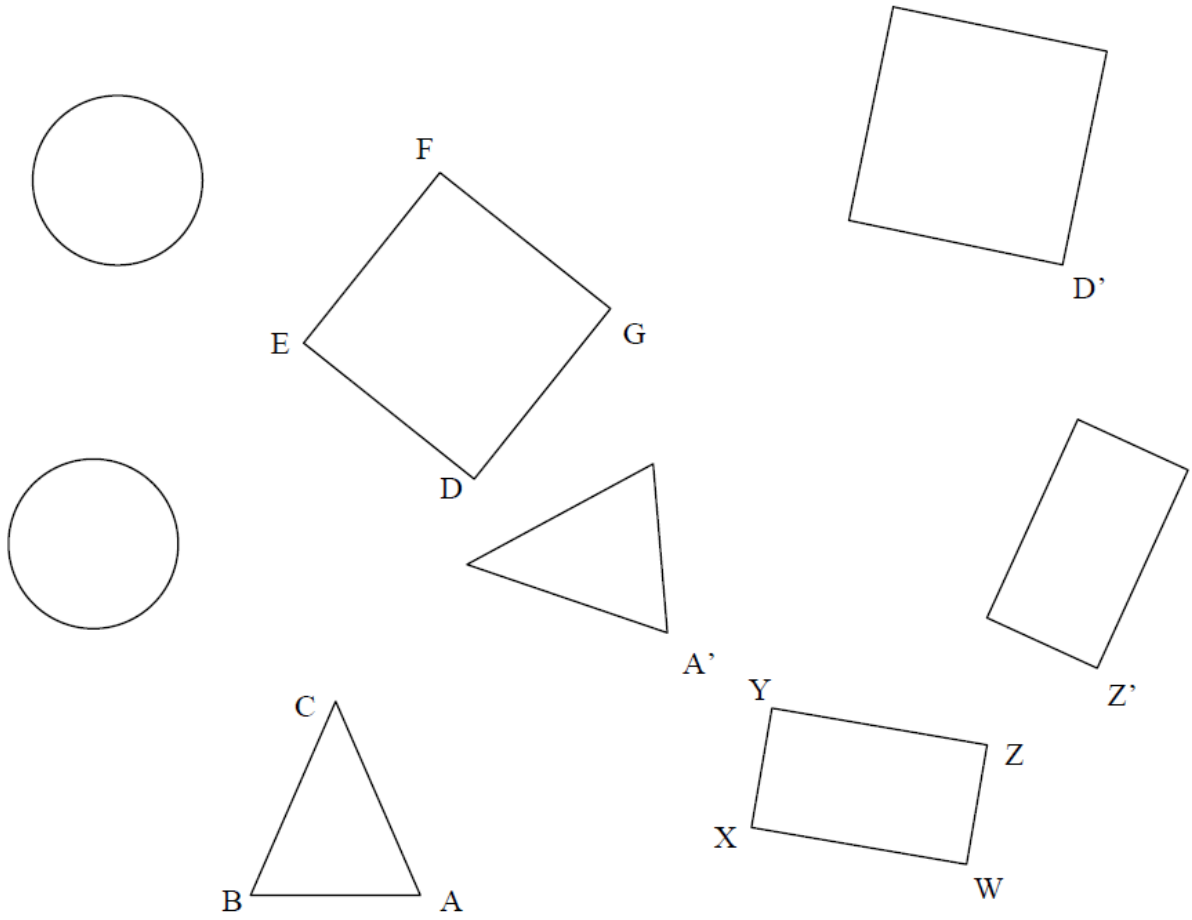
MIRA Transformations

A MIRA is an optical drawing tool that is partly reflective and partly transparent. A MIRA can be used to draw points and lines very accurately.

The "drawing" edge of the MIRA is the beveled edge. Every time you need to draw the line of reflection make sure you are using the "drawing" edge.

Finding line of reflection



Place your MIRA between the two circles above and move it until the image of one circle maps onto the other circle.

Use the pencil against the drawing edge of your MIRA to sketch the line of reflection between the two circles.

*Label the line **c**.*

*Find the line of reflection for each pair of congruent shapes. Label the lines as line **s** for the squares, line **r** for the rectangles, and line **t** for the triangles.*

For the triangle, square and rectangle, label the corresponding vertices on the images as follows:

Triangle: A', B' and C' ("A-prime", "B-prime", etc,)

Square: D', E', F', G'

Rectangle: W', X', Y', Z'

Using a ruler, connect each pair of corresponding vertices with a line segment.

