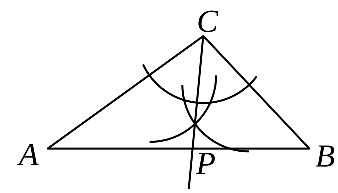
Geometry Assignments: Constructions

Day	Topics	Homework	HW Grade	Quiz Grade
1	Basic constructions	**HW T - 1**		
2	Practice	**HW T - 2**		
3	More practice	**HW T - 3**		
4	Practice and learn	**HW T - 4**		
5	Practice and learn some more	**HW T - 5**		
6	*****TEST*****			

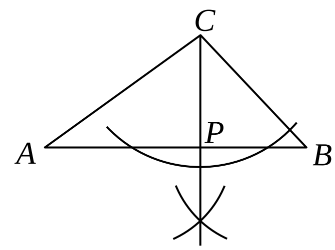
Geometry HW: Constructions - 1

Name ______________________________

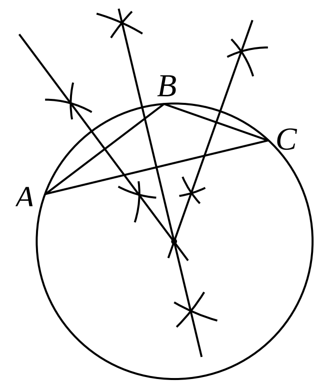
1. In the accompanying diagram of a construction, what does $\overline{CP}$ represent?
   (1) an altitude drawn to $\overline{AB}$
   (2) a median drawn to $\overline{AB}$
   (3) the bisector of $\angle ACB$
   (4) the perpendicular bisector of $\overline{AB}$



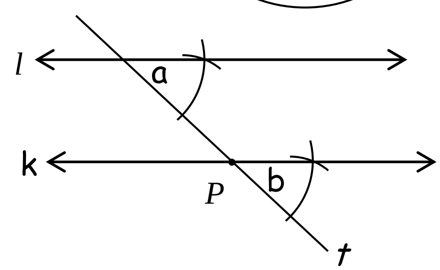
2. In the accompanying diagram of a construction, what does $\overline{CP}$ represent?
   (1) an altitude drawn to $\overline{AB}$
   (2) a median drawn to $\overline{AB}$
   (3) the bisector of $\angle APB$
   (4) the perpendicular bisector of $\overline{AB}$



3. The diagram at right shows the construction of the center of the circle circumscribed about $\triangle ABC$. This construction represents how to find the intersection of
   (1) the angle bisectors of $\triangle ABC$
   (2) the medians to the sides of $\triangle ABC$
   (3) the altitudes to the sides of $\triangle ABC$
   (4) the perpendicular bisectors of the sides of $\triangle ABC$

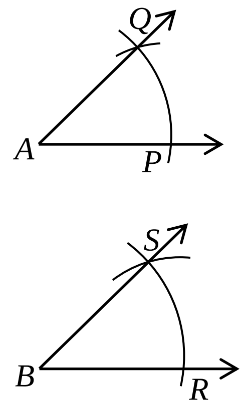


4. Ethelbert was told to construct a line parallel to line l through point P. He drew transversal t through point P and then used the congruent angle construction to construct $\angle b \cong \angle a$. He calls the final line of his construction k which he claims is parallel to line l. What one-sentence justification could he offer to tell why line k must be parallel to line l?



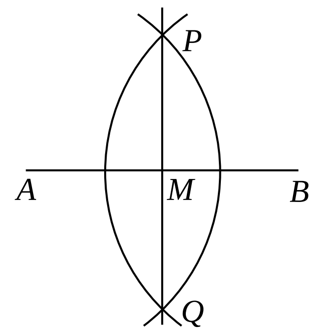
3. Elmer has to find the centroid of $\triangle ABC$. Describe how Elmer can find the centroid by construction.

6. Elyssa needs to justify why the construction shown below makes $\angle B \cong \angle A$. Help her by giving appropriate reasons for statements 4 and 5 of her proof.



Statements	Reasons
1. Draw segments $\overline{PQ}$ and $\overline{RS}$	1. Two points determine a unique line.
2. $\overline{AQ} \cong \overline{BS}$ and $\overline{AP} \cong \overline{BR}$	2. Congruent circles have congruent radii.
3. $\overline{PQ} \cong \overline{RS}$	3. Same as #3
4. $\Delta APQ \cong \Delta BRS$	4.
5. $\angle B \cong \angle A$	5.

7. Edgar needs to justify why $\overline{PQ}$ in the construction at right is the perpendicular bisector of $\overline{AB}$.



Statements	Reasons
1. Draw segments $\overline{AP}$, $\overline{BP}$, $\overline{AQ}$, $\overline{BQ}$	1.
2. $\overline{AP} \cong \overline{BP}$ (S) and $\overline{AQ} \cong \overline{BQ}$ (S)	2.
3. $\overline{PQ} \cong \overline{PQ}$ (S)	3.
4. $\Delta APQ \cong \Delta BPQ$	4.
5. $\angle APM \cong \angle BPM$ (A)	5.
6. $\overline{PM} \cong \overline{PM}$ (S)	6.
7. $\Delta APM \cong \Delta BPM$	7.
8. $\overline{AM} \cong \overline{BM}$ so $\overline{PQ}$ bisects $\overline{AB}$	8.
9. $\angle AMP \cong \angle BMP$	9.
10. $\angle AMP \cong \angle BMP$ are rt. $\angle$s so $\overline{PQ} \perp \overline{AB}$	10.

