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"#$!%&'!()%*!
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+ ,#-! ./0123045 ,-6!

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 $708!\#-,!10-59\#44\$!9:;9',5!/0!\#//,:5!/3,!()\%*!\#::8\#4!<,,/9:=!0>!?/0123045,-?!0>!@A!B,13:040=9,?!C0-D0-\#/90:'!E3913!\\ E,!E944!3045!0:!F-95\#\$'!G84\$!\%('!()\%*'!\#/!*6))!\#H<\#'!401\#4!/9<,'!\#/!/3,!0>>91,?!0>!C#D9/#4! I,#4/3! J5;9?0-?'!*%K)!L#44,-9#!C08-/'!B39-5!F400-'!M#D4,?'!F40-95\#!KN\%)*<math>\#$ 1!

 $I\ ,!!!+...!D4,\#?,5!/0!/\#2,!\#5;\#:/\#=,!0>!\ ,18-9/9,?!\#:5!OP13\#:=,!CO<<9??90:!-84,?!/3\#/!\#440E!9??8,-?!/0!>8-:9?3!D-OP\$!\\ <\#/,-9\#4?!/0!/3,9-!?/0123045,-?!0:!/3,!0:/,-:./\fl I\ ,!R,49,;\ ,!/3,?,!-84,?!\#440E!8?!/0!D-0;95,!08-!?/0123045,-?!E9/3!!\\ /3,!9:>0-<\#/90:!/3,\$!:\ ,,5'!E394,!40E,-9:=!/3,!10?/?!0>!5,49;\ ,-\$!\#:5!-,5819:=!/3,!\ ,:;9-0:<\ ,:/\#4!9<D\#1/!0>!08-!\#::8\#4!<\ ,,/9:=\fl!S:!0-!\#R08!!\ \"\#$!(N'!()\\%*'!E,!,PD,1/!/0!R,-9:!<\#949:=!\#IMO/91,!0>!0:/\,-:./!J\ ;\#94\#R949/\$!0>!T-OP\$!\ \"\#,-\9\#4?'!0-!0UD-OP\$!\ :0/91,''\0!08-!?/0123045,-?!0>!-,10-5!\#?!0>!/3,!140?,!0>!R8?9:,??!0:!\ \"\$\$\$\$\$!B3,!0UD-OP\$!:0/91,!10:/\#9:?!9:?/-81/90:?!\ >0-!\$08-!8?,!0>!/39?!D-01,??'!9:14859:=!3-4(!)-6(C)(:)TjET1(81/)-2(9)-2(0:?)-1(!)]TjET0q0.24000.2412-\&11-2(!)-2(0:?)-1(!)q0.24000.2412-\&11-2(!)-1(!)q0.24000.2$ 

