

H = @ A@ Q ? = ?E JNA HI L H A @ A B O R K N @ R H = JNE B E ?@ @AKJ K O D =



½ Á Š » :	A O ? N E L ? E > F A R R D@ A H	J E ? R=Q E N K C N N > F A R R D	A ? D@ A A N I E J = ? E	A N=N E A J @ AA @ E ?	A N O K J : A O L K J O :	½ » ½ ½ < ½ » ? P Q = H E V@=A O P = @ K
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=L=?EPN=HJ QARK LANDKJ=H@ OK>NA
AHQK @AKO@PKO@H AN=OKH>KNHMDA
OAAJ?QAU P@J AJ AH@EJK @H AL=N@J AJPK
@A AQ>NNKH@H QANV= =>KNH i
U

C K I O P
= J Q = H AA J P
O A C Q A =
JA ? A O = N E K

J ? Q A O P
L M R EU=

K K@I E J = @
AQ@H AHLNK?ACK
ANGEO U
AC@K=H =NAAN
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NA O A J P =@?AE j J = H A N O K@JA
UO K ? E K I O@NE = @K @AH
A O P =@AKH@H = @H@K =@K@AH
? K J @ =@AKJ K O D =

C K I O P
= J Q = H AA J P
A PKN@HE I
C N Q@KA
A JKBM Q A

L H = V =O@ K ‡
RK I RA X=AR= H G= =
AQ P E H@V j
L M ? A OAK@ E J O
U A C E K J
= M A N@ PSD=UO

½ > i
AQ>NNKH#NQJ
LNK?AKL=N@
ERKHO?N=N=HKO
L=@AOAJ H@
LHJ@=?E J
=?=@ I B=U
LNKB@EJK=HMDA
@?H@U%

½ Š J BKN =NOK>NA
HKOCANREPKO@AH
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NKLKN@EJK=N
LNKNH =OU
CANREPKO@A
MQA OA=J R-HKN=@KO
LKNH@KOL=@AOU
=UQ@NKO
AJ PAJ @ANI AFRN
U=LKU@N=OOO
AOQ@EJPAO
K>FAPR@KOU@HJAO@A
=?E J Š

KOL=@AO@P@KNAOCANKJ LNAOU@P=@KO+H
LKNP@H=N@L=@AO@A AH@K @Q@JPAÁŠ
=?E@=?E J
J I d@E K@AQJ=NAQJ@J BKN =H@A
L=@AO?KJ AH@Q@EJPAUAH@KJ@AFANK
AJ HKOON=@KOÁU½»

?P@NA
=JQ@H AJPA

J BKN A @A
L=N@P@E= ?E J
@AHKOL=@AO
AJ =NAAN
N@EJC

KJ@AFANKO
AHJV AH@KN@H
L=N@L=@AO@A AH@K
UOALNAOU@P =HO
B@ E@O@A =
P@R O@A
?KJ@ANU?E@O@A
KPKhKŠ

½ Š qH@EHAO
KLKNPQE@-@AO
L=N@L=N@P@E=NAJ
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Š

½ Á Š » :
A M Q E C

A O ? N E L ? E > F A R R D @ A H

J E ? R = Q E N K C = N > F A R R D

A ? D @ A

½ Á Š » :
A M Q E C

A O ? N E L ? E > F A R R D @ A H

J E ? R = Q E N K C = N > F A R R D

½ Á Š » AM Q E C	A O ? N E L ? E	> F A R R E @ A H	J E ? R = P E N K C = N > F A R R D	A ? D @ A A N I E J = ? E	A N = N E A J @ AA @ E ?	A N O K J A O L K J O	½ » ½ ½ < ½ » ? P Q = H E V @ - A O P = @ K
							<p>& (6\$ 5 HG\$ 5 & 3 UHSQDUFyQ XQYHUVWVUD SURHMRQDO FRP XQWVUD OMy D FDER YDUUDVUH XQLRQH / . 8 6' DVLWV DFQGD UH XQyQ</p> <p>/ RVHWXGLDQAH/VWHQH ODRSRUWXQGDGHH SDWVLSDUHQ 2 WJDQJ DFLRQH/VGH (WXGLDQAH/GH & DUWHUDV 7 pFQFDV ' (& \$) %/ \$) && / \$ + 2 6\$ \ 6NQOB 6\$ < (GXFDRUHV/HQ DVFHQR</p> <p>ANAHENKJ AT?QNDEKAO= HKO AI LHA=@KNAOK?=HQS</p> <p>KOATDE> EPEKJA O RENQ=HKO@A ?=NNAN=O AJ RERK KNC=J E= @O L=N= AORQE=J PAOGA</p>

