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CROZZLE
APPLICATION TESTING

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Introduction

Aim

The aim was to perform a range of tests on the application 'Crozzle' to ensure it would meet the optimal Crozzle generation requirements given in 'SIT323 Assignment 2 brief' (Dew, 2016).

Background

A Crozzle is a type of word puzzle played on a grid of various sizes depending on difficulty. To score, the player places words from a supplied list onto the grid, one letter in each grid square. The score is calculated as the sum of the points given to each non-intersecting letter, each intersecting letter and each word.

Words placed onto the grid must abide by the following general rules:

1. Words can only be placed horizontally or vertically.
2. A word can only be used once.
3. A horizontal word can only run from left to right.
4. A vertical word can only run from high to low.
5. All consecutive horizontal or vertical letters on the grid must form one of the supplied words.

In addition to the general rules a 'Easy' Crozzle must also abide by the following rules:

1. Words must intersect at least 1 and at most 2 other perpendicular words.
2. Words cannot touch any other word of the same orientation (there must be at least one grid square between them).

In addition to the general rules a 'Medium' Crozzle must also abide by the following rules:

1. Words must intersect at least 1 and at most 3 other perpendicular words.
2. Words can touch other words of the same orientation as long as general rule 5 still holds true.

In addition to the general rules a 'Hard' Crozzle must also abide by the following rules:

1. Words must intersect at least 1 other perpendicular word.
2. Words can touch other words of the same orientation as long as general rule 5 still holds true.

Determining the optimal Crozzle given a set of available words is an almost impossible task if done manually. Computer generation of an optimal Crozzle is an obvious solution, however it too has problems given the huge number of possible word combinations. As a brute force approach to generating the optimal Crozzle may take years to process, a Greedy algorithm was used. This type of algorithm works in a loop, determining the next best word and adding it, until no more words can be added. To ensure accuracy, the algorithms required to generate an optimal Crozzle must be tested with a range of Crozzle puzzles with known results.

Scope

The scope of the tests included determining the accuracy of the following:

- Determining if a valid easy Crozzle can be generated with a score above 50.
- Determining if a valid medium Crozzle can be generated with a score above 500.
- Determining if a valid hard Crozzle can be generated with a score above 500.

Method

A range of three tests were set up for each of the possible inputs. These were as follows:

1. Test generating a valid easy Crozzle.
2. Test generating a valid medium Crozzle.
3. Test generating a valid hard Crozzle.

Each test was run and the displayed result was recorded as a screen capture. The log entries for that test were also recorded in the log file 'log.txt'. The results were compared against their known result.

Extra Considerations

The Crozzle application window and GUI layout displayed in tests was similar to that shown on the following page.

SCOTT KITCHELL
CROZZLE

Crozzle

FileCrozzle RulesHelp

Validate a Crozzle

Crozzle

Difficulty: EASY

Words

ALAN	ANGELA	BETTY	BILL	BRENDA
CHARLES	FRED	GARY	GEORGE	GRAHAM
HARRY	JACK	JESSICA	JILL	JOHNATHON
LARRY	MARK	MARY	MATTHEW	OSCAR
PAM	PETER	ROBERT	ROGER	RON
RONALD	ROSE	SUSAN	TOM	WENDY

Score: 57

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1		R	O	B	E	R	T								
2				I					O	S	C	A	R		W
3		J	I	L	L						H				E
4		E		L					H		A				N
5		S							A		R				D
6		S		M	A	R	Y		R		L	A	R	R	Y
7		I		A		O			R		E				
8		C		R		G	A	R	Y		S				
9	J	A	C	K		E									
10						R									

14 words out of 30 were used in 2 group(s).

No rules broken!

Crozzle File Validation

No validation errors!

No configuration validation errors!

The length of a page depends on the number of words listed, the size of the Crozzle grid and the error lists present. For long pages a scroll bar appears and as such a screen capture will not display the full result. In these circumstances the page was captured in segments and the wordlist was omitted.

Application Testing

Test 1 – Generate Optimal Valid Easy Crozzle

Input files:

1. Test 1 Crozzle.txt
2. Test 1 Configuration.txt

File readouts can be found in Appendix Test 1 – Valid Easy Crozzle.

Expected Result:

A new valid easy Crozzle is generated in under 5 minutes with a score above 50.