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5#/,'!"#$!%N'!()%*'!R$!/3,!>0440E9:=!9:59;958#4?!0-!=-08D?6!
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                                                                            \#DD, \#-9:=!9:!/39?!D-OP\$!?/\#/, <,:/!]/3,!^M\#<,5!OP,18/9;,!S>>91,-?_`X!#:5!
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                              @,:,>919#4!0E:,-?39D!9?!5,/,-<9:,5!9:!#110-5#:1,!E9/3!/3,!-84,?!0>!/3,!.OC!#:5!=,:,-#44$!9:1485,?!;0/9:=!0-!
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Q:/,-:#/90:#4!Q:1H!]M7.O6!dSM`!>-0<!G8:,!%**[!/0!G#:8#-$!())fH!"-H! I 9449?!3045?!1,-/9>91#/90:?!#?!#!Y,#:!"#?/,-!#:5!.9P!
.9=<#!@4#12!@,4/!#:5!@H.H!#:5!"H.H!5,=-,,?!9:!Q:58?/-9#4!B,13:040=$!>-0<!O#?/!C#-049:#!c:9;,-?9/$H!
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2-*'0#6"#C3&4-20!E#?!#DD09:/,5!#?!08-!C39,>!B,13:040=$!S>>91,-!,>>,1/9;,!J8=8?/!N'!()%&H!d,!Z09:,5!!
/3,!C0<D#:$!9:!())&!#:5!<0?/!-,1,:/4$!?,-;,5!#?!/3,!V91,!T-,?95,:/!o!T-0Z,1/!(f!.048/90:?'!-,?D0:?9R4,!>0-!D-0581/!
5,>9:9/90:!#:5!<#-2,/!#:#4$?9?'!E9/3!#!>018?!0:!5,;,40D<,:/!0>!08-!TU(f!<0R94,!#:5!D0-/#R4,!-#590!D-0581/?H!.9:1,!%**K'!"-H!d0/3#8?!3#?!R,,:!#1/9;,9:!/3,!5,;,40D<,:/!0>!4#:5!<0R94,!-#590!D-0581/?!#:5!/3,!TU(f!+9=9/#4!b#590!./#:5#-5?H!d,!3045?!#:!"H.H!+,=-,,9:!O4,1/-91#4!O:=9:,,-9:=!>-O<!.08/3,-:!",3059?/!c:9;,-?9/$H!
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!! #########PO)#E1/+5#12#5-+)63I+"#-"#61, ,-33)5#3I#<I15#E2"-.)""#>+/63-6)"9#3+/.">/+).6'#-.#2-./.6-/(#+)>I+3-.<#/.5#30)#O-<0)"3# ()B)(#12#6I+>I+/3)#<IB)+./.6)\pmPO)#E1/+5#12#5-+)63I+"9#NO-60#-"#)()63)5#E'#30)#"316I0I(5)+"9#-"#1?+#?(3-,/3)#5)6-"-1.K,/I-.<# E15'9#)F6)>3#N-30#+)">)63#3I#30I")#,/33)+"#+)")+B)5#3I#1?+#"316I0I(5)+"\pmPO)#E1/+5#")()63"#30)#").-1+#,/./<),).3#3)/,9# NO-60#-"#60/+<)5#N-30#30)#61.5?63#12#1?+#E?"-.)""\pmM/B-.<#")()63)5#30)#").-1+#,/./<),).3#3)/,9#30)#E1/+5#12#5-+)63I+"#/63"#/"#/.#/5B-"I+#/.5#61?.")(I+#31#").-1+#,/./<),).3#/.5#?(3-,/3)('#,I.-3I+"#-3"#>)+2I+,/.6)\pm!!

!! 0.1#110.5#.1 IE0/21/2 IM7

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 $0:!\#110-5\#:1,!E9/3!/3,!M7.O!J<,-91\#:!10-D0-\#/,!=0;,-:\#:1,!49?/9:=!?/\#:5\#-5?'!9/!9?!08-!D0491\$!/3\#!/3,!R0\#-5!0>!59-,1/0-?!10:?9?/!0>!\#!<\#Z0-9/\$!0>!9:5,D,:5;:/!59-,1/0-?\!S8-!R0\#-5!0>!59-,1/0-?!-,;9,E?!/3,!-,4\#/90:?39D?!/3\#!,\#13!59-,1/0-!3\#?!E9/3!8?!\#:5!0/3,-!D\#-/9,?\!S:4\$!/30?,!59-,1/0-?!E30!50!:0/!3\#;,!\#:\$!0>!/3,!1\#/,=0-91\#4!-,4\#/90:?39D?!/3\#/!D-,1485,!/3,<!>-0<!R,9:=!9:5,D,:5;:/!E9/39:!/3,!9:5,D,:5;:1,!-,W89-,<,:/?!0>!/3,!M7.O!J<,-91\#:!10-D0-\#/,!=0;,-:\#:1,!49?/9:=!?/\#:5\#-5?!\#:5!E30!/3,!R0\#-5!0>!59-,1/0-?\#\>9-<\#/9;,4\$!5,/,-<9:,?\!3\#;,!:0!-,4\#/90:?39D?!/3\#/!E0845!9:/,->,-,!E9/3!/3,!,P,-19?,!0>!9:5,D,:5;:/\Z85=<,:/\!9:!1\#--\$9:=!08/1/3,!-,?D0:?\$9R949/9,?\!0>!\#!59-,1/0-!\#-,!10:?\$9,-,5!/0!R,!9:5,D,:5;:/\!59-,1/0-?\!B3,!R0\#-5!0>!59-,1/0-?\-;9,E?\#!:8<R,-\!0>!\$\#1/0-?\!0!,\$\#4\##/90:?\$9D?!E9/3!8?\#:5!08-!?\$R?\$5\#-9,?\!/3,9-!-,4\#/90:?\$9D?!E9/3!<\#:\#=,<,:/\!\#:5!0/3,-!59-,1/0-?\!/3,!-,4\#/90:?\$9D?!E9/3!8?\#:5!08-!?\$R?\$5\#-9,?\!/3,9-!-,4\#/90:?\$9D?!E9/3!<\#:\#=,<,:/\!\#:5!0/3,-!59-,1/0-?\!/3,!-,4\#/90$ 

