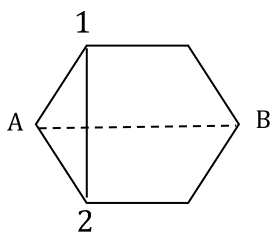
8.1 Line Symmetry

A line of symmetry: a line that separates a shape into two halves that are mirror images of each other. Each pair of corresponding points is the same perpendicular distance from each other.



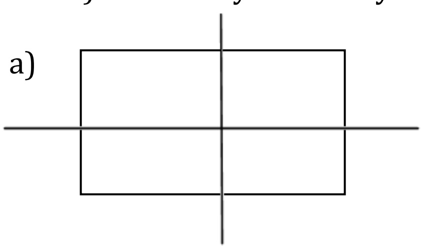
AB is a line of symmetry. Corresponding points 1 and 2 are perpendicular t the line.

In a design, each corresponding point must be the same colour.

A shape can have more than 1 line of symmetry.

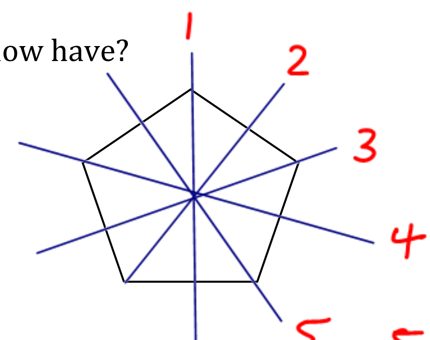
Ex: 1) How many lines of symmetry do the shapes below have?

a)



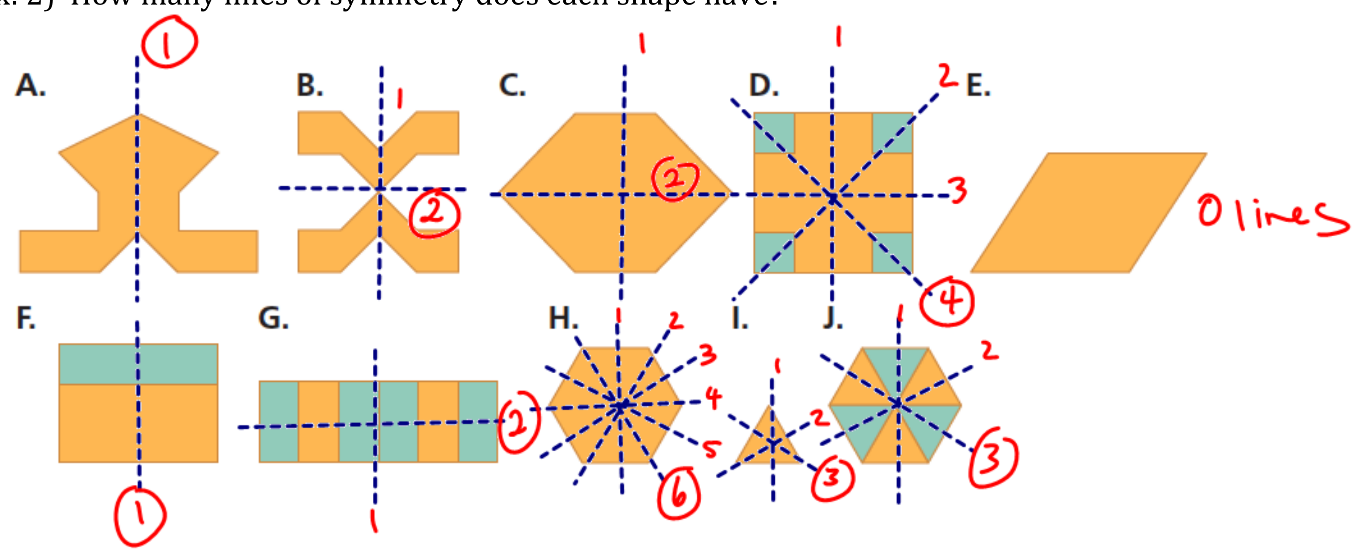
2 lines of symmetry

b)



5 lines of symmetry.

Ex: 2) How many lines of symmetry does each shape have?



Tessellation: is the tiling of a plane using one or more geometric shapes without any gaps or overlaps. Since tessellations go on forever, they can have many lines of symmetry.