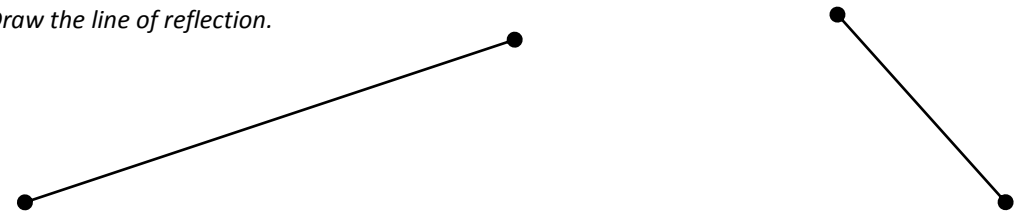
1. *Which pair of shapes could you not map onto each other?*

2. *Each line that you drew is called a line of reflection. Where is the line of reflection located in relation to the figures?*

3. *How is the line of reflection related to the lines connecting the corresponding vertices?*

Find the perpendicular bisector

Place your MIRA between the two endpoints of a line segment until one point is mapped onto another. Draw the line of reflection.

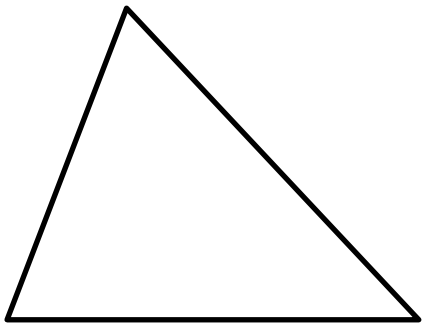


4. *How is the line of reflection related to the line segment?*

5. *Where is the line of reflection located on the line segment?*

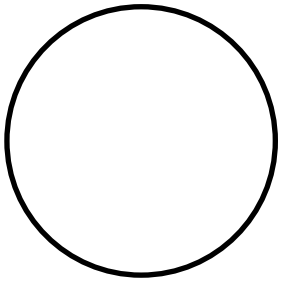
6. *Why is this line of reflection called a perpendicular bisector?*

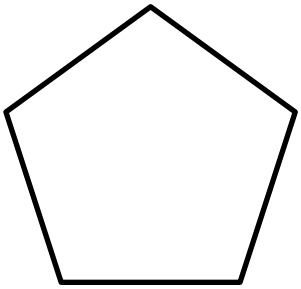
Find the perpendicular bisectors of each side of the triangle.

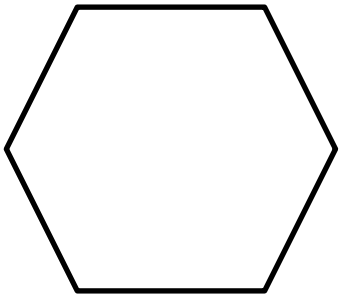


7. *The three perpendicular bisectors should meet at a single point. What do you call this point? (Look back in your book if you need to.)*

Find lines of symmetry







8. *In how many positions may the MIRA be placed so that the image of one half of the circle maps onto the other half? Draw a few of the lines. Do these lines have a special name?*

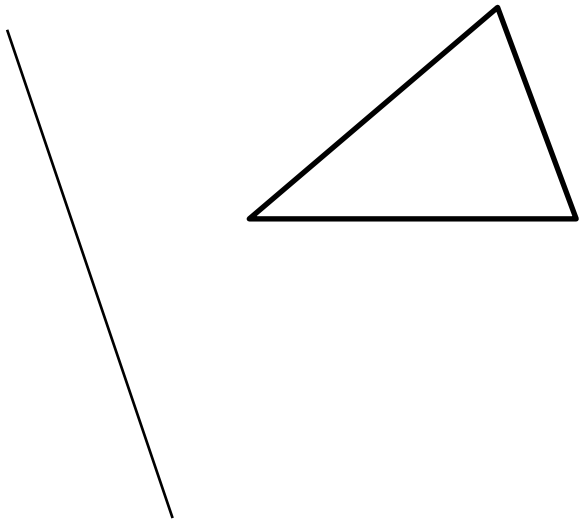
9. *Draw each line of reflection for the pentagon. In how many positions may this be done for the pentagon?*

10. *Draw each line of reflection for the hexagon. In how many positions may this be done for the hexagon?*

