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                                                I\#,\&E)\$+.(!:\$(\&3(\&!='+?'3G9!:\&H3')G\&\#)!+,!=\&2\$3)'\$E(9!L+11\&?\&!+,!K\&2\$E\$\#\&9!"\#\$\%\&'(\$)*!
                                                +,!-+.)/!01+'$23<!
5+\% - 637\$/3'*.,'*6*#,3'
A6A5BAD!
                                                 8 G&'$E3#!8((+E$3)$+#!,+'!)/&!82%3#E&G&#)!+,!-E$&#E&![Z&E.)$%&!`'3#E/!0&11+^(/$H!
                                                  8G\&'\$E3\#!=(*E/+1+?\$E31!8((+E\$3)\$+\#!-H'\$\#?,\$\&12!JR `TXI8b!L+\#?'\&((\$+\#31!0\&11+^(/\$H!)))
A6A@BA5!
                                                  "-0!03E.1)*! "#2&'?'32.3)&! ] &(&3'E/!K&#)+'(/$H!R'3#)!0c4A66P!
A6A@!!!!!
A6AA!!!!!
                                                 8 = 8! - +E \%)*! + !! ; \& 3! / ! = (*E/+1+?*!L+GG \% #23) + #! + !! + 822 \cdot \& ((\$ #?!; \& 31) / !: \$(H3'\$) \& (!) + (H3') + (H3
                                                  " - 0!U+G\&\#!\$\#!J\&32\&'(/\$H!3\#2!=/\$13\#)/'+H*!8^3'2!0cD666P!
A6AA!!
A6AA!!
                                                  "-0!S.)()3#2$#?!03E.1)*!8 ^3'2!
A6A4!!
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4MMN! !
                                        I#)\&'#3)\$+#31!-E/++1!=(*E/+1+?*!8((+E\$3)\$+#!L31!L3))\&'311!8^3'2!0cD66P!!
4MM4!!
                                         " - 0!; +#+'(!L+#%+E3)$+#!!
)+*!7$.8'+9/+#$+.!+'
8:;2<;=>'!?<:@>@'
='+,&((\$+\#31!3\#2![)/\$E31!I((.\&(!\$\#!=(*E/+1+?*!LJ=!NNA@!
='+,&((\$+\#31!3\#2![)/\$E31!='+>1\&G(!-\&G\$\#3'!=-V!7M@4!
L1$#$E31!='3E)$E.G!=-V!NM5N!
T*H$E31!3#2!8)*H$E31!: &%&1+HG&#)!: [=!NN67!
 : &%&1+HG&#)31! : $(3>$1$)$&(!LJ=!N57C!
8 HH'+3E/!)+!L1$#$E31!3#2!`&/3%$+'31!]&(&3'E/!$#!82+1&(E&#)(f!0+E.(!+#!;I\!RK-!NC@N!
I#)'+2.E)$+#!)+!-E/++1!=(*E/+1+?*!-&G$#3'!-=-!NM@N!
: +E)+'3!!3#2![2<-<!-E/++1!=(*E/+1+?*!I#)&'#(/$H!-&G$#3'!-=-!7764!
L+\#(.1)\$\#?!,+'!-3,,!:\&\%\&1+HG\&\#)![:0!N4NN!
=(*E/+\&2.E3)\$+#31!:\$3?#+(\$(!3#2!='\&(E'\$H)\$+#!II!-=-!N4MC!0T\&3E/\$#?!8((\$()3#)P!)
K3()\&'a(!T/\&()(!=-V!NM74!
"A2>:B:;2<;=>'!?<:@>@"
=(*E/+1+?*!+,!R\&#2\&'!-S=!576A!
 ; \&31)/!=(*E/+1+?*!LJ=!5@45!0X.31\$)*!K3))\&'(!L\&')\$,\$E3)\$+\#P!
[)/E(!\#!=(*E/+1+?*!3#2!;\&31)/!LJ=!5NA5!]
[)/E(!\#!=(*E/+1+?*!=-V!5M@4!
 : \&\%\&1 + HG\&\#)31! = (*E/+1 + ?*! : [=!56D@!0X . 31\$)*!K3))\&'(!3\#2!R1 +> 31!L\$)\$g\&\#(!='+\emptyset\&E)!L\&')\$,\$E3)\$ + \#(P!) + \#(
U+G\&\#a(!K\&\#)31!;\&31)/!-S=!5755!
I#)'+2.E)$+#!)+!=(*E/+1+?$E31!-E$&#E&(!=-V!A64A!
 `&/3%$+'!K+2$,$E3)$+#!LJ=!5545!
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7< **! 0>AA>DEHI>**k9!T<9!L3'\$+9!8<9!

@D< **! 0>AA>DEHI>**9!T**:**9!<u>R3>>\$2+#</u>k9! d : 9!<u>J*##</u>9!L : 9! h !] +2'\$? . &g9!L : (!0A64MP<!=(*E/+1+?\$E3!!,3E)+'(!'&13)&2!)+! '&(\$1\$&#E&!3#2!% . 1#&'3>\$1\$)*!3G+#?!*+.)/!^\$)/!; I \ !\$#!3#!\$#)&?'3)&2!E3'&!(&))\$#?<! 05P9! DB44</))H(fee2+\$<+'?e46<46C6e6MD564A4<A64C<45CC6@A!