9. Complete the following.

a. The locus of points equidistant from two points A and B is

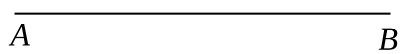
b. The locus of points equidistant from the sides of $\angle A$ is

Geometry HW: Constructions - 2

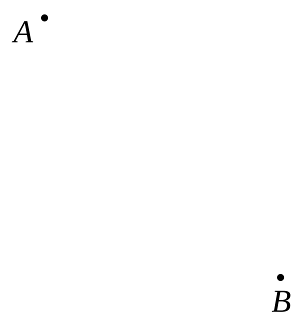
Name _________________________________

Use the basic constructions you learned on Day 1 of the unit to do the following. I will be looking for evidence that you know the correct method for each one. *All construction marks must show clearly on your paper.*

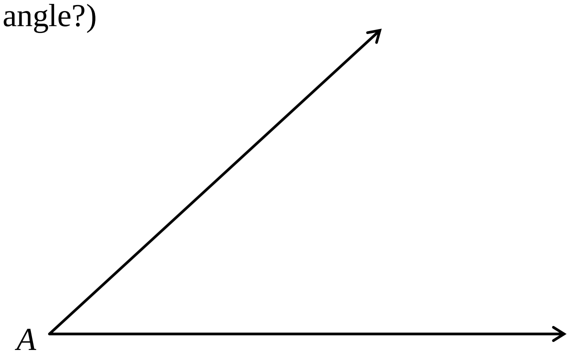
1. Construct an equilateral triangle that has $\overline{AB}$ as its base.



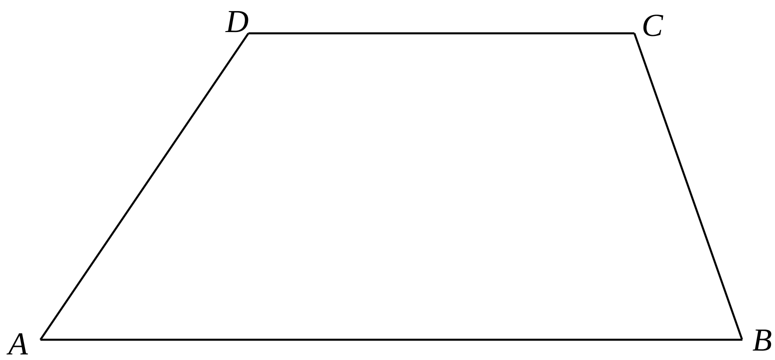
2. Construct the set of points in the plane that are equidistant from points *A* and *B*. (From last unit, what are the points that are equidistant from the endpoints of $\overline{AB}$?)



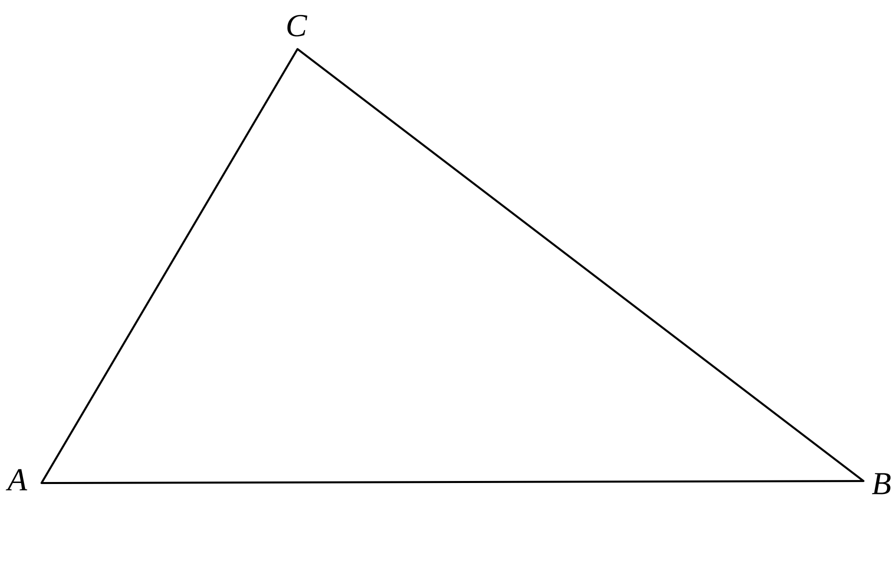
3. Construct the set of points that are equidistant from the sides of $\angle A$. (From last unit, what are the points that are equidistant from the rays of an angle?)



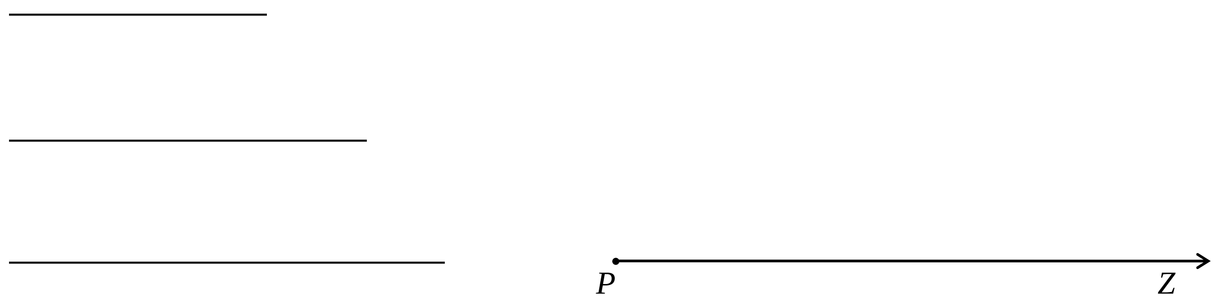
4. Find the altitude from D in the trapezoid below. (It may be convenient to extend side $\overline{AB}$ past A.)



