!!!

''#\$%&!'(!)'*''&*''+!,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,,,!-
('.&/'.0!,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	1
2*".'03)"2'*4,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	H
5 2++2 ' *!+"#"& 5 & *",,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	H
* ' *602+) . 252* # "2 ' *!7 ' %2) 8!,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
92+2'*!+"#"& 5 & * ",,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
&03) #"2' *#%\7 · 2%' + ' 7 · 8!	///L

4

5%

% ! "#\$%

#CC!DECFGFHI!GEJKLFJHM!NHOHFJ!LDDCP!KE!LCC!IKQMHJKIR!SLGQCKP!LJM!IKLSS,!!!

!

8%

5 #+"&.!'(!+)2&\*)&!7:8+2)2#\*!#++2+"#\*"!+"302&+!7.';.#5! +"30&\*"!:#\*0\$''A! 0'52\*2)#\*!3\*29&.+2"8!'(!)#%2('.\*2#!

 $-\ ./01\ 2\ .!31!34\ .!\ 5\ 1\ 2\ 676087!\ 9\ 76\colon .\ .; <63=!1>!\ )\ 8/6>1\ ; \\768!\&4=<60687!\ ?<<6<3873!\#3@A6.<!\&;1B;8\ 2\ C!$ 

!

```
5 #+"&.!'(!+)2&*)&!7:8+2)2#*!#++2+"#*"!+"302&+!7.';.#5!
+"30&*"!:#*0$''A!
0'52*2)#*!3*29&.+2"8!'(!)#%2('.*2#!
```

'4.!512676087!976:.;<63=!1>!) 8/6>1;768! "8<3.;!1>!#06.70.!&4=<60687!?<<6<3873!#3@A6.<!&;1B;82!6<!8!PQM!21734!=.8;M;1@7A!F;1B;82H!'46<!F;1B;82!48<!;.0.6:.A!?00;.A6383617M&;1:6<6178/!>;12!34.!?00;.A6383617

! 5 +7#+!70EUOLV!0FMLGKFG!LJM!) CFJFGLC!) Q00FGQCQV!	! 3 JFKI!
!!!!!!!!!!!!!!!!!!!!E)D)#&)/!Q!I!B,(\$<&, </td <td>!</td>	!

&?!^ZbZ!

) @;;.73! ' 1F60<!67!34.!&?!&;1>.<<617!!

71

```
! !
!
!
!
!
!
!
!
!
!
!
```

```
" "#$%&'()'%'*+,-.*%/0.,1##2!!
```

! "#\$%&'()'%'\*+,-.\*%/0.,1##2%

!

! !

 $\#3@A.73<!<41@/A!:6<63! \underline{433F[NNGGGHA12676087H.A@N808A.260<N;.<1@;0.<N0838/1B}!>1;!8!/67E!31!34.!W.7.;8/! ?08A.260!&1/606.<!87A!&;10.A@;.<!0173.73!8;.8!1>!34.!591)!?08A.260!) 838/1BH!'46<!<.03617!0173867<! 012F/.3.!87A!A.386/.A!67>1;283617!;./8367B!31!976:.;<63=!808A.260<!808A.260!F1/606.<!87A!F;10.A@;.<! J670/@A67B!F/8B68;6<2 KM!?08A.260!+17.<3=\\87A!34.!?08A.260!+171;!)1A.\\81!$ 

### B6E"J676K !E:G`6F:E!

?7!67A6:6A@8/!G634!8!A6<8D6/63=!6<!A.>67.A!8<!87=!F.;<17!G41!JZK!48<!8!F4=<608/!1;!2.738/!62F86; 2.73!G4604! <@D<387368//=!/6263<!17.!1;!21;.!28\frac{8}{1};!/6>.!8036:636.<g!JPK!48<!8!;.01;A!1>!<@04!62F86; 2.73g!1;!J\K!6<!;.B8;A.A!8<!48:67B!<@04!87!62F86; 2.73l!!?7!67A6

?!087A6A83.!2@<3!D.!8D/.!31!1D<.;:.!F836.73<!800@;83./=!87A!012F/.3./=\!D134!83!8!A6<3870.!87A!0/1<./=\!'46<!8D6/63=\!:.S@6;.<\>@7036178/!:6<617\!4.8:67B\!87A!<128360!<.7<83617\!

## F.DD'\*,<\$&,.\*!

### \ .&./!

!

?!087A6A83.!<41@/A!48:.!<@>>606.73!2131;!>@703617!31!./6063!67>1;283617!>;12!F836.73<!D=!F8/F83617!!8@<0@/383617!!87A!F.;0@<<617!!8<!G.//!8<!08;;=!1@3!A68B71<360!287.@:.;<!!!

