

TRANSFORMATIONS A1

8				p				
7			p					
6			K	R				
5								
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

Given this position, draw the new position if they are **translated 4 spaces to the right and 5 spaces down.**

8								
7								
6								
5								
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

TRANSFORMATIONS

A1

8				p				
7			p	N				
6			K	R				
5								
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

Given this position, draw the new position if they are **translated 4 spaces to the right and 5 spaces down.**

8								
7								
6								
5								
4								
3								p
2							p	N
1							K	R
0	a	b	c	d	e	f	g	h

TRANSFORMATIONS A2

8								
7								
6								
5						p		N
4							Q	R
3								
2								
1								
0	a	b	c	d	e	f	g	h

Given this position,  
draw the new  
position if they  
are **translated**  
**5 spaces to the**  
**left and**  
**2**  
**spaces down.**

8								
7								
6								
5								
4								
3								
2								
1								
0	A	b	c	d	e	f	g	h

8								
7								
6								
5						p		N
4							Q	R
3								
2								
1								
0	a	b	c	d	e	f	g	h

Given this position,  
draw the new  
position if they  
are **translated**  
**5 spaces to the**  
**left and**  
**2**  
**spaces down.**

8								
7								
6								
5								
4								
3		p		N				
2			Q	R				
1								
0	a	b	c	d	e	f	g	h

TRANSFORMATIONS A3

8								
7								
6								
5			R					
4		B						
3	R	B						
2		B						
1								
0	a	b	c	d	e	f	g	h

Given this position,  
draw the new  
position if they  
are **translated**  
**5 spaces to the**  
**right and 2**  
**spaces up.**

8								
7								
6								
5								
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

8								
7								
6								
5			R					
4		B						
3	R	B						
2		B						
1								
0	a	b	c	d	e	f	g	h

Given this position,  
draw the new  
position if they  
are **translated**  
**5 spaces to the**  
**right and 2**  
**spaces up.**

8								
7								R
6							B	
5						R	B	
4							B	
3								
2								
1								
0	a	b	c	d	e	f	g	h

8								
7								
6								
5								
4								
3				Q	B			
2				p				
1				p				
0	a	b	c	d	e	f	g	h

Given this position,  
 draw the new  
 position if they  
 are **translated**  
**3 spaces to the**  
**left and 4**  
**spaces up.**

8								
7								
6								
5								
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

8								
7								
6								
5								
4								
3				Q	B			
2				p				
1				p				
0	a	b	c	d	e	f	g	H

Given this position,  
draw the new  
position if they  
are **translated**  
**3 spaces to the**  
**left and 4**  
**spaces up.**

8								
7	Q	B						
6	p							
5	p							
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h



8								
7								
6								
5			B	B	Q	R		
4					K			
3								
2								
1								
0	a	b	c	d	e	f	g	h

Given this position,  
 draw the new  
 position if they  
 are **translated**  
**3 spaces down**  
**and 2 spaces**  
**to the left.**

8								
7								
6								
5								
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

8								
7								
6								
5			B	B	Q	R		
4					K			
3								
2								
1								
0	a	b	c	d	E	f	g	h

Given this position,  
draw the new  
position if they  
are **translated**  
**3 spaces down**  
**and 2 spaces**  
**to the left.**

8								
7								
6								
5								
4								
3								
2	B	B	Q	R				
1			K					
0	a	b	c	d	e	f	g	h

8								
7								
6								
5								
4			p	K				
3				K				
2			B	K				
1								
0	a	b	c	d	e	f	g	h

Given this position,  
 draw the new  
 position if they  
 are **translated**  
**up 4 spaces and to**  
**the right 3 spaces.**

8								
7								
6								
5								
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

8								
7								
6								
5								
4			p	K				
3				K				
2			B	K				
1								
0	a	b	c	d	e	f	g	h

Given this position,  
draw the new  
position if they  
are **translated**  
**up 4 spaces and to**  
**the right 3 spaces.**

8						p	K	
7							K	
6						B	K	
5								
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

8								
7								
6								
5								
4								
3	K	Q						
2	p							
1	N							
0	a	b	c	d	e	f	g	h

What are the new positions  
(file and rank) of the pieces if  
they are translated 4 spaces up  
and 3 spaces to the right?