11. *Where do your lines intersect for each figure?*

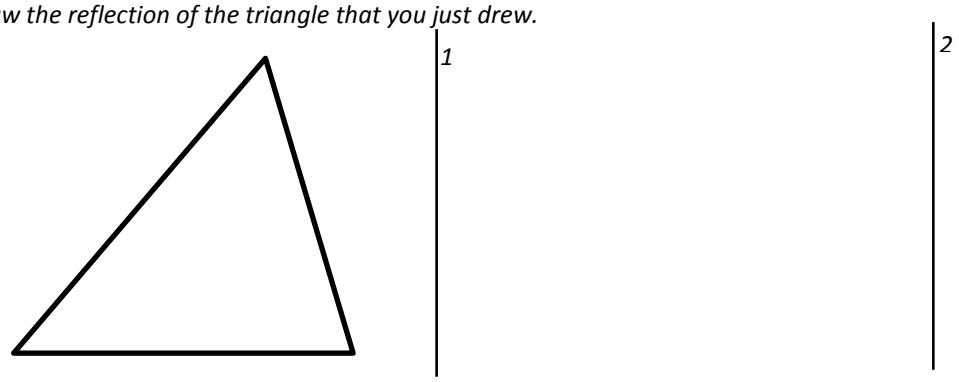
Given a polygon and a line of reflection, draw the reflection

Place your MIRA on the given line of reflection. Carefully draw the vertices of the reflection of the triangle. Use a ruler to draw the rest of the triangle.



12. *Use your ruler to draw segments connecting the corresponding vertices. Measure the distance from the corresponding vertices to the line of reflection. What do you notice about the distances?*

Place your MIRA on line one and carefully draw the vertices of the reflection of the triangle. Then move your MIRA to line two and draw the reflection of the triangle that you just drew.



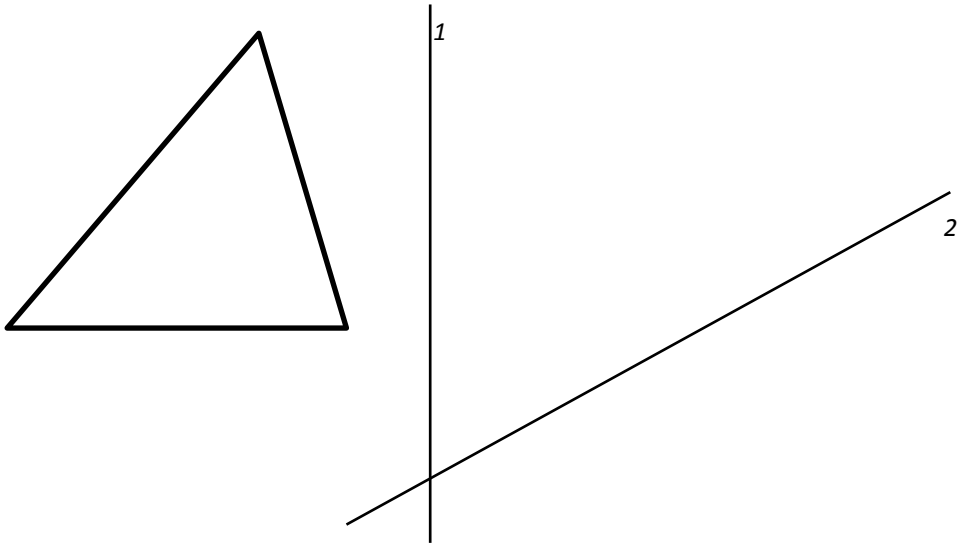
13. *What do you notice about the second reflection and the original triangle?*

14. *What type of transformation would have the same effect as this double reflection?*

15. *Use a ruler to measure the distance between the two lines of reflection. What is the distance?*

16. *Use a ruler to measure the distance between corresponding vertices of the second reflection and the original. How is this distance related to the distance between the two lines of reflection?*

Place your MIRA on line one and carefully draw the vertices of the reflection of the triangle. Then move your MIRA to line two and draw the reflection of the triangle that you just drew.



17. *What do you notice about the second reflection and the original triangle?*

18. *What type of transformation would have the same effect as this double reflection?*

19. *Use a protractor to measure the angle between the two lines of reflection. What is the angle?*

20. *Draw a line segment connecting a vertex of the original triangle with the intersection of the lines of reflection. Draw a line segment connecting the corresponding vertex of the second reflection with the intersection of the lines of reflection. Use a protractor to measure the angle between these two lines. How is this angle related to the angle between the two lines of reflection?*