?!087A6A83.!<41@/A!48:.!2131;!>@703617!<@>>606.73!31!.L.0@3.!21:.2.73<!;.8<178D/=!;.S@6;.A!31! F;1:6A.!B.7.;8/!08;.!87A!.2.;B.70=!3;.832.73!31!F836.73<!!#@04!<E6//<!;.S@6;.!011;A6783617!1>!B;1<<! 87A!>67.!2@<0@/8;!21:.2.73<!!.S@6/6D;6@2%!87A!<.7<83617!!

 $? !087A6A83 . !<41@/A!D . !8D/ . !31! 2 876F@/83 . ! . S@6F 2 . 73!87A!67<3; @ 2 . 73<!31!F . ;>1; 2 !D8<60!/8D1;831;=! 3 . <3<!87A!F; 10 . A@; . <!; . S@6; . A!31!833867!0@;;60@/8; !B18/<!J . HBH\\!7 . . A/ . <\!<3 . 341<01F . \\!1F4348/2 1<01F . \\!1F4348/2 1<01F . \\!18317B@ . !D/8A . <\\!673;8 : . 71@<! . S@6F 2 . 73\\!B=7 . 01/1B60!<F . 0@/@ 2 \\!87A!<08/F . /\\!H!$ 

# 6\*&)22)<&'\$2IF. \*<)0&'\$2+!6\*&)A/\$&,C)!\$\*(!c'\$\*&,&\$&,C)!''1,2,&,)#!

&:1D/. 2!

 $5 @; 67B!.7; 1//2.73\% 34.!F; 1B; 82R <! ?08A. 260!\&; 1B;. <<!) 122633..!G6/! 217631; !<3@A.73 <!>1; !017367@67B! \\ 012F/6870.!G634!3.047608/! <387A8; A<!! '4.!>80@/3=!1>!34.! "#&?#!&; 1B; 82!; .01B76X.!346<!; .<F17<6D6/63=!31! \\ 8<<..<!.804!<3@A.73R <!012F/6870.!G634!34.!3.047608/!<387A8; A<!67!1; A.; !31!8/1G!<3@A.73 <!31!.73.; !87A!017367@.! \\ 67!34.!F; 1B; 82!87A!31!F; .<.73!087A6A83.<!>1; !34.!&?!0.; 36>6083.!G41!48: .!34.!E71G/.AB.!87A!<E6//<!31!>@703617! \\ 67!8!G6A.!: 8; 6.3=!1>!0/67608/!<63@83617<!87A!31!; .7A.; !8!D; 18A!<F.03; @2!1>!F836.73!08; .!!$ 

### $\ \ : B6F"7!G:F8GBE!$

 $17>1; 2\,83617!F; 1:6A.A!D=!<3@A.73<!83!\,2\,83;60@/83617!87A!F.;61A608//=!A@;67B!34.6;!.A@083617!83!\,5\,1\,2\,676087! \\ 9\,76:.;<63=!J6H.H!!6\,2\,2\,@76X83617!87AN1;!D/1\,1A!3.<3!A10@\,2\,.7383617!87A!3@D.;0@/1<6<!0/.8;870.!87A!<0;...767B! \\ >1; 2<K!G6//!D.!01/.03.A!87A!;.3867.A!67!8!<.0@;.!.7:6;17\,2\,.73!67!34.!" #&?#!&;1B;8\,2!1>>60.<!87AN1;!D=! \\ )\,8<3/.U;8704\!34.!17/67.!D80EB;1@7A!<0;...767B!87A!01\,2\,F/6870.!3;80E67B!01\,2\,F87=!@<.A!D=!34.!F;1B;8\,2!! \\ 12\,2\,@76X83617!87A!3@D.;0@/1<6<!0/.8;870.!;.01;A<!8;.!8/<1!E.F3!D=!34.!F;1B;8\,2!87AN1;!D=! )\,8<3/.U;8704!>1;! \\ <@D!3@I2\,2\,@76X@\,.767@7S0.\,2\,41(.!)\,-\,1\,(8/)\,-\,1\,(<.2\,400\,(6)\,-\,1\,(7!\,(12\,)\,S0.\,2\,417!46300\,-\,183T^*T261T\,f\,[\,(87AN2\,1c\,s\,0)] \\ <0.2\,417!46300\,-\,183T^*T261T\,f\,[\,(87AN2\,1c\,s\,0)] \\ <0.2\,417!46300\,-\,183T^*T261T\,f$ 

F;1B;82!'.047608/!#387A8;A<!28=!;.<@/3!67!A6<26<<8/!>;12!34.!"#&?#!&;1B;82|!! !#/03(+20/#,-#\*""#',.20+,'>#;!#\$/-</\*3#7\*).",&?#;/-</\*3#4(/0),-/#\*+2#902()\*"#4(/0),-/#3\*&#+-,#

!#/03(+20/#, -#\*'''#', . 20+, '\#; !#\$/-</\*3#7\*).",&!#;/-</\*3#4(/0), -/#\*+2#902()\*'#4(/0), -/#3\*&#+-,#
\$\*/,()(\$\*,0#(+#,%0#302()\*'#)\*/0#-7#; !#', . 20+, '=#@%('#('#\*+#!A8B; !#\*))/02(,\*,(-+#',\*+2\*/2#

#### 

!