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#8/30 - #?!/3, !?/0123045, -!0 - !9 : /, -, ?/, 5!D# -/\$!# : 5!14, # -4\$!?/#/, !E3, /3, -!/3, !9 : /, :5, 5! -, 19D9, : /?!0 > !/3, !4, //, -!# -, !#44! < , < R, -?!0 > !/3, !8 : //3, !9 : //3, !9 : //3, !9 : //3, !9 : //3, !9 : //3, !4, //, -!# -, !#44! < , < R, -?!0 > !/3, !4, //, -!# -, !#44! < , < R, -?!0 > !/3, !8 : //3, !9 :

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"913#,4!bH!+944

 $S>>01,-?!\#:5!0/3,-!0>>01,-?!\#:5!<\#2,?!-,10<<,:5\#/90:?!-,=\#-59:=!/3,!M\#<,5!OP,18/9;,!S>>01,-?!\#:5!0/3,-!0>>01,-?!\#:5!\\<\#:\#=,-?!/0!/3,!10<D,:?\#/90:!10<<9//,,!>0-!9/?!10:?95,-\#/90:!\#:5!\#DD-0;\#\#!B3,!10<D,:?\#/90:!10<<9//,,!1\#:!,P,-19?,!9/?!59?1-,90:!9:!<059>$9:=!\#:$!0>!08-!D-9:19D#4!,P,18/9;,!0>>01,-k?!-,10<<,:5\#/90:?!10:!0,->0-<9:=!9/?!>8:1/90:?'1/3,!\\10<D,:?\#/90:!10<<9//,,!<\partial_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\psi_{1},-<9:\p$ 

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Q:!#110-5#:1,!E9/3!/3,!:0<9:#/9:=!#:5!=0;,-:#:1,!10<<9//,,k?!E-9//,:!13#-/,-'!/3,!:0<9:#/9:=!#:5!=0;,-:#:1,!
10<<9//,,|3#?!,?/#R49?3,5!D04919,?!#:5!D-01,58-,?!>0-!/3,!:0<9:#/90:!0>!59-,1/0-!1#:595#/,?!/0!/3,!R0#-5!0>!59-,1/0-?!!B3,!

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J:\$!?813!,49=9R4,!?/0123045,-!]0-!#>949#/,5!=-08D!0>!?/0123045,-?']9?!-,W89-,5!/0!?8R<9/!10<D4,/,!9:>0-<#/080!!9/2,4>!#:5!/3,!-,10<<,:5,5!59-,1/0-!1<math>#:595#/,!#?!?D,19>,5!9:!/3,!10<<9//,k?!^T-01,58-,?!>0-!./0123045,-?!.8R<9//9:=!+9-,1/0-!C#:595#/,!#,10<<,:5#/90:?\_!D0491\$!#:5!#?!?./!>0-/3!9:!/3,!#5;#1:1,!:0/91,!D-0;9?90:?!9:!08-!#4<,:5,5!#5:!#5!#7.\*\*
R\$4#E?!!.813!9:>0-<#/90:!<8?/!9:1485,'!#60:=!0/3,-!/39:=?'!]9':!/3,!:8<R,-!0>!08-!10<<0:!?3#-,?!R,:,>919#44\$!0E:,5!R\$!/3,!-,10<<,:59:=!?/0123045,-!#5:1/3,!4,:=/3!0>!/9<,!?813!?3#-,?!3#5;#7.\*\*
Sp-,1/0-!1#:595#7.\*\*
Sp-,1/0-!1#:595#7.\*\*
Sp-,1/0-!1#:595#7.\*\*
Sp-,1/0-!1#:595#7.\*\*
Sp-,1/0-!1#5:595#7.\*\*
Sp-,1/10-!9:59-,1/!<\$\dar{\phi}\$/\phi,-,?/!9:!#5.\*\*
Sp-,1/0-!1#5.\*\*
Sp-,1/0-!1#5.\*

