!
!
!
!
!
!
!
!
!

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

/ %0"(1(2%3&"45'4#6(067(, 8 59% 8 %6'0'4#6!

!

!

RESEARCH IN MATHEMATICS EDUCATION

!

!
!

""!

(/?!@3+@*1?!*:!%/"1!%?7/ ' "7$&!+?@*+%!"1!%*!4"I?!+?$G?+1!$ ' !* I?+I"?6!*:!%/?!TOP]<TOPY!
" . @&? . ?'%$%"* ' !*:!;+*^?7%!- ([_B!`-3@@*+%" ' 4!(?$7/" ' 4!*:![&4?>+$U!_ ' G"I"G3$&!B?$G" ' ?11a℄!
_ . @&? . ?'%$%"* ' !*773++?G!" ' !:*3+! . "GG&?!17/**&1U!$!b*+%/!(?,$1!17/**&R!$!#?'%+$&!(?,$1!17/**&R!
$ ' !3+>$ ' ! 9 "11*3+"!17/**&R!$ ' G!

"""!

_'%+*G37%"*'! P

J?17+"@%"*'!*:!;+*^?7%!#*.@*'?'%1! P

#*+?!;+*:?11"*'$&!J?I?&*@.?'% 2

($"&*+?G!;J 2

#*$7/"'4 4

B?1?$+7/![11?11.?'%1!:*+!(?$7/?+1! X

(?$7/?+![11?11.?'%1 6

[11?11.?'%1!:*+!-%3G?'%1! Y

f?$+!P!_.@&?.?'%$%"*'! PT

;$+%"7"@$%"'4!-7/**&1

L '!%/?!:"+1%!G$)!*:!#*+?!; J R!%?$7/?+1!6?+?!"'%+*G37?G!%*!%/?!%?$. R!$'G!6?+?!@+*I"G?G!$'!
I?+I"?6!:!%/?!1%3G)!$'G!"%1!@3+@*1?C!(/?!;+"'7"@$&!_'I?1%"4$%*+1!`;_a!$'G!E+$G3$%?!B?1?$+7/!
[11"1%$'%1!`EB[a!$%!?$7/!1"%?!@+?1?'%?G!$>*3%!%/?!F?)!7* . @*'?'%1!*:!J 0_!$'G!%/?!$11?11 . ?'%1!%*!
>?!31?G!"'!%/?!@+*^?7%C!(/?!? . @/$1"1!6$1!*'!1%?@1!*'?!$'G!%6*!*:!J 0_!g!?I"G?'7?<>$1?G!
@+$7%"7?1!$'G!?1%$>&"1/"'4!$!@+?1?'%!&?I?&!*:!@?+:*+ . $'7?C!(?$7/?+1!?'4$4?G!"'!%/?!7*'%?'%!31"'4!
;*&&!8I?+)6/?+?R!$!%**&!%/$%!$&&*6?G!@$+%"7"@$'%1!%*!+?1@*'G!%*!\3?1%"*'1!I"$!%/?"+!?&?7%+*'"7!
G?I"7?1!$'G!%/?'!1??!%/*1?!+?1@*'1?1!G"1@&$)?G!:*+!%/?!4+*3@!"'!I$+"*31!:*+ . $%1C!(/?1?!@*&&1!
6?+?!$&1*!31?G!$1!:*+ . $%"I?!$11?11 . ?'%1!*:!%?$7/?+!&?$+'"'4C!;/)1"7$&! . $%?+"$&1!:*+!%/?!%+$"'"'4!
"'7&3G?G!1$. @&?! !G$%$!4+$@/1R!1$. @&?! !`JL9[a!
+?13&%1R!$'G!?,$. @&?1!*:! !`[B;9a! . ?$13+?1C!(?$7/?+1!
?'4$4?G!6"%/!%/?1?! . $%?+"$&1!%*!:$. "&"$+"=?!%/? . 1?&I?1!6"%/!%/?!+?@*+%1!$'Gj*+!"%? . 1!*'!?$7/!
$11?11 . ?'%C!
!
(/?!1?7*'G!G$)!*:!#*+?!; J!>?4$'!6"%/!$!+?I"?6!*:!J 0_!31"'4!;*&&!8I?+)6/?+?C!(/?!;_!$'G!
EB[1!$%!?$7/!1"%?!@+?1?'%?G!*'!J 0_!G?17+">"'4!@+*4+?11! . *'"%*+"'4R!7*&&?7%"'4!G"$4'*1%"7!G$%$R!
$'G!G?7"1"*'<. $F"'4!>$1?G!*'!1%3G?'%!+?1@*'1"I?'?11C!;+?1?'%?+1!%/?'!%**F!%/?!%?$7/?+1!%/+*34/!
$!7$1?!?,$. @&?R!"'I"%"'4!%/?!%?$7/?+1!%*!@$+%"7"@$%?!"'!?$7/!1%?@!*:!%/?!J 0_!@+*7?11C!9$%?+"$&1!:*+!
%/"1!%+$"'"'4!"'7&3G?G!$!:*+ . !:*+!"'%?+@+?%"'4!%/?!JL9[!G"$4'*1%"7!G$%$!$'G!%6*!1$. @&?1!*:!
[B;9!G$%$!31?G!%*!@+$7%"7?!$@@&)"'4!G?7"1"*'!+3&?1C!
!
(/?!%/"+G!G$)!*:!#*+?!; J!>?4$'!6"%/!$!+?I"?6!*:!%/?!@+"*+!%6*!G$)1!*:!%+$"'"'4!"'7&3G"'4!J 0_R!
%/?!$11?11 . ?'%1!%*!>?!31?G!"'!%/?!@+*^?7%R!$'G!?,@?7%$%"*'1!*:!%/?"+!@$+%"7"@$%"*'C!(/?! . $^*+"%)!*:!
%/?!%+$"'"'4!:*731?G!*'! . $%/? . $%"71!7*'%?'%!$'G!"'1%+37%"*'$&!$G$@%$%"*'1C!-@?7":"7$&&)R!
7* . @*'?'%1!*:!"'1%+37%"*'$&!G?&"I?+)!"'7&3G?GU!?,@&"7%!"'1%+37%"*'R! . 3&%"@&?!+?@+?1?'%$%"*'1R!$'G!
%/?!31?!*:!@+?7"1?! . $%/? . $%"7$&!&$'43$4?R!$'G!1%+$%?4"?1!"'7&3G"'4!:&3?'7)!>3"&G"'4R!31"'4!
@+*>&? . <1*&I"'4!/?3+"1%"71R!$'G!"'7+?$1"'4! . *%"I$%"*'C!9$%?+"$&1!:*+!%/"1%+$"'"'4!"'7&3G?G!$!
@$7F?%!*:!'*%?<%$F"'4!:*+ . 1!:*+!%?$7/?+1!%*!3%"&"=?!6/?'!&?$+'"'4!$>*3%!%/?!@+$7%"7?1!$'G!
1%+$%?4"?1!$!6?&&!$1!?,$. @&?1!*:!'%?+I?'%"*'1!%/$%!%/?!%?$7/?+1!1*+%?G!"'%*!?,$. @&?1!$'G!'*'<
?,$. @&?1!6/"&?!6*+F"'4!"'!1 . $&&!4+*3@1C!
!

