cdi id WZ gZVa^oZY, ?dg i]Z [^hXVa nZVg ZcYZY Cj cZ 1.* 0.0/* i]Z <d b eVcn gZaZVhZY kVaj Vi^dc Vaad l VcXZh gZaViZY id N,L, ?ZYZgVa GHEh d["42 b^aa^dc i]Vi VgZ bdgZ a^ Zan i]Vc cdi id WZ gZVa^oZY,

 $\begin{array}{lll} Z & \text{\it j.TBRCQIOSINM} > \text{\it iDEN} ; \textit{\it EQUICER} \text{\it z} \text{\it M} \text{\it]} Z < d\text{\it b} \text{\it eVcn-h} \text{\it Lj} \text{\it WhXg}^ei^AcC} \text{\it O}^YZd \text{\it LZgk}^XZh \text{\it hZ} \text{\it b} \text{\it EZci} \text{\it egdk}^YZh \text{\it hedgih}^* \text{\it ZciZgiV}^c \text{\it b} \text{\it Zci} \text{\it VcY} \text{\it cZ} \text{\it 1} \text{\it h} \text{\it hZgk}^XZh \text{\it id} \text{\it eVn+MO} \text{\it VcY} \text{\it higWhYg}^WZgh \text{\it VcY} \text{\it di} \text{\it JZg} \text{\it Xd} \text{\it b} \text{\it b} \text{\it ZgX}^A \text{\it va}^XZchZZh^* \text{\it eg}^h \text{\it b} \text{\it Vg}^a\text{\it n} \text{\it k}^A \text{\it V} \text{\it XVWaZ}^* \text{\it hViZaa}^A \text{\it iZ} \text{\it VcY} \text{\it ciZgcZi} \text{\it Y}^h\text{\it ig}^W\text{\it ij}^A \text{\it dc}^* \text{\it VcY} \text{\it Xdch}^h\text{\it ih} \text{\it d} \text{\it [\&^{\Lambda'} i]Z} < d\text{\it b} \text{\it eVcn-h} \text{\it 43} \# \text{\it ^ciZgZhi} ^c \text{\it i]Z} \text{\it ?dmiZa} \text{\it @gdje} \text{\it \&} \text{\it 1}^A\text{\it i]} \text{\it i]Z} \text{\it gZb} \text{\it V}^c^c \text{\it c} \text{\it VcY} \text{\it A}^A \text{\it VcY} \text{\it M}^A \text{\it VcY} \text{\it M}^A \text{\it VcY} \text{\it VcY} \text{\it M}^A \text{\it Vc} \text{\it VcY} \text{\it A}^A \text{\it Vc} \text{\it VcY} \text{\it M}^A \text{\it Vc} \text{\it VcY} \text{\it Vc} \text{\it$

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 $\label{eq:continuous} \mbox{M]Z [daad 1 $^c \in iVWaZ$ $hZih [dgi]$ $i]Z < dbeVcn~h \ \ gdhh \ XVh] eV^Y [dgiVmZh \ VcY \ ^ciZgZhi8] $$$

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M]Z XdbedcZcih d[: XXjbjaViZY di]Zg XdbegZ]Zch^kZ adhh 1ZgZ Vh [daad1h8						
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7YR XVd I = eVc R | 7 ec' | gVc : I R TIR | FVa' ceI X

 $M]ZgZ]VhWZZccdX]Vc\Z^ci]Z<dbeVcn-h^ciZgcVaXdcigdadkZg[^cVcX^VagZedgi^c\ \&VhhjX]iZgb^hYZ[^cZY^cKjaZh/1V+/3\&['VcY/3Y+/3\&['jcYZgi]Z>mX]Vc\Z:Xi'Yjg^c\ i]Z<dbeVcn-h[djgi]fjVgiZgd[i]Z[^hXVanZVgZcYZYCjcZ1.*0.00i]Vi]VhbViZg^VaanV[[ZXiZY*dg^hgZVhdcVWana^^ZanidbViZg^VaanV[[ZXi*i]Z<dbeVcn-h^ciZgcVaXdcigdadkZg[^cVcX^VagZedgi^c\,$