 $COD9, ?!O>!/3, !DO4919, ?!O>!/3, !: O<9: \#/9: = !\#:5!10-DO-\#/, !=0;, -: \#:1, !10<<9//,, !\#-, !\#; \#94\#R4, !0: !08-!E, R?9/, !\#/!EEB\#R2/, 13: 040=9, ?\#10<\9:;, ?/O-U-, 4#/90: ?\#!$ 

 $\begin{array}{l} ... \\ !!!!!!!!!!!!!83,!:0<9:\#/9:=!\#:5!=0;,-:\#:1,!10<<9//,,!,:\#48\#/,5!:",??-?H!+H!A$4,!C,-<9:\#-\#'!Y,E9?!" H!G03:?0:!!" 913\#,4!bH! \\ +944!!C3\#-4,?!BH!Y\#:2/-,,'!OH!L-\#$!T\#$:,'!G03:! I H!./-8R4,!\#:5!b$#:!bHAH!B8-:,-'!#4!O>!E30<!\#-,!9:18<R,:/!59-,1/0-?'!\#:5! \\ -,10<<,:5,5!/3,9-!:0<9:\#/90:!/01/3,!R0\#-5!O>!59-,1/O-?H!B3,!R0\#-5'!9:!/8-:'!:0<9:\#/,5!/3,?,!?,;,:!D,-?0:?!>0-!,4,1/90:!#?! \\ 59-,1/0-?!\#/!/3,!\#::8\#4!<,,/9:=H!!! \end{array}$ 

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F040E9:=!/3,!#50D/90:!0>!/3,!:,E!59-,1/0-!10<D,:?#/90:!D-0=-#<'!E3913!D-0:95,?!>0-!#:!#:: \$#4!=-#:/!0>!-,?/-91/,5! ?/012!8:9/?!E9/3!#!;#48,!0>!pN)')))'!0:!.,D/,<R,-!e'!()%['!/3,!10<D,:?#/90:!10<<9//,,!=-#:/,5!f')eK!-,?/-91/,5!?/012!8:9/?!E9/3!#!;#48,!0>!p()')))!/0!,#13!0>!/3,!:0:U,<D40\$,,!59-,1/0-?!!B3,!-,?/-91/,5!?/012!8:9/?!E,-,!=-#:/,5!/0!/3,!:0:U,<D40\$,,!59-,1/0-?!9:!49=3/!0>!/3,!=-#:/!0>!f'N&\*!-,?/-91/,5!?/012!8:9/?!E9/3!#!;#48,!0>!p()')))!=-#:/,5!/0!,#13!:0:U,<D40\$,,!59-,1/0-!0:!G8:,!N'!()%[!#:,8#4!?/0123045,-?k!<,,/9:=#!

 $\begin{array}{l} 0 : |\#559/90: !'|/3, |: , E!59-, 1/0-!10 < D, : ?\#/90: |D-0=-\# < |D-0;95, ?|>0-|\#: |\#559/90: \#4|\#: : 8\#4|1\#?3!-, /\#9: ,-|0>!pK')))'! \\ D \#\$\#R4, |9: |W8\#-/, -4\$!1\#?3|9: ?/\#44 < , : /?'|>0-!, \#13|R0\#-5!10 < < 9//, ,!?, -; ,5!0: '!0-|#: |\#559/90: #4|#: : 8\#4!1\#?3!-, /\#9: ,-!0>!p%)')))'! \\ D \#\$\#R4, |9: |W8\#-/, -4\$!1\#?3|9: ?/\#44 < , : /?'|D, -!10 < < 9//, ,|>0-!?, -; 91, |#?!10 < < 9//, ,!13\#9 - < \#: |#183, |C3\#9 - < #: |#:5!C0UC3#9 - < #: !0>! /3, |@0\#-5!\#4?0!, \#13!-, 1,9; ,|#: |#559/90: #4|#: : 8#4!1#?3!-, /#9: ,-!0>!p&f')))'! \\ D \#\$R4, |9: |W8\#-/, -4\$!1#?3!9: ?/#44 < , : /?|| J 44|: 0: U | J$ 