- @N< $\underline{W3119}! \ 8 \ 9! \ 10 > AA > DEHI> k 9! T \ 9! \] + 2' \ ? \ kg 9! \ J \ 9! \ h ! S \ a ` ' \ k# 9! Y < !0A64MP < !03E) + ' (!3,, &E) \ $# ?! ; I \ !) \& () \ $# ?! 3G + # ?! \ + .) / ! \ #! \ d & # \ 3 <! 0CP 9! 45D6 < ! /)) H (fee 2 + \ 4 ' ? e 46 < @ M6e \ 0 & 'H / 4N6C 45D6!$
- @C< <u>J*##k</u>9!L<0! **! 0>AA>D**EH>9!T<0!`'321&*Bd1.?9!d<0!-><!Y+/#!U31(/9!8<0!:&2'\$E_9!]<0!h!]+2'\$?.&g9!L<8<!
 0A64MP<!:&H'&((\$+#9!3#Z\$&)*9!3#2!H+())'3.G3)\$E!()'&((!3(!H'&2\$E)+'(!+,!\$GG.#&!,.#E)\$+#\$#?f!
 :\$,,&'&#E&(!>&)^&&#!*+.)/!^\$)/!>&/3%\$+'311*!3#2!H&'\$#3)311*!3Ej.\$'&2!;I\<!
 046P9!
 4AN4B4A76<!/))H(fee2+\$<+'?e46<46C6e6MD564A4<A64M<4DC7@D5!
- @M< <u>J*##</u>k9!L<9!`'321&*Bd1.?9!d<9!**! 0>AA>DE**HD>9!T<9!-)<!Y+/#!U31(/9!8<9!:&2'\$E_9!]<9!h!]+2'\$?.&g9!L<!
 0A64CP<!K&#)31!/&31)/!(E'&&#\$#?!\$#!\$#)&?'3)&2!E3'&!(&))\$#?(f!I2&#)\$,*\$#?!'3)&(!+,!2&H'&((\$+#9!3#Z\$&)*9!
 3#2!H+())'3.G3)\$E!()'&((!3G+#?!*+.)/!^\$)/!;I\<!
 0@P9!
 A@MBA5D<!/))H(fee2+\$<+'?e46<46C6e4D@C4D64<A64C<45@7DCD!

0AP9!464B447<!<u>/))H(fee2+\$<+'?e46<4CM4e6CCMB</u>

C@M4<@4<A<464!

- 54<-)<!Y+/#!U3!(/k9!8<-<9!<u>U&(1&*9</u>!d<9!<u>T3#9</u>!-<V<9!<u>J*##</u>9!L<9!<u>SaJ&3'*9</u>!d<9!U3#?9!V<9!W?.*	!:<9! **! 0>AA>DE**HI>9!T<9!h!]+'\$?.&g9!L<!0A647P<!-E'&&#\$#?!,+'!2&H'&((\$+#!3G+#?!*+.)/!^\$)/!;I\!\$#!
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 AM07P9!CD4BCD7<!/_))H(fee2+\$*+'?e46<46C6e!
 6MD564A4<A647<4AC4C7C!
- 5@< **! 0>AA>DE**HI>k9!T</br>
 9! K
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 82\$E3)\$+#!32/&'&#E&!\$#!4@B!)+!A5B*&3'B+12!*+.)/!1\$%\$#?!^\$)/!; I \<!
 0@P9!@C@B@M5!/))H(fee2+\$<+'?e46<464Ne0<03#3<A64N<44<66A!</td>
- 5D< Y&# \$#(k9!-\delta! O>AA>DEHI>9!T\d! h!-31#3\$)\$(9!L<!0A647P<! 8 '&!H&&'!(H&E\$31\$()(!/3HH*q!; +^!)'3\$#\$#?!3#2! '+1&!E13'\$)*!3,,&E)!\delta+>!(3)\$(,3E)\$+#<! <! [H.>!3/&32!+,!H'\$#)<! /))H(fee2+\$<+'?e46<46@7eH'\d6666ADM!
- 5N< **! 0>AA>DEIII>K**9!T<0! h!-)<!Y+/#!U31(/9!8<-<!0A64NP<!8!G\$#2,.1!'3)\$+#31!1\$%\$#?!3HH'+3E/!,+'!322'&((\$#?!;I\\\$#!)/&!(E/++1!(&))\$#?<!