K \_\_\_\_\_  
Q \_\_\_\_\_  
p \_\_\_\_\_  
N \_\_\_\_\_

B2

8				B	R	K		
7			p				Q	
6								
5								
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

What are the new positions  
(file and rank) of the pieces if  
they are translated 5 spaces down  
and 2 spaces to the left?

p = \_\_\_\_\_  
B = \_\_\_\_\_  
R = \_\_\_\_\_  
K = \_\_\_\_\_  
Q = \_\_\_\_\_

8								
7								
6								
5								
4								
3	K	Q						
2	p							
1	N							
0	a	b	c	d	e	f	g	h

What are the new positions  
(file and rank) of the pieces if  
they are translated 4 spaces up  
and 3 spaces to the right?

K   (d,7)  

Q   (e,7)  

p   (d,6)  

N   (d,5)  

B2

8				B	R	K		
7			p				Q	
6								
5								
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

What are the new positions  
(file and rank) of the pieces if  
they are translated 5 spaces down  
and 2 spaces to the left?

p =   (b,2)  

B =   (c,3)  

R =   (d,3)  

K =   (e,3)  

Q =   (f,2)

8								
7	B	Q						
6		K	p					
5								
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

What are the new positions  
(file and rank) of the pieces if  
they are translated 5 spaces to  
the right and 3 spaces down?

B \_\_\_\_\_  
Q \_\_\_\_\_  
K \_\_\_\_\_  
p \_\_\_\_\_

B4

8								
7								
6					p	B	N	
5							Q	
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

What are the new positions  
(file and rank) of the pieces if  
they are translated 4 spaces to the  
left and 2 spaces down?

p = \_\_\_\_\_  
B = \_\_\_\_\_  
N = \_\_\_\_\_  
Q = \_\_\_\_\_

8								
7	B	Q						
6		K	p					
5								
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

What are the new positions  
(file and rank) of the pieces if  
they are translated 5 spaces to  
the right and 3 spaces down?

- B \_\_\_(f,4)\_\_\_
- Q \_\_\_(g,4)\_\_\_
- K \_\_\_(g,3)\_\_\_
- p \_\_\_(h,3)\_\_\_

B4

8								
7								
6					p	B	N	
5							Q	
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

What are the new positions  
(file and rank) of the pieces if  
they are translated 4 spaces to the  
left and 2 spaces down?

- p = \_\_\_(b,4)\_\_\_
- B = \_\_\_(c,4)\_\_\_
- N = \_\_\_(d,4)\_\_\_
- Q = \_\_\_(d,3)\_\_\_



								8								
		K						7								
	p		p					6								
	B	K	B					5								
								4								
								3								
								2								
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1								
								-2								
								-3								
								-4								
								-5								
								-6								
								-7								
								-8								

TRANSFORMATIONS  
 Draw the new positions if these are translated 10 spaces to the right and 6 spaces down.

								8								
								7								
								6								
								5								
								4								
								3								
								2			B	R				
								1		R	B	K				
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1								
								-2								
								-3								
								-4								
								-5								
								-6								
								-7								
								-8								

C2  
 Draw the new positions if these are translated 7 spaces to the left and 5 spaces up.

								8								
		K						7								
	p		p					6								
	B	K	B					5								
								4								
								3								
								2								
								1				K				
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	p	d	p	f	g	h
								-1			B	K	B			
								-2								
								-3								
								-4								
								-5								
								-6								
								-7								
								-8								

TRANSFORMATIONS

Draw the new positions if these are translated 10 spaces to the right and 6 spaces down.

								8								
						B	R	7								
			R	B	K			6								
								5								
								4								
								3								
								2				B	R			
								1		R	B	K				
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	E	f	g	h
								-1								
								-2								
								-3								
								-4								
								-5								
								-6								
								-7								
								-8								

C2

Draw the new positions if these are translated 7 spaces to the left and 5 spaces up.