 $E>=!6.A+>4.6!8;.!<3;17B/=!.701@;8B.A!31!G863!31!F@;048<.!34.6;!.S@6F2.73!@736/!8>3.;!34.=!0122@76083.!\\G634!34.!"#&?#!&;1B;82#!'4.!"#&?#!&;1B;82!873606F83.<!3483!21<3\|6>!713!8/\|2.A608/!.S@6F2.73!G6//!D.!\\F@;048<.A!>1;!@<.!D.B67767B!67!34.!>6;<3!<.2.<3.;!1>!34.!F;1B;82#!!$ 

 $\label{eq:continuous} $$ '4.!F;1B;82!G6//!8;;87B.!>1;!7.G!<3@A.73<!31!F@;048<.!.S@6F2.73!83!A6<01@73.A!F;6067B!F;61;!31!8;;6:8/!17! 082F@<!34.!>6;<3!<.2.<3.;\!J#F.06>60!67>1;283617!17!.S@6F2.73!87A!:.7A1;!G6//!D.!<.73!31!7.G!<3@A.73<!A@;67B! 34.!<@22.;\!K$ 

#3@A.73<!28=!F@;048<.!1;!;.73!D11E<!83!34.!591)!082F@<!D11E<31;.!1;!28=!F@;048<.!34.2!17/67.!34;1@B4!34.!D11E<31;.!83

!			

 $?//!;.S@6;.A!63.2<!8;.!/6<3.A!17!34.!) 8<3/.U;8704!G.D<63.\$!670/@A67B!287A831;=!>1;2<!3483!2@<3!D.!012F/.3.A!87A!<@D2633.A!31!34.!<.;:60.\text{\text{H!}}'4.\text{\text{I2}}2@76X83617!87A!+.8/34!510@2.73!(.S@6;.2.73<!A10@2.73!28=!8/<1!D.!@<.A!31!86A!67!B834.;67B!34.!;.S@6;.A!63.2<\text{\text{\text{H!}}}$ 

```
!

ZZH &; .B7873!4.8/3408; .!G1;E.;<!<41@/A!<3;603/=!8A4.; .!31!F; .08@3617<!31!267626X.!34.!;6<E!1>!+Ij!
3;87<26<<617H!
!
ZPH ?//!<F.062.7<!2@<3!D.!0173867.A!67!8!/.8EMF;11>!F/8<360!D8B!/8D./.A!hD61M48X8;AHi!
```

## E8F6"7!\:B6"!%876F!

 $\#1068/!\ 2\ . A68!; .>.; <!31!I73.; 7\ . 3MD8<. A!311/<!A. <6B7. A!31!0; .83. !8!46B4/=!800. <<6D/. !67>1; 2\ 83617!46B4G8=H! '4.<.! 311/<!8; .!8!F1G.; >@/!87A!>8; M; .80467B! 2\ .87<!1>!01\ 2\ 2\ @76083617!3483!087!48: .!8!<6B76>60873!6\ 2\ F803!17!8! <<3@A.73R<!F; 1>. <<6178/!; .F@383617!87A!<383@<H! , L8\ 2\ F/. <!670/@A.\!D@3!8; .!713!/6\ 2\ 63\ .A!31\!*67E.AI7\!'\ G633\ .;\!V80.D11E\!V/60E;\!O1@'\@D.\!#78F0483\!87A!I7<38B; 8\ 2\!!$ 

 $\#3@A.73<!8;.!/68D/.!>1;!87=3467B!34.=!F1<3!31!<1068/!2.A68!<63.< \#87A!34.!<82.!/8G< \#F;1>.<<6178/!.LF.0383617< \#87A!B@6A./67.<!2.@<3!D.!2.8673867.A!8<!6>!34.=!G.;.!673.;80367B!67!F.;<17\!!'4.!>1//1G67B!B@6A./67.<!48:.!D..7!A::./1F.A!31!1@3/67.!8FF;1F;683.!<387A8;A<!1>!017A@03!>1;!34.!>@3@;.!1>!8!<3@A.73!87A!34.!;.F@383617!1>!34.!\#%?#!&;1B;82[!$ 