(
$"&*+?G!; J!I"G?*1!"'7&3G?G!>+"?:!T<PO! . "'3%?!I"G?*1!*'!%*@"71!137/!$1!J 0_!$'G!31"'4!
. $'"@3&$%"I?1!%*!%?$7/!1@?7":"7! . $%/? . $%"7$&!7*'7?@%1C!e*+!%/?!TOP]<PY!" . @&? . ?'%$%"*'R!I"G?*1!
6?+?!@+?@$+?G!>)!%6*!;_1U!8+"7$!A? . >F?!$'G!-$+$/!;*6?&&C!e*+!:3%3+?!" . @&? . ?'%$%"*'!)?$+1R!%/?!
4*$&!"1%*!7+?$%?!I"G?*1!>)!%?$7/?+1!$'G!EB[1!%*!"'7&3G?!$! . *+?!G"I?+1?!@**&!*:!@+?1?'%?+1!%*!
$@@?$&!%*!$!4?'?+$&!$3G"?'7?C!(/?1?!I"G?*1!6"&&!"'7&3G?!%*@"71!137/!$1!73&%3+$&&)!+?1@*'1"I?!
%?$7/"'4!$'G!7*''?7%"'4!+?1?$+7/!%*!@+$7%"7?!$1!6?&&!$1!7+?$%"'4! . *+?! . $%/? . $%"71!7*'%?'%!
I"G?*1!$7+*11!$!6"G?+!+$'4?!*:! . $%/? . $%"7$&!G* . $"'1C!!
!
0)!%/?!?'G!*:!f?$+!PR!6?!+?7*+G?G!$!%*%$&!*:!]O!I"G?*1C!e"I?!I"G?*1!:?$%3+?G!8+"7$!A? . >F?!
?,@&$"'"'4!%/?!:*3'G$%"*'1!$'G!" . @&? . ?'%$%"*'!*:!J 0_R!$'G!MN!I"G?*1!:?$%3+?G!-$+$/!;*6?&&!

T!

%/?'!:"'$&&)!$!;+*^?7%!-((_B!&$>?&C!(/"1!1)1%?.!*:!&$>?&"'4!%/?!I"G?*1!6$1!7+?$%?G!$:%?+!%/?!@+*G37%"*'!$'G!@*1%"'4!*:!.$')!*:!%/?!I"G?*1C!!-*.?!?$+&)!I"G?*1!$+?!"'!%/?!@+*7?11!*:!>?"'4!+?&$>?&?G!%*!:*&&*6!%/"1!'$."'4!7*'I?'%"*'C!(/?!4*$&!"1!%*!7+?$%?!$!+?@*1"%*+)!*:!I"G?*1!6/?+?!%?$7/?+1!7$'!1?$+7/!?"%/?+!>)!7*'%?'%!$+?$!*+!>)!1%$'G$+G!%*!:"'G!$!7

" . @&? . ?'%$%"*'!*:!;+*^?7%!-([_BR!$'G!$!1?7*'G!%" . ?!$%!%/?!?'G!*:!" . @&? . ?'%$%"*'C!(/"1!%**F!
%?$7/?+1!*'!$I?+$4?!PY! . "'3%?1!%*!7* . @&?%?C!!
!

(/?! !"'7&3G?G!$!%*%$&!*:!1?I?'!"%? . 1!*'!$!A"F?+%!17$&?R!$'G!6$1!
G@%?G!:+* . !;*6?&&!?%!$&C!`TOPYa!$'G!:?$%3+?G!\3?1%"*'1!1" . "&$+!%*!%/*1?!1%3G"?G!"'!%/?!7&$11"7!
E">1*'!$'G!J? . >*!`PY]Qa!1?&:<?::"7$7)!@$@?+R!$&*'4!6"%/!0*)G!?%!$&C!`TOPQa!$'G!E"&?1!?%!$&C!
`TOPXaC!(/?!\3?1%"*'1!7*I?+?G!7*':"G?'7?!%?$7/"'4! . $%/? . $%"71R!3'G?+1%$'G"'4!*:! . $%/? . $%"7$&!
7*'7?@%1R!$'G!F'*6&?G4?!$'G!7* . :*+%!$+*3'G!%?$7/"'4!$'G!?,@&$"'"'4! . $%/? . $%"7$&!7*'7?@%1!"'!
%/?!7&$11+** . C!!
!
(/"1!13+I?)!6$1!$&1*!4"I?'!%*!%?$7/?+1!*'7?!@+"*+!%*!" . @&? . ?'%$%"*'!*:!;+*^?7%!-([_B!$'G!$!
1?7*'G!%" . ?!$%!%/?!?'G!*:!" . @&? . ?'%$%"*'C!(/?!@3+@*1?!*:!%/?!(?$7/?+!-?&:<8::"7$7)!-7$&?!6$1!%*!
4?%!$'!3'G?+1%$'G"'4!*:!%?$7/?+1d!1?&:<?::"7$7)!"'!%/?"+!$>"&"%)!%*!%?$7/! . $%/? . $%"71!>?:*+?!$'G!
$:%?+!" . @&? . ?'%$%"*'!*:!;+*^?7%!-([_BC!(/"1!13+I?)!%**F!%?$7/?+1!$'!$I?+$4?!*:!P! . "'3%?!%*!
7* . @&?%?C!(/?!"'1%+3 . ?'%!"1!"'7&3G?G!"'![@@?'G",!#C!
!

(/?! !`2$7*>1*'!K!
_=1$FR!TOPOa!"'7&3G?G!?"4/%!@$"+1!*:!\3?1%"*'1R!PX!\3?1%"*'1!%*%$&C!(/?!:"+1%!\3?1%"*'!"'!?$7/!@$"+!
@+?1?'%?G!$!7&$11+** . !17?'$+"*R!$'G!%/?1?7*'G!\3?1%"*'!6$1!$!A"F?+%!17$&?!$1F"'4!$>*3%!
%?$7/?+1d!@?+7?"I?G!F'*6&?G4?!$'G!$>"&"%)!%*!/$'G&?!%/?!17?'$+"*C!(/?!:"+1%!\3?1%"*'!"'!?$7/!@$"+!
$1F?G!%/?!+?1@*'G?'%!$>*3%!/*6!$!1%3G?'%! . "4/%!6*+F!%/+*34/!%/?!@+*>&? . !G"17311?G!"'!%/?!
17?'$+"*C!e*3+!\3?1%"*'1!$1F?G!%/? . !%*!7/**1?!%/?!*@%"*'!%/$%!>?1%!7/$+$7%?+"=?1!$!1%3G?'%d1!
%?7/'"\3?!:*+!:"'G"'4!%/?!$16?+C!(/?!*%/?+!:*3+!\3?1%"*'1!@+?1?'%?G!1?I?+$&!6$)1!$!1%3G?'%!
."4/%!6*+F!%/+*34/!%/?!@+*>&? . R!$'G!$1F?G!6/"7/!*:!%/?! . ?%/*G1!G"1@&$)?G!*+!G?17+">?G!6"&&!
6*+F!$'G!6/"7/! . ?%/*G1!6"&&!'*%C!(/?!A"F?+%!17$&?!\3?1%"*'1!6?+?!7*'1"1%?'%!%/+*34/*3%!%/?!
13+I?)!$'G!"'7&3G?U!D'*6"'4!/*6!%*!$'16?+!\3?1%"*'1!&"F?!%/"1!"!*'?!*:!%/?! . *1%!" . @*+%$'%!
%/"'41!)*3!'??G!%*!F'*6!%*!>?!$!4**G! . $%/? . $%"71!%?$7/?+R!_!$. !4**G!$%!$'16?+"'4!\3?1%"*'1!
&"F?!%/"1!*'?R!_!*:%?'!:??&!'?+I*31!6/?'!_!%+)!%*!$'16?+!\3?1%"*'1!&"F?!%/"1!*'?R!$'G!_:!_!%+)!/$+GR!_!
7$'!313$&&)!:"43+?!*3%!\3?1%"*'1!&"F?!%/"1!*'?C!!
!
(/"1!13+I?)!6$1!$G . "'"1%?+?G!*'7?!$%!%/?!?'G!*:!" . @&? . ?'%$%"*'C!(/"1!13+I?)!%**F!%?$7/?+1!*'!
$I?+$4?!QO! . "'3%?1!%*!7* . @&?%?C!!
!

(/?! !13+I?)!/$G!$!%*%$&!*:!PQ!"%? . 1R!6/"7/!"'7&3G?G!:"I?!
A"F?+%<

]!

31?:3&!$'G!6/$%!''??G1!". @+*I?.?'%R!:*&&*6?G!>)!$!:"'$&!*@?'<?'G?G!+?1@*'1?!:*+!%?$7/?+1!%*!
1/$+

Y!