Output:

Score: 52

	1	2	3	4	5	6	7	8	9	10
1		A		M		D	R	E	M	A
2		L		A	L		E			L
3		E		T			X	E	N	A
4		X		T						N
5	C	A	T	H	E	R	I	N	E	
6		N		E						T
7		D		W		T	E	D	D	Y
8		R							R	
9	J	A	Q	U	E	L	I	N	E	
10									W	

12 words out of 200 were used in 2 group(s).

No rules broken!

Crozzle File Validation

No validation errors!

No configuration validation errors!

Log File

- ```
1 02-Oct-16 2:53:24 PM : Configuration file opened. File Validation
 Started.
2 02-Oct-16 2:53:24 PM : Configuration file validation complete.
 Status: True.
3 02-Oct-16 2:53:24 PM : Crozzle file opened. File validation
 started.
```

```
4 02-Oct-16 2:53:24 PM : Crozzle file validation complete. Status:
 True.
5 02-Oct-16 2:53:24 PM : Start generating optimal Crozzle.
6 02-Oct-16 2:53:25 PM : Generating optimal Crozzle complete. Tame
 taken: 668ms
7 02-Oct-16 2:53:25 PM : Crozzle Display in WebBrowser.
```

## Result:

A valid easy Crozzle was generated in 668ms and a score of 52 was displayed. This was as expected.

## Test 2 – Generate Optimal Valid Medium Crozzle

### Input files:

3. Test 2 Crozzle.txt
4. Test 2 Configuration.txt

File readouts can be found in Appendix Test 2 – Valid Medium Crozzle.

### Expected Result:

A new valid medium Crozzle is generated in under 5 minutes with a score above 500.

### Output:

**Score: 889**

|    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|----|---|---|---|---|---|---|---|---|---|----|
| 1  |   | A |   | W | H | I | T | N | E | Y  |
| 2  |   | R |   |   |   |   | Y |   | D |    |
| 3  |   | T | E | R | R | Y |   | Z |   | T  |
| 4  |   | H |   | O |   |   | S | U | Z | Y  |
| 5  | Q | U | I | N | T | Y |   | Z |   | R  |
| 6  |   | R |   |   | R |   |   | A |   | I  |
| 7  |   |   | S | T | E | V | E | N |   | A  |
| 8  |   |   |   |   | V |   |   | N |   | N  |
| 9  |   | T | I | M | O | T | H | Y |   | N  |
| 10 |   |   |   |   | R |   |   |   | L | E  |

14 words out of 300 were used in 2 group(s).

No rules broken!

**Crozzle File Validation**

No validation errors!

No configuration validation errors!

## Log File

```
1 02-Oct-16 2:55:25 PM : Configuration file opened. File Validation
 Started.
2 02-Oct-16 2:55:25 PM : Configuration file validation complete.
 Status: True.
3 02-Oct-16 2:55:25 PM : Crozzle file opened. File validation
 started.
4 02-Oct-16 2:55:25 PM : Crozzle file validation complete. Status:
 True.
5 02-Oct-16 2:55:25 PM : Start generating optimal Crozzle.
6 02-Oct-16 2:55:26 PM : Generating optimal Crozzle complete. Tame
 taken: 214ms
7 02-Oct-16 2:55:26 PM : Crozzle Display in WebBrowser.
```

## Result:

A valid medium Crozzle was generated in 214ms and a score of 889 was displayed. This was as expected.

## Test 3 – Generate Optimal Valid Hard Crozzle

### Input files:

1. Test 3 Crozzle.txt
2. Test 3 Configuration.txt

File readouts can be found in Appendix Test 3 – Valid Hard Crozzle.

## Expected Result:

Hard Crozzle loads with no validation errors, no rule breaks and a score displays.



## Output:

**Score: 514**

|    | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|----|---|---|---|---|---|---|---|---|---|----|
| 1  |   |   |   |   |   |   |   | Z | E | D  |
| 2  |   |   |   | Z | O | R | B | A |   |    |
| 3  |   | O |   | U |   |   |   | R |   |    |
| 4  |   | Z |   | Z |   |   | Z | A | C | K  |
| 5  | E | Z | Z | A | R | D |   |   |   | A  |
| 6  |   | I |   | N |   | E | D |   |   | Y  |
| 7  | L | E |   | N |   | N |   | S |   | N  |
| 8  | U |   | T | Y |   | Z |   | U |   | E  |
| 9  |   |   | E |   | M | I | T | Z | I |    |
| 10 | R | E | X |   |   | L |   | Y |   |    |

17 words out of 400 were used in 1 group(s).