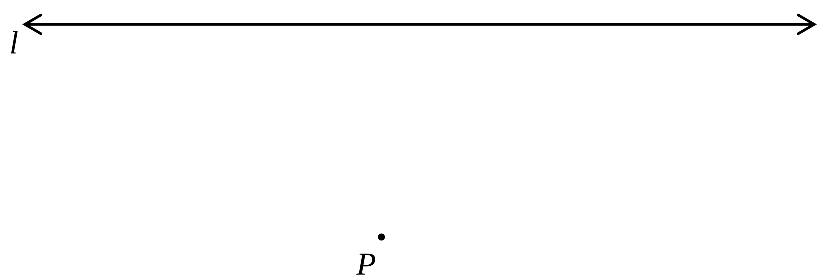
5. Find the centroid of ΔABC and label it G.



6. In the space to the right, construct ΔPQR using the three sides below with longest side $\overline{PQ}$ longest side on ray *PZ*.



7. Construct a line through point *P* parallel to line *l* .

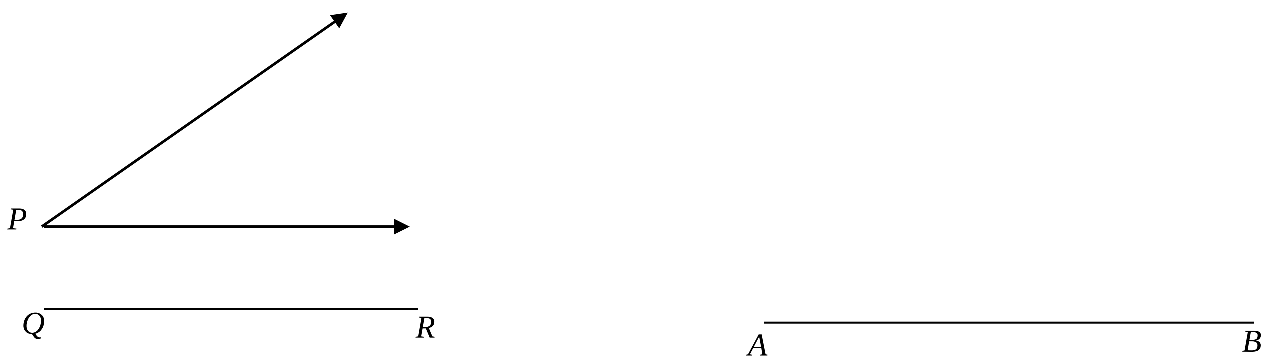


Geometry HW: Constructions - 3

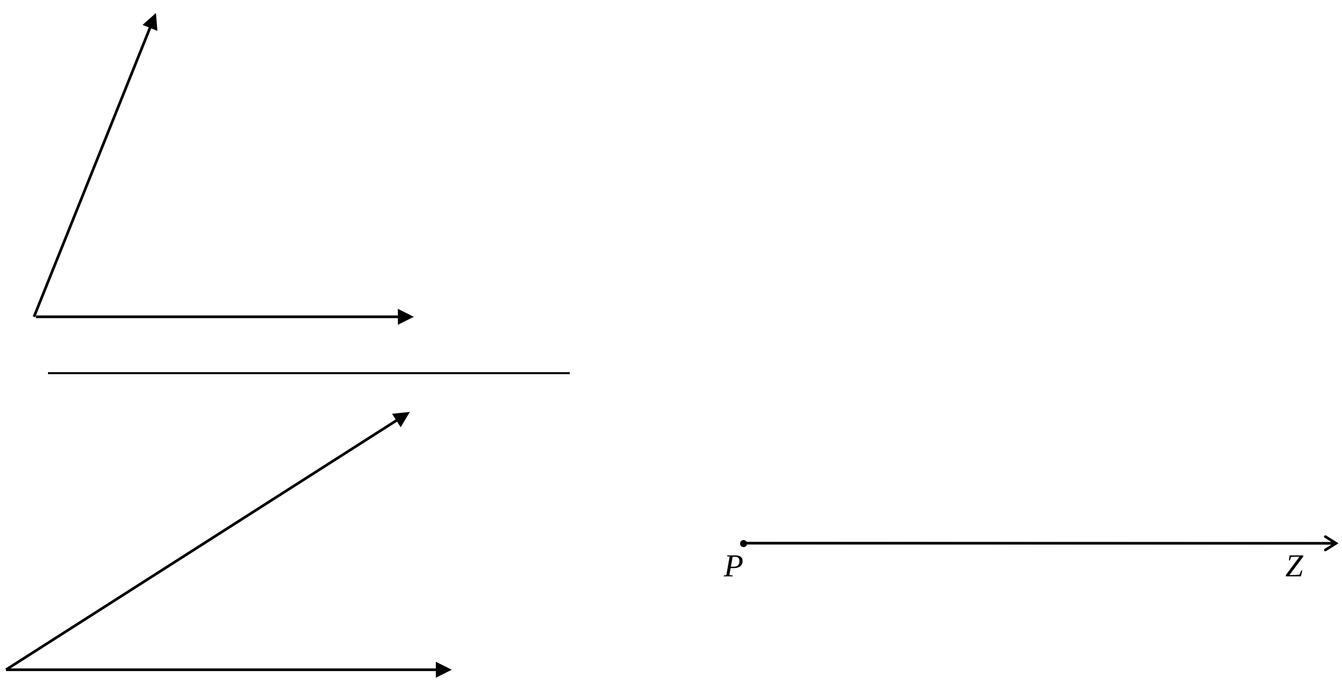
Name ________________________________

Do the following constructions. Again, I will be looking for evidence that you know the correct method for each one. *All construction marks must show clearly on your paper.*

1. Let $\overline{AB}$ (below right) be the base of ΔABC.
   a. Construct ΔABC so that $\angle A \cong \angle P$ and $\overline{AC} \cong \overline{QR}$.
   b. Assuming you and a classmate both make perfect constructions, will your triangles be congruent or could two triangles made from these parts be non-congruent? Justify your answer.