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GdcZ

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 $\label{eq:model} $$M]Z ^c[dg b Vi^dc gZfj^gZY \ Wn i]^h ^iZb 1^i] gZheZXi id i]Z < db eVcn^h = ^gZXidgh ^h XdciV^cZY ^c i]Z Igdmn LiViZb Zci [dg i]Z < db eVcn^h 0.00 : ccj Va FZZi^c \ d[LidX`]daYZgh &i]Z {Igdmn LiViZb Zci|' id WZ [^aZY 1^i] i]Z L>< jcYZg i]Z]ZVY^c \ {IgdedhVa Gd, /8 > aZXi^dc d[= ^gZXidgh| VcY ^h ^cXdgedgViZY Wn gZ[ZgZcXZ ^c i]^h : ccj Va KZedgi, }$

M]Z ^c[dg b Vi^dc gZf j^gZY Wn i]^h ^iZ b 1^i] gZheZXi id i]Z <d b eVcn-h ZmZX ji^kZ d[[^XZgh ^h XdciV^cZY ^c i]Z Igdmn LiViZ b Zci j cYZg i]Z]ZVY^c\ {>mZX ji^kZ H[[^XZgh d[GZ l h < dgedgVi^dc | VcY ^h ^cXdgedgViZY Wn gZ[ZgZcXZ ^c i]^h : ccjVa KZedgi,

Md i]Z ZmiZci Veea^XVVWaZ* i]Z ^c[dg b Vi^dc gZf j^gZY Wn i]^h ^iZb 1^i] gZheZXi id Xd b ea^VcXZ 1^i] LZXi^dc /4&V' d[i]Z >mX]Vc\Z : Xi ^h XdciV^cZY ^c i]Z Igdmn LiViZbZci j cYZg i]Z]ZVY^c\!=Za^cf jZci LZXi^dc /4&V' KZedgih! VcY ^h ^cXdgedgViZY Wn gZ[ZgZcXZ ^c i]^h : ccj Va KZedgi,

 $\label{eq:model} $$M]Z ^c[dg b Vi^dc gZfj^gZY Wn i]^h ^iZb 1^i] gZheZXi id i]Z < dbeVcn^h LiVcYVgYh d[; jh^cZhh < dcYjXi ^h XdciV^cZY ^c i]Z Igdmn LiViZb Zci jcYZg i]Z]ZVY^c \\ {<dgedgViZ @dkZgcVcXZ F ViiZgh z < dgedgViZ @dkZgcVcXZ Ida^X^Zh| VcY ^h ^cXdgedgViZY Wn gZ[ZgZcXZ ^c i]^h : ccjVa KZedgi, }$

M]Z ^c[dg b Vi^dc gZfj^gZY Wn i]^h ^iZ b 1^i] gZheZXi id i]Z egdXZYjgZh Wn 1]^X] hZXjg^in]daYZgh b Vn gZXd b b ZcY cd b ^cZZh id i]Z ; dVgY d[=^gZXidgh ^h XdciV^cZY ^c i]Z Igdmn LiViZb Zci j cYZg i]Z]ZVY^c\ {<dgedgViZ @dkZgcVcXZ F ViiZgh z LidX`]daYZg KZXd b b ZcYVi^dc d[=^gZXidg <VcY^YViZh| VcY ^h ^cXdgedgViZY Wn gZ[ZgZcXZ ^c i]^h : ccjVa KZedgi,

 $\label{eq:model} $$M]Z ^c[dg b Vi^dc gZfj^gZY \ Wn i]^h ^iZb 1^i] gZheZXi id i]Z < db e^Vcn^h : jY^i < db b^iiZZ^* ^cXajY^c \setminus i]Z : jY^i < db b^iiZZ^h b Zb WZgh VcY ^ih [^cVcX^Va ZmeZgi* ^h XdciV^cZY ^c i]Z Igdmn LiViZb Zci j cYZg i]Z]ZVY^c \setminus {<dgedgViZ @dkZgcVcXZ F ViiZgh z ; dVgY < db b^iiZZh| VcY ^h ^cXdgedgViZY Wn gZ[ZgZcXZ ^c i]^h : ccjVa KZedgi, }$

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M]Z ^c[dg b Vi^dc gZfj^gZY Wn i]^h ^iZ b 1^i] gZheZXi id ZmZXji^kZ Xd b eZchVi^dc VcY Y^gZXidg Xd b eZchVi^dc ^h XdciV^cZY ^c i]Z Igdmn LiViZ b Zci j cYZg i]Z]ZVY^c \h {<d b eZchVi^dc = ^hXjhh^dc VcY : cVanh^h*| {>mZXji^kZ <d b eZchVi^dc*| {IVn KVi^d| VcY {=^gZXidg <d b eZchVi^dc*| gZheZXi^kZan* VcY ^h ^cXdgedgViZY Wn gZ[ZgZcXZ ^c i]^h : ccjVa KZedgi,