½ Á Š » :
A M Q E C

A O ? N E L ? E > F A R R E @ A H

J E ? R = Q E N K C = N > F A R R D

A ? D @ A
A N = N E A J

A N O K J : ½ » ½ ½ < ½ »
A O L K J O : ? P Q = H D U <

$\frac{1}{2} \tilde{A} \check{S} \gg$ A M Q E C	A O ? N E L ? E \rightarrow F A R R \oplus A H	J E ? R \oplus E \& K C \& N > F A R R \oplus	A ? D @ A A N = N E A J	A N I E J = ? E \oplus AA @ E ?	A N O K J A O L K J O :	$\frac{1}{2} \gg \frac{1}{2} \frac{1}{2} \ll \frac{1}{2} \gg$? P Q = H E \oplus A O P = @ K
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į Š j i KAHLNKONH = @
 A@Q=?E J L=N AH
 AI LHAK>NEJ @NK=??AOK
 =HKO?QNN?QHKO
 =LHP=@KO ONRE?EKO@
 KNAUP=?E J U
 =OOKNH EAJPK
 LNAL=N=?E J P ?JE=?
 =LNAJ @A=FA @AF RAJAJO
 AEOPNQ=?E J AJ
 D=>E@AO
 NAH=?EJK=@O?KJ AH
 AI LHAKŠ

QN=JPAH=AQQAH
 OA?QJ @NE=TPK@OHKO
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 EJRAOPC=NKJ KL?EJKAO
 LKOPA?QJ @NEOU
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$\frac{1}{2} \text{ Á } \check{\text{S}} \text{ » }$ AM Q E C	A O ? N E L ? E	> F A R R D @ A H	J E ? R = P E N K C = N N > F A R R D	A ? D @ A A N I E J = ? E	A N = N E A J @ AA @ E ?	A N O K J A O L K J O	$\frac{1}{2} \gg \frac{1}{2} \frac{1}{2} \ll \frac{1}{2} \gg $? P Q = H E V @ - A O P = @ K
			<p>H=AO@A P=NP KH=ACA KS i AJ =PAS=U A?DJ E=H KH=ACA</p> <p>QNKO@A =NBO@A ??ACOPK KH=ACA NA@P i AJ AOPQAHOO?QJ @NEOU =NU KH=ACA NA@P NK=NH i AJ EOPQ?EJK AOLKODA?QJ @NEOK?=HAO</p>	QHK=JQ=HI AJPA	<p>JBKN A @ =PAS=U A?DJ E=H KH=ACA L=N=HO ACOPQAHOO QJ @NEO</p> <p>JBKN A @ PK@OKHO =HQ JKOK@AKO ?QNKO</p>	K K @ E J = @	<p>Á ³A O P Q @C E = O K H EK?JE Q N @</p> <p>Á ³A O P Q @C E = O K H EK?JE Q N @</p>
$\frac{1}{4} @$	<p>I L H A I A J @ P J = N A O = P A N C E = N E B K H Q N @ N = O A I L A N O + G = D E J O P E P @ ? A E K A @ Q ? = ? E j J L K O P O A ? Q J @ B Q A N ! > K H N @ A O K = H N @ K I = L H = J E B E C ? A = J ? A E N A J ? K J O K J ? J K ? E H = J @ A O E @ = @ L M U A ? P = @ = O S</p>	<p>=OAI LNAQ=OK?=H@C HKOK?EKO LKODA?QJ @NKO@AH @Q=NNKH@K @A+ BQAN=H =>KN@H@NAQ@EJK ?KJ AHL@KJ=H@A L=N=LH@J@P=N HOJA?AO@=AO BQPN=GS</p> <p>=N@E@AAJ AH KJOK@PK @A LNAL=N=?E J LNK@EJK=H@A =PAS=U A?DJ E=H KH=ACA</p> <p>H@L@KJ=H@A @ AO I E@I >NK @H@K?K@P O=O@KNAO@A =PAS=U A?DJ E=H KH=ACA</p> <p>KI @P EN@PK @A LN@J @V@FA QRAJ@H</p>	<p>A B J P = H O A I L N A Q = O = H @ N A Q J E J @A L A N O K J = H @ A @ A = C O P K L = N = = J = H @ N A H L H @ J @ A O P Q @ C O H O J A ? A C E @ A O @ A A I L H A K = ? P Q = H A C H O P A J @ A ? E O @ A H E I @ Q P N E @ A P ? S</p> <p>AQJEKJAO I AJQ=HAO OALPEI >N@I =UK</p> <p>@KORA?AO=H@H@K</p>	<p>JQ=HI AJPA AJ OKOK</p> <p>AQJEKJAO I AJQ=HAO OALPEI >N@I =UK</p> <p>@KORA?AO=H@H@K</p>	<p>R=HQ=?E J @ A H @ N A Q J E J</p> <p>?H@J @N@K @ A L A N Q @ P R =</p> <p>?P= @ A NAQJ E J</p> <p>?P= @ A NAQJ E J</p>	<p>KKN@J=@K@A</p> <p>KKN@J=@K@A</p> <p>KKN@J=@K@A</p> <p>KKN@J=@K@A</p>	<p>K=CQ-JP @>E@C=</p> <p>Š EN@Q@H</p> <p>@N@J P A R K @ K A H @ H K U</p> <p>=O@F =</p> <p>NAQJEKJAOI AJQ=HAO @A =N@N@N@L KJOK@Q</p> <p>L=N@E@=AJ H@O NAQJEKJAO@A H Q J P = @A AC=NNKH@K @A+ QAN= =>KN@H@A QNAOPA @A E@KJ@E U @A H KJOK@A KJOPN?E J @A H QNAOPA @A E@KJ@E Š</p>