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    E+11\&?\&!().2\&\#)(<!
                                                                                        0@P9!AMB@D<!
N5< ! 0>AA>DEHE>k9!T<!0A66CP<! ] &( .1)(!, '+G!3#!&GH$'$E31!() .2*!+,!(E/++1!H'$#E$H31(a!2&E$($+#(!3>+ .)!
    2$(E1+(.'&!+,!;I\!()3).(<!
      0AP9!MB@6<!
ND< ! 0>AA>DEIII>k9!T<!0A666P<! ; I \ 9!E+#,$2&#)$3|$)*9!3#2!2.)*!)+!H'+)&E)f! 8 !2&E$($+#BG3 $#?!G+2&!<!
                                                                !0NP9!NN4BN76<!/))H(fee2+$<+'?e46<46@7ee67@DB
    76AC<@4<N<NN4!
NN < U + 2 \\ $E/k9! : \\ \\ J \\ @! - ^&'21 \\ \\ 9! K \\ [ \\ @! \\ \textbf{0} > AA > \textbf{DEHE} > 9! \\ T \\ @! \\ \textbf{h} \\ !J3\#23 \\ . 9! - \\ <!04 \\ \texttt{MMMP} \\ !; \\ I \\ \textbf{e} \\ \textbf{8} \\ !: - !3G \\ + #?!E \\ / \$12 \\ `&\#!
    3#2!32+1\&(E\&#)(f!IGH1\$E3)\$+#(!,+'!)/\&!E/3#?\$#?!'+1\&!+,!(E/++1!H(*E/+1+?\$())(<!)
                 !0AP9!AACBA54<!!
9++:$; 8.<1"#3$
N7< ! 0>AA>DEHI>k9!T<! h !R3>>$2+#9! d<!0A6A@P<!=&2$3)'$E!3#2!32+1&(E&#)! ; I \ <!I#!K<!K<!E&',&E)9!L<8<!
    ] $EE$+9! h!K<8<!`'3*!0 [ 2(P9!
                                              !0A#2!\&2\$)\$+#P<!U3(/\$#?)+#9!:Lf!8G\&'\$E3#!=(*E/+1+?\$E31!)
    8 ((+E\$3)\$+#<!
NC< ! 0>AA>DE||>\89!T<9! h !R3'2*9! -<!0A6A@P<! [ )/$E(!$#!G&#)3!!/&3!)/!'&(&3'E/<!I#!; <-<!0'$&2G3#! h !L<!
    K3'_&*!0[2(P9!
                                                                       !0HH<!C4@BCA6P ! [1(&%$&'<!
NM< - & 'H3(k9! : <R<9!R3>>$2+#9!d<9!! 0>AA>DE$\text{D}$\text{P}$\! T<9! h! - 3|$#3(BK$'3#239!8<8<!0A6AAP<!03G$!*9!
    #&$?/>+'/++29!3#2!E+GG.#$)*!(.HH+')(!$#!H'+G+)$#?!$2&#)$)*!2&%&1+HG&#)!3G+#?!JR`TX!*+.)/!+,!
    E+1+'<!I\#! <! : 31H\&'\#BO\&1(/\&'!h!K<8<!K+'\&\#+!0[2(P!
    0A<sup>FO</sup>! [2$)$+#P![1(&%$&'<!
76< ] +2'$?.&gk9!J<K<9!`&1)'3#9!\<9!h!!0>AA>DEHE>9!T<!0A6A6P<!I#)$G3)&!H3')#&'!%$+1&#E&!$#!E+11&?&!
    (&))$#?(<!I#!]<!R&,,#&'9!Y<!U<!U/$)&9!J<!d<!;3G>&'?&'9!8<!]+(&#>3.G9!\<!\3.?/3#B[2&#9!h!\<!I<!
    \ \$\&)/!0 \[ 2(P9!)
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74< ! 0>AA>DEHI>k
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- @< <u>U 3\(1\&^(_\\$9!-\d)! \ 0\) AA>DEHI>\(9!\R 3\)>\\\$2+\(\frac{9}!\d\d)!-3)E/\&'\(9!\R')!\K\\d)!\h!: '3\&\?\&'\(9!\\\<!0A6A5\(9!\R')!\R')!\R'\(10A6A5\(9!\R')!\R'\(10A6A5\(9!\R')!\R')!\R'\(10A6A5\(9!\R')!\R'\(10A6A5\(9!\R')!\R'\(10A6A5\(9!\R')!\R')!\R'\(10A6A5\(9!\R')!\R'</u>
- 5< ! 0>AA>DEHI>9!T<! J\$?G3#9! d<! U3(\$1&^(\$9!-<! h ! : 3(&))9! K<!0A6A59! 8 H '\$1P<! 8 ((&((\$#?!-&Z.31!; &31)/! J\$)&'3E*!)+!='&%&#)!; I\9!-TI(9!3#2!"#^3#)&2!='&?#3#E*f!='+?'&((!T+^3'2!-E31&!: &%&1+HG&#)<! 1=+()&'m<!0!+'\$23!; I\!L+GG.#\$)*9!='+%\$2&'(9!3#2!]&(&3'E/&'(!L+#,&'&#E&<!T3GH39!01+'\$23<!!
- D

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- N< ! **0**>AA>DEHI>9!T<!0A6A59!K3'E/P<!I2&#)\$,*\$#?!3#2!'&(H+#2\$#?!)+!&)/\$E31!2\$1&GG3(!1L+#)\$#.\$#?! [2.E3)\$+#!U+'_(/+H

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- $4D < \textbf{! 0} > \textbf{AA} > \textbf{DEHE} > 9! T < 9! : 3(_\&)) 9! K < 9! R 3 >> \$2 + \#9! d < 9! : '3 \& ? \& '9! \setminus 9! h ! 3) E / \& '9! K < !0 A 6 A @ 9! Y . 1 * P <! & Z . 31 \$) * !3 \# 2! / & 31) / * !' & 13) \$ + \# (/\$H! \& 2 . E3) \$ + \#! 3 G + \#?! > 13 E _! G \$ 221 \& ! (E/++1 \& '(!) \#! (\$Z! 01 + '\$ 23! E + . \#) \$ \& (f! L + GH3 '\$ (+ \#! + ,! (\& '\% \$ E \& ! . H) 3 _ \& !) + !' \$ (_! > \& / 3 \% \$ + '!) ' \& \# 2 (<! = + () \& '! H ' \& (\& \#) \& 2! 3) !) / \& ! S _, \$ E \& ! + ,! = + H . 13) \$ + \#! 8 _, 3 \$ ' (!T \$) 1 \& ! r ! R ' 3 \#) \& \& ! L + \#, \& ' \& \# E \& <! ` 31) \$ G + ' \& 9! K : <!$