TRANSFORMATIONS C3

								8								
								7								
								6	p							
								5	B	B	K					
								4			R					
								3			R					
								2								
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1								
								-2								
								-3								
								-4								
								-5								
								-6								
								-7								
								-8								

Draw the new positions if these are translated 5 spaces to the left and 9 spaces down.

								8								
								7								
								6								
								5								
								4								
								3								
								2								
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1								
								-2								
	R							-3								
	B	K	p					-4								
		K	p					-5								
			B					-6								
			K					-7								
								-8								

C4

Draw the new positions if these are translated 10 spaces to the right and 6 spaces up.

KEY

								8								
								7								
								6	p							
								5	B	B	K					
								4			R					
								3			R					
								2								
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1								
								-2								
					p			-3								
				B	B	K		-4								
						R		-5								
						R		-6								
								-7								
								-8								

Draw the new positions if translated 5 spaces to the left and 9 spaces down.

								8								
								7								
								6								
								5								
								4								
								3			R					
								2			B	K	p			
								1				K	p			
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	D	B	f	g	h
								-1					K			
								-2								
	R							-3								
	B	K	p					-4								
		K	p					-5								
			B					-6								
			K					-7								
								-8								

C4  
Draw the new positions if translated 10 spaces to the right and 6 spaces Up.

TRANSFORMATIONS

								8								
			R					7								
	p	B	K					6								
			N					5								
								4								
								3								
								2								
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1								
								-2								
								-3								
								-4								
								-5								
								-6								
								-7								
								-8								

D1

Given these positions, give the new position (file and rank) of the pieces if they are translated 4 spaces to the right and 12 spaces down.

- p \_\_\_\_\_
- B \_\_\_\_\_
- R \_\_\_\_\_
- K \_\_\_\_\_
- N \_\_\_\_\_

D2

								8								
								7								
								6								
								5								
								4								
								3								
								2								
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1								
								-2								
								-3								
								-4		B		p				
								-5			K		R			
								-6							N	
								-7								
								-8								

Given these positions, give the new position (file and rank) of the pieces if they are translated 11 spaces up and 10 spaces to the left.

- B \_\_\_\_\_
- p \_\_\_\_\_
- K \_\_\_\_\_
- R \_\_\_\_\_
- N \_\_\_\_\_

KEY

								8								
			R					7								
	p	B	K					6								
			N					5								
								4								
								3								
								2								
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1								
								-2								
								-3								
								-4								
							R	-5								
					p	B	K	-6								
							N	-7								
								-8								

TRANSFORMATIONS

D1

Given these positions, give the new position (file and rank) of the pieces if they are translated 4 spaces to the right and 12 spaces down.

- p \_\_(-c,-6)
- B \_\_(-b,-6)
- R \_\_(-a,-5)
- K \_\_(-a,-6)
- N \_\_(-a,-7)

D2

								8								
	B		p					7								
		K		R				6								
					N			5								
								4								
								3								
								2								
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1								
								-2								
								-3								
								-4		B		p				
								-5			K		R			
								-6							N	
								-7								
								-8								

Given these positions, give the new position (file and rank) of the pieces if they are translated 11 spaces up and 10 spaces to the left.

- B \_\_(-g,7)
- p \_\_(-e,7)
- K \_\_(-f,6)
- R \_\_(-d,6)
- N \_\_(-c,5)

TRANSFORMATIONS

								8								
								7								
								6							K	
								5			Q		R		B	
								4				p				
								3								
								2								
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1								
								-2								
								-3								
								-4								
								-5								
								-6								
								-7								
								-8								

D3

Given these positions, give the new position (file and rank) of the pieces if they are translated 7 spaces down and 4 spaces to the left.

B \_\_\_\_\_

K \_\_\_\_\_

R \_\_\_\_\_

p \_\_\_\_\_

Q \_\_\_\_\_

D4

								8								
								7								
								6								
								5								
								4								
								3								
								2								
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
				N				-1								
			B		R			-2								
				K				-3								
				p				-4								
								-5								
								-6								
								-7								
								-8								

Given these positions, give the new position (file and rank) of the pieces if they are translated 8 spaces to the right and 4 spaces up.