$\frac{1}{2} \text{ Á } \check{\text{S}} \text{ » }$ A M Q E C	A O ? N E L ? E	> F A R R E @ A H	J E ? R = P E N K C = N N > F A R R D	A ? D @ A A N I E J = ? E	A N = N E A J @ AA @ E ?	A N O K J A O L K J O	$\frac{1}{2} \gg \frac{1}{2} \frac{1}{2} \ll \frac{1}{2} \gg$? P Q = H E V @ - A O P = @ K	
			K I P @ A E O N = V O K @ A A N G E J O A G - N N K H A Q J = L X O E J = A J A H O E K S A > @ A O K ? E ? E K J A O K I A N P E H A O = N K > P A J A N Q J = @ A O N E ? E J C A U A N H @ A H O B K N = O A J M Q A H ? K I Q J E @ @ A I L N A G - N E - H L Q A @ A L = N P E E = N Š	Q H K 1 \frac{1}{2} 1 \frac{1}{4}	? P = @ A N A Q J E J J O P = J P X J A = @ A H L X O E J = S A > @ A	A N O K J = H @ A š š M Q E K @ A H O N = V O K @ A J Q E B A	K J P E J q = @ A G - N N K H B J @ K O A Š K ? E K O ? K I A N P E H A O @ A N E Q K O - H O E K S A > @ A U = H O E K S A > @ A	
$\frac{1}{2} = i$	N K L K N P E K J = N ? K J K ? E E B A J P K @ A H = N N A N = A J A H J E R A H A O A H A N A J P H A C Š Q L A ? E P = I A J P A % 1 \check{\text{S}} K N M Q H C A J P A • P N > = F \check{\text{Z}} 1 \check{\text{S}} = O ? K J @ ? E K J A O > = F K H O ? Q = H O H O L A N D K J = O P N > = F J Š 3 \check{\text{S}} K O J E R A H A O @ A B K N = ? E J U A @ Q ? = ? E J J A ? A G - N K O L = N = A H P N > = F K Š T L A ? P = F E R - O ? K I Q J A O L = N = H K O A I L H A = @ K O A J A H H O C = N @ P N > = F K Š A \check{\text{S}} j \ I K O A N A H ? E K J = J H O A T L A ? P = F E R - O A J H A Q P Q A H ? K J H O A T L A ? P = F E R - O A J A H I Q J @ K H > K N H \\$	H ? K I L H A P = N H K O A \check{\text{S}} C N = @ K H K O A Q P Q E J P A O A J P A J @ A N M Q A D = U Q J = C N J R - N A @ @ @ A K L K N P Q J E @ @ A O L N K B A D E K J = H A O @ O L K J E S H A O U M Q A O A J A ? A O P = I Q ? D K P N > = F K ‡ A @ Q ? = ? E J U ? = L = ? E P = ? E J L = N D = ? A N H K > E A J \check{\text{S}}	= O = ? P I R E @ @ A O @ A T L H K N = ? E J @ A ? = N N A N = O U D > H H O @ @ O O A H M A R - J = ? = K A J ? = @ C N = @ K @ A L N E = N E A J A H A O @ A I = N K Š	= N K = J Q = H I A J P A	H = J @ A H A ? ? E K J C A J - A @ N K C L K A H I = A O K P N A ? Q N @ A A F A I L H K T L H E K N E j . @ A = M A N % L N E I = N E	? K J O A F A N K O @ A H A Q P Q A H L N E = N E ^ I = A O P N K O @ A Q P Q K O K ? E H A O N A H ? E K J = @ K ? K J H O ? = N N A N = \check{\text{S}}	K O ? K J O A F A N K O @ Q P Q A J H O ? = N N A N = O F Q J P K ? K J A H L H J @ A A Q P Q @ K O @ A Q P Q @ K O K ? E H A O N A H ? E K J = @ K ? K J H O ? = N N A N = \check{\text{S}}	K O A Q P Q E J P A O @ A j \check{\text{S}} U \check{\text{A}} \check{\text{S}} C N = @ K @ Q P Q A J Q Q O B K N P H A V - O A E J P A N A O O U ? I K L Q A @ A J H M A R - N = B Q P Q N = O K L ? E K J A O @ A ? = N N A N = \check{\text{S}} = O D > H H O @ A O O K ? E H A O U H O A T L A ? P = F E R - O @ A ? K I L K N P = I E A J P K N A H ? E K J = @ O ? K J I = J P A J A N Q J P N > = F K O A @ Q P = ? J @ Q N J P A H O H A ? ? E K J A O @ A H ? K J O A F A N K Š

