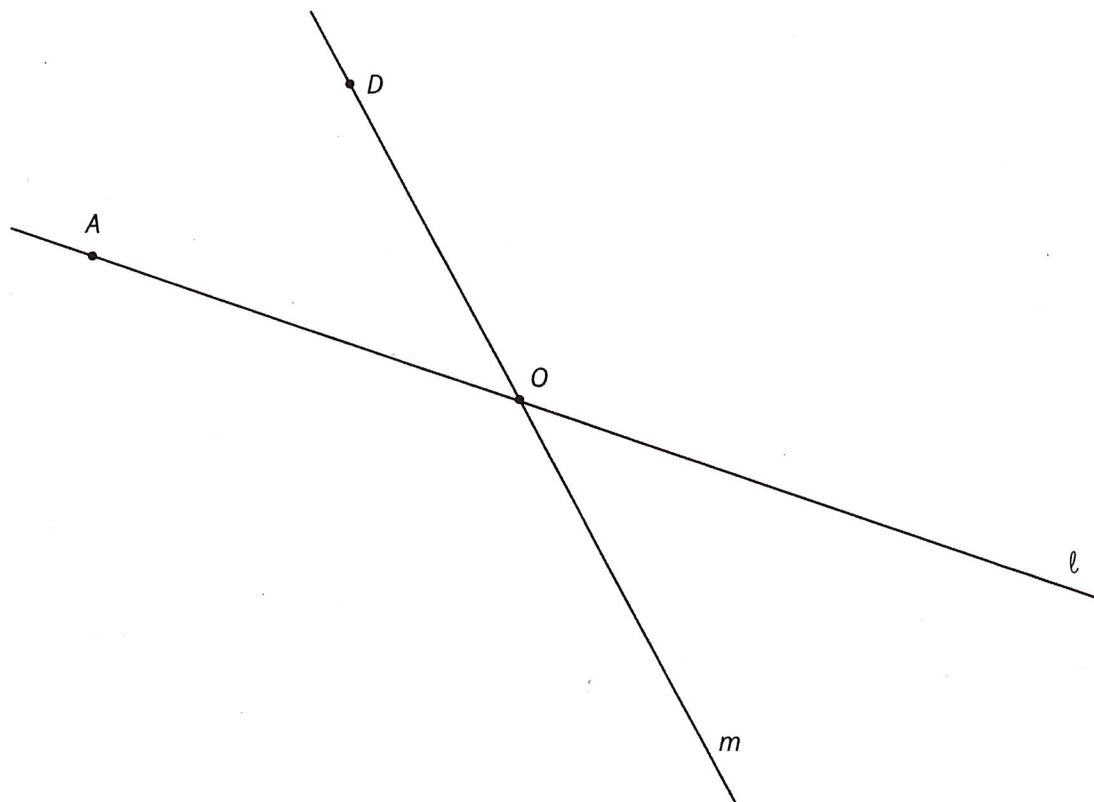


3. The diagram shows two lines  $\ell$  and  $m$  that intersect at a point  $O$  with point  $A$  on  $\ell$  and point  $D$  on  $m$ .
- Rotate the figure 180 degrees around  $O$ . Label the image of  $A$  as  $A'$  and the image of  $D$  as  $D'$ .
  - What do you know about the relationship between the angles in the figure? Explain or show your reasoning.



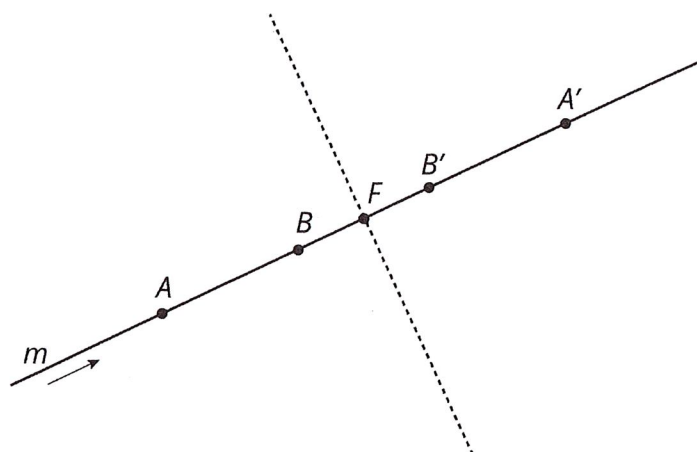
### Lesson 9 Summary

Rigid transformations have the following properties:

- A rigid transformation of a line is a line.
- A rigid transformation of two parallel lines results in two parallel lines that are the same distance apart as the original two lines.

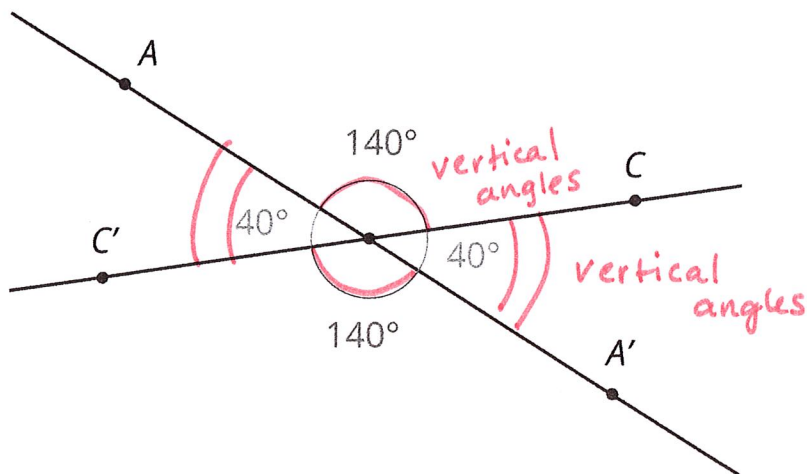
\* Sometimes the original lines are not parallel to the image lines, but both sets of lines are still parallel

- Sometimes, a rigid transformation takes a line to itself. For example:



- A translation parallel to the line. The arrow shows a translation of line  $m$  that will take  $m$  to itself.
- A rotation by  $180^\circ$  around any point on the line. A  $180^\circ$  rotation of line  $m$  around point  $F$  will take  $m$  to itself.
- A reflection across any line perpendicular to the line. A reflection of line  $m$  across the dashed line will take  $m$  to itself.

These facts let us make an important conclusion. If two lines intersect at a point, which we'll call  $O$ , then a  $180^\circ$  rotation of the lines with center  $O$  shows that vertical angles are congruent. Here is an example:



Rotating both lines by  $180^\circ$  around  $O$  sends angle  $AOC$  to angle  $A'OC'$ , proving that they have the same measure. The rotation also sends angle  $AOC'$  to angle  $A'OC$ .

### Lesson 9 Glossary Terms

- vertical angles