% f

 $, < \text{D40\$}, , !59\text{-}, 1/0\text{-}?!\#\text{-}, !, : /9/4, 5!/0!\text{-}, 9 < \text{R8-}?, <, : /!0>!\text{-}, \#?0: \#84, !08/U0>UD012, /!, PD, : ?, ?!9: 18\text{-}, 5!R\$!/3, < !9: !10: : , 1/90: !E9/3! /3, 9-!#//, : 5#: 1, !#/! <, , /9: =?!0>!/3, !R0#-5!#: 5!#: $!!10 < < 9//, , !/3, -, 0>!0: !E3913!/3, $!?, -; , <math>\text{H}\text{Q}\text{-}\text{H}\text{P}\text{-}: 0: U, < \text{D40\$}, , !59\text{-}, 1/0\text{-}!50, ?!: 0/!} ?, .; , !0: !/3, !R0#-5!0-!#!R0#-5!0 < < 9//, , '!0-!#?!C3#9-< #: !0-!C0UC3#9-< #: !0>!/3, !@0#-5'!0-!#?!#!R0#-5!10 < < 9//, , !13#9-< #: '!$ 

%e

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@#?,5!0:!/3,!10:?95,-#/90:?!#:5!59?18??90:?!-,>,--,5!/0!#RO;,'!/3,!#859/!10<<9//,,!-,10<<,:5,5!/0!08-!R0#-5!0>!
59-,1/0-?!]#:5!/3,!R0#-5!#DD-0;,5^1/3#/!/3,!#859/,5!10:?0495#/,5!>9:#:19#4!?/#/,<,:/?!>0-!()%[!R,!9:1485,5!9:!08-!J::8#4!
b, DO-!/0: !FO-<!\%) UA !>0-!/3, !\$, \#-!, :5, 5!+, 1, < R, -!K\%'!()\%['!\#?!>94, 5!E9/3!/3, !., 18-9/9, ?!\#: 5!OP13\#:=, !CO<<99?90: !!!
         B39?!-,D0-/!9?!D-0;95,5!R$!/3,!>0440E9:=!9:5,D,:5,:/!59-,1/0-?'!E30!10<D-9?,1/3,!#859/!10<<9///,6!
!!
!!
                                                              GO3:! I H!./-8R4,!]13#9-D,-?0:`!
!!
                                                              " 913#,4!bH!+944!
!!
                                                              L,:,-#4!OH!L-#$!T#$:,!
!!
         S:!"#-13!(['!()%*'!/3,!b,0-=#:9a#/90:!E#?!10<D4,/,5\\!J?\#!-,?84/!0>\/3,!b,0-=#:9a#/90:'\@A\B,13:040=9,?'\\0.1\\
R,1#<,!08-!E3044$U0E:,5!?8R?959#-$'!#:5!@A!B,13:040=9,?!C0-D0-#/90:!R,1#<,!/3,!D8R4914$!3,45!10<D#:$H!@A!
B, 13:040=9, ?'!0:11!10:/9:8, ?!/0!10:581/!/3, !?#<, !0D, -#/90: ?!#?!9/!595!D-90-!/0!/3, !10 < D4, /90: !0>!/3, !b, 0-=#:9a#/90: 110: !
10::,1/90:!E9/3!/3,!b,0-\#:9a\#/90:!'!/3,!M\#<,5!OP,18/9;,!S>>91,-?!-,/\#9:,5!/3,9-!O>>91,-!DO?9/90:?!E9/3!@A!B,13:O4O=9,?'!
0:1H'!E394,!#4?0!R,9:=!#DD09:/,5!0>>91,-?!0>!8?H!