Md i]Z ZmiZci Veea^XVWaZ* i]Z ^c[dg b Vi^dc gZfj^gZY Wn i]^h ^iZ b 1^i] gZheZXi id Xd b eZchVi^dc Xd b b ^iiZZ ^ciZgadX`h VcY ^ch^YZg eVgi^X^eVi^dc ^h XdciV^cZY ^c i]Z Igdmn LiViZ bZci j cYZg i]Z]ZVY^c\ {<d b eZchVi^dc <d b b ^iiZZ BciZgadX`h VcY Bch^YZg IVgi^X^eVi^dc | VcY ^h ^cXdgedgViZY Wn gZ[ZgZcXZ ^c i]^h : ccjVa KZedgi,

M]Z XdbeZchVi^dc Xdbb^iiZZ gZedgi gZfj^gZY Wni]^h^iZb^h XdciV^cZY^ci]Z Igdmn LiViZbZci jcYZgi]Z]ZVY^c\ {KZedgi d[i]Z <dbeZchVi^dc <dbb^iiZZ|VcY^h^cXdgedgViZY WngZ[ZgZcXZ^ci]^h:ccjVaKZedgi,

 $M]Z \wedge c[dg b Vi^dc gZfj^gZY \ Wn i]^h \wedge iZb 1^i] gZheZXi id Xd b eZchVi^dc eda^XX^Zh VcY egVXi^XZh Vh i]Zn gZaViZ id i]Z < d b eVcn^h g^h`b VcV \ Zb Zci ^h XdciV^cZY ^c i]Z Igdmn LiViZb Zci j cYZg i]Z]ZVY^c \ {K^h`h KZaViZY id < d b eZchVi^dc Ida^X^Zh VcY IgVXi^XZh | VcY ^h ^cXdgedgViZY Wn gZ[ZgZcXZ ^c i]^h : ccj Va KZedgi, }$

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M]Z ^c[dg b Vi^dc gZfj^gZY Wn i]^h ^iZb 1^i] gZheZXi id hZXjg^i^Zh Vji]dg^oZY [dg ^hhjVcXZ j cYZg i]Z <db eVcn~h Zfj^in Xd b eZchVi^dc eaVch ^h XdciV^cZY ^c i]Z Igdmn LiViZb Zci j cYZg i]Z]ZVY^c\ {>fj^in <db eZchVi^dc IaVc Bc[dg b Vi^dc| VcY ^h ^cXdgedgViZY Wn gZ[ZgZcXZ ^c i]^h : ccjVa KZedgi,

 $M]Z \wedge c[dg b Vi^dc gZfj^gZY \ Wn i]^h \wedge iZb 1^i] gZheZXi id i]Z hZXjg^nin d 1 cZgh]^e d[XZgiV^c WZcZ[^X^Va d 1 cZgh VcY b VcV \ Z b Zci ^h XdciV^cZY ^c i]Z Igdmn LiViZ b Zci j cYZg i]Z]ZVY^c \ \{LZXjg^nin H 1 cZgh]^e d[GZ 1 h < dgedgVi^dc | VcY ^h ^cXdgedgViZY Wn gZ[ZgZcXZ ^c i]^h : ccjVa KZedgi,$

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M]Z ^c[dg b Vi^dc gZfj^gZY Wn i]^h ^iZ b 1^i] gZheZXi id igVchVXi^dch 1^i] gZaViZY eZghdch ^h XdciV^cZY ^c i]Z Igdmn LiViZ b Zci j cYZg i]Z]ZVY^c\ {<dgedgViZ @dkZgcVcXZ F ViiZgh z KZaViZY IZghdc MgVchVXi^dch Ida^Xn| VcY ^h ^cXdgedgViZY Wn gZ[ZgZcXZ ^c i]^h : ccj Va KZedgi,

 $\label{eq:model} $$M]Z ^c[dg b Vi^dc gZf j^gZY Wn i]^h ^iZb 1^i] gZheZXi id Y^gZXidg ^cYZeZcYZcXZ ^h XdciV^cZY ^c i]Z Igdmn LiViZbZci j cYZg i]Z $$]ZVY^c h {$<dgedgViZ @dkZgcVcXZ F ViiZgh z =^gZXidg BcYZeZcYZcXZ| VcY {$<dgedgViZ @dkZgcVcXZ F ViiZgh z ; dVgY <db b^iiZZh| VcY ^h ^cXdgedgViZY Wn gZ[ZgZcXZ ^c i]^h : ccjVa KZedgi, $$$