(/?! !`JL9 [a!;+?< [&4?>+$!"1!$'!$11?11 . ?'%!*:!1%3G?'%1d!
[&4?>+$!_!+?$G"'?11!`A?%d1!E*!A?$+'R!_'7CR!TOPYaC! (/"1!$11?11 . ?'%!+?\3"+?1!$!G?1F%*@!*+!&$@%*@!
7* . @3%?+R!17+$%7/!@$@?+R!$'G!/?$G@/*'?1C! (/?!$11?11 . ?'%!"1!$G . "'"1%?+?G!%/+*34/!A?%d1!E*!
A?$+'R!_'7Cd1!6?>1"%?C! (/?!\3?1%"*'1!$+?!+?$G!$&*3G!%*!1%3G?'%1!G3+"'4!%/?!$11?11 . ?'%C! (/?!
$11?11 . ?'%!31?1!$G$@%"I?!%?7/'*&*4)!%*!?I$&3$%?!%/?!$+?$1!*:! . $%/? . $%"71!7*'1"G?+?G!?11?'%"$&!

?1%$>&"1/?G!$!.*G?+$%?!4*$&!*:!P!''3.?+"7$&!17*+?!''7+?$1?!$7+*11!%/?!''?,%!PO!6??F1!*:!17/**&R!
1?%%''4!%/?!4*$&!$%!TO!$'G!@&$7''4!%/"1!'3.>?+!''!%/?!>*,C!!
!
L'7?!%?$7/?+1!7*&&?7%?G!%/?!>?'7/.$+F!G$%$!:*+!%/+??!6??F1!*'!%/?!oJ$%$!8'%+)p!1/??%R!%/?)!
>?4$'!%*!31?!''%?+I?'%"*'1!6"%/!%/?"+!1%3G?'%1!$'G!+?7*+G!%/?"+!17*+?1!*'!%/?!o_'%?+I?'%"*'1p!%$>C!
5?+?R!%/?!G$%?!$'G!17*+?1!7*'%''3?G!%*!>?!+?7*+G?G!$1!6$1!G*'?!*'!%/?!oJ$%$!8'%+)p!%$>C!-7*+?1!
@&$7?G!*'!%/"1!1/??%!7*++?1@*'G!%*!.$+F1!*'!%/?!%+?'G!&''?1!7+?$%?G!*'!%/?!o-%3G?'%!rrp!%$>C![:%?+!
?$7/!''%?+I?'%"*'!3%"&"=?G!>)!%/?!%?$7/?+R!%/?)!+?7*+G?G!%/?"+!17*+?1!3'G?+!%/?!'?,%!1?7%"*'!''!
o_'%?+I?'%"*'1C!p!(/+??!1?7%"*'1!$&&*6?G!%?$7/?+1!%*!$%%?.@%!%/+??!''%?+I?'%"*'1!6"%/!%/?"+!
1%3G?'%1C![:%?+!+?7*4''="'4!'*!7/$'4?!''!1%3G?'%!17*+?1!$1!"&&31%+$%?G!*'!%/?!o-%3G?'%!rrp!%$>!
4+$@/1R!%?$7/?+1!6?+?!%*!''%+*G37?!$!'?6!''%?+I?'%"*'!$'G!>?4''!+?7*+G''4!%?1%!17*+?1!$:%?+!%/?!

PP!

7* . . "%%??!1?%!%$+4?%1!:*+!?$7/!1%$'G$+GC!_'G?,!P!`-%3G?'%![7/"?I?.?'%a!/$G!$!%$+4?%!17*+?!*:!XO!
@*"'%1!`-%3G?'%![7/"?I?.?'%aR!_'G?,!T!`-%3G?'%!;+*4+?11a!/$G!$!%$+4?%!17*+?!*:!cOR!_'G?,!c!
`#&*1"'4!;?+:*+.$'7?!E$@1a!/$G!$!%$+4?%!17*+?!*:!TX!$'G!_'G?,!Q!`;*1%1?7*'G$+)!B?$G"'?11a!/$G!
$!%$+4?%!17*+?!*:!Pc!`(8[R!TOPM7aC!
!
-7/**&![!?,7??G?G!%/?!%$+4?%!*'!?$7/!*:!%/?!:*3+!"'G"7?1C!-7/**&![d1!17*+?1!:*+!TOPM!6?+?!XY!:*+!
1%3G?'%!$7/"?I?.?'%R!cM!:*+!1%3G?'%!@+*4+?11R!cM!:*+!7&*1"'4!@?+:*+.$'7?!4$@1R!$'G!cY!:*+!
@*1%1?7*'G$+)!+?$G"'?11C!!
!
_'!TOPMR!-7/**&![d1!-7/**&!B?@*+%!#$+G!1/*6?G!%/$%!%/?!17/**&!.?%!1%$%?!$77*3'%$>"&"%)!
1%$'G$+G1!$7+*11!$&&!"'G"7?1C![%%?'G$'7?!+$%?!:*+!%/?!7$.@31!"'!%/?!TOPX<TOPM!17/**&!)?$+!6$1!
YXCc sR!1&"4/%&)!/"4/?+!%/$'!%/?!G"1%+"7%!$%%?'G$'7?!+$%?!*:!YNCP s!$'G!!%/?!1%$%?!$%%?'G$'7?!+$%?!*:!
YNC] sC!(/?!.*>"&"%)!+$%?!:*+!TOPN<TOPX!17/**&!)?$+!6$1!PPCY sR!6/"&?!.*>"&"%)!:*+!%/?!G"1%+"7%!
6$1!PNCY s!$'G!.*>"&"%)!:*+!%/?!1%$%?!6$1!PXCT sC!(/?!$I?+$4?!1"=?!*:!$!.$%/?.$%"71!7&$11+**.!
:*+!M%/!$'G!]%/!4+$G?!6$1!PXCX!1%3G?'%1R!7*.@$+?G!%*!P]C]!1%3G?'%1!$%!%/?!G"1%+"7%!&?I?&R!$'G!P]CO!
$%!%/?!1%$%?!&?I?&C!(/?!4+$G?!X!1%3G?'%1d!7&$11!1"=?!6$1!'*%!.?$13+?G!>)!13>^?7%!>?7$31?!%/?!1%$%?!
:!(?,$1!7*'1"G?+1!X%/!4+$G?!?&?.?'%$+)R!6/"7/!6$1!.?$13+?G!>)!6/&?!7&$11!1"=?C!X%/!4+$G?!
7&$11?1!$1!$!6/*&?!/$G!PNCc!1%3G?'%1!*'!$I?+$4?!$%!-7/**&![R!7*.@$+?G!%*!PNCc!$%!%/?!G"1%+"7%!
&?I?&!$'G!TOCQ!$%!%/?!1%$%?!&?I?&C!`(8[R!TOPM$a!
!
"3;..7!Q!M:0&4$67K

!

J ?17+"@%"* ' !	($+4?%! - 7*+?!	- 7/**&! [!	- 7/**&! 0 !

_'!7*/*+%!P!*:!;+*^?7%!-((_BR!%/?+?!6?+?!PX!:?.$&?!@$+%"7"@$'%1!`MTCM s a!@$+%"7"@$'%1!$'G!1",!
.$&?!@$+%"7"@$'%1!`TMCc s a!:*+!$!%*%$&!*:!TT!%?$7/?+1!`1??!($>&?!QaC!(/?!.$^*+"%)!*:!@$+%"7"@$'%1!
"G?'%":"?G!$1!6/"%?!` tPQR!XcCX s a!:*&&*6?G!>)!5"1@$'"7jA$%"'*![.?+"7$!K!i/"%?!` tQ!P]CT s aC!
[1"$'![.?+"7$'j;$7":"7!_1&$'G?+!` tPR!QCN s aR!0&$7F!` tPR!QCN s aR!$'G!%6*!+?1@*'G?'%1!G"G!'*%!
$'16?+!%/"1!\3?1%"*'C!8"4/%!+?1@*'G?'%1d!$4?!+$'4?G!:+*.!QO<QY!`cXCQ s aR!:*&&*6?G!>)!1",!
+?1@*'G?'%1!:+*.!cO<cY!`TMCc s aR!:*3+!:+*.!TO<TY!`P]CT s aR!%6*!:+*.!NO<NY!`YCP s aR!$'G!%6*!G"G!
'*%!+?1@*'GC!!
!