ZH #3@A.73<!<41@/A!D.48:.!;.<F17<6D/=!87A!@<.!B11A!Y@AB2.73H!I7012F/.3.\!67800@;83.\!34;.83.767B\!48;8<<67B!F1<3<\!1;\\34.\!@<.!1>!F;\1>8763=!17!F1<367B<!6<!<3;\603/=!F;\146D63.AH!\I3!6<!678FF;\1F;\683.\!31!@<.!<1068/!2.A68!<63.<!8<!8!:.7@.!>\\1;\\1:.7367B\|

```
1H
     ) 1 2 F/. 3617!1>!+. 8/34!I7<@;870. !&1;38D6/63=!87A!?001@738D6/63=!?03!J+I&??K!87A!T#+?!3;86767B!6<!
     A10@2.73.AH!!
ΛH
     5;@B!<0;..767B!87A!0;62678/!D80EB;1@7A!04.0E!0/.8;870.!6<!1D3867.All!!
```

- U\*#!87A!?) \*#!0.;36>6083617!6<!1D3867.AH!
- ` || '4.!8D6/63=!31!2...3!34.!3.047608/!<387A8;A<!48<!D...7!:..;6>6.All!
- QH &;11>!3483!.7;1//2.73!67!8!4.8/34!67<@;870.!F;1B;82!6<!<@D2633.AH!!
- cH?7=!134.;!6<@.<!8<!A.3.;267.A!D=!34.!"#&?#!&;1B;82!56;.031;!1;!34.!)/67608/!'.82#!

# "<\$()**D**,<!**B**)>,<,)\*<,)#!!

!

?//! "#&?#!&;1B;82!<3@A.73<!8;.!;.S@6;.A!31!8A4.;.!31!34.!?08A.260!#387A67B!&1/606.<!8<!1@3/67.A!67!34.! #836\$\times8031;=! ? 08A. 260!&;1B;.<\!&1/60=!/1083.A!83!GGGHA12676087H.A@N8A26\$\!65017\$\\N86AN\$\!851!+#6B767B!1>!34.!! #3@A.73!+87AD11E!#6B783@;.!#4..3!:.;6>6.<!3483!34.!<3@A.73!48<!;.0.6:.A!01F6.<!1;!48<!800.<<!31!34.<.! 283.;68/<!87A!8B;..<!31!8A4.;.!31!63<!F1/606.<#!!

### 6^KG8B[FK68^!

 $\begin{array}{l} '46<!0173.73!8;.8!0173867<!F1/606.<!87A!;.S@6;.2.73<!3483!B1:.;7!808A.260!F.;>1;2870.!87A!F;1>.<<6178/!\\ 017A@03!>1;!8//!<3@A.73<!G41!8;.!.7;1//.A!67!87=!F48<.!1>:!34.!PQM21734! "8<3.;!1>!#06.70.!67!&4=<60687!\\ ?<<6<3873!#3@A6.<!&;1B;82#! '4.<.!F1/606.<!8;.!@76S@.!31!34.!F;1B;82!87A!8;.!A.<6B7.A!31!F;1213.!<387A8;A<!>>1;1808A.260!012F.3.70=M:F;1>.<<6178/!D.48:61;!87A!673.B;63=M:87A!F.;<178/!;.<F17<6D6/63=!7.0.<<8;=!>1;!\\ F;80360.!8<!8!F4=<60687!8<<6<3873H! '4.=!;.F;.<.73!34.!F8;82.3.;<!1>:8046.:.2.73!87A!D.48:61;!34.!F;1B;82!\\ >80@/3=!.LF.03<!1>:163<!3@A.73<!8<!>@3@;.!4.8/34!F;80363617.;<!G41!G6//!D.!<.;:67B!34.!F@D/60!87A!017<@2.;H!I3!6<!34.!;.<F17<6D6/63=!1>!8//!<3@A.73<!31!D.!E71G/.AB.8D/.!8D1@3!F;1B;82!F1/606.<H! '4.!F1/606.<!G6//!D.!8FF/6.A!31!8//!8<F.03<!1>:134.!<3@A.73$<!808A.260!F;1B;.<<!87A!017A@03!>1;!8<!/17B!8<!34.!<3@A.73!6<!.7;1//.A!67!34.!F;1B;82H!$ 