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 $M]Z ^c[dg b Vi^dc gZfj^gZY Wn i]^h ^iZb ^h XdciV^cZY ^c i]Z Igdmn LiViZb Zci j cYZg i]Z]ZVY^c h {?ZZh IV^Y id BcYZeZcYZci KZ ^hiZgZY Ij Wa^X : XXdj ci^c \ ?^g b | VcY {: j Y^i < d b b^iiZZ IgZ+: eegdkVa Ida^X^Zh VcY IgdXZY j gZh | VcY ^h ^cXdgedgViZY Wn gZ[ZgZcXZ ^c i]^h : ccjVa KZedgi,$

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- &V' M]Z [daad 1 ^c \ YdXj b Zcih VgZ [^aZY Vh eVgi d[i]^h gZedgi8
 - /, M]Z <dbeVcn~h <dchda^YViZY ?^cVcX^Va LiViZbZcih gZfj^gZY id WZ [^aZY Vh eVgi d[i]^h : ccjVa KZedgi VcYi]Z KZedgih d[BcYZeZcYZci KZ\^hiZgZY IjWa^X : XXdjci^c\ ?^gb VgZ ^cXajYZY ^c IVgi BB* BiZb 6, ?^cVcX^Va LiViZbZcih VcY LjeeaZbZciVgn =ViV,
 - 0, : aa di]Zg [^cVcX^Va hiViZ b Zci hX]ZY jaZh VgZ d b ^iiZY WZXV jhZ i]Z gZf j ^gZY ^c[dg b Vi^dc ^h cdi Veea^XVWaZ* dg WZXV jhZ i]Z ^c[dg b Vi^dc XVaaZY [dg ^h ^cXaj YZY ^c i]Z <d b e Vcn~h <dchda^YViZY ?^cVcX^Va LiViZ b Zcih dg i]Z GdiZh id i]Z <dchda^YViZY ?^cVcX^Va LiViZ b Zcih,
 - 1, >m]^W^ih z M]Z Zm]^W^ih a^hiZY j cYZg I Vgi &W' WZad l VgZ [^aZY dg ^cXdgedgViZY Wn gZ[ZgZcXZ Vh eVgi d[i]^h : ccjVa KZedgi, : {x | ^YZci^[^Zh ZVX] b VcV\Zb Zci XdcigVXi dg Xd b eZchVidgn eaVc dg VggVc\Zb Zci gZfj^gZY id WZ [^aZY Vh Vc Zm]^W^i id i]^h : ccjVa KZedgi* VcY hjX] a^hi^c\ ^h ^cXdgedgViZY]ZgZ^c Wn gZ[ZgZcXZ,
- &W' $>m \rceil^{N}W^{i}h$

0,0

- $\begin{array}{l} 2\text{,}1 & \frac{?\text{dg b d} \left[\ 1,653 \ \# \ \text{LZc} \ \text{dg GdiZh YjZ 0.07, \&BcXdgedgViZY Wn gZ[ZgZcXZ id >m} \right] \ \text{Whi 2,0 id i} \ \text{Z} < \text{jggZci KZedgi d} \left[\ \text{GZ 1h} \right. \\ & \frac{<\text{dgedgVi} \ \text{dc dc } ?\text{dg b 6+D \& ?^aZ Gd, ...} + 13547' \left[\ \text{^aZY 1} \ \text{^i} \right] \ \text{i} \ \text{Z} \ \text{LZXjg} \ \text{^i} \ \text{XD VcY >mX} \ \text{VcY } < \text{d b b } \ \text{^hhh} \ \text{dc dc } : eg^a \ / 3^* \\ & 0.0 \ \text{/} . \end{array} \right) } \\ & \frac{?\text{dg b d} \left[\ \text{No ellow} \ \text{Volume} \ \text{Allow} \ \text{Model of color of$
- 2,2 BcYZcijgZ* YViZY ?ZWgjVgn //* 0.00* WZi 1 ZZc i]Z <dbeVcn VcY N,L, ;Vc` Mgjhi <dbeVcn* GVi^dcVa : hhdX^Vi^dc* VhigjhiZZ, &BcXdgedgViZY Wn gZ[ZgZcXZ id >m]^W^i 2,/ id i]Z <jggZci KZedgi d[GZ 1 h <dgedgVi^dc dc ?dg b 6+D &?^aZ Gd, .../+13547' [^aZY 1 ^i] i]Z LZXjg^i^Zh VcY >mX]Vc\Z <db b ^hh^dc dc ?ZWgjVgn /2* 0.00,
- 2,3 $\frac{?\text{dg b d} [\ 3,/03\ \#\ LZc^dg\ GdiZh\ YjZ\ 0.10,\ \&BcXdgedgViZY\ Wn\ gZ[ZgZcXZ\ id\ >m]^W^i\ 2,0\ id\ i]Z\ < jggZci\ KZedgi\ d[\ GZ\ 1h] }{< dgedgVi^dc\ dc\ ?dg\ b\ 6+D\ \&?^aZ\ Gd,\ .\ .\ /+13547'\ [^aZY\ 1^ai]\ i]Z\ LZXjg^i^aZh\ VcY\ >mX]^Vc\ Z\ < d\ b\ ^hh^dc\ dc\ ?ZWgj\ Vgn\ /2^* }{0.00.'}$
- /.,0 : bZcYZY VcY KZhiViZY > beadn bZci : \gZZ bZci* YViZY CjcZ /6* 0.0.* WZi 1ZZc GZ 1 h < dgedgVi^dc VcY LjhVc