N \_\_\_\_\_

B \_\_\_\_\_

R \_\_\_\_\_

K \_\_\_\_\_

p \_\_\_\_\_

KEY

								8								
								7								
								6							K	
								5			Q		R		B	
								4				p				
								3								
								2								
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1			K					
								Q		R		B				
								-3	p							
								-4								
								-5								
								-6								
								-7								
								-8								

TRANSFORMATIONS

D3

Given these positions, give the new position (file and rank) of the pieces if they are translated 7 spaces down and 4 spaces to the left.

B   (d,-2)  

K   (c,-1)  

R   (b,-2)  

p   (a,-3)  

Q   (0,-2)  

D4

								8								
								7								
								6								
								5								
								4								
								3				N				
								2			B		R			
								1				K				
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	p	e	f	g	h
				N				-1								
			B		R			-2								
				K				-3								
				p				-4								
								-5								
								-6								
								-7								
								-8								

Given these positions, give the new position (file and rank) of the pieces if they are translated 8 spaces to the right and 4 spaces up.

N   (d,3)  

B   (c,2)  

R   (e,2)  

K   (d,1)  

p   (d,0)



8								
7		p				R		
6				K			Q	
5	B		N					
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

Give the new position

if the pieces are

reflected over the

**4 rank.**

p \_\_\_\_\_ B \_\_\_\_\_

N \_\_\_\_\_ R \_\_\_\_\_

Q \_\_\_\_\_ K \_\_\_\_\_

E2

8								
7			R			p		
6								
5			K					
4							N	
3		B						
2						Q		
1								
0	a	b	c	d	e	f	g	h

Give the new position

if the pieces are reflected

over the **d file.**

p \_\_\_\_\_ N \_\_\_\_\_

Q \_\_\_\_\_ B \_\_\_\_\_

R \_\_\_\_\_ K \_\_\_\_\_

8								
7		p				R		
6				K			Q	
5	B			N				
4								
3								
2								
1								
0	a	b	c	d	e	f	g	h

Give the new position

if the pieces are

reflected over the

**4 rank.**

p   (b,1)      B   (a,3)

N   (d,3)      R   (g,1)

Q   (h,2)      K   (e,2)

E2

8								
7			R			p		
6								
5			K					
4							N	
3		B						
2						Q		
1								
0	a	b	c	d	e	f	g	h

Give the new position

if the pieces are reflected

over the **d file.**

p   (b,7)      N   (a,4)

Q   (b,2)      B   (f,3)

R   (e,7)      K   (e,5)

8									Give the new position if the piece is reflected over the given rank:  p (4 rank) _____ B (3 rank) _____ N (7 rank) _____ R (5 rank) _____ Q (2 rank) _____ K (6 rank) _____
7		p							
6					N				
5	K						B		
4									
3						Q			
2		R							
1									
0	a	b	c	d	e	f	g	h	

E4

8									Give the new position if the piece is reflected over the given file:  p (g file) _____ B (d file) _____ N (b file) _____ R (e file) _____ Q (f file) _____ K (c file) _____
7						p			
6			N						
5						K			
4		B							
3				Q					
2								R	
1									
0	a	b	c	d	e	f	g	h	

8		■		■		■		■	Give the new position if the piece is reflected over the given rank:
7	■	p	■		■		■		
6		■		■	N	■		■	
5	K		■		■		B		
4		■		■		■		■	
3	■		■		■	Q	■		
2		R		■		■		■	
1	■		■		■		■		
0	a	b	c	d	e	f	g	h	

p (4 rank) \_\_\_(b,1)\_\_\_  
 B (3 rank) \_\_\_(g,1)\_\_\_  
 N (7 rank) \_\_\_(e,8)\_\_\_  
 R (5 rank) \_\_\_(b,8)\_\_\_  
 Q (2 rank) \_\_\_(f,1)\_\_\_  
 K (6 rank) \_\_\_(a,7)\_\_\_