                                                                                                !
!!
         B3,!>0440E9:=!/#R4,!D-0;95,?!1,-/#9:!?8<<#-$!9:>0-<#/90:!10:1,-:9:=!/3,!10<D,:?#/90:!0>!08-!M#<,5!OP,18/9;,!
S \gg 91, -?! > 0 - !/3, !4#?/!/E0!10 < D4, /, 5! > 9?1#4! \$, #-?!, :5, 5! +, 1, < R, -!K%'!() % [6!]
         !!
                                                 !!
                                                                   1 1 1
```

 $p(f')))!/0! \text{ "-H!A,44\$'!} \\ p(f')))!/0! \text{ "-H!I 9449?!} \\ 1.5!p\%('f))!/0! \text{ "-H!dO4/3} \\ 4.8?!R\#?,5!8D0:!/3,9-!()\%\&!D,->0-<\#:1,\mathbb{H}! \\ 1.9449?!9?!:0/!?30E:!9:!/3,!/\#R4,!\#R0;,!\#?!3,!E\#?!:0/!\#!M\#<,5!OP,18/9;,!S>>91,-!>0-!>9?1\#4! \\ ()\%\&\mathbb{H}! \\ 2.5!p(f')))!/0! \text{ "-H!A,44\$'!} \\ 2.5!p(f')))!/0! \text{ "-H!A,44\$'!} \\ 3.9!p(f')))!/0! \text{ "-H!A,44\$'!} \\ 3.9!p(f'))$ 

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 $OP1, D/!\#?!59?140?, 5!\#R0;, '!", ??-?<math>\mathbb{H}^{0}$ 08'!A, 44\$'! I 9449? $\mathbb{H}^{0}$ 5!595!:0/!-,1,9;, ! $\mathbb{H}^{0}$ 5!0/3,-!10<D,: ? $\mathbb{H}^{0}$ 90:!58-9:=! ()%[!0-!()%&'!,P1,D/!>0-!D,- $\mathbb{H}^{0}$ 99',?! $\mathbb{H}^{0}$ 5!0/3,-!D,-?0:#4!R,:,>9/?'!0>!E3913!/3,!/0/#4! $\mathbb{H}^{0}$ ==-,= $\mathbb{H}^{0}$ 7,! $\mathbb{H}^{0}$ 8,!>0-!,#13!0>!/3,<!595!:0/!,P1,,5!p%)')) $\mathbb{H}^{0}$ 1

" !!

 $S:! "\#-13!()'!()\%*'!/3,!CO < D\#:\$!,:/,-,5!9:/0!, < D40\$ < ,:/!\#--, < ,:/?!E9/3!/3,!M\# < ,5!OP,18/9;,!S>>91,-?!\\ ]1044,1/9; ,4\$'!/3,!^O < D40\$ < ,:/! J=-, < ,:/?_`6!]9'!B9 < O/3\$! J <math>\mathbb{N}^{1}$   $\mathbb{N}^{1}$   $\mathbb{N$ 

 $B3,!O < D40\$ < , :/!J = - , < , :/?!D - 0;95,!>O - !\# : !\# : :8\#4!R\#?, !?\#4\# - \$!O > !p(\&f')))!>O - ! " - !\#!V9/08!\# : 5!p(\%f')))!>O - ! , #13!O>! " , ?? - ?\ !!A, 44\$'! I 9449?!\# : 5! d 04/3 #8?\ !!O #13!M # < , 5!OP, 18/9; , !S >> 91, -!E 944!R, !, 49 = 9R4, !>O - !D, ->O - < #: 1, UR #?, 5!1O < D, : ?\ #/90 : !9 : !/3, !>O - < !O > !\ !# : :8 #4!RO : 8?'!$ 

()