- /.,0. =ZZY d[: bZcYbZci* YViZY Vh d[GdkZbWZg /3* 0./7* id i]Z <db bdc MZgbh = ZZY Idaa* YViZY Vh d[: eg^a /.* 0./0* bVYZ Wn ?dmiZa F VcV\ZbZci Iin EiY VcY i]Z di]Zg eVgi^Zh i]ZgZid VXi^c\ Vh ^c^i^Va\ j VgVcidgh ^c [Vkdg d[i]Z [^cVcXZ eVgi^Zh YZ[^cZY i]ZgZ^c, &BcXdgedgViZY Wn gZ[ZgZcXZ id >m]^W^i /.,4 id i]Z J j VgiZgan KZedgi d[GZlh <dgedgVi^dc dc ?dgb /.+J &?^aZ Gd, ../+13547' [^aZY 1^i] i]Z LZX j g^i^Zh VcY >mX]Vc\Z <db b^hh^dc dc ?ZWg j Vgn 5* 0.0.,'
- /..0/ @ j Vg Vcidg: hh j b ei^dc = ZZY I daa* YViZY Vh d[GdkZb WZg /3* 0./7* id i]Z < d b b dc MZg bh = ZZY I daa* YViZY Vh d[

9 i YZSZe

Bf ^SVc 9 i YZSZe 8 VdTcZaeZ`

- / .,05 : XXZhh^dc = ZZY Idaa* YViZY Vh d[GdkZ b WZg 00* 0 . /7* id i]Z = ZZY d[@ j VgVciZZ* YViZY Cjan 03* 0 . /0* ZmZXjiZY Wn ZVX] Zci^in a^hiZY ^c i]Z LX]ZYjaZ i]ZgZid, &BcXdgedgViZY Wn gZ[ZgZcXZ id >m]^W^i / .,/ . id i]Z J j VgiZgan KZedgi d[GZ 1 h < dgedgVi^dc dc ?dg b / .+J &?^aZ Gd, . . /+13547' [^aZY 1^i] i]Z LZXjg^i^Zh VcY >mX]Vc\Z < d b b^hh^dc dc ?ZWg j Vgn 5* 0 . 0 . .'
- O/,/ E^hi d[LjWh^Y^Vg^Zh,(
- 01,/ <dchZci d[>gchi \$ Rdjc\ EEI 1^i] gZheZXi id GZ1h <dgedgVi^dc,(
- $\frac{1/,}{<|^7Z[>mZXji^kZH[[^XZg<Zgi^[^XVi^dc~gZfj^gZY~Wn~KjaZh~/1V+/2~VcY~/3Y+/2~j~cYZg~i]Z~LZXjg^i^zh>mX]Vc\Z~:Xi~d[^712*~Vh~Vb~ZcYZY,($
- $\frac{1/,0}{\sqrt{12^{\circ} \text{ Ve Ve X/Va } H[[^{XZ}g < Zgi^{^{X}Vi^{\circ}dc } gZfj^{\circ}gZY \text{ Wn } KjaZh / 1V+/2 \text{ Ve Y } / 3Y+/2 \text{ } j \text{ e YZ}gi]Z \text{ } LZXjg^{i}Zh > mX]\text{Ve } Z : Xid[-2]}{\sqrt{12^{\circ} \text{ Vh V b Ze YZY}}}$
- 10,/ <Zgi^[^XVi^dc d[<]^Z[>mZXji^kZ H[[^XZg VcY <]^Z[?^cVcX^Va H[[^XZg ejghjVci id /6 N,L,<, LZXi^dc /13.* Vh VYdeiZY ejghjVci id LZXi^dc 7.4 d[LVgWvcZh HmaZn : Xi d[0..0,((
- / .2 M]Z XdkZg eV\Z [gd b GZ l h <dgedgVi^dc\h : cc j Va KZedgi dc ?dg b / .+D [dg i]Z [^hXVa nZVg ZcYZY Cj cZ 1 .* 0 . 00* [dg b ViiZY ^c Bca^cZ Q ; KE &^cXa j YZY Vh >m]^W^i / ./',(