!
($>&?!N!1/*61!%/$%!P]!+?1@*'G?'%1!+?@*+%?G!%/?"+!73++?'%!"%&?!$1!7&$11+**.!%?$7/?+1!`]PC] s aR!
%/+??!1@?7"$&!?G37$%"*'!%?$7/?+1!`PcCX s aR!$'G!*'?!"'%?+I?'%"*'"1%!`QCN s aC!!
!

!"#$%"&'(")$&*+,*-.!		s !
/".&#0'"(1$#,*-.',"#$%"&!	P]!	]PC] s !
2.,"&3".,*-.*),!	P!	QCN s !
4+"$*#0'"(1$#,*-.',"#$%"&!	c!	PcCX s !

PX!

3%1"G?!:!?G37$%"*'!`  t!XR!cO s aR!3'1@?7":"?G!$+?$!`QR!P] s aR!$'G!'*!+?1@*'1?!` !t!TR!Y s aC!(/?+?!
6?+?!PX!+?1@*'G?'%1!6/*!1%$%?G!%/?)!/$G!$!9$1%?+d1!G?4+??!*+!$+?!"'!%/?!@+*7?11!*:!$!G?4+??C!L:!
$&&!+?1@*'G?'%1R!Pc!`Mc s a!/$G!9$1%?+1!G?4+??1!+?&$%?G!%*!?G37$%"*'!`?C4CR!1?7*'G$+)!
?G37$%"*'j$G."'"1%+$%"*'R!%?$7/"'4!$'G!$G."'"1%+$%"*'R!73++"73&3.!$'G!"'1%+37%"*'R!?G37$%"*'$&!
&?$G?+1/"@!$'G!@*&"7)!$'$&)1"1R!7*3'1?&"'4aR!$'G!T!+?1@*'G?'%1!`Y s a!6?+?!@3+13"'4!.$1%?+d1!
G?4+??1!"'!$+?$1!*3%1"G?!?G37$%"*'!`?C4CR!$77*3'%"'4!K!:"'$'7?aC!(/?!.$^*+"%)!*:!@$+%"7"@$'%1!G"G!
'*%!@3+13?!$')!?G37$%"*'!$:%?+!$!.$1%?+d1!G?4+??C!L'&)!c!+?1@*'G?'%1!`PQ s a!+?@*+%?G!%/$%!%/?)!
/*&G!$!G?4+??!>?)*'G!%/?!.$1%?+d1!&?I?&C!
!
8&?I?'!`NO s a!+?1@*'G?'%1!+?@*+%?G!%/?"+!/"4/?1%!&?I?&!*:!?G37$%"*'!6$1!$!9$1%?+d1!G?4+??C!8"4/%!
`cX s a!%?$7/?+1!+?@*+%?G!%/$%!%/?!/"4/?1%!G?4+??!%/?)!/?&G!6$1!$!0$7/?&*+d1!G?4+??R!$'G!%/+??!
`PQ s a!%?$7/?+1!+?@*+%?G!%/$%!%/?)!/?&G!G?4+??1!>?)*'G!%/?"+!9$1%?+d1!G?4+??C!!

>*B%"),'"(1$#,*-.#0'("B&""!		e+?\3?'7)!
'"'J#$%"0-&K)!	M!	cPC] s !

PM!

!	#3++"73&3 . <>$1?G!	9 $%/? . $%"71!	J $%$<>$1?G!G?7"1"*'!
(" . ?!"'!5*3+1!	. ?$13+? . ?'%!`#0 9 a!	$11?11 . ?'%!	. $F"'4!
uP!	0!	P!!	0!

P<

PY!

$'G!I"+%3$&!I"1"%1R!>?%6??'!b*I?.>?+!$'G!e?>+3$+)C!-%3G?'%1!6?+?!$11?11?G!6??F&)!*'!%/?!
[B;9C![%!-7/**&!#R![B;9!.?$13+?1!6?+?!$G."'"1%?+?G!>)!%?$7/?+!@$+%"7"@$'%1!"'!%/"1!1%3G)C!
[%!-7/**&!JR![B;9!.?$13+?1!6?+?!$G."'"1%?+?G!>)!$!17/**&<>$1?G!"'1%+37%"*'$&!7*$7/!6/*!6$1!
'*%!$!@$+%"7"@$'%!"'!%/"1!1%3G)C!(/?1?!4+$@/?G!G$%$!6?+?!+?I"?6?G!:*+!G?7"1"*'!.$F"'4!"'!
7*$7/"'4!.??%"'41C!(/?!'3.>?+!*:!G$%$<@*"'%1!$%!6/"7/!G?7"1"*'!.$F"'4!*773++?G!I$+"?G!>)!

%?$7/?+1R!%/"1!6$1!$>*3%!P]!7*$7/"'4!1?11"*'1!"'!$&&C!!(/?!7*$7/"'4!7)7&?!*:!*>1?+I$%"*'R!@*1%<
7*':?+?'7?!6$1!:3&&)!".@&?.?'%?G!%/+??!%".?1C!(/?!7*$7/!31?G!%/?!-([_B!#*$7/"'4!;+*%*7*&!
-9H!G*73.?'%!%*!+?7*+G!%/?!*>1?+I$%"*'1!$'G!@*1%<*>1?+I$%"*'!7*':?+?'7?1C!(/?1?!:*+.1!6?+?!
31?G!%/?!?'%"+?!&?'4%/!*:!%/?!@+*^?7%!:+*.!-?@%?.>?+!%/+*34/!J?7?.>?+C!!
!!
(/?!:*731!*:!?$7/!7*$7/"'4!1?11"*'!6$1!*'!%/?!J 0_!@+*7?11R!+?I"?6"'4!%/?!%+?'G1!"'!1%3G?'%!

TP!

#*+?!;+*:?11"*'$&!J?I?&*@.?'%!:*+!%?$7/?+1!6$1!7*'G37%?G!>)!%/?!;_1!$'G!EB[1!$7+*11!%/+??!G$)1C!;+*:?11"*'$&!G?I?&*@.?'%!"'7&3G?G!%/+??!G$)1!*:!"'%+*G37"'4!@$+%"7"@$'%1!%*!%/?!@3+@*1?!$'G!G"+?7%"*'1!:*+!$G."'"1%+$%"*'!:*+!J0_R![11?11.?'%!$'G!_'1%+37%"*'!"'!;+*^?7%!-([_BC!;+*:?11"*'$&!G?I?&*@.?'%!"'7&3G?G!%?$7/?+1!?'4$4"'4!6"%/!;*&&!8I?+)6/?+?R!@$+%"7"@$%"*'!"'!7*&&?7%"'4!G$%$!$'G!1?&?7%"'4!1%3G?'%1R!$'G!&?$+'"'4!.$%/?.$%"71!7*'%?'%!$'G!"'1%+37%"*'!@+$7%"7?1C!!

($"&*+?G!;J!I"G?*1!T<PO!."'3%?1!"'!&?'4%/!6?+?!G?I?&*@?G!>)!;_d1!8+"7$!A?.>F?!$'G!-$+$/!;*6?&&C!(/?+?!6?+?!$!%*%$&!*:!]O!I"G?*1!$%!%/?!?'G!*:!f?$+!PC!k"G?*1!:*731?G!*'!J0_!$'G!>?1%!@+$7%"7?1C!(/?!&"4/%>*$+G!+**.!&*7$%?G!*'!%/?!H(!7$.@31!6$1!31?G!%*!+?7*+G!%/?!($"&*+?G!;J!I"G?*1C!k"G?*1!6?+?!%/?'!@*1%?G!*'!f*3(3>?!$'G!%/?!;+*^?7%!-([_B!6?>1"%?C!!

f?$+!P!_.@&?.?'%$%"*'!*:!;+*^?7%!-([_B!/$G!1?I?'!7*$7/?1!6"%/!>$7F4+*3'G1!"'!?G37$%"*'!$'G!.$%/?.$%"71C!#*$7/?1!6?+?!$11"4'?G!%*!@$+%"7"@$%"'4!%?$7/?+1C!#&$11+**.!*>1?+I$%"*'1!6?+?!@?+:*+.?G!>)!%/?!7*$7/?1!6"%/!$!@*1%<*>1?+I$%"*'!7*':?+?'7?!*773++"'4!6"%/"'!%6*!G$)1!*:!%/?!*>1?+I$%"*'1C!#*$7/?1!31?G!%6*!G"::?+?'%!*>1?+I$%"*'!:*+.1!6"%/!-9H!31?G!$'!*@?'<?'G?G!*>1?+I$%"*'!:*+.R!6/"&?!%/?!9H!%?$.!31?G!$!G"::?+?'%!:*+.!"'7*+@*+$%"'4!>*%/!$!A"F?+%<17$&?!1?7%"*'!6"%/!*@?'<?'G?G!\3?1%"*'1C!0*%/!%?$.1!31?G!@+?!$'G!@*1%<*>1?+I$%"*'!:*+.1C!#*$7/?1!/?&G!@*1%<*>1?+I$%"*'!7*':?+?'7?1!"'!@?+1*'!$'G!I"+%3$&&)!6"%/!%/?"+!%?$7/?+1C!!