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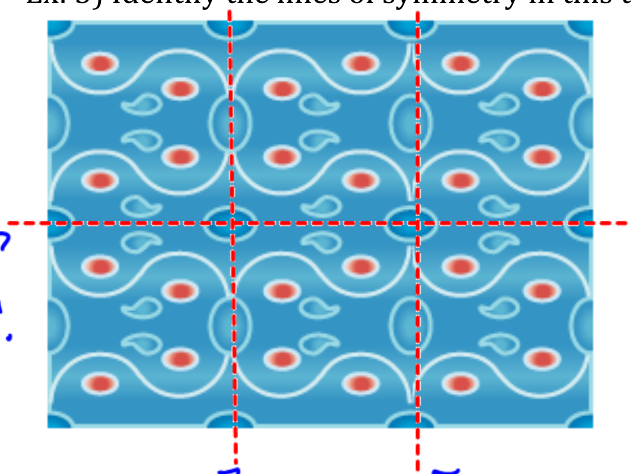
Ex: 3) Identify the lines of symmetry in this tessellation:

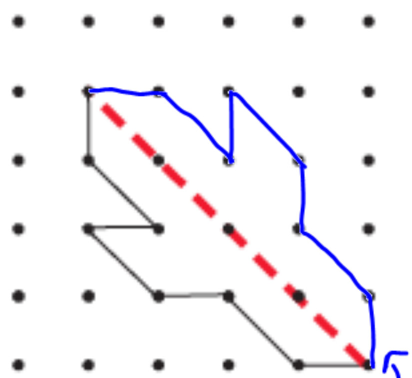


and the row!

* Think about the design in terms of columns and rows. Lines of symmetry occur along the columns & rows where the pattern repeats itself.

design is reflected on both sides of the column

Ex: 4) If we know that a shape is symmetrical and its line of symmetry, we can sketch the other half. Complete the object below:



mirror images!

Homework: pg. 370, #1-6, 9, 10, 12a, 17 and worksheet

8.2 Rotation Symmetry

Definitions:

- Rotation symmetry – when a rotating shape fits exactly over itself with a turn of less than 360°.

- Order of rotation symmetry – The number of times a shape can rotate onto itself within 360° is its order of rotation.

* The order of rotation = 360° ÷ (angle of rotation)

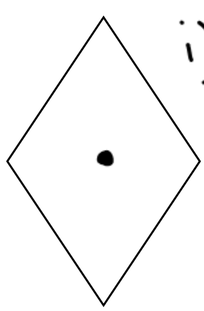
- Angle of rotation symmetry - The number of degrees needed for the shape to rotate onto itself.

* A shape can rotate around its centre or around an outside point.

This shape has a rotation angle of 180° and a rotation order of 2. (360 ÷ 180 = 2)

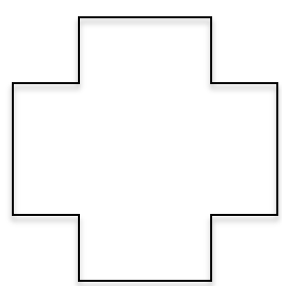
Ex: 1) Find the i) order of rotation and ii) the angle of rotation.

a)



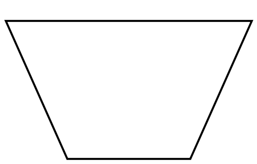
i) 2
ii) 180°
(360 ÷ 180 = 2)

b)



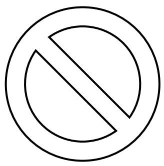
i) 4
ii) 90°
(360 ÷ 90 = 4)

Ex: 2) For each shape, determine the number of lines of symmetry, its order of rotation, and the angle of rotation.

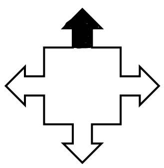


Lines of symmetry: 1
Order of rotation: 1
Angle of rotation: 360°

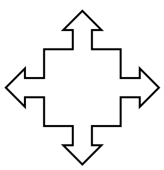
Lines of symmetry: 2
Order of rotation: 2
Angle of rotation: 180°



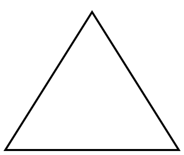
Lines of symmetry: 2
Order of rotation: 2
Angle of rotation: 180°



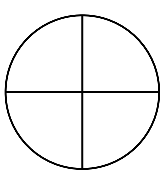
Lines of symmetry: 1
Order of rotation: 1
Angle of rotation: 360°



Lines of symmetry: 4
Order of rotation: 4
Angle of rotation: 90°



Lines of symmetry: 3
Order of rotation: 3
Angle of rotation: 120°



Lines of symmetry: 4
Order of rotation: 4
Angle of rotation: 90°

Homework: pg. 377 #1bc, 3, 5, 8

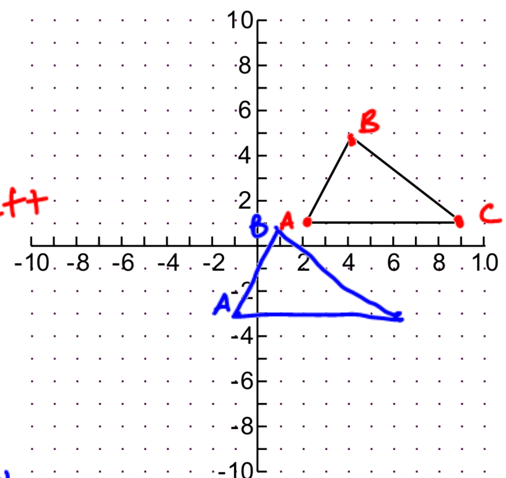
8.4 Symmetry on the Co-ordinate Plane Pt. 1

Translations, Reflections and Rotations

A. Translations:

Translation – a translation or a slide involves moving a figure in a specific direction for a specific distance.