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                                                                                                                                                                                                                                                                                                                                                          <!=+()&'!H'&(&#)&2!
               3)!)/&!8##.31!L+#%&#)$+#!+,!)/&!I#)&'#3)$+#31!8I:-!-+E$&)*<!K+#)'&319!X.&>&E9!L3#323<
AM < \textbf{!} \ \textbf{0} > AA > \textbf{DEHE} > 9! \ \textbf{T} < 9! \ \textbf{R} < 9 > \$2 + \#9! \ \textbf{d} < 9! : '3 \& ? \& '9! \ \textbf{A} < 9! \ \textbf{E} < 9! \ \textbf{K} < 9! \ \textbf{L} ' + G \& 2 * 9! \ \textbf{K} < 9! \ \textbf{h} \ ! \ \textbf{L} < 3H + > \$3 \# E + 9! \ \textbf{Y} < !0 A6 AA9! \ \textbf{A} < 9! \ \textbf{A
               Y.1*P<!
                                                                                                                                          <!=+()\&'!H'\&(\&\#)\&2!3)!)/\&!S,
$E\&!+,!=+H.13)$+\#!8,
$3'a(!T\&\&\#!='\&?\#3\#E*!
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                                                                                                                =+()\&'!H'\&(\&\#)\&2!3)!)/\&!''\#\&2!-)3)\&(!03G\&1*!3\#2!V+.)/!-\&'\%\&E\&(!`.'\&3.a(!)3)
               82+1&(E&#)!='&?#3#E*!='&%&#)$+#!R'3#)&&!L+#,&'&#E&<!\$').31<
@4< R3>>$2+#9! d<9! ! 0>AA>DEHI>9!T<9! h !J+H&g9! d<!0A6AA9! K3'E/P<!
                                                                                                                                              <!=3H&'!H'&(&#)&2!3)!)/&!-+E$&)*!,+'!=.>|$E!; &3|)/![2.E3)$+#!:$?$)3!!
                8##.31!L+#,&'&#E&<! \ $').31<!
@A < = 1\&9!Y < 9! - 3#g9!Y < 9! h! ! 0>AA>DEHI>9!T < !0A6AA9!0&>' . 3'*P < !
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!=+()&'!H'&(&#)&2!3)!)/&!8##.3!!L+#%&#)\$+#!+,!)/&!W3)\$+#3!!8((+E\$3)\$+#!+,!)