No rules broken!

**Crozzle File Validation**

No validation errors!

No configuration validation errors!

## Log File

```
1 02-Oct-16 2:59:25 PM : Configuration file opened. File Validation
 Started.
2 02-Oct-16 2:59:25 PM : Configuration file validation complete.
 Status: True.
3 02-Oct-16 2:59:25 PM : Crozzle file opened. File validation
 started.
4 02-Oct-16 2:59:25 PM : Crozzle file validation complete. Status:
 True.
5 02-Oct-16 2:59:25 PM : Start generating optimal Crozzle.
6 02-Oct-16 2:59:26 PM : Generating optimal Crozzle complete. Tame
 taken: 698ms
7 02-Oct-16 2:59:26 PM : Crozzle Display in WebBrowser.
```

## Result:

A valid hard Crozzle was generated in 698ms and a score of 514 was displayed. This was as expected.

## Conclusion

In conclusion, the range of tests performed on the application 'Crozzle' displayed results meeting the criteria identified in the design requirements document given in 'SIT323 Assignment 2 brief' (Dew, 2016). Given this, any Crozzle generated with the application can be deemed as close to that of an optimal Crozzle.

## References

Dew, D. R., 2016. *Assessment Task 2 - Crozzle Creation*, Geelong: s.n.

## Appendix

### Appendix Test 1 – Valid Easy Crozzle

#### 'Test 1 Crozzle.txt'

```
1 EASY,200,10,10,0,0
2 AARON,AL,ALAN,ALEXANDRA,ALI,AMY,ANDREW,ANN,ANTHONY,AXL,AYDEN,BELIND
 A,BEN,BETTY,BEV,BEVERLEY,BILL,BLAZE,BOB,BOBBY,BORIS,BRENDA,BRUNO,BY
 NUM,CAM,CATHERINE,CHAZ,CLIVE,CON,CONNOR,CONWAY,CRUZ,DALE,DAN,DAVE,D
 AVID,DAVY,DAWN,DENNIS,DENZIL,DOM,DON,DREMA,DREW,ED,EDDY,EDITH,EDWAR
 D,ELIZABET,ELVIS,EMMA,ENZO,ERICA,EVA,EVAN,EZZARD,FAWN,FRED,GARY,GIO
 VANNY,GLENDA,GRAHAM,GWEN,GWYN,HOPE,HUEY,HUXLEY,IAN,ISA,IVAN,IVON,IZ
 A,JACK,JAKE,JAQUELINE,JILL,JIM,JOHN,KARL,KAY,KAYNE,KELVIN,KEVIN,LE,
 LEO,LEON,LES,LEWIS,LILA,LIZ,LOC,LOU,LU,LUCILE,LULU,MADALYNN,MAL,MAR
 GARET,MARK,MARY,MATHEW,MATTHEW,MAVIS,MAY,MICHELLE,MITZI,MURRAY,NED,
 NEIL,NOE,NOEL,OLIVE,OMAR,ORAN,OSCAR,OWEN,OWENS,OZZIE,PAM,PENELOPE,P
 ENNY,PETER,PHEBE,QUINCY,QUINTY,RACHELLE,RAS,RAY,REMI,RENTON,REX,RIC
 HARD,ROBERT,ROD,ROGER,RON,ROWAN,ROY,ROZY,RYDER,SALLY,SAM,SARAH,SHEL
 DON,SPENCER,STEPHEN,STEVE,STEVEN,SUE,SUZY,SYLVIA,TAMMY,TEDDY,TERRY,
 TIMOTHY,TOBY,TODD,TOM,TRACEY,TREVOR,TY,TYRIANNE,VELVET,VERA,VERN,VI
 C,VICK,VICKY,VICTOR,WADE,WALLY,WALT,WENDY,WES,WESLEY,WHITNEY,WILL,W
 ILLY,WILMA,WYNNIE,XAVIER,XENA,XIA,XIANG,YEE,YOEL,YOKO,YOLANDA,YOSEF
 ,ZACH,ZACK,ZARA,ZELDA,ZENA,ZETA,ZEUS,ZILI,ZOLA,ZORBA,ZUZANNY
```