E4

8		■		■		■		■	Give the new position if the piece is reflected over the given file:
7	■		■		■	p	■		
6		■	N	■		■		■	
5	■		■		K	■		■	
4		B		■		■		■	
3	■		■	Q		■		■	
2		■		■		■		R	
1	■		■		■		■		
0	a	b	c	d	e	f	g	h	

p (g file) \_\_\_(h,7)\_\_\_  
 B (d file) \_\_\_(f,4)\_\_\_  
 N (b file) \_\_\_(a,6)\_\_\_  
 R (e file) \_\_\_(b,2)\_\_\_  
 Q (f file) \_\_\_(h,3)\_\_\_  
 K (c file) \_\_\_(a,5)\_\_\_

								8								
								7								
			p					6				K				
								5								
						Q		4								
								3	..R				B			
			..N					2								
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1	..Q							
								-2					..p			
			R					-3								
							..K	-4				N				
								-5								
	..B							-6								
								-7								
								-8								

Give the new position of the pieces if they are reflected over the given rank or file.

p (2 rank) \_\_\_\_\_

..p (-5 rank) \_\_\_\_\_

B (a file) \_\_\_\_\_

..B (-b file) \_\_\_\_\_

N (f file) \_\_\_\_\_

..N (-1 rank) \_\_\_\_\_

R (-a file) \_\_\_\_\_

..R (-2 rank) \_\_\_\_\_

Q (0 file) \_\_\_\_\_

..Q (-3 rank) \_\_\_\_\_

K (0 rank) \_\_\_\_\_

..K (c file) \_\_\_\_\_

								8								
								7								
			p					6				K				
								5								
						Q		4								
								3	..R				B			
			..N					2								
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1	..Q							
								-2					..p			
			R					-3								
							..K	-4				N				
								-5								
	..B							-6								
								-7								
								-8								

Give the new position of the pieces if they are reflected over the given rank or file.

p (2 rank)  $\_(-e,-2)$

..p (-5 rank)  $\_(e,-8)$

B (a file)  $\_(-d,3)$

..B (-b file)  $\_(c,-6)\_$

N (f file)  $\_(h,-4)\_$

..N (-1 rank)  $\_(-e,-4)\_$

R (-a file)  $\_(c,-3)$

..R (-2 rank)  $\_(b,-7)$

Q (0 file)  $\_(b,4)\_$

..Q (-3 rank)  $\_(b,-5)\_$

K (0 rank)  $\_(d,-6)\_$

..K (c file)  $\_(g,-4)\_$

8		■		■		■		■
7	■		■		■		■	
6		■		■		■		■
5	■		■		■		■	
4		■		■		■		■
3	■		■		■		■	
2		■		■		■		■
1	■		■		■		■	
0	a	b	c	d	e	f	g	h

Show how you could place eight queens on the board where no queen is attacking another queen.

Give the coordinates of the eight places: \_\_\_\_\_

What horizontal line of reflection would find another way to place the queens? \_\_\_\_\_

Give the new coordinates after being reflected about that line.

\_\_\_\_\_

What vertical line of reflection would find another way to place the queens? \_\_\_\_\_

Give the new coordinates after being reflected about that line.

\_\_\_\_\_

What diagonal line of reflection would find another way to place the queens? \_\_\_\_\_

Give the new coordinates after being reflected about that line.

\_\_\_\_\_

What is another diagonal line of reflection that can be used to find another way? \_\_\_\_\_

Give the new coordinates after being reflected about that line.

\_\_\_\_\_

8						Q		
7		Q						
6							Q	
5	Q							
4				Q				
3								Q
2					Q			
1			Q					
0	a	b	c	d	e	f	g	h

Show how you could place eight queens on the board where no queen is attacking another queen.

Give the coordinates of the eight places: (c,1) (e,2) (h,3) (d,4) (a,5) (g,6) (b,7) (f,8)

What horizontal line of reflection would find another way to place the queens?  $y = 4.5$

Give the new coordinates after being reflected about that line.

\_\_\_\_(a,4) (b,2) (c,8) (d,5) (e,7) (f,1) (g,3) (h,6)\_\_\_\_\_

What vertical line of reflection would find another way to place the queens?  $x = d + \frac{1}{2}$

Give the new coordinates after being reflected about that line.

\_\_\_\_\_(h,5) (g,7) (f,1) (e,4) (d,2) (c,8) (b,6) (a,3)\_\_\_\_\_

What diagonal line of reflection would find another way to place the queens?  $y = x$

Give the new coordinates after being reflected about that line.

