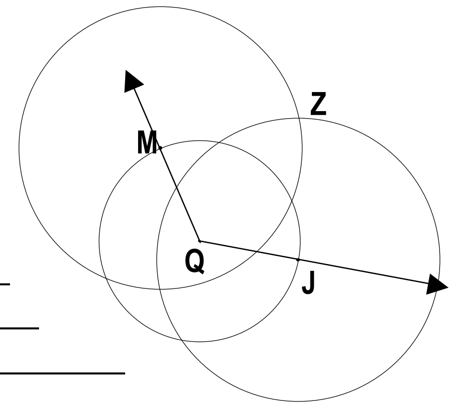
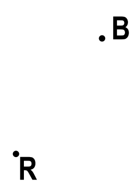
3.9 Lesson
Name (print first and last) ____________________________________ **Per**_____ **Date:** 10/24 due 10/25
3.9 Rigid Transformations: Parallel Lines & Rotation **Geometry Regents 2013-2014 Ms. Lomac**
SLO: I can articulate the invariant qualities of reflections, rotations and translations and explain relationships involving perpendicular bisectors.



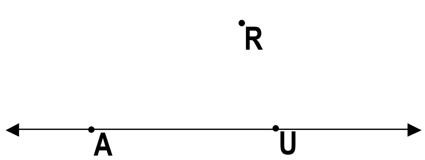
(1) ☐ The steps for constructing an angle bisector are listed below. Describe what each step does for you. Complete the final step.
(1) Construct circle Q.____
____
(2) Construct circles J and M with the same radius measure.______________
____
____
(3) Construct . . . .____
____

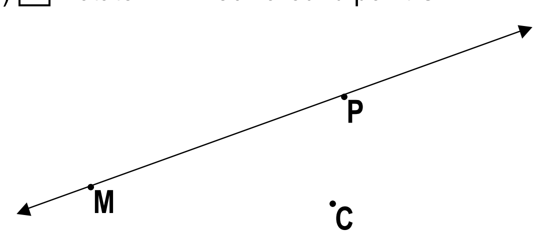
(2) ☐ How can we rotate a point 180° around a center of rotation? Rotate the points below to help you answer this question.
(a) ☐ Rotate B 180° around point R (b) ☐ Rotate Z 180° around point C



So, how can we rotate a point 180° around a center of rotation? ______________________________
____
____
____

(3) What seems to happen when we rotate a line 180° around a center of rotation? Rotate the points below to help you answer this question. (Is rotating 2 points on a line enough to determine the line after rotation? ________________
(a) ☐ Rotate $\overleftrightarrow{AU}$ 180° around point R (b) ☐ Rotate $\overleftrightarrow{MP}$ 180° around point C





So, what seems to happen when you rotate a line 180° around a center of rotation? ______________________
____

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(4) ☐ Prepare your mind to prove that rotating a line 180° around a point not on the line ALWAYS results in parallel lines.

(a) ☐ True or false: Two lines in a plane are either **parallel** or **not parallel**. ____________________

(b) ☐ Lines are not parallel if they ______________________.

(c) ☐ True or false: A point can be on a line and not on the line at the same time. ________________

(d) ☐ A **contradiction** happens when a claim is made that two things happen at the same time which cannot possibly happen at the same time. For example: Ms. Lomac is in Albany and in Rochester right now. Write your own contradiction: ____

(5) ☐ Prove that rotating a line 180° around a point that is not on the line ALWAYS results in parallel lines. The easiest way to prove this is by contradiction. Use the Geogebra file on Ms. Lomac's website to see what is happening at each step by checking the box. (http://rcsdk12.org/Page/32037)

Start your proof by **contradiction** by assuming the OPPOSITE of what you want to prove.

1. Assume that rotating $\overleftrightarrow{AB}$ (☐AB) 180° around point C (☐C) not on $\overleftrightarrow{AB}$ ____________________ result in parallel lines.

2. Since the lines are not parallel, then $\overleftrightarrow{A'B'}$ (☐A'B') must ______________ $\overleftrightarrow{AB}$ in some point X (☐X) on $\overleftrightarrow{AB}$ and $\overleftrightarrow{A'B'}$.

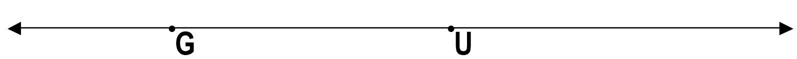
3. Since $\overleftrightarrow{A'B'}$ is a rotation of $\overleftrightarrow{AB}$ there must exist a point X' (☐X') on $\overleftrightarrow{A'B'}$ such that ______ is a diameter of circle C.

4. Since both X and X' must be on $\overleftrightarrow{A'B'}$ and $\overline{XX'}$ must contain C (since it is a diameter), then point C must be on _______. (Drag points to convince yourself that C must be on $\overleftrightarrow{A'B'}$ and $\overline{XX'}$.)