Ex: 1) Translate ΔABC, A(2,1), B(4,5), C(9,1), (Left 3, Down 4)



Mapping diagram

$x-3;\ y-4$

* move all 3 coordinates left 3 & down 4.

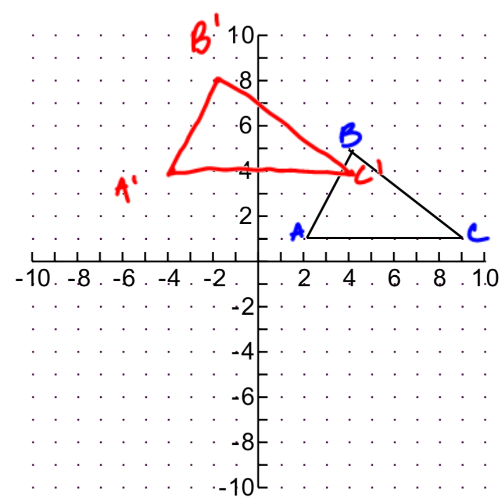
A(2,1)→ (2 – 3 ; 1 – 4) → (-1 , -3)

B(4,5)----- $(4-3;\ 5-4)=(1,1)$

C(9,1)----- $(9-3;\ 1-4)=(6,-3)$

*Add if you are moving up or right
Subtract if you are moving down or left.

Ex:2) Translate ΔABC (Left 6, Up 3)



$x-6;\ y+3$

$A(2,1)\rightarrow(2-6;\ 1+3)=(-4,4)\ A'$

$B(4,5)\rightarrow(4-6,\ 5+3)=(-2,8)\ B'$

$C(9,1)\rightarrow(9-6,\ 1+3)=(3,4)$

B. Reflections:

Reflections – images can be reflected over a line to create a mirror image.

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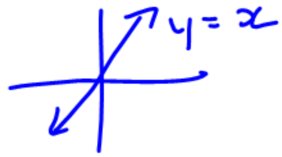
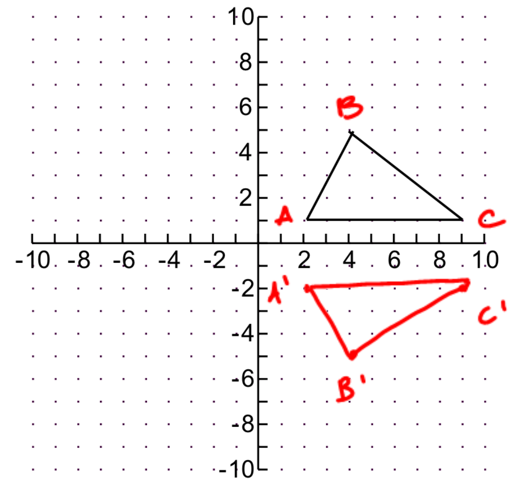
Shapes can be reflected over:

- The x axis
- -The y axis
- The line y=x or
- any other line



Ex: 1) Reflect ΔABC, A(2,1), B(4,5), C(9,1) over the x-axis.

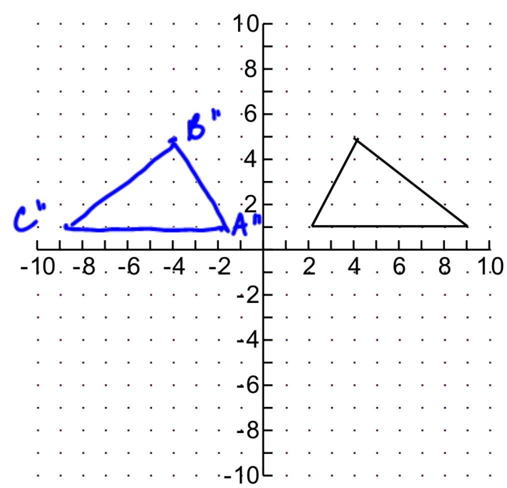


When you reflect over the x-axis:
(x , y) → (x , -y)

A' = "A prime"

A(2,1)---A′ (2,-1)
B(4,5)---B′ (4,-5)
C(9,1)---C′ (9,-1)