```
!
; )3).3-1.#D<+)), ).3!
         S:!+,1, <R,-!%['!()%['!/3,!10<D,:?#/90:!10<<9//,,!#DD-0;,5!#!-,/,:/90:!#=-,,<,:/!R$!#:5!R,/E,,:!8?!#:5!!
"-!! I 9449?!9:!10::,1/90:!E9/3!"-!! I 9449?k?!-,401#/90:!>-0<!C3#-40//,'!M0-/3!C#-049:#'!/0!@-,;#-5!C08:/$'!F40-95#'!9:!0-5,-!/0!
R,!: \#-1/3, |CO < D\#: \$k?|D-9: 19D\#4!, P, 18/9; , |0>>91, ?\B3, |\#=-, , <, :/|D-0: 95, ?|>O-|\#|0: , |U/9 <, !1\#?3!D\#\$ <, :/|O>|pK)'))) > O < |8?!
/0! " -H! I 9449?!/0!0>>?, /!D0/, :/9#4!40??, ?!9:18--, 5!R$! " -H! I 9449?!9:!10::, 1/90:!E9/3!/3,!?#4,!0>!39?!308?,!401#/,5!9:!C3#-40//,'!
MO-/3!C#-049:#'!E3913!E,!D#95!/0! "-H! I 9449?!9:!G#:8#-$!()%*H!T-,;908?4$'!9:!()%&'!E,!D#95!p%)'*&(!/0! "-H! I 9449?!#?!
#??9?/#:1,!E9/3!39?!<0;9:=!,PD,:?,?H!
         T8-?8#:/!/0!/3,!-,/,:/90:!#=-,,<,:/!9>! "-#! I 9449?k?!,<D40$<,:/!E9/3!8?!9?!/,-<9:#/,5!R$! "-#! I 9449?!,9/3,-!
;048:/#-94$!]0/3,-!/3#: |>0-!^=005!-,#?0:_\!0-!R$!8?!>0-!^1#8?,_!58-9:=!]9\!/3,!D,-905!R,=9::9:=!/3,!5#/,!0>!/3,!-,/,:/90:!
#=-., <, :/!#:5!, :59:=!0:!/3,!;,10:5!#::9;,-?#-$!0>!39?!, <D40$<,:/!5#/,!] J 8=8?/!%'!()%&`!/3,!,:/9-,!-.401#/90:!#440E#:1,!
[pK)')))`!D-0;95,5!8:5,-!/3,!#=-,,<,:/!E94!R,!9<<,59#/,4$!-,D#$#R4,!/0!8?'!]99`!/3,!D,-905!R,=9::9::9::9(1:43,!5#$!>0440E9::=!
/3,!?,10:5!#::9;,-?#-$!0>!39?!,<D40$<,:/!5#/,!#:5!,:59:=!0:!/3,!/39-5!#::9;,-?#-$!0>!39?!,<D40$<,:/!5#/,'!/E0U/39-5?!0>!!
/3.!-.401#/90:!#440E#:1,!]p()')))`!E944!R,!9<<,.59#/.4$!-,D#$#R4,!/0!8?'!#:5!]999`!/3,!D,-905!R,=9::9:=!0:!/3,!>08-/3!
\#::9;,-?\#-\$!0>!39?!,<D40\$<,:/!5\#/,'!0:,U/39-5!0>!/3,!-,401\#/90:!\#440E\#:1,!]p\%)')))^!E944!R,!9<<,59\#/,4\$!-,D\#\$\#R4,!/0!8?!!
J:$!?813!#<08:/?!/3#/!#-,!-,D#$#R4,!/0!8?!<#$!#4?0!R,!5,581/,5!>-0<!#:$!#<08:/?!0/3,-E9?,!D#$#R4,!/0!" -H! I 9449?!R$!8?!
8D0:139?!/,-<9:#/90:#!F0-!D8-D0?,?!0>!/3,!-,/,:/90:#=-,,<,:/!^1#8?,_!#:5!^=005!-,#?0:_!3#;,!/3,!<,#:9:=?!?,/!>0-/3!9:!!
/3,!()%&!T4#:H!
!!
```

0:!()%['!/3,!10<D,:?#/90:!10<<9//,.!.:=#=,5!T#\$!L0

!

!!