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56< ! 0>AA>DEHI>9!T<9! h!-E/^3')gBK&))&9!]<!0A6A69!8.?.()P<!
                                                                                           =3H\&''H'\&(\&\#)\&2!3)! / &! 8 ## . 31!L+#%&#)$+#!+,!)/&! 8 G&'$E3#!
          =(*E/+1+?$E31!8((+E$3)$+#<!\$').31<!
54< ! 0>AA>DE||>9!T<9!-E/^3')g9!Y<9!J3#?,+'29!L<9!:&(3$9!8<9!h!8#2'&^(9!Y<!0A6A69!8.?.()P<!
                                                                                                                                                                                                  <!-*GH+(S.G!H'&(&#)&2!3)!)/&!
           8##.31!L+#%&#)$+#!+,!)/&!8G&'$E3#!=(*E/+1+?$E31!8((+E$3)$+#9!\$').31<!
5A< ! 0>AA>DEIII>9!T<9!: '3 &9!; \( 9!R3>>$2+#k!d<9!L3'$+9!8<9!h!]+2'$?.&g9!L<!0A6A69!8.?.()P<!
                                                                                                                                                                                                                 =+()\&'!H'\&(\&\#)\&2!3)!)/\&!
          W3)$+#31! ] *3#! U /$)&!L+#,&'&#E&!+#! ; I \ !L3'&!3#2!T'&3)G&#)<! \ $') . 31<!
5@< L3'$+9!8<9!! 0>AA>DEHE>9!T<9!: '3_&9!; <9!h!]+2'$?.&g9!L<!0A6A69!8.?.()P<!
                                                                                                                                                                                                         <!=+()&'!H'&(&#)&2!3)!)/&!
          W3)$+#31! ] *3#! U /$)&!L+#,&'&#E&!+#! ; I \ !L3'&!3#2!T'&3)G&#)\! \ $') . 3\!
55 < = \&1\&((9!T < 9! ! 0 > AA > DEHE > L!T < 9!R3 > $2 + #9! d < 9!h! \ $? . & 9! - < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A6 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A66 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < !0A6A666 < 9! 8 H' \$ | P < 
                                                                                                                                                                                      <! 8##.31!L+#%&#)$+#!+,!)/&!
           -+.)/\&3()\&'\#!=(*E/+1+?\$E31!8((+E\$3)\$+\#<!W\&^!S'1\&3\#(9!J8<!0E+\#,\&'\&\#E\&!E3\#E\&1\&2!2.\&!)+!LS \setminus I:B4Mt!
          +#1$#&!'&H+($)+'*!3%3$13>1&P
5D< ! 0>AA>DEHI>9!T<!0A64M9!8.?.()P<!
                                                                                                                                                        ; +)!T+HE(!$#![)/E(!-*GH+($.G!E/3$'&2!>*!
          )/\&!8=8![)/\$E(!L+GG\$))\&\&!3)!)/\&!8\#\#.3!!L+\#\%\&\#)\$+\#!+,!)/\&!8G\&'\$E3\#!=(*E/+1+?\$E3!!8((+E\$3)\$+\#!+))/\&!8
          L/$E3?+9!IJ<!!
5N< ! 0>AA>DEHI>9!T<9!: '3_&9!; <9!R3>>$2+#9!d<9!]+2'$?.&g9!L<8<9!h!; $?/)+^BU &$2G3#9!J<!0A64M9!
          8.?.()P<!
                                                        =+()\&'!H'\&(\&\#)\&2!3)!)/\&!8\#\#.3!!L+\#\%\&\#)\$+\#!+,!)/\&!8G\&'\$E3\#!=(*E/+1+?\$E3!!
           8((+E\$3)\$+\#(!L/\$E3?+9!IJ!0]\&E\&\$\%\&2!-+E\$\&)*!,+'!;\&31)/!=(*E/+1+?*a(!S.)()3\#2\$\#?!=+()\&'!8^3'2P(!!)
57< : '3_&9!; <9!! 0>AA>DEHI>9!T<9! h!]+2'$?.&g9!J<!0A64M9!K3'E/P<!
                                                                                                                                                                                =+()\&'!H'\&(\&\#)\&2!3)!)/\&!8\#\#.31!
          L+#%&#)$+#!+,!)/&!I#)&'#3)$+#31!8((+E\$3)\$+#!,+'!=(*E/+1+?\$E31!-E\$\$#E\&<!=3'\\(9!O'3#E\&<
5C< ! 0>AA>DEIII>9!T<!R3>>$2+#9!d<!: '3 &9!; <9!L3'$+9!8<!K&'$239!K<!h!]+2'$?.&g9!L<8<!0A64C9!
           : &E&G>&'P<!
                                                                     <!=+()&'!H'&(&#)&2!3)!)/&!W3)$+#3!!]*3#!U/$)&!L+#,&'&#E&!+#!;I\!L3'&!3#2!
          T'\&3)G\&\#/<!^31)$G+'\&9!K3'*13#2<!!
5M\ : '3_&9!; \dolday! \tag{0}\AA>DEHE>9!T\dolday! ] +2'\$? . \&g9! \, \dolday! \h! \=\&1\&((\text{9}!\tag{1}\cdot \)0\A64C9!Y . \1*P\dolday!
                                                                                                                                                                                               =+()\&'!H'\&(\&\#)\&2!3)!)/\&!