(?^aZY]ZgZ 1 ^i]

- $((?igc^h]ZY]ZgZ1^i]$
- x FVcV\ZbZci XdcigVXi dg XdbeZchVidgn eaVc dg VggVc\ZbZci
- r <ZgiV^c edgi^dch d[i]^h Zm]^W^i]VkZ WZZc db^iiZY ejghjVci id BiZb 4./&W'&/.' d[KZ\jaVi^dc L+D,

=H9A+0(:CFA+*'?GIAA5FM

GdcZ,

G=; B5H1F9G

 $\label{eq:lighty} I\ jgh\ j\ Vc\ i\ d\ i\]Z\ gZf\ j^gZ\ b\ Zc\ ih\ d[\ LZXi^dc\ /1\ dg\ /3\&Y'\ d[\ i\]Z\ LZXj\ g^i^Zh\ >mX]\ Vc\ Z\ : Xi\ d[\ /712^*\ i\]Z\ gZ\ ^hig\ Vc\]\ Vh\ Y\ j\ an\ XV\ j\ hZY\ i\]^h$ gZedgi id WZ h^\cZY dc ^ih WZ]Va[Wn i]Z jcYZgh^\cZY* i]ZgZjcid Yjan Vji]dg^oZY,

> G > PL < HKIHK : MBHG&KZ\^higVci'

; n8

-h- LjhVc IVcjXX^d

GfdR_DR_fTTZ` 7 YZVW:1_R_TZR] CWWZTVc

=ViZ8 : $j \setminus jhi / 0*0.00$

 $\label{eq:continuous} \mbox{dc WZ]Va[d[i]ZgV^higVciVcY^ci]ZXVeVX^i^ZhVcYdci]ZYViZh^cY^XViZY8}$

GℤX_RefcV	H7e]V	8 ReV
-h- KdWZgi C, M]d b hdc F`SVce >(HY`^d`_	<pre><]^Z[>mZXji^kZ H[[^XZg VcY =^gZXidg &Ig^cX^eVa >mZXji^kZ H[[^XZg'</pre>	: j\jhi /0* 0.00
-h- LjhVc IVcjXX^d GfdR_ DR_fTTZ`	<]^Z[?^cVcX^Va H[[^XZg &Ig^cX^eVa ?^cVcX^Va H[[^XZg'	: j\jhi /0* 0.00
-h- F Vgn\gVXZ =Z@gVo^d A RcjXcRTV 8V; cRkZ`	<pre><]^Z[: XXdjci^c\ H[[^XZg &Ig^cX^eVa : XXdjci^c\ H[[^XZg'</pre>	: j\jhi /0* 0.00
-h- D, KjeZgi FjgYdX] ?(FfaVce A fcU`TY	$>$ mZX j i^kZ $<$] V^g b V c	: j\jhi /0* 0.00
-h- EVX]aVc D, F jgYdX] @RTY]R_ ?(A fcU`TY	$< d+<] V^{\wedge}g b Vc$: j\jhi /0* 0.00
-h- DZaan : ndiiZ ?V]] j 5 j eeV	- =^gZXidg	: j\jhi /0* 0.00
-h- Cdhp F VgqV : ocVg >`dl ARcmR 5k_Rc	- =^gZXidg	: j\jhi /0* 0.00
-h- GViVa^Z ; VcXgd[i BReR]ZV 6R_Tc`We	- =^gZXidg	: j\jhi /0* 0.00
-h- IZiZg E, ; VgcZh DVeVc @(6Rc_Vd	- =^gZXidg	: j\jhi /0* 0.00
-h- : cV IVjaV IZhhdV 5_R DRf]R DVdd`R	- =^gZXidg	: j\jhi /0* 0.00
-h- F Vhgddg L^YY^fj^ A Rdc``c GZUUZbfZ	$=^{g}ZXidg$: j\jhi /0* 0.00