\_\_\_\_\_(e,1) (a,3) (g,2) (b,5) (d,4) (h,6) (f,7) (c,8) \_\_\_\_\_

What is another diagonal line of reflection that can be used to find another way?  $y = -x+9$

Give the new coordinates after being reflected about that line.

\_\_\_\_\_(d,8) (h,6) (b,7) (e,5) (g,4) (f,1) (c,2) (a,3) \_\_\_\_\_



8										
7										
6			Q							
5						p				
4										Q _____
3		B			R					p _____
2							K			K _____
1										R _____
0	a	b	c	d	e	f	g	h		B _____

Rotate the pieces  
90 degrees clockwise  
about the space (d,4)

F2

8										
7										
6										
5				Q						
4			p							Q _____
3								K		p _____
2									R	K _____
1		B								R _____
0	a	b	c	d	e	f	g	h		B _____

Rotate the pieces  
90 degrees  
counterclockwise about  
the space (d,3).

8									Rotate the pieces
7									90 degrees clockwise
6			Q						about the space (d,4)
5						p			
4									Q <u>  </u> (f,5) <u>  </u>
3	B			R					p <u>  </u> (e,2) <u>  </u>
2							K		K <u>  </u> (b,1) <u>  </u>
1									R <u>  </u> (c,4) <u>  </u>
0	a	b	c	d	e	f	g	h	B <u>  </u> (c,7) <u>  </u>

F2

8									Rotate the pieces
7									90 degrees
6									Counterclockwise about
5				Q					the space (d,3).
4			p						
3							K		Q <u>  </u> (b,3) <u>  </u>
2								R	p <u>  </u> (c,2) <u>  </u>
1		B							K <u>  </u> (d,6) <u>  </u>
0	a	b	c	d	e	f	g	h	R <u>  </u> (e,7) <u>  </u>
									B <u>  </u> (f,1) <u>  </u>

								8								
								7								
								6								
						K		5			N					
								4								
			B					3			..p					
								2				..Q				
						..R		1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1	..K							
								-2								
			Q			..N		-3								
								-4			R					
				p				-5		..B						
								-6								
								-7								
								-8								

Give the new position of each piece as they are rotated about the space given.

p (-d, -1) 180 degrees \_\_\_\_\_

R (0,0) 270 degrees clockwise \_\_\_\_\_

..p (c,-1) 90 degrees clockwise \_\_\_\_\_

..R (-b,-3) 90 degrees counterclockwise \_\_\_\_\_

B (-d,1) 90 degrees counterclockwise \_\_\_\_\_

Q (-d, 1) 180 degrees \_\_\_\_\_

..B (d,-2) 270 degrees clockwise \_\_\_\_\_

..Q (b,1) 270 degrees counterclockwise \_\_\_\_\_

N (b,0) 90 degrees clockwise \_\_\_\_\_

K (0,0) 180 degrees \_\_\_\_\_

..N (-e,-2) 270 degrees counterclockwise \_\_\_\_\_

..K (b,5) 90 degrees clockwise \_\_\_\_\_

								8								
								7								
								6								
						K		5			N					
								4								
			B					3			..p					
								2					..Q			
						..R		1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	g	h
								-1	..K							
								-2								
			Q			..N		-3								
								-4			R					
				p				-5		..B						
								-6								
								-7								
								-8								

Give the new position of each piece as they are rotated about the space given.

p (-d, -1) 180 degrees  $\rightarrow$  (-d,3)

R (0,0) 270 degrees clockwise  $\rightarrow$  (d,4)

..p (c,-1) 90 degrees clockwise  $\rightarrow$  (g,-1)

..R (-b,-3) 90 degrees counterclockwise  $\rightarrow$  (-f,-3)

B (-d,1) 90 degrees counterclockwise  $\rightarrow$  (-f,0)

Q (-d, 1) 180 degrees  $\rightarrow$  (-c,5)

..B (d,-2) 270 degrees clockwise  $\rightarrow$  (g,-4)