          I#)&'#3)$+#31!8I:-!-+E$&)*!L+#,&'&#E&9!8G()&'23G<!
D6\(\frac{J*##9!L\(\theta\!!\) D\(\text{AA}\) D\(\text{DEHI}\) 9!T\(\theta\!!\) '321\(\delta\!"\) Bd1. ?9!d\(\delta\!!\) -\(\text{!!}\) +/#!U31\(\frac{9!}{8}\!!\) \(\delta\!'\) \(\delt
           ]+2'$?.&g9!L<!0A64C9!Y.1*P<!
                                                                                        <!=+()\&'!H'\&(\&\#)\&2!3)!/\&!I\#)\&'\#3)\$+\#31!8I:-!-+E\$\&)*!L+\#,\&'\&\#E\&9!
           8G()&'23G<!
0A64C9!8H'$1P<!
                                                                                                                                       <!=+()\&'!H'\&(\&\#)\&2!3)!)/\&!-+E\&\&)*!+,!=\&2\$3)'\&E!
          =(*E/+1+?*!8##.31!L+#,&'&#E&<!S'13#2+9!01+'$23<!
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MA< ! 0>AA>DEHI>9!T<! h!K311&'9!-<!04MMM9!8H'$1P!
         !!=3H&'!H'&(&#)&2!3)!)/&!8##.31!W3)$+#3!!8((+E$3)$+#!+,!-E/++1!=(*E/+1+?$()(!L+#%&#)$+#9!J3(!
    \ &?3(9!W&%323<!!
M@< ! 0>AA>DEHI>9!T<! h ! K 3#?$+#&9!L<!04MMC9!W+%&G>&'P!
                              \langle !!=3H\&'!H'\&(\&\#)\&2!3)! \rangle / \&! 8 \# . 3!!J + . \$(\$3\#3!-E/++1!=(*E/+1+?\$E3!!)
    8 ((+E$3)$+#!L+#,&'&#E&9!J3,3*&)\&9!J+.$($3#3<!!
M5< ! 0>AA>DEHI>9!T<!04MMC9!8.?.()P!
                                                                                                             <!!
    =+()&'!H'&(&#)&2!3)!)/&!465)/!8##.31!8G&'$E3#!=(*E/+1+?$E31!8((+E$3)$+#!L+#,&'&#E&9!-3#!
    0'3#E$(E+9!L31$,+'#$3<!!!!
MD< ! 0>AA>DEHI>9!T<! h ! K 311&'9! - <Y<!04MMC9! 8 . ? . ()P!
                  <!!=+()&'!H'&(&#)&2!3)!)/&!465)/!8##.31!8G&'$E3#!=(*E/+1+?$E31!8((+E$3)$+#!
    L+#,&'&#E&9!-3#!0'3#E$(E+9!L31$,+'#$3<!!!
MN< ! 0>AA>DEHI>9!T<8<!04MM79!W+%&G>&'P!
                                                                                               <!!=+()&'!
   H'\&(\&\#)\&2!3)!/\&!A5)/!8\#\#.3!!0!+'$23!8((+E\$3)\$+\#!+,!-E/++1!=(*E/+1+?\$()(!L+\#,\&'\&\#E\&9!:3*)+\#3!
    `&3E/9!01+'$23<!!'
M7< ! 0>AA>DEHI>9!T<8<!04MM79!Y.#&P!
                                !!=3H\&'!H'\&(\&\#)\&2!3)!)/\&!N)/!8\#\#.31!O1+'$23!;I \setminus !L+\#,\&'\&\#E\&9!S'13\#2+9!
    01+'\$23<!!!
MC < d\#+...9! : < K < 9! h! ! 0>AA>DEHI>9!T < 8 < !04MM79! 8 H'$1P!
                                                                    !-*GH+(\$.G!E/3\$'\&2!3)!)/\&!8##.31!
    W3)$+#3!!8((+E$3)$+#!+,!-E/++!!=(*E/+1+?$()(!L+#%&#)$+#9!8#3/&$G9!L31$,+'#$3!!!
MM < d\#+, 9! ; < K < 9! h! ! 0>AA>DEHI>9! T < 8 < !04MMN9! W+% & G>& 'P!
                                   !=3H\&'!H'\&(\&\#)\&2!3)!)/\&!A@'2!8\#.3!!01+'$23!8((+E$3)$+\#!+,!-E/++1!
    =(*E/+1+?)((!L+#,\&'\&#E\&9!0)<!J3.2\&'231&9!01+'$23<!!!
466 < = + ^k11B - G )/9! d < 8 < !! 0>AA>DEHI>9!T < !! h !0 & 23 9! K < !04MMN9!W + % & G> & 'P!
                                 !!=3H\&'!H'\&(\&\#)\&2!3)!/\&!A@'2!8\#\#.31!01+'$23!8((+E$3)\$+\#!+,!-E/++1!
    =(*E/+1+?)((!L+#,\&'\&#E\&9!0)<!J3.2\&'231&9!01+'$23<!!!
464<
        ! 0>AA>DEHI>9!T<8<!04MMN9!Y.1*P!
                    !!=3H&'!H'&(&#)&2!3)!)/&!4MMN!8##.3!!I#)&'#3)$+#3!!-E/++1!=(*E/+1+?*!8((+E\$3)\$+#!
    L+11+j.$.G9![?&'9!;.#?3'*<!!0=3H&'!E/+(&#!3(!+#&!)/3)!u>&()!'&H'&(&#)&2!$##+%3)$%&!H'3E)$E&(v!$#!)/&!
    .$&12!+,!-E/++1!=(*E/+1+?*P!$
518''\#\$!\#''3''-1.1'+-30\$C-\&'1'')\$E./:30\$F+\#:38+<30\$.-)\$G, ''31\$H''21, \#''3\$
        ! 0>AA>DEIII>9!T<!0A6A59!Y.1*P<![)/$E31!L+#($2&'3)$+#(!.+'!=(*E/+1+?$()(!U+' $#?!$#!L+''&E)$+#31!
46A<
    O3E$\$\$&(f!J&3'#$#?!,'+G!I#)&?'3\&2!L3'&!-&)\$#?(<!1L+#\$#.$#?![2.E3\$+#!U+' (/+Hm<!0&2&'31!
    ` . '&3 . !+,!='$(+#(<! \ $') . 31<!
46@< U3($1&^(_$9!-\d!; .#)&'9! [\d!] O>AA>DEHI>9!T\d!; 3 . ?9!W\d!h!; 3'()&'9!d\d\0A6A@9!: &E&G>&'P\d!
    R'32.3)&!().2&#)!&)/$E(!^'$)$#?!E+GH&)$)$+#!^$##&'f!I]`!^3$%&'(!+,!H3'&#)3!!E+#(&#)!,+'!JR`TXb!
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46N< ! 0>AA>DEHI>9!T<!0A6A@9!8H'\$IP<!0'+G!'\$(_!)+!'&(\$1\$&#E&f!T'3.G3B\$#,+'G&2!E3'&!,+'!*+.)/!^\$)/!; I\<!I#%\$)&2!T31_<!81>3#*!K&2\$E31!L&#)&'!-H&E\$31\$g&2!L3'&!L&#)&'!,+'!82+l&(E&#)(!3#2!V+.#?!82.1)(!A6A@!T&3E/\$#?!:3*<!\\$').31<!!