_'!$&&R!TT!%?$7/?+1!:+*.!:*3+!17/**&1!@$+%"7"@$%?G!"'!%/?!@+*^?7%C!(/?!17/**&1!6?+?!&*7$%?G!"'!b*+%/!(?,$1R!#?'%+$&!(?,$1R!H+>$'!9"11*3+"R!$'G!B3+$&!9"11*3+"C!8$7/!%?$7/?+!1?&?7%?G!%6*!%*!%/+??!1%3G?'%1!%*!@$+%"7"@$%?!"'!%/?!@+*^?7%C!8$7/!%?$7/?+!7*.@&?%?G!>*%/!@+?!$'G!@*1%!@+*^?7%!$11?11.?'%1!+?4$+G"'4!G?.*4+$@/"71R!"'1%+37%"*'$&!@+$7%"7?1R!1?&:<?::"7$7)R!$'G!.3&%"@&"7$%"I?!+?$1*'"'4C!(?$7/?+1!$&1*!7*.@&?%?G!$!13+I?)!+?4$+G"'4!;J!1$%"1:$7%"*'C!!

TT!

(?,$1!8G37$%"*'![4?'7)!`TOPM>a! B?%+"?I?G!:+*.!
/%%@1Ujj%?$%?,$1!4*Ij1"%?1jG?:$3&%j:"&?1jLI?+I"?6 s TOTOPM s TO;?+:*+.$'7? s TO 'G?, s TOe+$.?6*+Fx:'&!@G:! [3%/*+!!

(?,$1!8G37$%"*'![4?'7)!`TOPM7a! [3%/*+!H''"I?+1"%)!*:!_*6$!
`TOOXa!

) **"%+,-( ) (. (/ 0 (1 2 ' "$345,6%(76$ 8 (

!

,$0ĸDE/0$F64%.&!

P℃ #*$7/!1/*3&G!1?'G!%?$7/?+!%/"1!&"'F!

`/%%@1ŲjjG*71℃4**4&?℃7*.j:*+.1jGj?jPe⌈_@nA-?).m7:"x//8Y9(0 i 0B1 i 6&8]GG+cT"0 ?+<0>fX5kYN@(T-nnjI"?6:*+.y31@t1:x&"'Fa!$%!&?$1%!:"I?!17/**&!G$)1!@+"*+!%*!%/?! *>1?+I$%"*'℃!

T℃ (?$7/?+!1/*3&G!7*.@&?%?!%/"1!13+I?)!$%!&?$1%!%6*!G$)1!@+"*+!%*!%/?!*>1?+I$%"*'℃!

c℃ #*$7/!1/*3&G!7/?7F!%/?!%?$7/?+d1!+?1@*'1?1!@+"*+!%*!%/?!*>1?+I$%"*'℃!

!

DE/0$F64%.&!G.$C!

*!"#$%&"'()*+,'-#)#.'/*0&1!'23)$*0&1!4 #53%67$5%&9#38&"5:;'<#%67=3'*('>!#33)**+'?#7#=&+&7\'#7"'%73%)5A%*7#!'-5$$*)%3'-A*)67='<5B)%A'2C*&B!&)'&%'#!&:;'#7"'>/-'>!#33)**+'D7%E&)3#!3'%7E&7%*)F'*

!

#$%&&'()

+/(6:/4"<41 0 13/2" 0 @735<7/"234(3/C5/2"D14"217A5&C" <41?7/ 0 29" +/(6:/4"@3575F/2"/A58/&6/=	□"	□"	□"	□"	□"	" " " " " "

Q!

!

, . /4KDE/0$F64%.&! : .63;%&'! : .&F0$/64%.&!

!

A063;0$!N6C0!`e"+1%! b$. ?R!A$1%!_' "%"$&aU!! ! ! ! ! !!!   **A063;0$!"4-IT**!V**R**U!! ! ! ! ! ! !

: .63;!`e"+1%! b$. ?R!A$1%!_' "%"$&aU!!

X!

) **"%+,-(9(.(: / 0(1 2'"$345,6%(76$ 8(

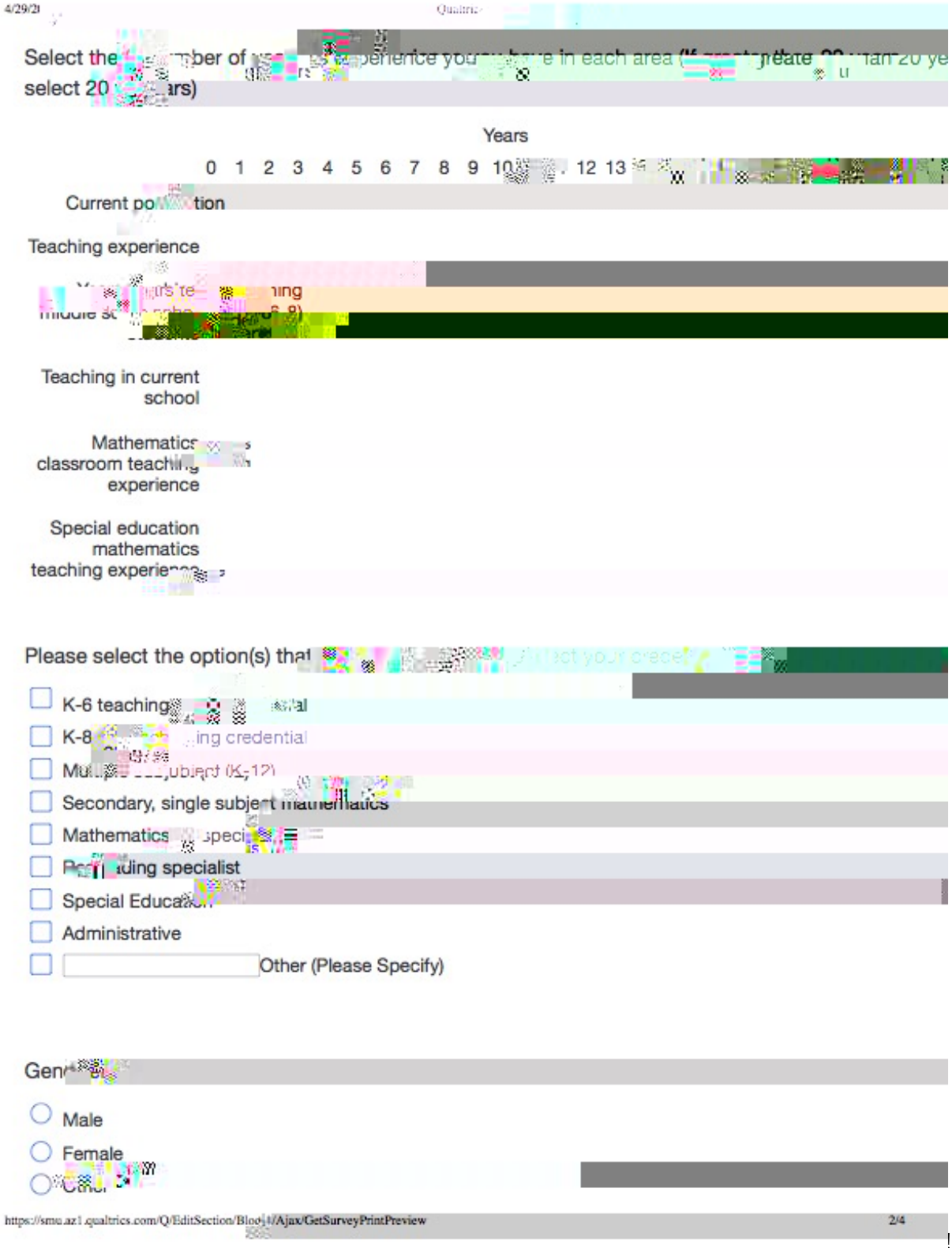
%&'()*+,-./0
5''('' 6(/,'0

!%=>$

PO!