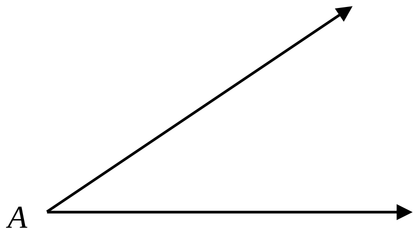


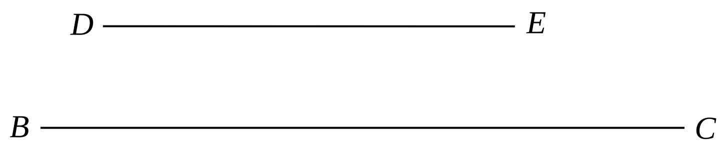
2. In the space to the right, construct a triangle using the given angles and side below assuming that the side is included between the two angles. Let one side of the triangle be on ray *PZ* with one vertex at *P*.

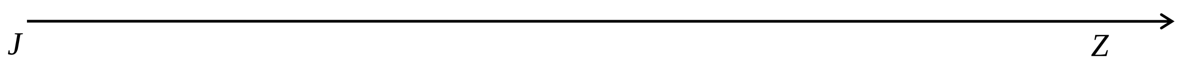


3. a. Using ray JZ below, construct $\angle KJZ \cong \angle A$. Construct $\overline{JK} \cong \overline{BC}$.

   b. From K, construct an arc of radius DE that intersects ray JZ twice. Label the intersections L and M. Draw $\overline{KL}$ and $\overline{KM}$.



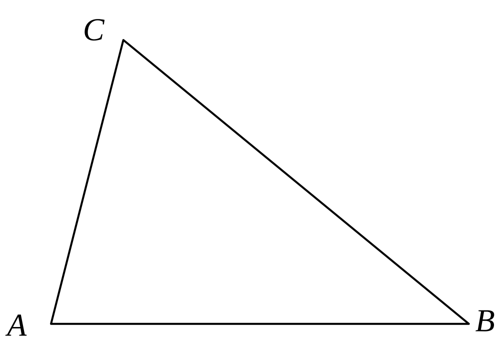


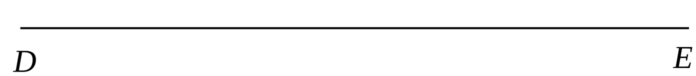


   c. You should now have two triangles, JKL and JKM. Give one reason (you have three to choose from) that proves the triangles are *not* congruent.

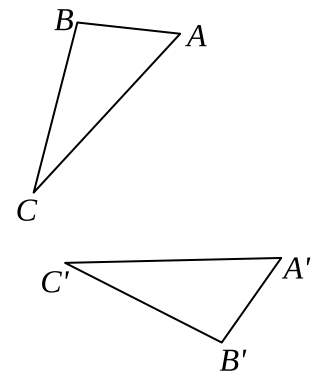
   d. We have $\overline{JK} \cong \overline{JK}$ (S) and $\angle J \cong \angle J$ (A) both by the reflexive postulate and $\overline{KL} \cong \overline{KM}$ (S) because radii of the dame arc (circle) are congruent. Why doesn't this prove the triangles *are* congruent?

4. Construct ΔDEF similar to ΔABC given side $\overline{DE}$.

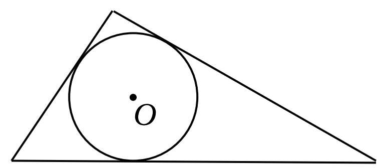




5. $\Delta A'B'C'$ is the image of ΔABC after a line reflection. Describe (two steps) how you could find the line of reflection by construction. You don't actually have to do the construction (unless you want to).



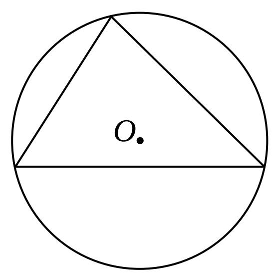
6. Fritz wants to construct an *inscribed circle* in a triangle. This is a circle that is inside the triangle and intersects each side in just one point. The center of this circle is called the *incenter* of the triangle.



   a. The incenter of a triangle is (multiple choice)
      (1) at the centroid of the triangle.
      (2) equidistant from the vertices of the triangle.
      (3) equidistant from the sides of the triangle.

   b. Describe briefly how Fritz can find the incenter by construction.

7. Frieda wants to construct a *circumscribed circle* around a triangle. This is a circle that is outside the triangle and passes through each vertex. The center of this circle is called the *circumcenter* of the triangle.



   a. The circumcenter of a triangle is (multiple choice)
      (1) at the centroid of the triangle.
      (2) equidistant from the vertices of the triangle.
      (3) equidistant from the sides of the triangle.

   b. Describe briefly how Frieda can find the circumcenter by construction.