'4.!" #&?#!&;1B;82!48<!8!;.<\F17<6D6/63=!31!<8\>.B@8;A!34.!F836.73!87A!F@D/60!D=!.A@08367B!012F.3.73!
F4=<60687!8<<6<3873!B;8A@83.<\!!?<!<@04\!34.!F

```
!
I7!#@ 2 28;=[!
ZH '46<!6<!8!F;1>.<<6178/!F;1B;82\!87A!34.;.>1;.!
PH ?33.7A870.!6<!287A831;=!83!8//!/.03@;.\!!/8D!87A!0/67608/!;1383617<\!!
\H ,L0.<<6:.!1;!;.F.83.A!8D<.70.<!28=!;.<@/3!67!/1G.;67B!1>!34.!01@;<.!B;8A.\!!
]H ?!F4=<60687\circ\!713.!28=!D.!;.S@6;.A!>1;!.L3.7A.A!8D<.70.<!A@.!31!6//7.<<\!!
^H #3@A.73<!2@<3!08//!1;!.286/!34.!)1@;<.!)11;A67831;!6>!34.=!G6//!D.!8D<.73!1;!/83.\!!
```

# $K^{(,*)}$ ##!

?;;6:67B!17!362.!A.217<3;83.<!;.<F.03!>1;!67<3;@031;<!87A!F..;<!! '8;A67.<!67!34.!A6A80360!F48<.!1>!3;86767B!
48<!D..7!/67E.A!31!38;A67.<<!87A!134.;!@7F;1>.<<6178/!D.48:61;<!67!34.!0/67608/!F48<.!1>!3;86767B\!87A!/83.;!67!
34.!G1;EF/80.\!! '4.;.>1;.\!38;A67.<<!6<!017<6A.;.A!8!F;1>.<<6178/6<2!67>;803617\!!, L0.<<6:..!38;A67.<<!8<!
A.3.; 267.A!D=!87=!>80@/3=\!28=!;.<@/3!67!F;1>.<<6178/6<2!G8;767B<!87A!1;!;.>.;;8/!31!34.!? &) !87A\\1;!
F;1>.<<6178/6<2!F;1D83617\!!, L0.<<6:..!38;A67.<<!6//!D.!A10@2.73.A!67!8!<3@A.73\!8<!808A.260!>6/.!8<!87!6706A.73!

```
!!
```

# F7"EEG88\!%876F6:E!

# [#)!.>!H,/)2)##!B)C,<)#!,\*!&3)!F2\$##/..D!

# G)<./(,\*A!.>!7)<&'/)#!

&.; 26<<617!31!; .01; A!/.03@; .<!6<!<1/./=!83!34.!A6<0; .3617!1>!34.!) 1@;<.!) 11; A67831; I87A!/.03@; .;!@7/.<<!

```
!
```

### : \ "67!:K6c [:KK:!

 $, 2\,86/!6<!87!.>>.036:..!87A!<387A8; A!G8=!31!01\ 2\ 2\ 076083..!860E/=!G634!\ 5\ 1\ 2\ 676087!>800/3=\%!<38>>\M287A!>.//1G!< 30A.73<!87A!6<!8/<1!34..!<387A8; A!67!D0<67.<<!01\ 2\ 2\ 076083617\M2!V1//1G67B!8;..!;.267A.;<!31!4./F! 28E.!34..! LF.;6.70..!21;..!F1<636:..!87A!F;1A0036:..!>1;!<30A.73<\M2800/3=\M287A!<38>>!87A!134..;!F;1>.<<6178/<\M281M!$ 

#3@A.73<!8;.!;.S@6;.A!31!@<.!34.6;!8<<6B7.A!512676087!.286/!8001@73!>1;!8//!A.F8;32.738/! 0122@76083617!!!