$\frac{1}{2} \text{ Á } \check{\text{S}} \text{ » : }$	A O ? N E L ? E > F A R R \ominus A H	J E ? R = P E N K C = N > F A R R \ominus	A ? D @ A A N I E J = ? E	A N = N E A J @ A A @ E ?	A N O K J : A O L K J O :	$\frac{1}{2} \gg \frac{1}{2} \frac{1}{2} \ll \frac{1}{2} \gg$? P Q = H E V @ - A O P = @ K
$\frac{1}{2} > i$	NKLKNPEKJ=N ATLHN= ? E J @ A ? =NNA=OAJ HKOJ BRAHO @AH ACQAH E PAN A @ Š Q A ? DE = I AJ PA %	H?KI LHAP=NHKO @ Š ON @ K @ HKO AOQ @ E J PAO AJ PAJ @ ANKJ ? j I K =HE A=NOQO D>EHE @ OA E PANAOAO	KOAOQ @ E J PAOKJ EJ PNK @ Q EKO= AHK U?KI LHAP=J HOATLA?P=H=O @AH LAN @ H @ A D>EHE @ OA @ J BRAHO ON @ S N= @ K Á % =NNA= =P=DI =GANT U GEHOU ATLHN= NCNLKO @ A ? =NNA=O	=UK=JQ=HJ AJ PA	J BKN A @ A AOXJ @ NAO @ A EJ=H= ? E J @ A ? =NPA= AJ AHK	KJOAFANKOU KKN @ E = @ KN @ A LKUK OQ @ E J REH OAD=J ? =NC= @ K U H O =?PQ=H= ? EKJ AOAOXJ AJ LNK?AOK OACqJ HKO ?KI AJ P=NEKO @ AHKO AOQ @ E J PAOUAH ?KME q!!W @
$\frac{1}{2} \check{\text{S}}$	KJ PEJ Q @ - @ A ? =NNA=O 1/2 HE A = ? E J @ A HKO E PANAOAO D>EHE @ =@AOLANDJ=HAO OANH ? EKJ = J ? KJ AQ-O=NNAN=O 3/2 LN AJ @ V=FA >Q=@KAJ AH PN>=EKAJ H AOQAH OA?QJ @ NE Š ? Š J RA @ E = ? E J @ A ? =NNA= L=N E @ A J REH = N LNABANAJ ? E O LANDKJ=HAO	LANDKJ=HAO=QJ= =I LHE R=NE @ - @ A ? =NNA=O E RA @ E = ? EKJ AO ? j I K LNAL=NND ABE=V AJ PAL=N HO? =NNA=O @ A E PAN O	N= @ K Á % =J RAJ P=NIK @ A OPEKO @ A =LNAJ @ V=FA @ R=H= ? E J @ A EJ RAJ P=NIK U =?P=RE @ OA @ A @ K?Q AJ P= ? E J N= @ K Á % =A @ ? PKN @ A ? =NNA=O @ ATLHN ? =NNA=O @ A E PAN @ V=AC @ N=AH LHJ RE= @ KN @ A ? QDKO @ AH ACQAH OA?QJ @ NE U?KI L=N=AH LKNP=BHK ? KJ H NAQJ E J @ AL= @ A @ S ? KJOAFANKO	EPAI >NA $\frac{1}{2} \gg \frac{1}{2} \tilde{A}$		KKN @ E = @ KN
			=LNAOAJ P= ? E J @ A =LNAJ @ V=FA @ R=RAJ EHO ? =N= NK ? KI KQJ=H= ? E J L=N= A @ H =?H= ? E J			

$\frac{1}{2}$ Á Š » :
AM Q E C
 $\frac{1}{2}$?