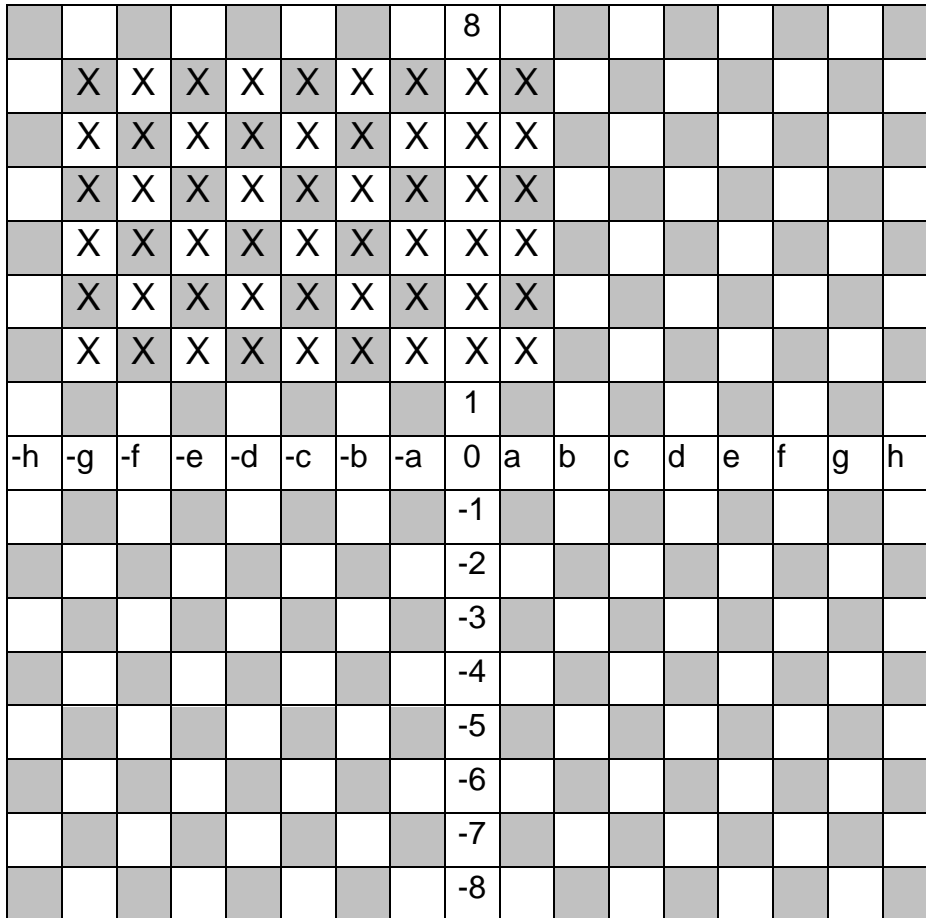
..Q (b,1) 270 degrees counterclockwise  $\rightarrow$  (c,-3)

N (b,0) 90 degrees clockwise  $\rightarrow$  (g,-2)

K (0,0) 180 degrees  $\rightarrow$  (b,-5)

..N (-e,-2) 270 degrees counterclockwise  $\rightarrow$  (-f,-5)

..K (b,5) 90 degrees clockwise  $\rightarrow$  (-d,6)



Show the new array if the figure shown is reduced to 1/3 of the original size. Give the new perimeter and area.