- , 2.86 < !<41@/A!D. |E.F3!<41;3!87A!<62F/.\|!<383.!0/.8;/=!87A!A6;.03/=!8!S@.<3617!1;!0170.;7\|!87A!2.73617!8!A.<6;.A|362.!>;82.!>1;!:.<F17<.\|!
- , 286/<!<41@/A!670/@A.!8!2.8767B>@/!<@DY.03!/67.!<1!34.!;.8A.;!087!A.06A.!41G!S@60E/=!8!;.<F17<.!6<!7..A.A!!!
- , 2.86/<!<41@/A!670/@A.!8!;.<F.03>@/!<8/@383617!J5.8;!5; t lbll;!&;1>.<<1; t lbll;#3@A.73<!8;.!8A:6<.A!31! 04.0E!G634!>80@/3=!31!<..!41G!34.=!F;.>.;!31!D.!8AA;.<<.Ah!U.B67767B!87!. 2.86/!31!8!>80@/3=!2.2D.;! G634!8!<8/@383617!<@04!8<!h+.=i!6<!7...;!8FF;1F;683.ll!

```
!
!
  QH
         ?//!<3@A.73<!G6//!<38;3!.804!.L82!83!34.!<82.!362.!!!!'4.!<48;.A!<3@A.73!08/.7A8;!G6//!D.!@FA83.A!G634!
         .804!>678/!.L826783617R<!<F.06>60!<38;3!87A!.7A!362.H!
!
  cH
         , : .;=!.L82!G6//!48: .!8!@76S@.!F8<<G1;A!3483!G6//!D.!<48; .A!83!34.!<38;3!1>!3483!F8;360@/8;!.L82#!
 Zbll
         ?//!<3@A.73<!8;.!.LF.03.A!31!D.!67!34.6;!<.83<!;.8A=!31!<38;3!34.6;!;.<F.036:.!.L8 2 6783617<!83!34.136 2.!
        F1<3.All!!
        !
 ZZH
        T70. !8!<3@A.73!48<!>676<4. A!87!. L8 2 6783617\|\dagger 4. \|<4. !<41@/A!0/1<. !46<\|\dagger 1. !01 2 F@3. ;!87A!/. 8:. !34.!
        0/8<:;112H!!E&'()*&#!$/)!*.&!&.!<.*A/)A$&)!.'&#,()!&3)!<2$##/..D!$*(!D$-!*.&!)*&)/!&3)!
        <2$##/..D!'*&,2!$22!#&'()*&#!3$C)!<.D0)&)(!&3)!);$D,*$&,.*5!#3@A.73<!28=!;.3@;7!31!34.!
        0/8<<;112!G4.7!34.!3.<3!6<!012F/.3.All!
 ZPH
        +83<N08F<!28=!713!D.!G1;7!A@;67B!87=!.L826783617!.L0.F3!>1;134.!G.8;67B!1>!8!4.8AF6.0.!>1;!
         ;./6B61@<!;.8<17<\!!?7=!<3@A.73!G.8;67B!8!483!G6//!D.!8<E.Al31!;.21:.!63\!!V86/@;.l31!012F/=!G634!346<!
        1;!87=!134.;!;.8<178D/.!;.S@.<3!1>!8!F;1031;!G6//!;.<@/3!67!34.!622.A683.!A6<26<<8/!1>!34.!<3@A.73!>;12!
        34.!.L8 2 6783617!87A! 2 8=!;.<@/3!67!8!X.;1!JbK!>1;!34.!.L8 2 H!
Z \setminus \mathbb{H}
```

```
!
!
```

<u>43</u>

#3@A.73<!G41!38E.!8!\*T?!F;61;!31!34.!012F/.3617!1>!8!<.2.<3.;!1;!0/67608/!D/10E!G6//!713!;.0.6:.!0;.A63!>1;!3483!283.;68/N;1383617N!@7/.<<!34.!<.2.<3.;!0173867.A!8!21A@/8;!01@;<.!3483!G8<!012F/.3.A!87A!F8<<.A!F;61;!31!38E67B!34.!/.8:.<math>#1.00

!

#3@A.73<!28=!G1;E!G63467!34.!67<363@3617!G46/.!F8;3606F8367B!67!34.!V.A.;8/!-1;E!#3@A=!&;1B;82!8<!/17B!8<!<@04!G1;E!G6//!713!673.;>.;.!67!

%

## %/.>)##,.\*\$2!F.()!.>!F.\*('<&!

#@00. << !67!34 . !F4 =< 60687!8 << 6<3873!F; 1>. << 617!; .S@6; .< !0.; 3867!F; 1>. << 6178/!D.48:61; 8/!833; 6D@3. < !67!8AA63617!31! 0173.73!E71G/.AB. <math># '4.; .>1; # '4.; .>1; # '4.; .>1; # '4.; .>1; # '4.; .>1; # '4.; .>1; # '4.; .>1; # '4.; .>1; # '4.; .>1; # '4.; .>1; # '4.; .>1; # '4.; .>1; # '4.; .>1; # '4.; .>1; # '4.; .>1; # '4.; .>1; # '5. | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |

"&&)\*(\$\*<)9!#3@A.73<!2@<3!;,F1;3!31!8//!0/8<<.<\!/8D<\!<.2678;<\!)8//!U80E!-..E<!87A!0/67608/!<63.<!83!

- j.;D8/!1;!G;633.7!;.F1;3<!87AN1;!.:8/@83617<!>;12!808A.260!>80@/3=\\\!0/67608/!F;.0.F31;\\\!1;!A.<6B7..<!
  67A608367B!3483!8!<3@A.73!6<!713!F;1B;.<<67B!808A.2608//=!87AN1;!713!A.217<3;8367B!F;1>606.70=!31!8!
  /.:./!G4.;.!63!28=!Y.1F8;A6X.!F836.73!<8>.3=!
- CH V86/@; .!31!>1//1G!87AN1;!01 2 F/=!G634!; . S@6; . 2 .73<!< .3!>1;34!D=!34 .! " #& ? #! ? & ) !87A!&; 1B;8 2 ! 56; .031;!

