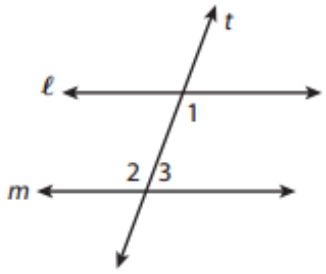
4.3-4.4 Proofs and Constructions

Justify Reasoning Write a two-column proof of the Converse of the Alternate Interior Angles Theorem.

Given: lines ℓ and m are cut by a transversal t; $\angle 1 \cong \angle 2$

Prove: $\ell \parallel m$

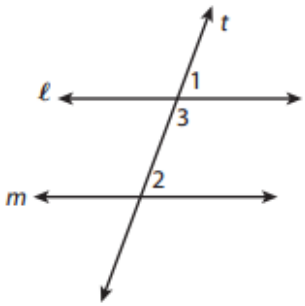


Statements	Reasons
① Lines ℓ & m are cut by a transversal ; ∠1 ≅ ∠2	① Given
② ∠2 & ∠3 are supp	② Linear Pair Thm
③ m∠2 + m∠3 = 180°	③ Def of Supp.
④ m∠1 = m∠2	④ Def of ≅
⑤ m∠1 + m∠3 = 180°	⑤ Subst. Prop.
⑥ ∠1 & ∠3 are supp.	⑥ Def of Supp.
⑦ ℓ ∥ m	⑦ Consec. Int ∠'s CONVERSE Thm

Justify Reasoning Write a two-column proof of the Converse of the Corresponding Angles Theorem.

Given: lines ℓ and m are cut by a transversal t; $\angle 1 \cong \angle 2$

Prove: $\ell \parallel m$



Statements	Reasons
① lines l & m are cut by a transversal ; ∠1 ≅ ∠2	① Given
② m∠1 + m∠3 = 180°	② Linear Pair thm
③ m∠1 = m∠2	③ Def of ≅
④ m∠2 + m∠3 = 180°	④ Subst. Prop.
⑤ ∠2 & ∠3 are Supp	⑤ Def of Supp.
⑥ l ∥ m	⑥ Consec. Int ∠'s Converse thm

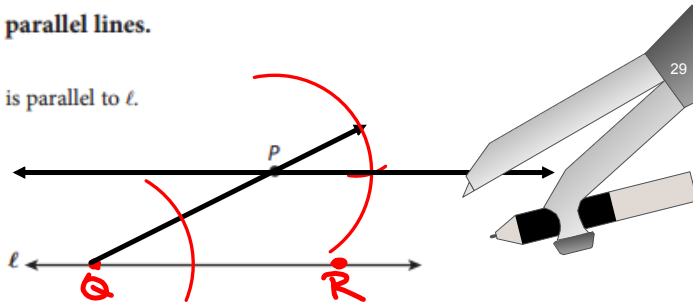
Explain 2 Constructing Parallel Lines

The Parallel Postulate guarantees that for any line ℓ, you can always construct a parallel line through a point that is not on ℓ.

The Parallel Postulate

Through a point P not on line ℓ, there is exactly one line parallel to ℓ.

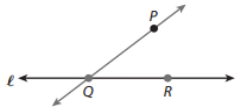
Example 2 **Use a compass and straightedge to construct parallel lines.**



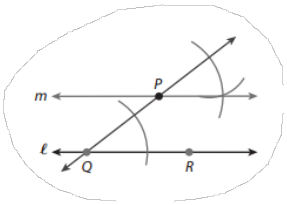
(A) Construct a line m through a point P not on a line ℓ so that m is parallel to ℓ.

Step 1 Draw a line ℓ and a point P not on ℓ.

Step 2 Choose two points on ℓ and label them Q and R. Use a straightedge to draw $\overleftrightarrow{PQ}$.



Step 3 Use a compass to copy $\angle PQR$ at point P, as shown, to construct line m.