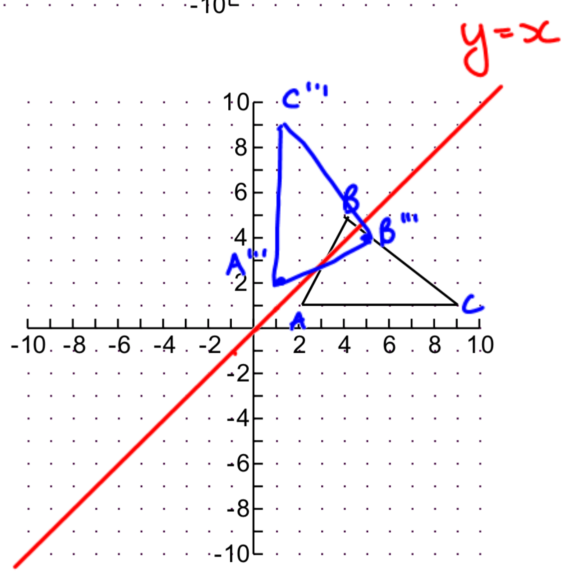
Ex: 2) Now reflect ΔABC over the y-axis:



When you reflect over the y-axis:
(x , y) → (-x , y) "A double prime"

A(2,1)---A″(-2,1)
B(4,5)---B″(-4,5)
C(9,1)---C″(-9,1)

Ex: 3) Now, reflect ΔABC over the line y = x



When you reflect over y = x:
(x , y) → (y , x)

A(2,1)---A‴(1,2)
B(4,5)---B‴(5,4)
C(9,1)---C‴(1, 9)

Homework: pg. 392 #1acd, 2ac, 3, 4, 5, 6

8.4 Symmetry on the Co-ordinate Plane Pt. 2

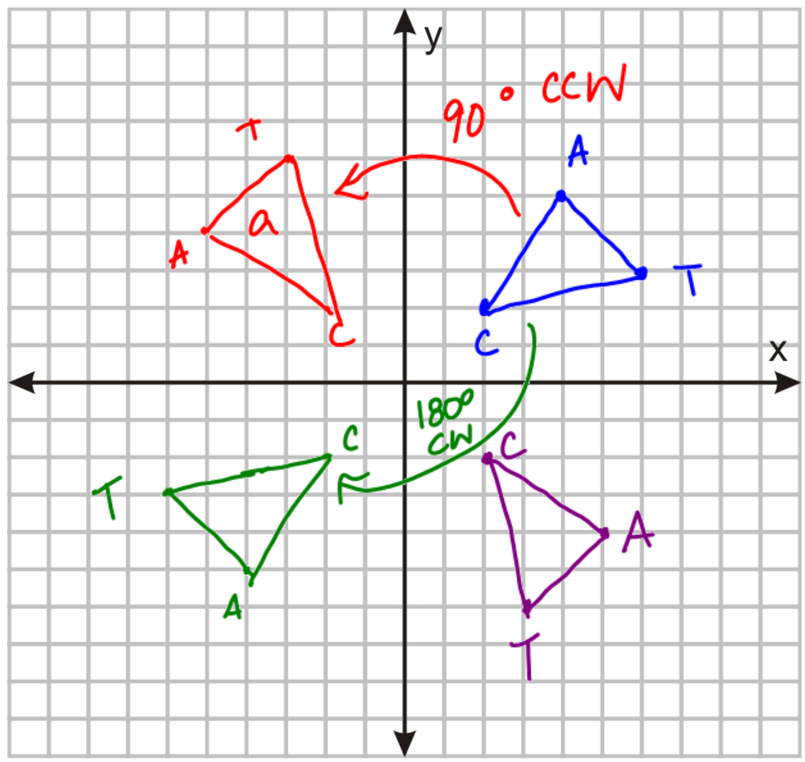
C. Rotations

Rotations – shapes can be rotated around the origin (0,0) or any other point.

CW = clockwise

CCW = counterclockwise

Ex:1) Sketch ΔCAT if C (2, 2), A(4, 5) and T(6, 3). (in blue)



a) C (-2, 2)
A (-5, 4)
T (-3, 6)

b) C (-2, -2)
A (-4, -5)
T (-6, -3)

c) C (2, -2)
A (5, -4)
T (3, -6)

a) Rotate ΔCAT 90° CCW around the origin (0, 0). (x, y) -> (y, x) -> (-y, x)

b) Rotate ΔCAT 180° CW around the origin. (x, y) -> (-x, -y)

c) Rotate ΔCAT 90° CW about ~~point C~~ (0, 0). (x, y) -> (y, x) -> (y -x)

* Remember: 90° CW = 270° CCW
180° CW = 180° CCW
270° CW = 90° CCW

Homework: pg 392, #1b, 2b, 3, 7b, 13; pg. 402 #1-3, 7