!

!

```
87A!7.3G1:E67B!1FF1:3@7636.<!F:1:6A.A!G63467!34.<.!1:B876X83617<!8:.!67:8/@8D/.!31!<3@A.73<!8<!34.=!.73.:!34.!
F;1>.<<617H!&;11>!1>!2.2D.;<46F!67!) ?&?!87A!??&?!6<!;.S@6;.AH!#3@A.73!D.7.>63<!>;12!2.2D.;<46F!67!
) ? & ?!87A! ? ? & ?!670/@A.!./6B6D6/63=!>1;!<041/8;<46F<\!!017>.;.70.!A6<01@73<\!87A!800.<<!31!17/67.!:.;<617<!1>!
F;1>.<<6178/!\\10@:78/<#! "1<3!62F1:3873/=#!)?&?!87A!??&?!8A:1083.!>1;134.!F;1>.<<617!83!34.!7836178/!87A!
<383.!/.:./<\h!T7/67.!8FF/6083617<!8;.!8:86/8D/.!83!34.!<63.<!D./1G\h!
F$2,>./*,$!"<$()D-!.>!%"#!
P\ZQ!#H!V86;:6.G!#3H!
#8738!?78\%!)?!cP`b]M]c\Q!
&417.[!J`Z]K!]P`Mb\PZ!
 , 286/[!08F8w08F87.3H1;B!
"D)/,<$*!"<$()D-!.>!%3-#,<,$*!"##,#&$*&#!
P\ZQ! " 6//! ( 18A!#@63.!Z\bb!
?/.L87A:68\\!! i ?!PP\Z1!
&417.[!Jb\K!Q\_MPP\P!
 , 286/![!88F8w88F8H1;B!
BG[]!W!"7F8N87!%876F_!!
5\ 1\ 2\ 676087!6<!01\ 2\ 2\ 633\ .A!31!\ 2\ 867386767B!8!A;@BM>; ... !08\ 2\ F@<\#!\ '4\ . \\ |\ '4\ . \\ |\ '9\ '13\ .L3!1>!34\ .!\ 9\ '16\ ... ; <63=R<!F1/60=!17!A;@B<!F1/60=!17!A; <63=R<!F1/60=!17!A; <63=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!F1/60=R<!
87A!8/0141/\!670/@A67B!F;10.A@;.<!B1:.;767B!A6<06F/678;=!803617<\!087!D.!>1@7A!67!34.!59T)!#3@A.73!
+87AD11E[!433F<[NNGGGHA12676087H.A@N082F@<M/6>.N<3@A.73M487AD11EM87AMF1/606.<!!?<!2.2D.;<!1>!34.!
5 1 2 676087!01 2 2 @763=\\.<3\@A.73<\\8;.\\8A:6<.A\\3483\\34.=\\G6\/\\Y.1F8;A6X.\\34.6;\.<3\\30@<\\83\\34.\\976:.;<6\\3=\\6>\\34.=\\
@<.\!<./\!\1;!67!87=!G8=!4./F!31!28E.!8;86/8D/.!31!134.;<!87=!6//.B8/!A;@B<!1;!8/0141/!!!
a6^"^F6"7!"EE6EK"^F:!!
?!28!1;63=!1>!512676087!976:.;<63=!1>!)8/6>1;768!<3@A.73<!8;.!;.0.6:67B!>6787068/!86A1:3=F608//=!8!
012\,D6783617!1>!B;873<!!/187<!!87A!G1;E!<3@A=!!)12\,F/.3.!>1;2<!87A!8FF/6083617<!8;.!8:86/8D/.!>;12!34.!T>>60.!
1>!V6787068/! ?6All:I3!6<!34.!<3@A.73R<!;.<F17<6D6/63=!31!E71G!87A!8A4.;.!31!8//!>6787068/!86A!8FF/6083617!
A.8A/67.<!!!D:\8\<3@A.73\!7..A<\8<<6<3870.\G634\!34.\F:\10.<<\\56787068/\86A\!01@7<./1:<\8:.\8:\86\8D/.\\87A\$3@A.73<!
8;.!8A:6<.A!31!0173803!34.!1>>60.!>1;!87!8FF16732.73H!
76JG"G_!6^a8G\"K68^!
 '4.!?;04D6<41F!?/.287=!*6D;8;=!41@<.<!0/1<.!31!Zbb\bbb!:1/@2.<!87A!<@D<0;6D.<!31!\`^!\1@;78/<!87A!
7.G<F8F.;<!67!F;673!8<!G.//!8<!48:67B!17/67.!800.<<!31!1:;!Zc\bbb!\1@;78/<!87A!.\\D11E<!34;1\\\\B11E<!34;1\\\\\B11E\)
A838D8<.<#! '4.!*6D;8;=!6<!1F.7!1::;!0b!41@;<!F.;!G..E!A@;67B!34.!>8//!87A!<F;67B!<.2.<3.;<#! (.>.;.70.!
<.;:60.<!F;1:6A.!8<663870.!67!/6D;8;=!;.<.8;04!87A!;.>.;.70.!/6D;8;687<!8;.!8:86/8D/.!<6L!A8=<!8!G..E!A@;67B!
34.!; .B@/8;!<0411/!3.; 2 !!!I3!6<!; .01 2 2 .7A.A!3483!8//!7.G!<3@A.73<!; .S@.<3!8!/6D;8;=!1;6.7383617\!G4604! 2 8=!D.!
A17.!83!34.!06:0@/83617!A.<EH!
8&3)/!'#)>'2!$/)$!2,1/$/,)#9!
xH!\&8@/!*.178;A!*6D;8;=H!#V!#383.!976:.;<63=!
                                                                                                            GGGH/6D;8;=H<><@H.A@!
                                                                                  1
9)!U.;E./.=!*6D;8;=!!!!!!!
                                                                                                   1
                                                                                                            GGGH/6DHD.;E./.=H.A@!
                                       !!!
                                                                                                           GGGH/6D;8;=H@0<>H.A@!
9)#V!*6D;8;=!
                               !
#387>1;A!976::;<63=! ".A608/!).73:;!*6D;8;=!
                                                                                          !
                                                                                                   !
                                                                                                            433F[NN4.8/34/6D;8;=H<387>1;AH.A@N!
#8 2 @ ./! " .;;633! 9 76: .;<63=!*6D;8;=!! !
                                                                                          !
                                                                                                  !
                                                                                                            GGGH<82@./2.;;633H.A@N/6D;8;=!
                                                                       !
                                                                               !
```