5. In step 1, we said that point C is not ________________. If point C ___________________ then it cannot be on ______________. In step 5 we said that point C must be on _______. This is impossible because point C cannot be _________________ AND _______________________. Since this is a contradiction, our assumption that rotating $\overleftrightarrow{AB}$ 180° around point C not on $\overleftrightarrow{AB}$ ____________________ result in parallel lines ____________ true. The only alternative to our assumption is that ______________________ ____

EXIT TICKET

(6) ☐ Construct $\overleftrightarrow{G'U'}$ parallel to $\overleftrightarrow{GU}$ by choosing a point L not on $\overleftrightarrow{GU}$ and rotating $\overleftrightarrow{GU}$ 180° around point L



☐ L is the midpoint of _____ and ______ because____
____

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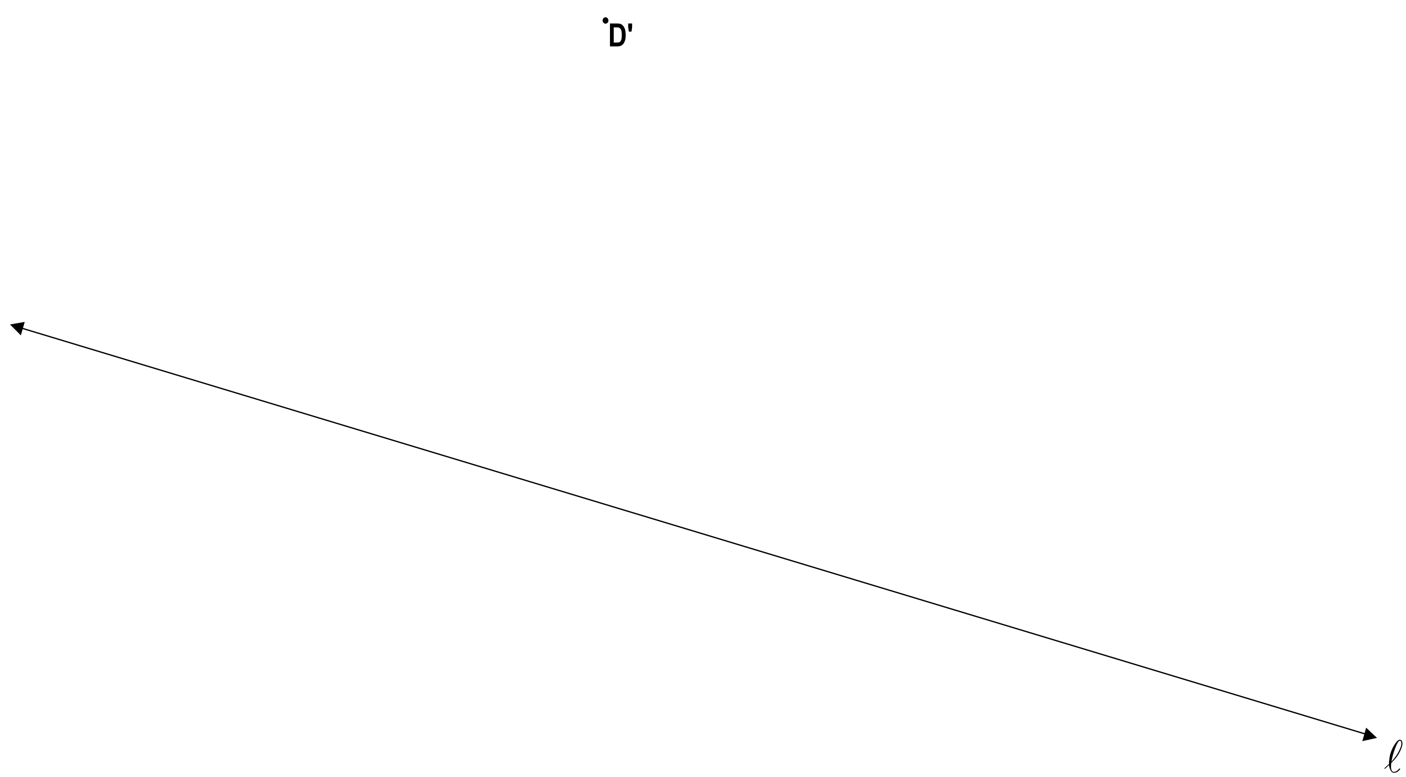
On the diagram below:

- [ ] Choose 2 points on line ℓ and label them N and E.
- [ ] Draw a line containing points N and D.
- [ ] Construct the midpoint of $\overline{ND}$ and label it O.

  You can do this by folding or by constructing the perpendicular bisector of $\overline{ND}$.

  Why does folding locate the midpoint?______________________________

  Why does a perpendicular bisector locate the midpoint? ______________________________
- [ ] Construct the rotation of line ℓ 180° around point O by rotating N and E.
- [ ] Label the image points D' and I respectively
- [ ] Construct the line containing I and T.
- [ ] Does $\overleftrightarrow{IT}$ appear to be parallel to $\overleftrightarrow{NE}$? ______



3.9 Exit Ticket Name____Per______

#6 on the lesson page.