#### 'Test 1 Configuration.txt'

```
1 GROUPSPERCROZZLELIMIT=1000
2 POINTSPERWORD=0
3 INTERSECTING:A=1
4 INTERSECTING:B=1
5 INTERSECTING:C=1
6 INTERSECTING:D=1
7 INTERSECTING:E=1
8 INTERSECTING:F=1
9 INTERSECTING:G=1
10 INTERSECTING:H=1
11 INTERSECTING:I=1
12 INTERSECTING:J=1
13 INTERSECTING:K=1
14 INTERSECTING:L=1
15 INTERSECTING:M=1
16 INTERSECTING:N=1
17 INTERSECTING:O=1
18 INTERSECTING:P=1
19 INTERSECTING:Q=1
20 INTERSECTING:R=1
21 INTERSECTING:S=1
22 INTERSECTING:T=1
23 INTERSECTING:U=1
24 INTERSECTING:V=1
25 INTERSECTING:W=1
26 INTERSECTING:X=1
```

```
27 INTERSECTING:Y=1
28 INTERSECTING:Z=1
29 NONINTERSECTING:A=1
30 NONINTERSECTING:B=1
31 NONINTERSECTING:C=1
32 NONINTERSECTING:D=1
33 NONINTERSECTING:E=1
34 NONINTERSECTING:F=1
35 NONINTERSECTING:G=1
36 NONINTERSECTING:H=1
37 NONINTERSECTING:I=1
38 NONINTERSECTING:J=1
39 NONINTERSECTING:K=1
40 NONINTERSECTING:L=1
41 NONINTERSECTING:M=1
42 NONINTERSECTING:N=1
43 NONINTERSECTING:O=1
44 NONINTERSECTING:P=1
45 NONINTERSECTING:Q=1
46 NONINTERSECTING:R=1
47 NONINTERSECTING:S=1
48 NONINTERSECTING:T=1
49 NONINTERSECTING:U=1
50 NONINTERSECTING:V=1
51 NONINTERSECTING:W=1
52 NONINTERSECTING:X=1
53 NONINTERSECTING:Y=1
54 NONINTERSECTING:Z=1
```

## Appendix Test 2 – Valid Medium Crozzle

### ‘Test 2 Crozzle.txt’

```
1 MEDIUM,300,10,10,0,0
2 AARON,AL,ALAN,ALEX,ALI,AMY,ANDREW,ANN,ARJUN,ARMANI,ARMIDA,ARTHUR,AR
VIL,ARYANA,ASHELY,ASHLEA,ASHLEE,ASHLEY,ASHLIE,ASHLYN,ASHTON,ASHTYN,
ASTRID,ATHENA,AUBREE,AUBREY,AUBRIE,AUDREY,AURORA,AUORE,AUSTIN,AXL,
AYDEN,BELINDA,BEN,BETTY,BEV,BEVERLEY,BILL,BLAZE,BOB,BOBBY,BORIS,BRE
NDA,BRIGGS,BRODIE,BROGAN,BROOKS,BRUNO,BRYANT,BRYCEN,BRYSEN,BRYSON,B
RYTON,BUDDIE,BUFORD,BURLEY,BURNEY,BURNIE,BURREL,BURTON,BUSTER,BUTLE
R,BYNUM,CAESAR,CAIDEN,CALLAN,CAM,CARA,CHAZ,CLIVE,CON,CONNOR,CONWAY,
CRUZ,DALE,DAN,DAVE,DAVID,DAVY,DAWN,DAYANA,DEANNA,DEANNE,DEASIA,DEBB
IE,DEBBRA,DEBERA,DEBORA,DEBRAH,DEEANN,DEEDEE,DEETTA,DEIDRA,DEIDRE,D
ELCIE,DELIAH,DELILA,DELINA,DELISA,DELLAR,DELLIA,DELLIE,DELOIS,DELOR
A,DELPHA,DELSIE,DENNIS,DENZIL,DOM,DON,DOT,DREW,ED,EDDY,EDITH,EDWARD
,ELIZABETH,ELVIS,EMMA,ENZO,ERICA,ERLENE,ERLINE,ERMINA,ERMINE,ERNEST
,ERYKAH,ESTELA,ESTELL,ESTHER,ETHYLE,EUDORA,EUGENE,EUNICE,EVA,EVALYN
,EVAN,EVELIN,EVELYN,EVERLY,EVETTE,EVONNE,EZZARD,FALLON,FANNIE,FANNY
E,FARRAH,FATIMA,FAWN,FELICE,FELIPA,FINLEY,FRED,GARY,GIOVANNY,GLEND
A,GRAHAM,GWEN,GWYN,HARVY,HOWARD,HUXLEY,IAN,IVA,IVAN,IVON,IZA,JACK,JA
KE,JAQUELINE,JILL,JO,JUDY,KARL,KAY,KAYLAH,KAYLAN,KAYLEE,KAYLEN,KAYN
E,KELVIN,KEVIN,LE,LEO,LEON,LES,LEWIS,LILA,LIZ,LOC,LOU,LU,LUCILE,LUL
U,MADALYNN,MAL,MARGARET,MARK,MARY,MATHEW,MATTHEW,MAVIS,MAY,MICHELLE
```