G,0:&2,+
C&-.>#1$D+
81,#>.,#12+

PT!


4/29/2
Qualtrics
Select the
select 20
Years
0 1 2 3 4 5 6 7 8 9 10 12 13
Current po tion
Teaching experience
Teaching in current school
Mathematics classroom teaching experience
Special education mathematics teaching experience
Please select the option(s) that
K-6 teaching
K-8
Secondary, single subject mathematics
Mathematics
Special Educa
Administrative
Other (Please Specify)
Gen
Male
Female
https://smu.az1.qualtrics.com/Q/EditSection/Blo
/Ajax/GetSurveyPrintPreview
2/4

!

!

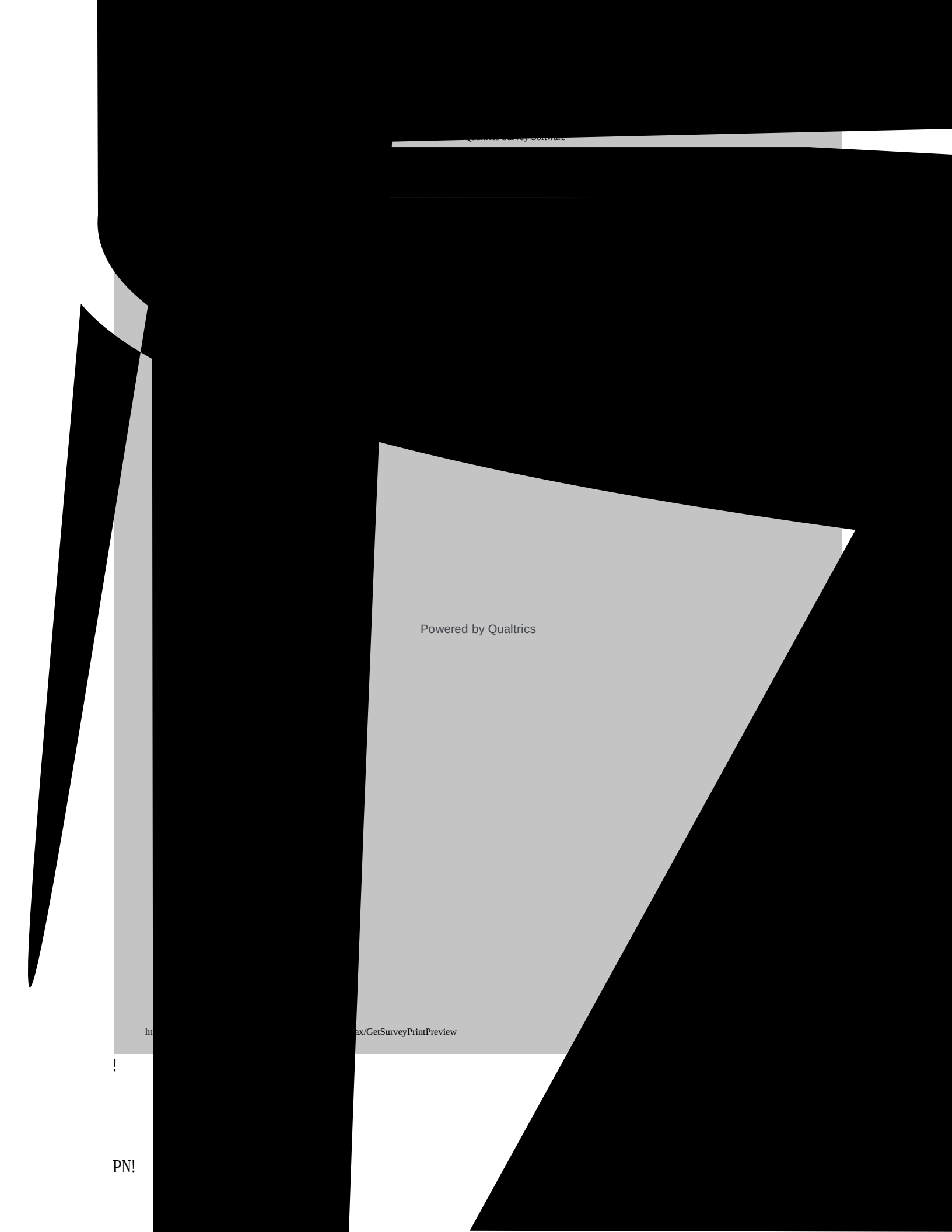
!

Pc!

!

! !

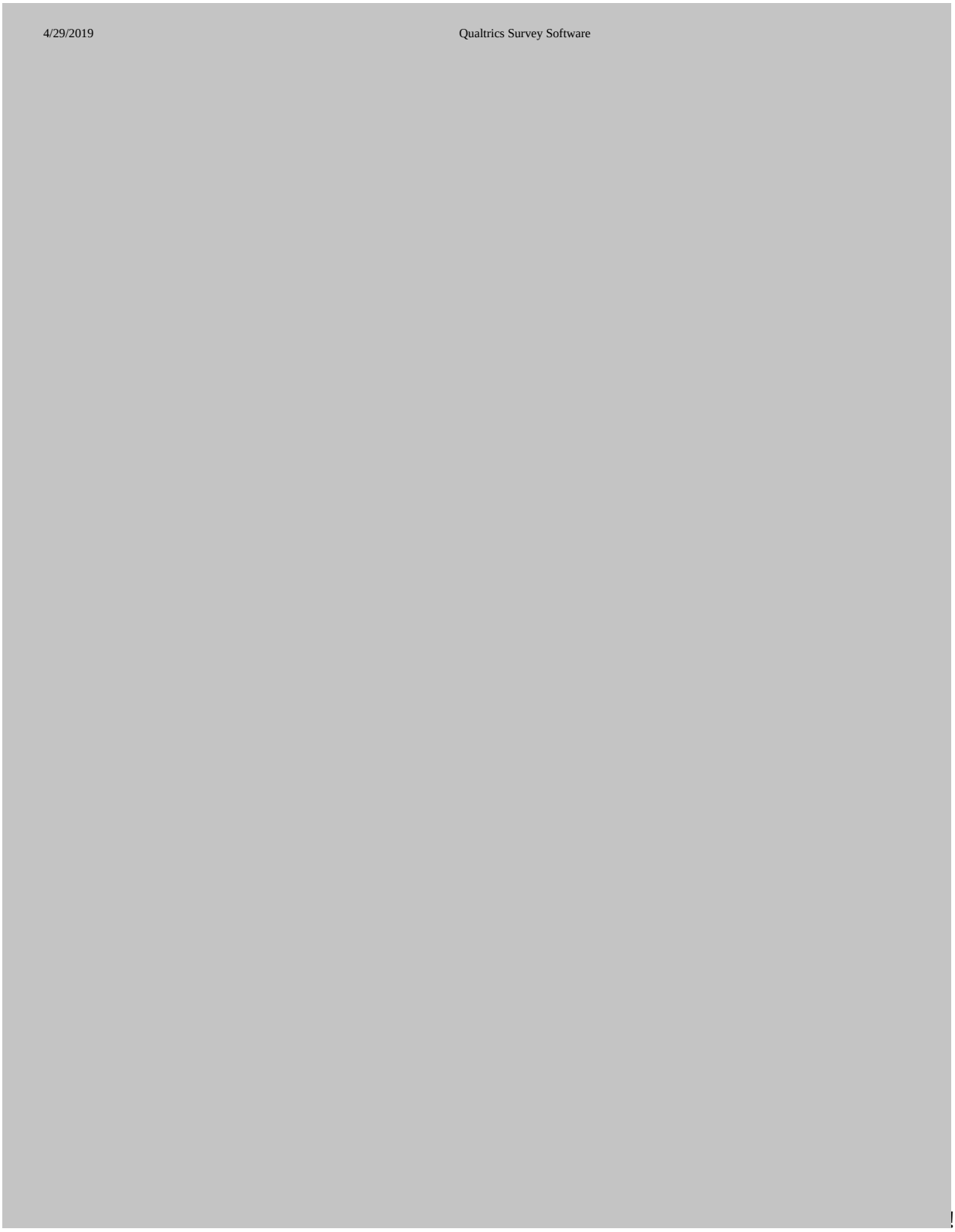
PQ!