A O ? N E L ? E > F A R R E @ A H

J E ? R = Q E N K C = N > F A R R D

A ? D @ A
A N = N E A J

A N O K J : $\frac{1}{2} \gg \frac{1}{2} \frac{1}{2} \ll \frac{1}{2} \gg$
A O L K J O : ? P Q = H E V @ = A
O P = @ K

<p>$\frac{1}{2} \text{ Á } \check{\text{S}} \text{ » : }$</p> <p>A M Q E C</p> <p>=HQ JKO=</p> <p>LNKONH =O@A</p> <p>A@@?=?F J</p> <p>LNKBAOKJ=HU</p> <p>P ?J E=‡</p> <p>E ?KQ@KO</p> <p>LNKONH =OAJ</p> <p>?KHAC@KO</p> <p>P ?J E@K\$</p> <p>$\check{\text{S}}$??AO@HKO</p> <p>=HQ JKO=</p> <p>E@BKN =?F J</p> <p>LNA?E= @AH</p> <p>I ANP=@K H>KNH</p> <p>J=?E@KJ=‡</p> <p>NAC@KJ=HU</p> <p>AOP=P@EJ ?HQ@-</p> <p>H@KBANP UH</p> <p>@A =J @- @AH</p> <p>I ANP=@K H>KNH\$</p> <p>$\check{\text{S}}$ JOPNQ=?F J U</p> <p>ATLANEJ ?E AJ</p> <p>AH@G@NNKH@KU</p> <p>LANBA??E@KJ=I EAJ</p> <p>PK @AHO</p> <p>D>H@- @AOU</p> <p>?K@ LKNP=I EAJ PK</p> <p>OMQAJA?AOP=J</p> <p>HKO=HQ JKO</p> <p>L=N K>PAJANU</p> <p>?KJ OANR=NQJ</p> <p>AI L@AK\$</p>	<p>A O ? N E L ? E > F A R R @ A H</p> <p>J E ? R@P E@N K C@N > F A R R @</p> <p>A ? D@ A A N I E J = ? E</p> <p>A N = N E A J @ AA @ E ?</p> <p>A N O K J A O L K J O :</p> <p>$\frac{1}{2} \gg \frac{1}{2} \frac{1}{2} \ll \frac{1}{2} \gg$</p> <p>? P Q = H E V@=A O P = @ K</p>
<p>N@K 1/1%H JAO@A NQ=HOK</p> <p>LNKBAOKJ=H@ABE@F J @AH TER@</p> <p>KL?E@KJAO@A PN=UA?PN@LNKBAOKJ=HU</p> <p>AJ PNAREP=O@A PN>=FK</p> <p>KOAPQ@=J PAO@A OA?QJ @NE</p> <p>L=NP@E=J AJ AH NKO@H =@A</p> <p>=OK?E=?F J AI LNAG@EHAJ A@@?=?F J</p> <p>; L=N REOP=NQJ ERAND@=AOU</p> <p>AI LNAG@OK?@HAOMQA>NEJ @J</p> <p>ATLHN@=?F J @A=?NN@N@NAH?E@KJ=@O</p> <p>?KJ H@O A?AD@=AO@AH ANP=@K</p> <p>H>KNH\$</p>	<p>=NK=JQ@H AJ FA</p> <p>J?QAD@ A</p> <p>QH@= @A</p> <p>L=NP@E=?F J</p> <p>KKN@=@KN@A</p> <p>AAR@Q=NL=N</p> <p>LKUK</p> <p>1/2 1/2 1/2 A tDh@, @</p> <p>OPQ@=J@H@U</p> <p>XI =N@ A</p> <p>KI ANPEK</p>

$\frac{1}{2}$ Á Š » :
A M Q E C

A O ? N E L ? E > F A R R E @ A H

@AHHQ JKŠ

$\frac{3}{4}$?

J E ? R = Q E N K C N N > F A R R D

A ? D @ A
A N = N E A J

A N O K J : $\frac{1}{2} \gg \frac{1}{2} \frac{1}{2} \ll \frac{1}{2} \gg$
A O L K J O : ? P Q = H E V @ = A
O P = @ K