Geometry HW: Constructions - 4

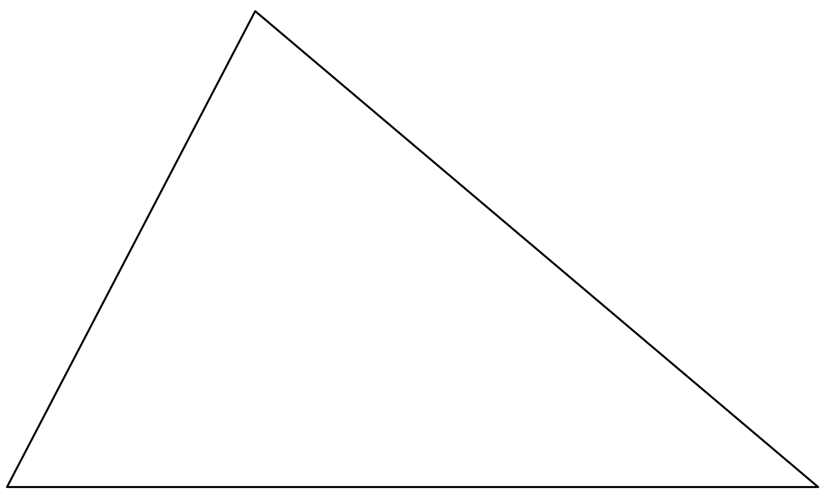
Name ______________________________

Today, besides practicing constructions, we are trying to learn/relearn some important facts about concurrent segments in triangles.

1. a. Construct all three medians in the triangle below.

   b. What is the point where the medians meet called?

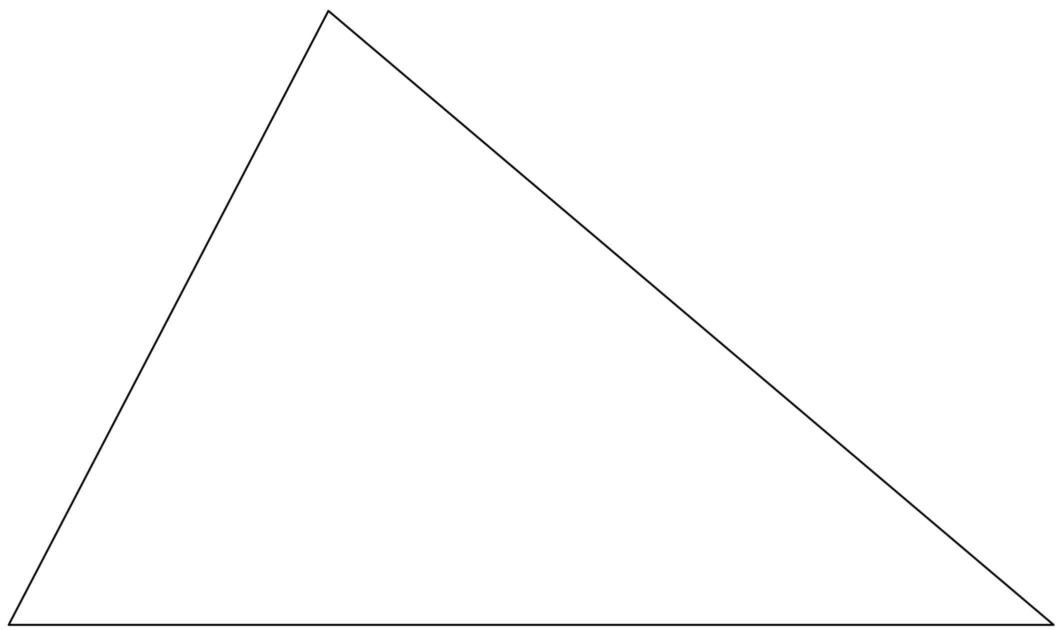
   c. Give two properties of this point.



2. a. Construct all three perpendicular bisectors of the sides of the triangle below.

   b. Learn this vocabulary word: The point where the three perpendicular bisectors intersect is called the *circumcenter* of the triangle.

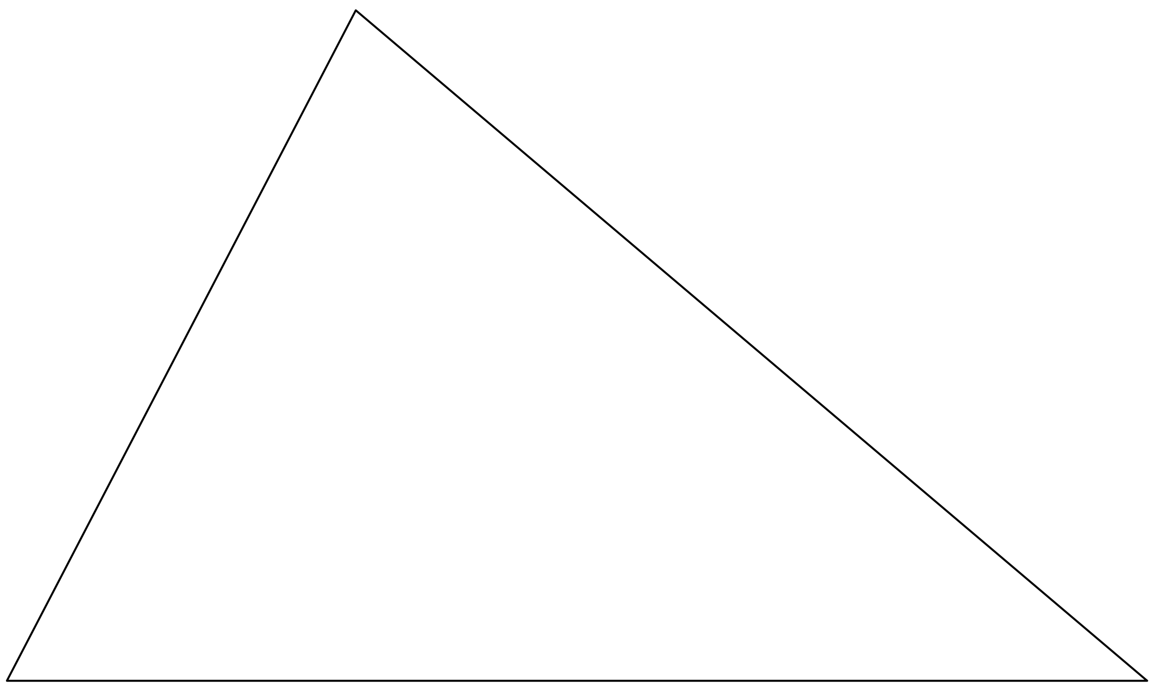
   c. Place the point of your compass on the circumcenter and the pencil on any vertex. Draw a circle. If everything went perfectly, what should have happened? This is called the *circumscribed circle* for the triangle (learn this vocabulary).