-)<!=&)&'(>. '?!L3GH.(!"#2&'?'32.3)&!]&(&3'E/!L+#,&'&#E&<!-)<!=&)&'(>. '?9!01+'\$23<!

- 467< ; 3(_&))9! K Ø! J\$?G3#9! d Ø!R3'2*9! Ø!L'3GH(\$&9!LØ!; 3')9!TØ! h! ! 0>AA>DEIII>9!T<!0A6A@9! K3'E/P<! &Z.3!!/&31)/!1\$)&'3E*!(E31&(f!8!(*()&G3)\$E!'&%\$&^<!=+()&'!H'&(&#)&2!3)!)/&!" 0!R'32.3)&!] &(&3'E/!-*GH+(\$.G<!T3GH39!01+'\$23<!!
- 46C< **! 0>AA>DEHI>**9!T<!0A6A@9!K3'E/P<!L/311&#?&(9!'&^3'2(9!3#2!(H&E\$31!E+#(\$2&'3)\$+#(!^/&#!E+#2.E)\$#?!'&(&3'E/!^\$)/!3#2!,+'!*+.)/<!I#%\$)&2!T31_<!=.>|\$E!; &31)/!SH&#!O+'.G9!"#\$%&'(\$)*!+,!U\$)^3)&'('3#29!Y+/3##&(>.'?9!-+.)/!8,'\$E3<!
- 46M< ! **0**>AA>DEHI>9!T<!0A6A@9!K3'E/P<!]&(&3'E/!^\$)/!3#2!,+'!*+.)/f!L/311&#?&(9!'&^3'2(9!3#2!(H&E\$31! E+#(\$2&'3)\$+#(<!I#%\$)&2!T31_<!=&'\$#3)31!; I\!]&(&3'E/!"#\$)9!"#\$%&'(\$)*!+,!U\$)^3)&'('3#29! Y+/3##&(>.'?9!-+.)/!8,'\$E3<!
- 444< ! O>AA>DEHI>9!T<!0A6AA9!SE)+>&'P<![)/\$E31!L+#(\$2&'3)\$+#(!,+'!=(*E/+1+?\$()(!U+'_\$#?!\$#!I#)&?'3)&2! L3'&!-&))\$#?(<!R.&()!1&E).'&!\$#!2+E)+'31B1&%&1!; &31)/!=(*E/+1+?*!E+.'(&!0='+,&((+'f!:\$3#3!]3#E+.')9! =/:P9!"#\$%&'(\$)*!+,!-+.)/!O1+'\$23<!!
- 44A< ! **0>AA>DEIII>**9!T<!0A6AA9!SE)+>&'P<!=(*E/+(+E\$31!I((.&(!03E\$#?!V+.)/!J\$%\$#?!^\$)/!; I\<!I#%\$)&2! T31_<!; .G3#!`\$+1+?*!3#2!; &31)/!-).2\$&(!='+?'3G9!"#\$%&'(\$)*!+,!T+'+#)+9!S#)3'\$+9!L3#323<!\\$').31<!
- 44@< **! 0>AA>DE**\$\text{9}!T<!0A6AA9! &H)&G>&'P<!] &E+?#\$g\$#?!3#2!'&(H+#2\$#?!)+!&)/\$E31!2\$1&GG3(<!I#%\$)&2!
 T31_<!0+')!U+')/!8'&3!=(*E/+1+?*!8((+E\$3)\$+#<!\\$').31<!
- 445< **! 0>AA>DEII**>9!T<!0A6AA9!0&>'.3'*P<!:3)3!E+11&E)\$+#f!U/3)9!^/	!^/*9!3#2!/+^q!I#%\$)&2!T31_<!

 J [8 : -!81!-)3,,!T'3\$#\$#?<!S'13#2+9!01+'\$23<!!
- 44D

 ! O>AA>DEHI>9!T<!0A6AA9!O&>'.3'*P<!; I\!'&(&3'E/!^\$)/!3#2!,+'!*+.)/f!L/3!1&#?&(!3#2!'&^3'2(<! I#%\$)&2!T31_<!R'32.3)&!:\$H1+G3!='+?'3G!\$#!; &31)/!=(*E/+1+?*!-&G\$#3'!-&'\$&(9!V+'_!"#\$%&'(\$)*9! T+'+#)+9!S#)3'\$+9!L3#323<!\\$').3!<!!
- 447< **! 0>AA>DEHI>**9!T<!0A6A49!W+%&G>&'P<! [) / \$E(!\$#!'&(&3'E/<!R . &()!1&E) . '&!\$#! . #2&'?'32 . 3)&!; +#+'(! ='+(&G\$#3'!0='+,&((+'f!Y&##\$,&'!L+##+11*9!=/:P<!V+'_!"#\$%&'(\$)*9!T+'+#)+9!S#)3'\$+9!L3#323<! \\$') . 31<!
- 44C< ! **0>AA>D**EHD>9!T<!0A6A49!W+%&G>&'P<!] &(&3'E/!&)/\$E(<!R.&()!!&E). '&!\$#!.#2&'?'32.3)&!; +#+'(!='+(&G\$#3'!0='+,&((+'f!-.g3##&!K3E:+#3129!=/:P<!V+'_!"#\$%&'(\$)*9!T+'+#)+9!S#)3'\$+9!L3#323<

45M< **! 0>AA>DEIII>**9!T<!0A64C9!Y.#&P<!8((&((\$#?!:&E\$(\$+#31!L3H3E\$)*!)+!L+#(&#)!,+'!]&(&3'E/f!8!='3E)\$E31!T'3\$#\$#?!-&((\$+#<!I#%\$)&2!T31_<!=&'\$#3)31!; I\!]&(&3'E/!"#\$)9!"#\$%&'(\$)*!+,!U\$)^3)&'('3#29!Y+/3##&(>.'?9!-+.)/!8,'\$E3<!