, MITZI, MURRAY, NAOMI, NED, NOE, NOEL, OLIVE, OMAR, ORAN, OSCAR, OWEN, OWENS, OZZIE, PAM, PENELOPE, PENNY, PETER, PHEBE, QUINCY, QUINTY, RACHELLE, RAE, RAY, REMY, RENTON, REX, RICHARD, ROBERT, ROD, ROGER, RON, ROWAN, ROY, ROZY, RYLEY, SALLY, SAM, SARAH, SHELDON, SOPHIE, STEPHEN, STEVE, STEVEN, SUE, SUZY, SYLVIA, TAMMY, TED, TERRY, TIMOTHY, TOBY, TODD, TOM, TRACEY, TREVOR, TY, TYRIANNE, VEL VET, VERA, VELDA, VIC, VICK, VICKY, VICTOR, WADE, WALLY, WALT, WENDY, WES, WESLEY, WHITNEY, WILL, WILLY, WILMA, WYNNIE, XAVIER, XENA, XIA, XIANG, YEE, YOEL, YOKO, YOLANDA, YORK, ZACH, ZACK, ZARA, ZELIA, ZENA, ZETA, ZEUS, ZILI, ZOLA, ZORBA, ZUZANNY

## 'Test 2 Configuration.txt'

```
1 GROUPSPERCROZZLELIMIT=1000
2 POINTSPERWORD=0
3 INTERSECTING:A=1
4 INTERSECTING:B=2
5 INTERSECTING:C=3
6 INTERSECTING:D=4
7 INTERSECTING:E=5
8 INTERSECTING:F=6
9 INTERSECTING:G=7
10 INTERSECTING:H=8
11 INTERSECTING:I=9
12 INTERSECTING:J=10
13 INTERSECTING:K=11
14 INTERSECTING:L=12
15 INTERSECTING:M=13
16 INTERSECTING:N=14
17 INTERSECTING:O=15
18 INTERSECTING:P=16
19 INTERSECTING:Q=17
20 INTERSECTING:R=18
21 INTERSECTING:S=19
22 INTERSECTING:T=20
23 INTERSECTING:U=21
24 INTERSECTING:V=22
25 INTERSECTING:W=23
26 INTERSECTING:X=24
27 INTERSECTING:Y=25
28 INTERSECTING:Z=26
29 NONINTERSECTING:A=1
30 NONINTERSECTING:B=2
31 NONINTERSECTING:C=3
32 NONINTERSECTING:D=4
33 NONINTERSECTING:E=5
34 NONINTERSECTING:F=6
35 NONINTERSECTING:G=7
36 NONINTERSECTING:H=8
37 NONINTERSECTING:I=9
38 NONINTERSECTING:J=10
39 NONINTERSECTING:K=11
40 NONINTERSECTING:L=12
41 NONINTERSECTING:M=13
```

42 NONINTERSECTING:N=14  
43 NONINTERSECTING:O=15  
44 NONINTERSECTING:P=16  
45 NONINTERSECTING:Q=17  
46 NONINTERSECTING:R=18  
47 NONINTERSECTING:S=19  
48 NONINTERSECTING:T=20  
49 NONINTERSECTING:U=21  
50 NONINTERSECTING:V=22  
51 NONINTERSECTING:W=23  
52 NONINTERSECTING:X=24  
53 NONINTERSECTING:Y=25  
54 NONINTERSECTING:Z=26