Powered by Qualtrics

!

PX!

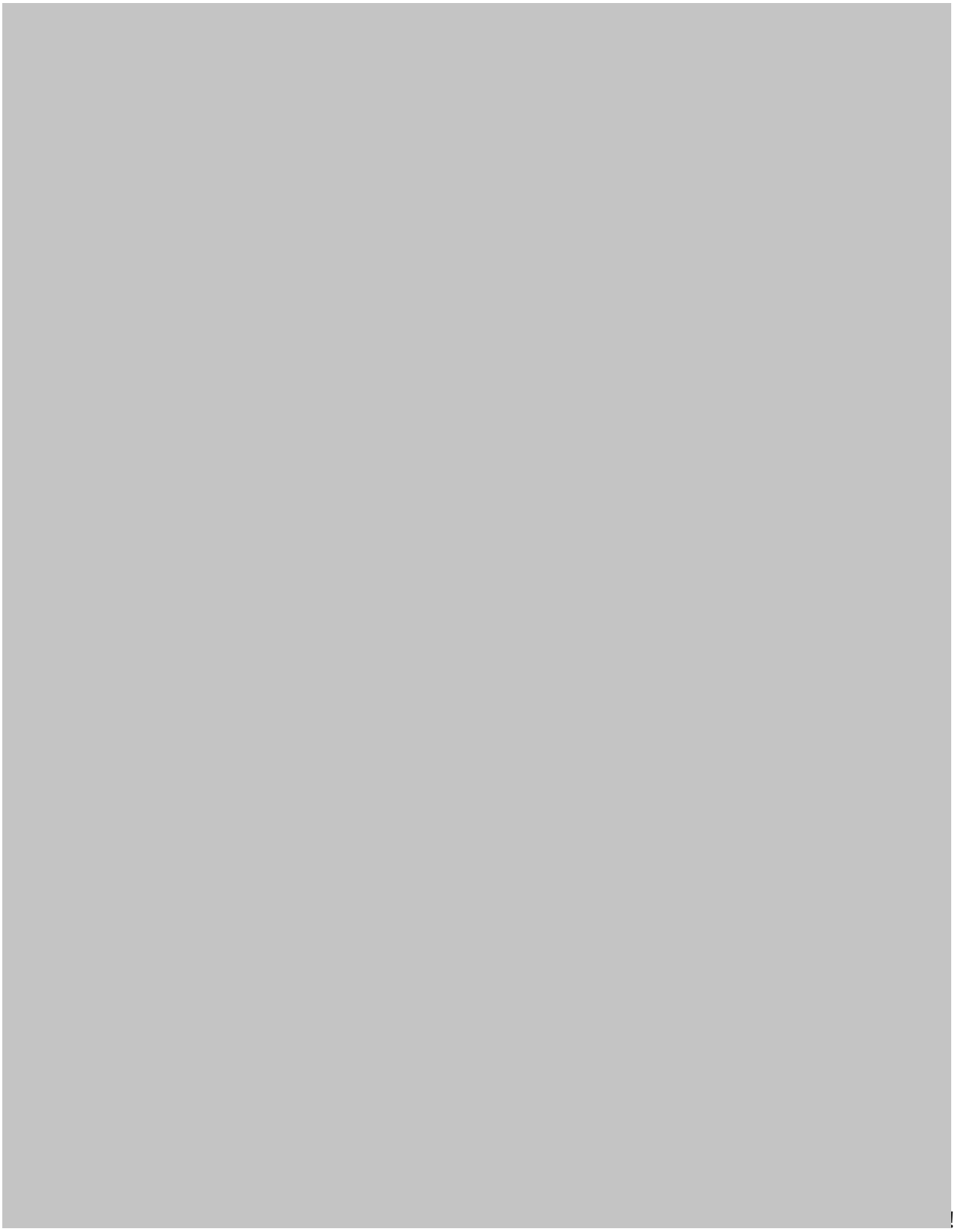
PM!



!

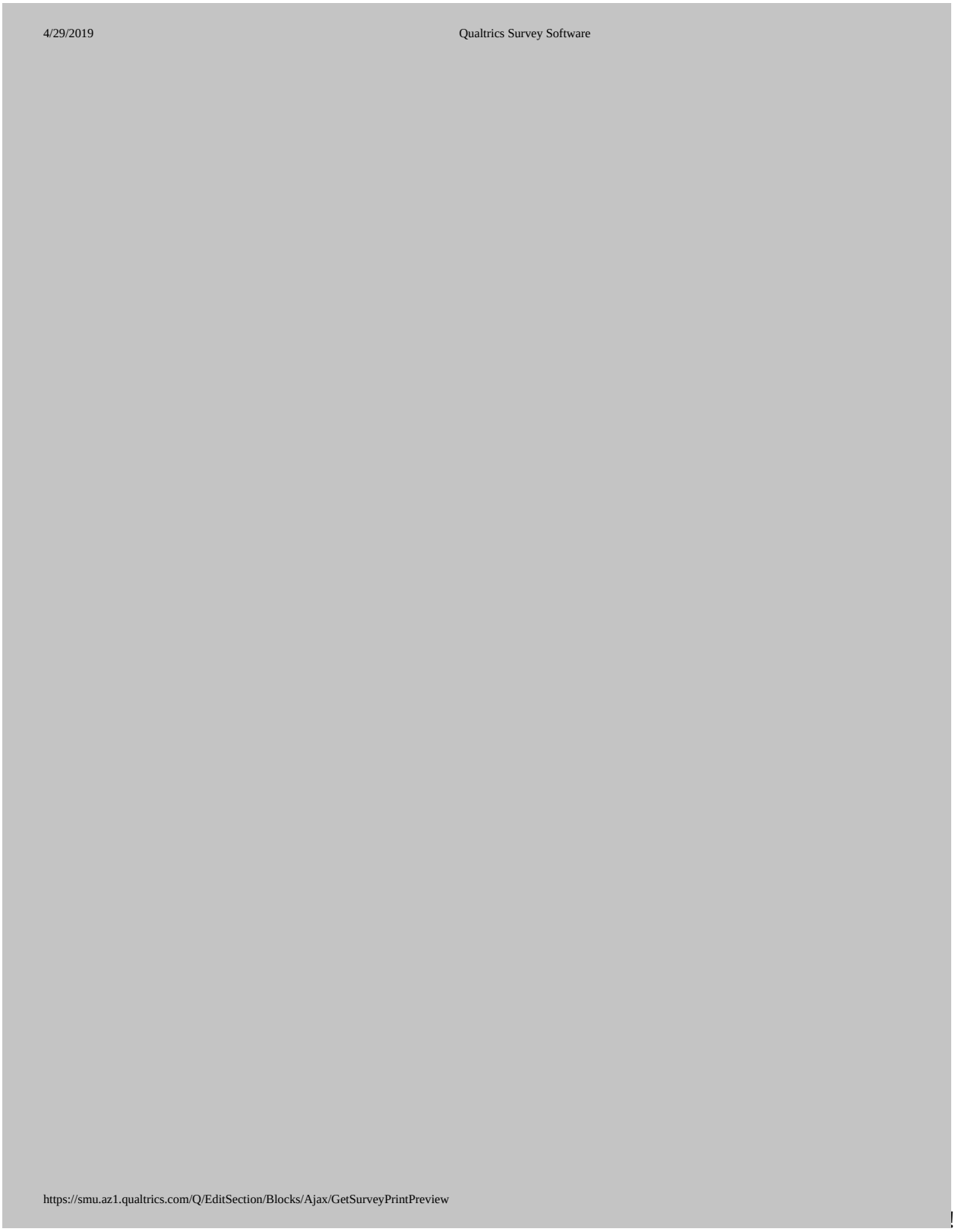
! !