3. a. Construct all three angle bisectors of the triangle below.

   b. Learn this vocabulary word: The point where the three perpendicular bisectors intersect is called the *incenter* of the triangle.

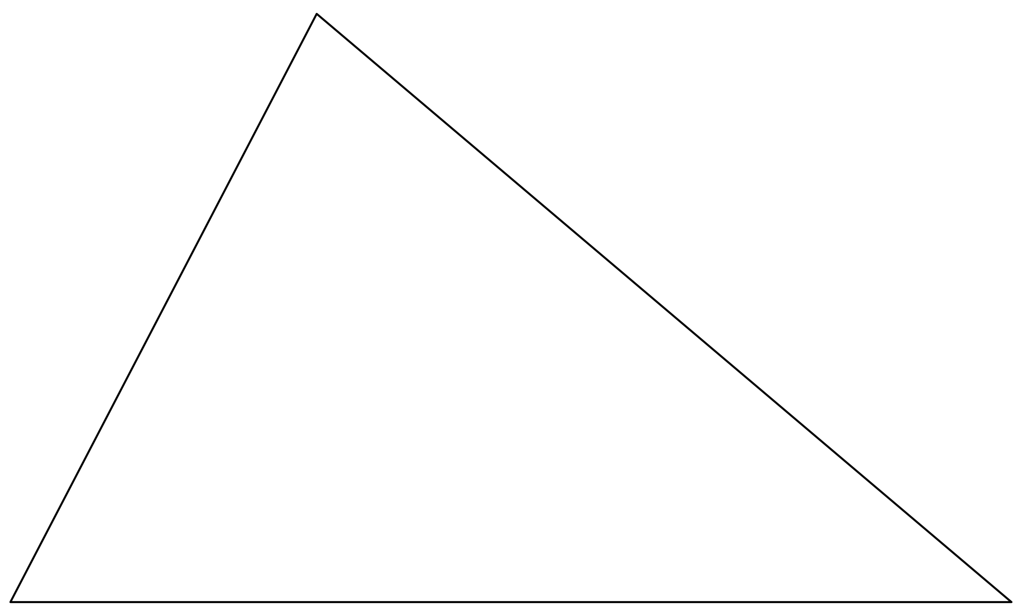
   c. Construct a line through the incenter and perpendicular to any one side of the triangle. Place the point of your compass on the incenter and the pencil on the point where your perpendicular intersects the side. Draw a circle. If everything went perfectly, what should have happened? This is called the *inscribed circle* for the triangle (learn this vocabulary).



4. a. Construct all three altitudes of the triangle below.

   b. Learn this vocabulary word: The point where the three altitudes intersect is called the *orthocenter* of the triangle.

   c. There really is no *c*. Other than the fact it exists, the orthocenter has no properties of interest in high school geometry.

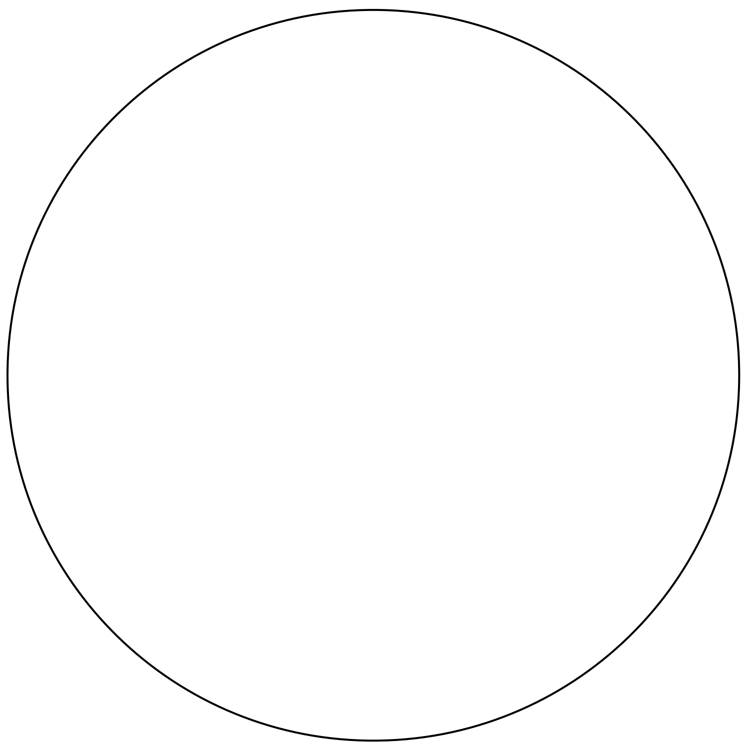


Geometry HW: Constructions - 5

Name ______________________________

Do the following constructions. Again, I will be looking for evidence that you know the correct method for each one. *All construction marks must show clearly on your paper.*

1. We want to construct a diameter of a circle and find the center of the circle.
   a. Draw any convenient chord $\overline{AB}$. (Don't make it really short but don't try to make it a diameter.)
   b. Construct the perpendicular bisector of $\overline{AB}$. Label the points where it intersects the circle *C* and *D*. $\overline{CD}$ is a diameter.
   c. Construct the perpendicular bisector of $\overline{CD}$ to find the center of the circle. Label the center *O*.