## Appendix Test 3 – Valid Hard Crozzle

### 'Test 3 Crozzle.txt'

1 HARD,400,10,10,0,0  
2 AARON,AL,ALAN,ALEX,ALEXANDRA,ALI,AMY,ANDREW,ANN,ARLYNE,ARMANI,ARMID  
A,ARTHUR,ARVIL,ARYANA,ASHELY,ASHLEA,ASHLEE,ASHLEY,ASHLIE,ASHLYN,ASH  
TON,ASHTYN,ASTRID,ATHENA,AUBREE,AUBREY,AUBRIE,AUDREY,AURORA,AUORE,  
AUSTIN,AXL,AYDEN,BELINDA,BEN,BETTY,BEV,BEVERLEY,BILL,BLAZE,BOB,BOBB  
Y,BORIS,BRENDA,BRIGGS,BRODIE,BROGAN,BROOKS,BRUNO,BRYANT,BRYCEN,BRYS  
EN,BRYSON,BRYTON,BUDDIE,BUFORD,BURLEY,BURNEY,BURNIE,BURREL,BURTON,B  
USTER,BUTLER,BYNUM,CAESAR,CAIDEN,CALLAN,CAM,CARA,CHAZ,CLIVE,CON,CON  
NOR,CONWAY,CRUZ,DALE,DAN,DAVE,DAVID,DAVY,DAX,DAYANA,DEANNA,DEANNE,D  
EASIA,DEBBIE,DEBBRA,DEBERA,DEBORA,DEBORRAH,DEBRAH,DEEANN,DEEDEE,DEE  
TTA,DEIDRA,DEIDRE,DELCIE,DELIAH,DELILA,DELINA,DELISA,DELLAR,DELLIA,  
DELLIE,DELOIS,DELORA,DELPHA,DELPHINE,DELSIE,DEMETRIA,DENNIS,DENZIL,  
DESTINEE,DESTINEY,DEYANIRA,DOM,DOMENICA,DOMINQUE,DON,DORATHEA,DOROT  
HEA,DREMA,DREW,DRUCILLA,DRUSILLA,ED,EDDY,EDITH,EDWARD,ELEANORA,ELEA  
NORE,ELEONORA,ELEONORE,ELFRIEDA,ELIZABET,ELIZABETH,ELIZBETH,ELVIS,E  
MMA,EMMALINE,EMMALYNN,EMMELINE,ENZO,ERICA,ERLENE,ERLINE,ERMINA,ERMI  
NE,ERNEST,ERYKAH,ESTEFANI,ESTEFANY,ESTELA,ESTELL,ESTHER,ESTRELLA,ET  
HELENE,ETHYLE,EUDORA,EUGENE,EUNICE,EUPHEMIA,EVA,EVALYN,EVAN,EVE,EVE  
LYN,EVERLY,EVETTE,EVONNE,EZZARD,FALLON,FANNIE,FANNYE,FARRAH,FATIMA,  
FAWN,FELICE,FELICITY,FELIPA,FERNANDA,FILOMENA,FINLEY,FRED,GARY,GIOV  
ANNY,GLENDA,GRAHAM,GWEN,GWYN,HARRISON,HARTWELL,HARVY,HERSCHEL,HERSH  
ELL,HEZEKIAH,HILLIARD,HOWARD,HUMBERTO,HUMPHREY,HUXLEY,IAN,IGNATIUS,  
IMMANUEL,ISA,IVAN,IVON,IZA,JACK,JAKE,JAMARCUS,JAMARION,JAQUELINE,JE  
DEDIAH,JEDIDIAH,JEFFEREY,JENNIFER,JENNINGS,JERAMIAH,JEREMIAH,JERIMI  
AH,JERMAINE,JILL,JIM,JOHATHAN,JOHN,JOHNPAYL,JONATHAN,JONATHON,JOSEL  
UIS,JOSEPHUS,KARL,KATHLEEN,KAY,KAYLAH,KAYLAN,KAYLEE,KAYLEN,KAYNE,KE  
LVIN,KENDRICK,KENYATTA,KEVIN,KEYSHAWN,LE,LEO,LEON,LES,LEW,LEWIS,LIZ  
,LOC,LOU,LU,LUCILE,LULU,MADALYNN,MAL,MARGARET,MARIANNA,MARIANNE,MAR  
IBETH,MARICELA,MARIETTA,MARILYNN,MARISELA,MARJORIE,MARK,MARLEIGH,MA  
RQUITA,MARY,MARYANNE,MARYBETH,MARYJANE,MATHEW,MATHILDA,MATHILDE,MAT  
THEW,MAVIS,MAY,MAYBELLE,MCKENZIE,MCKINLEY,MECHELLE,MELISSIA,MELLISS  
A,MERCEDES,MEREDITH,MERRILEE,MICHAELA,MICHAELE,MICHELLE,MIGDALIA,MI  
LAGROS,MINERVIA,MISSOURI,MITZI,MURRAY,NANNETTE,NAOMI,NATHALIA,NATHA  
LIE,NEIL,NICHELLE,NICHOLAS,NOE,NOEL,OLIVE,OMAR,ORAN,OSCAR,OWEN,OWEN  
S,OZZIE,PAM,PATIENCE,PATRICIA,PAULETTA,PENELOPE,PENNY,PETER,PHEBE,Q