P]!



! ! !

PY!

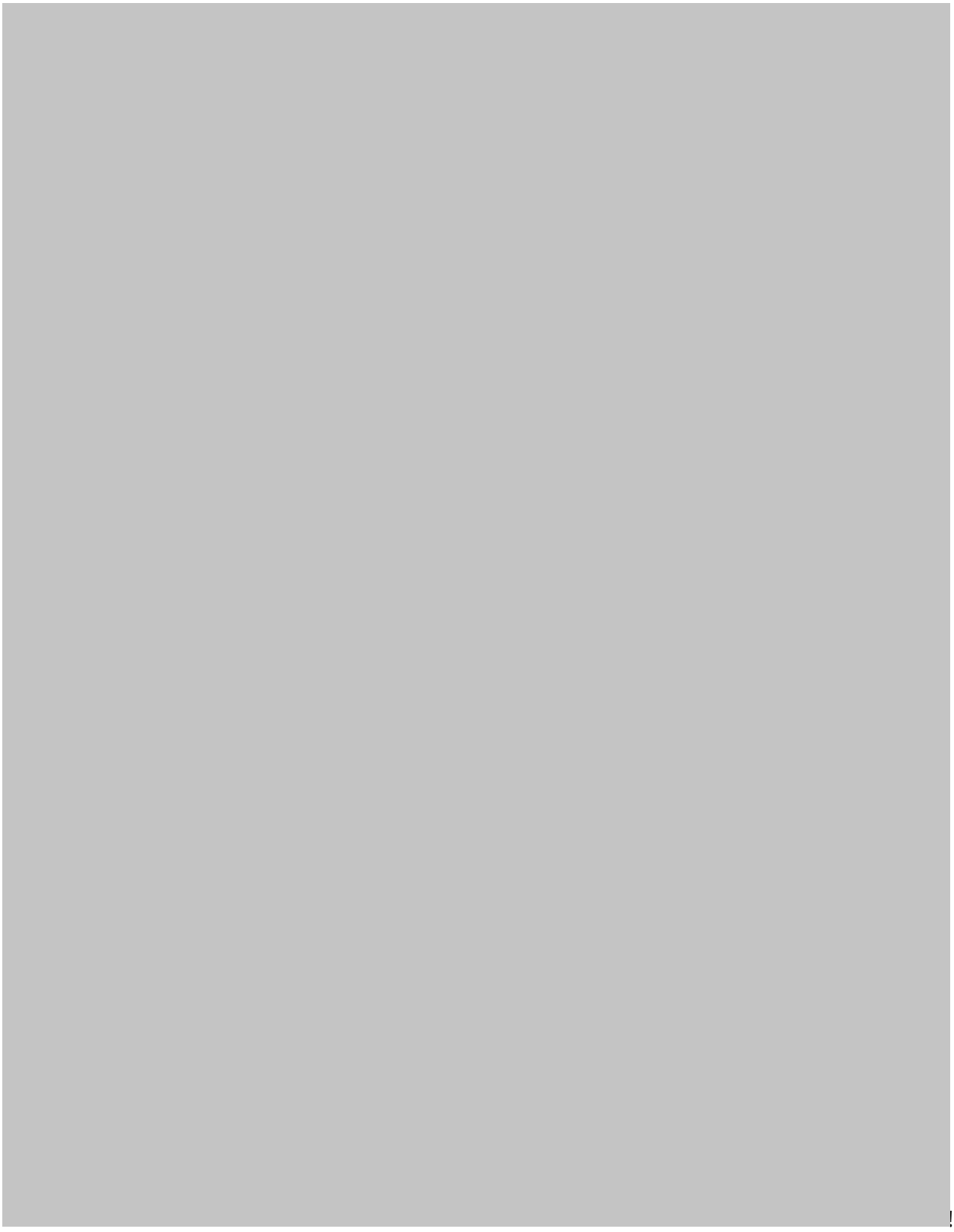


!

! !

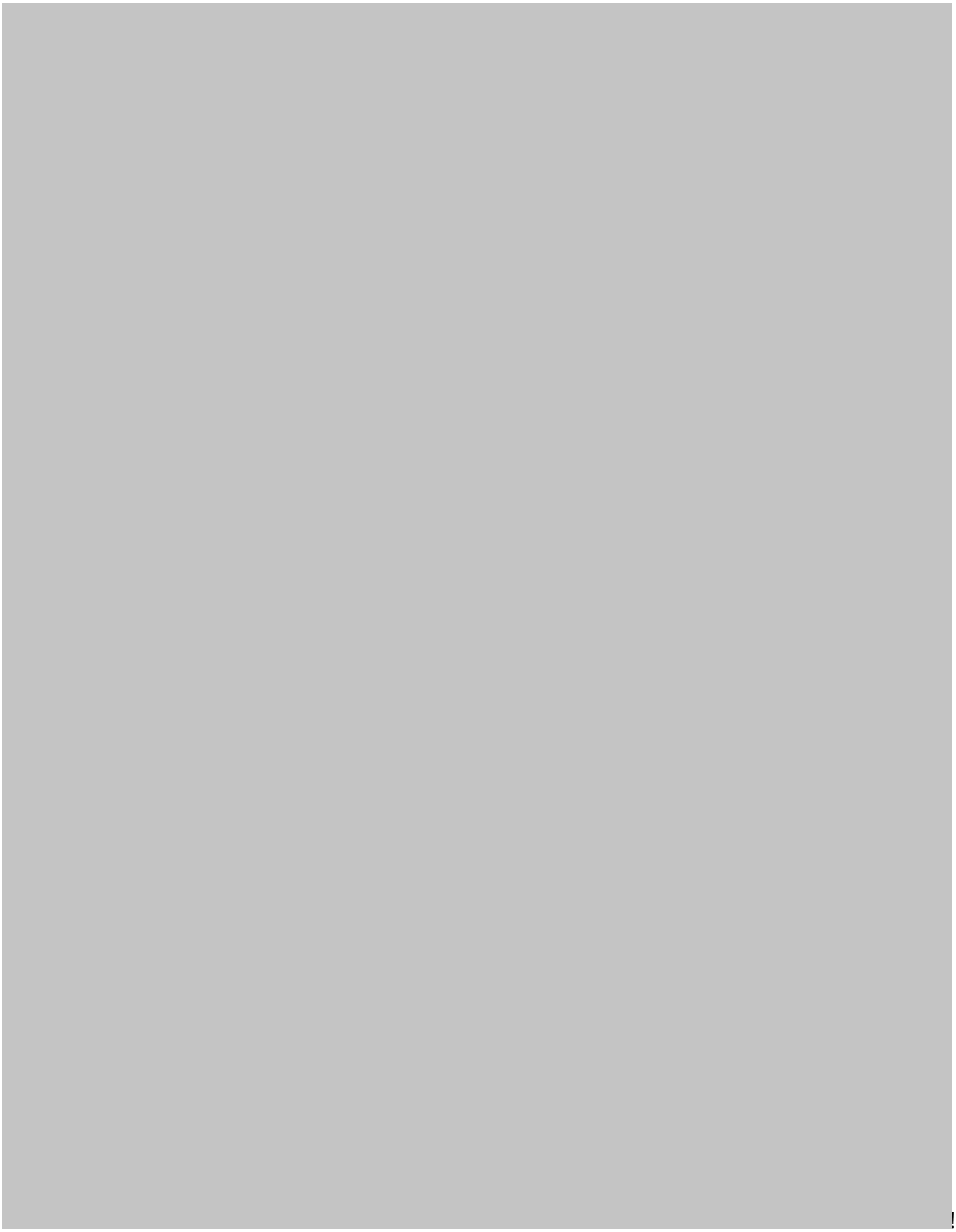
TO!

) **"%+,-(7(.(D$6#"'',6%4C(>"3"C6* 8 "%5(:45,'#4&5,6%(



!

TT!


!

Tc!