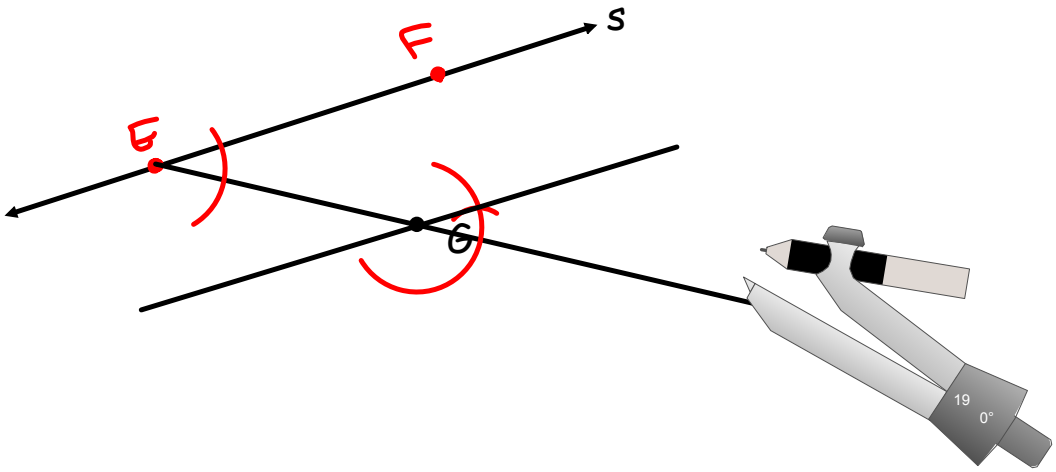


(B) In the space provided, follow the steps to construct a line r through a point G not on a line s so that r is parallel to s.

Step 1 Draw a line s and a point G not on s.

Step 2 Choose two points on s and label them E and F. Use a straightedge to draw $\overleftrightarrow{GE}$.

Step 3 Use a compass to copy $\angle GEF$ at point G. Label the side of the angle as line r.
line $r \parallel$ line s



4.4 Perpendicular Lines

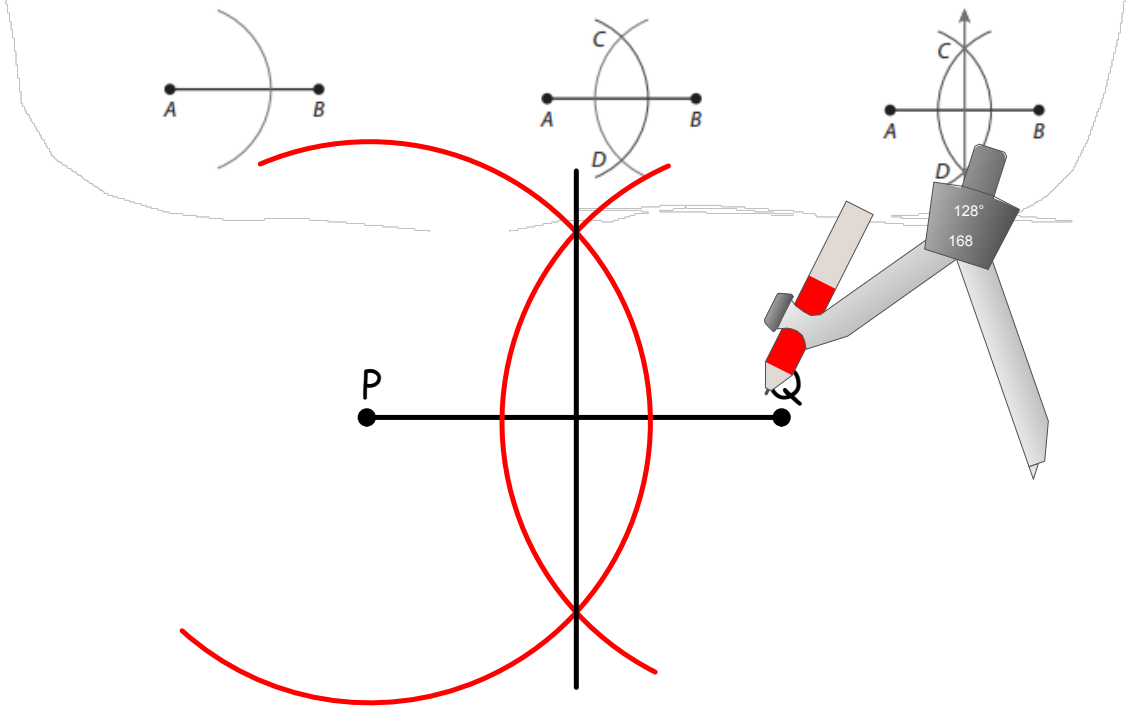
Explore Constructing Perpendicular Bisectors and Perpendicular Lines