```
!

VWRY#$-"6+)3-1./+'#*/"0#41.?")"!

!!

S:!"#-13!%N'!()%['!R#?,5!0:!<#:#=,<,:/k?!-,10<<,:5#/90:?!#:5!/3,!M#<,5!OP,18/9;,!S>>91,-?k!()%&!

D,->0-<#:1,'!/3,!10<D,:?#/90:!10<<9//,,!#DD-0;,5!/3,!D#$<,:/!0>!1#?3!R0:8?,?!0>!pf)')))!/0!"-#!V9/08'!p(f')))!/0!!

"-#!A,44$'!p(f')))!/0!"-#! I 9449?!#:5!p%('f))!/0!"-#!d04/3#8?#!

!!

VWRS#DN/+5"!
!!

S:!"#-13!f'!()%*'!/3,!10<D,:?#/90:!10<<9//,,!=-#:/,5!:0:UW8#49>9,5!?/012!0D/90:?!/0!",??-?#!V9/08'!A,44$'! I 9449?!

#:5!d04/3#8?!/0!D8-13#?,!K)')))'!()')))!#:5!()')))!?3#-,?'!-,?D,1/9;,4$'!0>!/3,!C0<D#:$k?!10<<0:!?/012'!#/!#:!
,P,-19?,!D-91,!0>!
```

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!

I ,!50!:0/!3#; ,!#!5,>9: ,5!R,:,>9/!D4#:!>0-!/3,!M#<,5!OP,18/9; ,!S>>91,-?!0-!0/3,-!,<D40$,,?!!B3,!0:4$!-,/9-,<,:/!

D4#:!#; #94#R4,!/0!/3,!M#<,5!OP,18/9; ,!S>>91,-?!9:!()%[!E#?!/3,!W8#49-9,5!N)%]2`!-,/9-,<,:/!D4#:'!E3913!9?!#; #94#R4,!/0!#4!!
,<D40$,,?!!

!!

O>>,1/9; ,!#?!0>!F,R-8#-$!(N'!()%e'!/3,!CO<D#:$!,:/,-,5!9:/0!13#:=,!0>!10:/-04!#=-,,<,:/?!]/3,!^()%e!C3#:=,!0>!

C0:/-04! J=-,,<,:/?_`!E9/3! ",??-?!!V9/08!#:5!A,44$'!E3913!E,-,!#DD-0; ,5!R$!/3,!10<D,:?#/90:!10<<9///,.!0:!/3#/!?#<,!5#$!!

B3,!()%e!C3#:=,!0>!CO:/-04! J=-,,<,:/?!-,D4#1,5!#:5!/,-<9:#/,5!/3,!()%e!C3#:=,!0>!CO:/-04! J=-,,<,:/?!!/3#/!/3,!CO<D#:$!
D-,;908?4$!,:/,-,5!9:/0!E9/3! ",??-?!!V9/08!#:5!A,44$'!E3913!,PD9-,5!0:!F,R-8#-$!(*'!()%e'!#:5!#-,!?8R?/#:/9#44$!?9<9##-!/0!
/3,!()%(!C3#:=,!0>!CO:/-04! J=-,,<,:/?!E9/3!!
",??-?!! I 949?!0-!d04/3#8?!!F040E9:=!/3,!b,0-#:9a#/90:'/3,!()%e!C3#:=,!0>!CO:/-04!J=-,,<,:/?!#-,!E9/3!@A!
```

B, 13:040=9, ?'!0:11!'!08-!E3044\$U0E:, 5!?8R?959#-\$!!#:5!13#:=, ?!0>!10:/-04!-,>, -!/0!/30?, !0>!08-!?8R?959#-\$!!#:5!13#:=, ?!0>!10:/-04!-,>, -!/0!/30?, !0>!00:/-04

!B3,!D#\$<,:/?!#:5!

!

!!

\$8-!())&!T4#:'!8:5,-!E3913!?0<,!,\\\\89\\\$!#E#-5?!-,<#9:!08\/?\#:59:='!#4?0!10:\/#9:?!D-0;9?90:?!D-0;959:=!>0-!!

/3,!;,?/9:=!0>!,\\\89\\\$!#E#-5?!9:!10::,1/90:!E9/3!#!13#:=,!9:!10:/-04!0>!/3,!C0<D#:\\$'!#?!5,?1-9R,5!R,40EH!

!!

B0!/3,!,P/,:/!/3#/!08/?/#:59:=!#E#-5?!=-#:/,5!8:5,-!/3,!())&!T4#:!#-,!#??8<,5!9:!10::,1/90:!E9/3!#!13#:=,!9:!

10:/-04'!/3,:'!,P1,D/!

```
!

S:!+,1,<R,-!%('!()%['!E,!,:/,-,5!9:/0!#!D8-13#?,!#=-,,<,:/!E9/3!+0:#45!FlcH!L0,R,-/'!#!=-,#/,-U/3#:U>9;,!D,-1,:/!

?/0123045,-!0>!8?'!D8-?8#:/!/0!E3913!E,!-,D8-13#?,5!())')))!?3#-,?!0>!08-!10<<0:!?/012!3,45!R$! "-H!L0,R,-/!#/!#ID-91,!0>!

pKH&)!D,-!?3#-,'!>0-!#:!#==-,=#/,!1#?3!#<08:/!0>!p&N)')))H!B3,!/-#:?#1/90:!E#?!#DD-0;,5!R$!08-!R0#-5!0>!59-,1/0-?H!!

"-H!L0,R,-/!D-,;908?4$!?,-;,5!#?!08-!59-,1/0-!8:/94!39?!-,?9=:#/90:!0:!G#:8#-$!*'!()%&H!

!

S:!"#-13!%N'!()%['!b#:5$! I 9449?!E#?!#DD09:/,5!#?!C39,>!SD,-#/9:=!S>>91,-!0>!/3,!C0<D#:$'!3#;9:=!?,-;,5!#?!V91,!
```

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K)