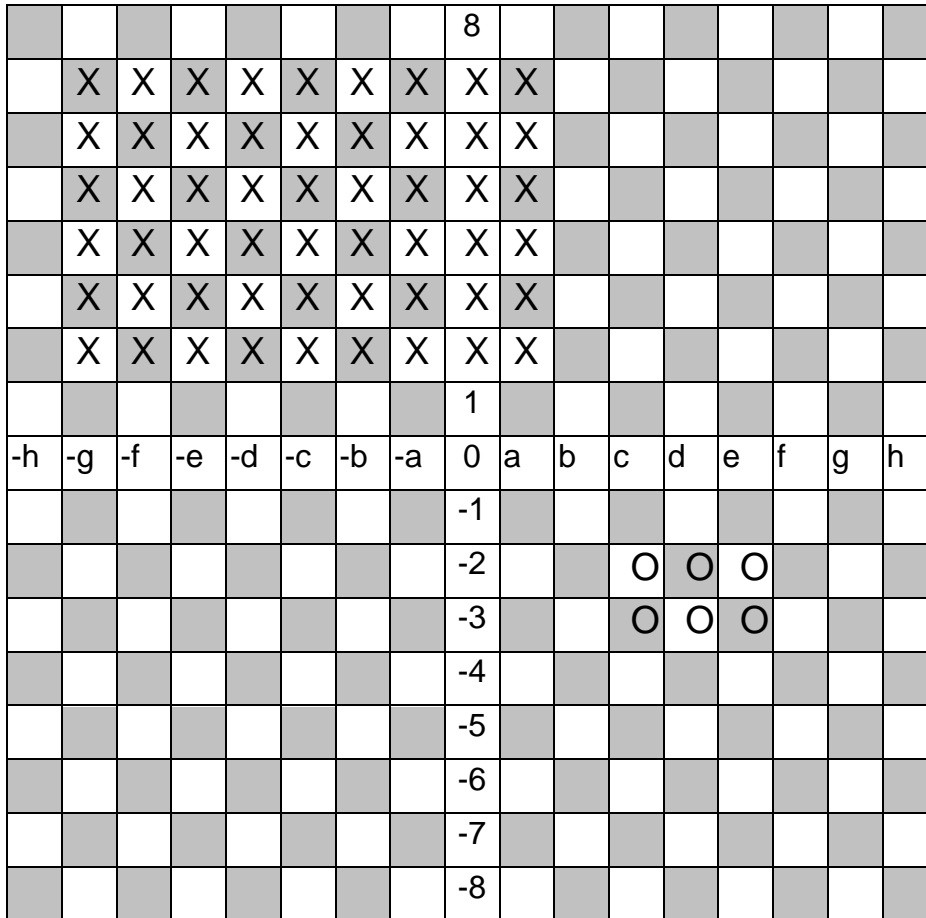
	Original		New
Perimeter	_____		_____
Area	_____		_____

Is the new perimeter 1/3 of it's original perimeter? If not, what part is it?

---

Is the new area 1/3 of it's original area? If not, what part is it?

---



Show the new array if the figure shown is reduced to 1/3 of the original size. Give the new perimeter and area.

	Original	New
Perimeter	___30__	___10__
Area	___54__	___6__

Is the new perimeter 1/3 of it's original perimeter? If not, what part is it?  
 yes\_\_\_\_\_

Is the new area 1/3 of it's original area? If not, what part is it?  
 \_\_\_no – the new area is 1/3 times 1/3 or 1/9 of it's original area\_\_\_

								8								
								7								
								6								
								5								
			X	X				4								
			X	X				3								
			X	X				2								
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	E	f	g	h
								-1								
								-2								
								-3								
								-4								
								-5								
								-6								
								-7								
								-8								

Show the new array if it is magnified by 2.

Give the perimeters and areas.

	Original	Magnified
Perimeter	_____	_____
Area	_____	_____

Is the new perimeter two times it's original perimeter? If not, what part is it?

---

Is the new area two times it's original area? If not, what part is it?

---

								8								
								7			o	o	o	o		
								6			o	o	o	o		
								5			o	o	o	o		
			X	X				4			o	o	o	o		
			X	X				3			o	o	o	o		
			X	X				2			o	o	o	o		
								1								
-h	-g	-f	-e	-d	-c	-b	-a	0	a	b	c	d	e	f	G	h
								-1								
								-2								
								-3								
								-4								
								-5								
								-6								
								-7								
								-8								

Show the new array if it is magnified by 2.

Give the perimeters and areas.

	Original	Magnified
Perimeter	_____ 10 _____	_____ 20 _____
Area	_____ 6 _____	_____ 24 _____

Is the new perimeter 2 times it's original perimeter? If not, what part is it?  
 \_\_\_\_\_ yes \_\_\_\_\_

Is the new area two times it's original area? If not, what part is it?  
 \_\_\_\_\_ no – the area is 2 times 2 or four times it's original area \_\_\_\_\_