In Steps A–C, construct the perpendicular bisector of $\overline{AB}$.

A Place the point of the compass at point A. Using a compass setting that is greater than half the length of $\overline{AB}$, draw an arc.

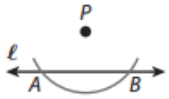
B Without adjusting the compass, place the point of the compass at point B and draw an arc intersecting the first arc in two places. Label the points of intersection C and D.

C Use a straightedge to draw $\overline{CD}$, which is the perpendicular bisector of $\overline{AB}$.

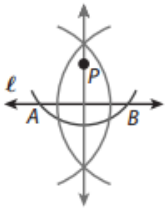


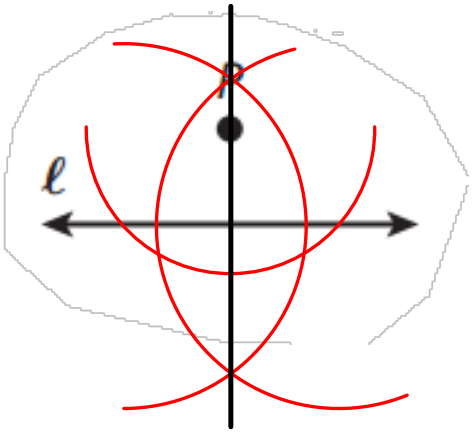
In Steps D–E, construct a line perpendicular to a line ℓ that passes through some point P that is not on ℓ.

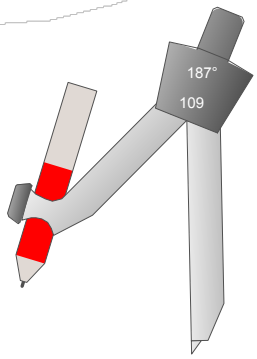
(D) Place the point of the compass at P. Draw an arc that intersects line ℓ at two points, A and B.



(E) Use the methods in Steps A–C to construct the perpendicular bisector of $\overline{AB}$.







Homework

Worksheet

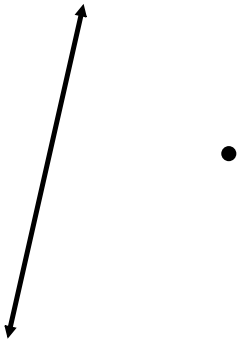
Geometry 4.3-4.4 Proofs and Constructions

Name: _____ Date: _____ Hr: ___

Draw a line parallel to the given line and through the given point.

1)

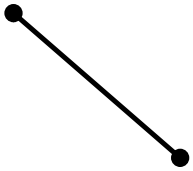
2)



Construct a perpendicular bisector for each segment.

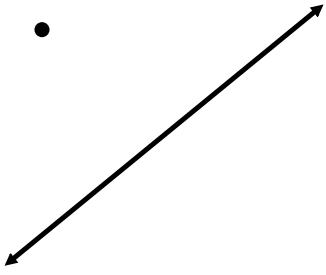
3)

4)



Construct a line that is perpendicular to the given line and goes through the given point.

5)



6)