- 4D6< **! 0>AA>DEIII>**9!T<!0A64C9! 8 H'\$1P<!=(*E/+(+E\$31!-E'&&#&'(f! 8 2G\$#\$()'3)\$+#9!-E+'\$#?9!3#2! :+E. G&#)3)\$+#<!!T'3\$#\$#?!H'+%\$2&2!)+!()3.,!\$#!)/&!!"-0!=&2\$3)'\$E!3#2!82+1&(E&#)!:\$(&3(&!='+?'3G<!!
- 4D4< =\&\(\left(\frac{9}{T}\cdot\) | \textbf{! 0>AA>DEHI>9}\(\textbf{T}\cdot\) | 103E. 1)*! 8 2%\(\cdot\) (+'\(\mathrm{n}\) 0A64C9! 8 H'\(\struct\) | 1044?\(\cdot\) (!+!)/\(\delta\)! L+#E&H). 31\(\struct\) 31\(\struct\) 31\(\delta\) 31\(\struct\) | 31\(\delta\) 31\(\delta\) 31\(\delta\) 31\(\delta\) 31\(\delta\) | 31\(\delta\) 31\(\delta\) 31\(\delta\) 42! K\(\delta\) (. '\(\delta\) 63\(\delta\) | 11\(\delta\) 11\(\delta\) 21\(\delta\) 11\(\delta\) 21\(\delta\) 21\(\delta\) 11\(\delta\) 21\(\delta\) 11\(\delta\) 21\(\delta\) 11\(\delta\) 21\(\delta\) 11\(\delta\) 22\(\delta\) 11\(\delta\) 12\(\delta\) 13\(\delta\) 12\(\delta\) 12\(\delta\) 12\(\delta\) 12\(\delta\) 12\(\delta\) 13\(\delta\) 12\(\delta\) 12\(\de
- 4DA< **! 0>AA>DEIII>**9!T<! h ! 8 ''\$#?)+#9!Y<!0A64C9! 8 H '\$1P<!R '+ ^ \$#?! " H!=+(\$)\$%&f!: +E. G&#)3'*!-E'&&#\$#?! 3#2!: \$(E.((\$+#<!0&()\$%31!+,!-&Z9!" #\$%&'(\$)*!+,!-+.)/!01+'\$23!-)<!=&)&'(>. '?<!'
- 4D@< **! 0>AA>DEIII>**9!T<!0A64C9!8H'\$1P<!T/&!; I\!-[[](!='+\&E)<!]&(&3'E/!J\$?/)#\$#?!T31_9!"#\$%&'(\$)*!+,! -+.)/!O1+'\$23!-)<!=&)&'(>.'?<!
- 4D5< **! 0>AA>DEIII>**9!T<!0A64C9!0&>'.3'*P<!K\$#2,.1!]3)\$+#31!J\$%\$#?<!I#%\$)&2!T31_<!;+#+'(!`'.E/9!"#\$%&'(\$)*!+,!-+.)/!01+'\$23!-)<!=&)&'(>.'?<!
- 4DD< **! 0>AA>DEHI>**9!T<!0A6479!SE)+>&'P<!T/&!K+'31!=3'32+Z!+,!; I\!L'\$G\$#31\$g3)\$+#!J3^(<!I#%\$)&2! T31 <! "#\$)3'\$3#! "#\$%&'(31\$()! "#\$)&2!O&11+^(/\$H9!-)<!=&)&'(>. '?9!O1+'\$23<!
- 4DN\ \ \ \!\ \mathbf{O} \sample AA > \mathbf{D}E\ \mathbf{D} \sigma 9!\ \tau \cdot \left(\text{0} \text{6479}!\ \cdot \
- 4D7< **! 0>AA>DEHI>**9!T<!0A6479! 8 H'\$1P<! : &%&1+HG&#)31!=(*E/+H3)/+1+?*<!R . &()!1&E) . '&!\$#! . #2&'?'32 . 3)&! : &%&1+HG&#)31!=(*E/+1+?*!E+ . '(&!0='+,&((+'f! U *!]+)&9!=/ : P9! "#\$%&'(\$)*!+,!-+.)/!01+'\$23!-)<! =&)&'(>. '?<!
- 4DC< **! 0>AA>DEIII>**9!T<!0A6479! 8 H'\$IP<! U +G&#!\$#!J&32&'(/\$H!3#2!T&E/#+1+?*<!I#%\$)&2!T31_<!-E3#B]\$)&! 8 HH!J3.#E/!03HH!E'&3)&2!>*!.#2&'?'32.3)&!; +#+'(!().2&#)!:&(/3#\$&!R+%&'P!3)!)/&!"#\$%&'(\$)*!+,!-+.)/!01+'\$23!-)<!=&)&'(>.'?<!
- 4DM< : '3 &9!; <!h!! **0>AA>DE**HD>9!T<!103E.1)*!82%\$(+'m!!0A6479!8H'\$1P<!T/&!&,,&E)!+,!3!H+)&#)\$31!H3')#&'a(! (&'+()3).(!+#!>&/3%\$+'3!!(&Z.31!\$#)&#)\$+#(!+,!G&#!^/+!/3%&!(&Z!^\$)/!G&#!+#1\$#&!3#2!+,,1\$#&<!=+()&'!H'&(&#)&2!3)!)/&!"-0-=!]&(&3'E/!-*GH+(\$.G<!
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]+2'\$?.&g9!L<!0A64N9!SE)+>&'P<!!:&H'&((\$%&!(*GH)+G(!'&13)&2!)+!>\$+1+?\$E31!G3'_&'(!+,!\$GG.#&!,.#E)\$+#\$#?!3G+#?!*+.)/!!\$%\$#?!^\$)/!;I\<!=+()&'!H'&(&#)&2!3)!)/&!Y+/#(!;+H_\$#(!811!L/\$12'&#a(!;+(H\$)31!]&(&3'E/!-*GH+(\$.G9!-)<!=&)&'(>.'?9!01+'\$23<!
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- 4M7< <u>K3E/3E&_9! K4'X.\$##9! K4!L+1&G3#9!-4!`3#2&'9!`4!!0>AA>DEHI>9!T<!103E.1)*!82%\$(+'m!0A6459!8H'\$IP!='&1\$G\$#3'*!'&(.1)(!,'+G!3!().2*!+,!H&'E&H)\$+#(!+,!;I\!E'\$G\$#31\$g3)\$+#!13^(<!=+()&'!H'&(&#)&2!3!!)/&!"#2&'?'32.3)&!]&(&3'E/!-*GH+(\$.G9!"#\$%&'(\$)*!+,!-+.)/!01+'\$23!-)<!=&)&'(>.'?9!-)<!=&)&'(>.'?9!0J<!!!!</u>
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- A4@< <u>`3.G()&\$?&'9</u>!]<!h!**!0>AA>D**EHD>9!T<!0A64A9!0&>'.3'*P<!:&,\$#\$#?!'&1\$?\$+(\$)*!3#2!(H\$'\$).31\$)*<!=+()&'!H'&(&#)&2!3)!"-0!;&31)/!]&(&3'E/!:3*9!T3GH39!01+'\$23<!

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