2. We want to construct a regular hexagon inscribed in circle *O*.

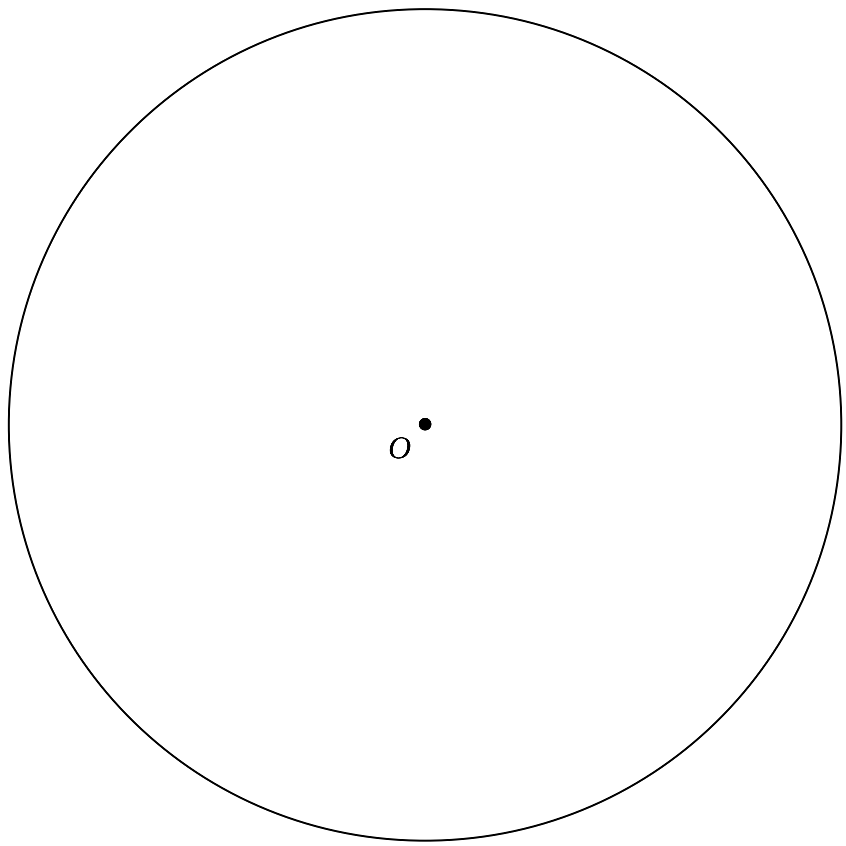
   a. Mark any point on the circle; label it *A*.

   b. With *A* as a center and with radius *OA*, make a short arc that intersects the circle; label that point *B*.

   c. With *B* as a center and with radius *OA*, make a short arc that intersects the circle (on the opposite side of *B* from *A*); label that point *C*.

   d. Repeat to locate points *D*, *E* and *F*.

   e. Draw $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, $\overline{DE}$, $\overline{EF}$, and $\overline{FA}$.



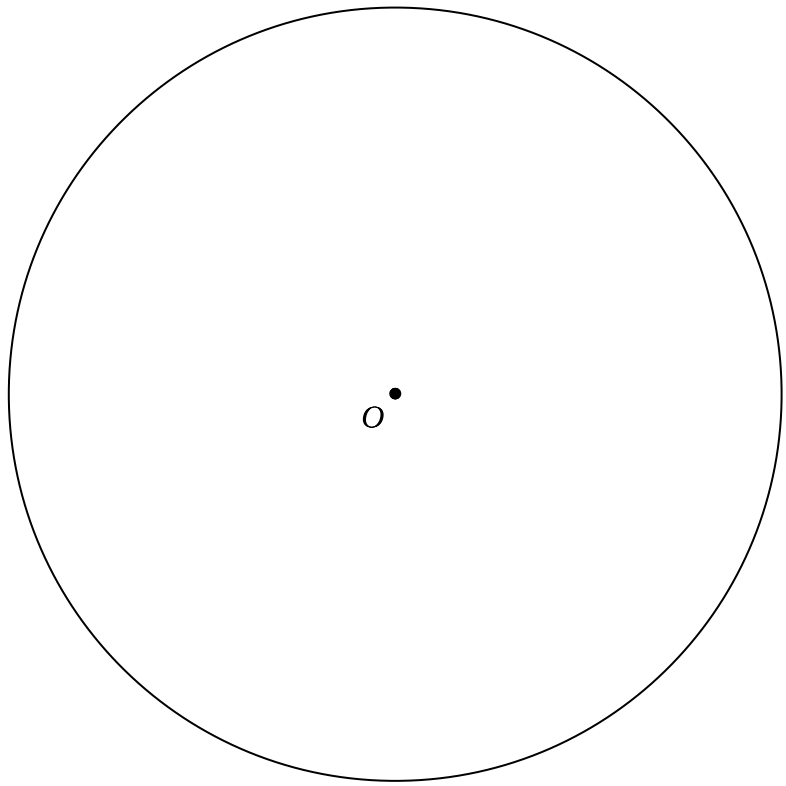
3. We want to construct a square inscribed in circle *O*.
Note: If the center of the circle is not shown, we must find it first. Here, the center is given.

a. Mark any point on the circle; label it *A*.

b. Draw radius $\overline{AO}$; extend it to intersect the circle again at *C*.

c. Construct the perpendicular bisector of $\overline{AC}$. Label the points where it intersects the circle *B* and *D*.

d. Draw $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, and $\overline{DA}$.