## EK [ B: ^K!N: "7KN!E:G`6F:E!!

'4.!#3@A.73!+.8/34!).73.;!6<!012 2 633. A!31!S@8/63=!08;.!87A!34.!F;12 13617!1>!1F36 2 8/!4.8/34!! '4.!976:.;<63=!.701@;8B.<!A6<.8<.!F;.:.73617!87A!4.8/34!8G8;.7.<<!67!63<!<3@A.73!0/6.73<!! '4.!+.8/34!).73.;!6<!<38>.A!D=!8!
7@;<.!F;80363617.;!G41!48<!8A:870.A!.A@083617!67!F;62 8;=!4.8/3408;.!87A!87!.2.;B.70=!2.A608/!
3.04760687\0011;A67831;!! '4.=!G1;E!67!01//8D1;83617!G634!8!F4=<60687!017<@/3873!!#.;:60.<!83!34.!+.8/34!).73.;!

 $8;.!8:86/8D/.!31!8//!<3@A.73<!.7;1//.A!83!512676087!976:.;<63=!1>!)8/6>1;768!! '4.!#3@A.73!+.8/34!).73.;!6<!/1083.A!67!U.;3;87A!+8/!87A!087!D.!;.804.A!D=!F417.!83!J]Z^K!]Q^M\PbQ!!$ 

## K[K8G6^]!E:G`6F:E!

```
I!48:.!; 84!@7A:.3874!874!88; ..!31!>1//1G!34.!F1/606.<!874!F; 10.40; ..!<13!4!D=!512676087!976:.; <63=!1>!
) 8/6>1;768!87A!34.! " 8<3.;!1>!#06.70.!&4=<60687!? <<6<3873!#3@A6.<!&;1B;82!8<!1@3/67.A!67!346<!487AD11EH!I!82!
;.<\F17<6D/.|>1;!;.>.;;67B!31!346<!487AD11E!>1;!<\F.06>60!\F1/606.<!87A!F;10.A@;.<!B1:.;767B!2=!<383@<!8<!8!
<3@A.73\!G4604!670/@A.!F;1B;82!;.S@6;.2.73<\!B18/<!87A!1D\.036;.<\!<836\>8031;=!808A.260!87A!F;1>.<<6178/!
F;1B;.<<\!\!B;8A@83617!;.S@6;.2.73<\\!87A!B;6.:870.!F1/606.<\!!
#3@A.73!$82.!J&;673K!
```