UINCY, QUINTY, RACHELLE, RAS, RAY, REMI, RENTON, REX, RICHARD, ROBERT, ROD, ROGER, RON, ROWAN, ROY, ROZY, RYDER, SALLY, SAM, SARAH, SHELDON, SOPHIE, STEPHEN, STEVE, STEVEN, SUE, SUZY, SYLVIA, TAMMY, TED, TERRY, TEX, TOBY, TODD, TOM, TRACEY, TREVOR, TY, TYRIANNE, VELVET, VERA, VERN, VIC, VICK, VICKY, VICTOR, WADE, WALLY, WALT, WENDY, WES, WESLEY, WHITNEY, WILL, WILLY, WILMA, WYNNIE, XAVIER, XENA, XIA, XIANG, YEE, YOEL, YOKO, YOLANDA, YORK, ZACH, ZACK, ZARA, ZED, ZENA, ZETA, ZITA, ZILI, ZOLA, ZORBA, ZUZANNY

### 'Test 3 Configuration.txt'

```
1 GROUPSPERCROZZLELIMIT=1
2 POINTSPERWORD=10
3 INTERSECTING:A=1
4 INTERSECTING:B=2
5 INTERSECTING:C=2
6 INTERSECTING:D=2
7 INTERSECTING:E=1
8 INTERSECTING:F=2
9 INTERSECTING:G=2
10 INTERSECTING:H=2
11 INTERSECTING:I=1
12 INTERSECTING:J=4
13 INTERSECTING:K=4
14 INTERSECTING:L=4
15 INTERSECTING:M=4
16 INTERSECTING:N=4
17 INTERSECTING:O=1
18 INTERSECTING:P=8
19 INTERSECTING:Q=8
20 INTERSECTING:R=8
21 INTERSECTING:S=8
22 INTERSECTING:T=8
23 INTERSECTING:U=1
24 INTERSECTING:V=16
25 INTERSECTING:W=16
26 INTERSECTING:X=32
27 INTERSECTING:Y=32
28 INTERSECTING:Z=64
29 NONINTERSECTING:A=0
30 NONINTERSECTING:B=0
31 NONINTERSECTING:C=0
32 NONINTERSECTING:D=0
33 NONINTERSECTING:E=0
34 NONINTERSECTING:F=0
35 NONINTERSECTING:G=0
36 NONINTERSECTING:H=0
37 NONINTERSECTING:I=0
38 NONINTERSECTING:J=0
39 NONINTERSECTING:K=0
40 NONINTERSECTING:L=0
41 NONINTERSECTING:M=0
42 NONINTERSECTING:N=0
43 NONINTERSECTING:O=0
```

```
44 NONINTERSECTING:P=0
45 NONINTERSECTING:Q=0
46 NONINTERSECTING:R=0
47 NONINTERSECTING:S=0
48 NONINTERSECTING:T=0
49 NONINTERSECTING:U=0
50 NONINTERSECTING:V=0
51 NONINTERSECTING:W=0
52 NONINTERSECTING:X=0
53 NONINTERSECTING:Y=0
54 NONINTERSECTING:Z=0
```