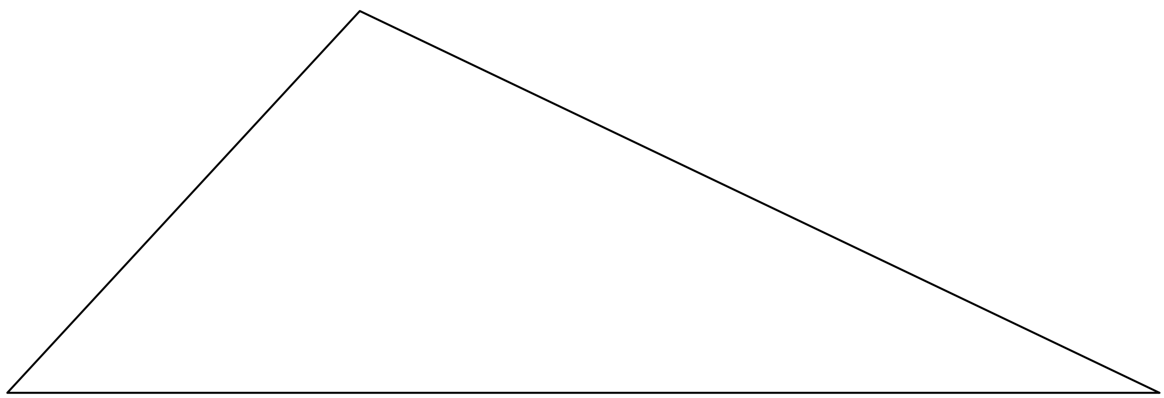
4. Construct the circumscribed circle for a triangle.

   a. Find the perpendicular bisectors of any two sides. Label their intersection *C*.

   b. What is point *C* called? What is special about it?

   c. Unlike problem #2 on the previous assignment, this time point *C* is *outside* the triangle. What is different about this triangle that makes that happen?

   d. The radius of the circle is the distance from *C* to any one vertex. Construct the circumscribed circle.



5. Construct the inscribed circle for a triangle.

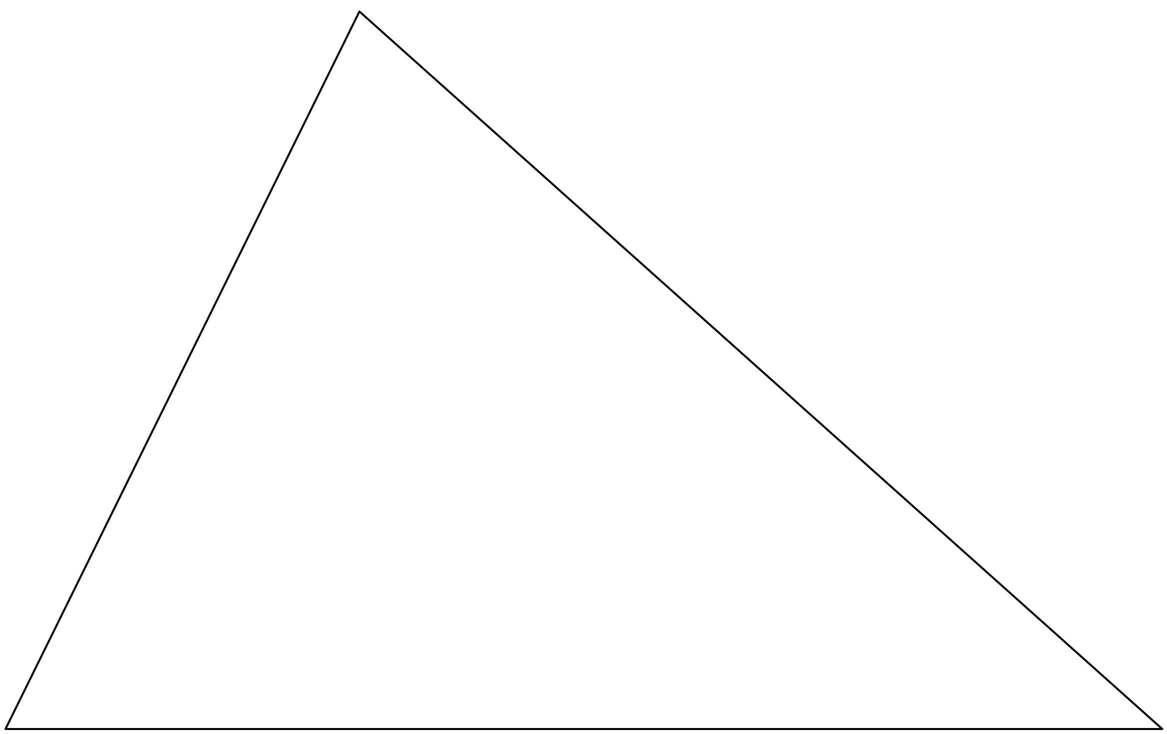
   a. Bisect any two angles. Label the intersection of the bisectors *I*.

   b. What is point *I* called? What is special about it?

   c. Could point *I* ever be outside the circle (say, if the circle were obtuse)?

   d. Construct a line through *I* perpendicular to any one side of the circle. Label the point where it intersects that side *R*.

   e. With center at *I* and radius *IR*, construct the inscribed circle.



6. Fill in the missing statements in the proof below.

Given: ΔABC

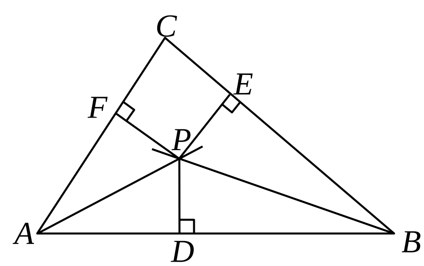
Prove: The perpendicular bisectors of the sides of ΔABC are concurrent

Statement	Reason
1. ______________________________	1. ____
2. Construct the perpendicular bisectors of $\overline{AB}$ and $\overline{AC}$; label the intersection P	2. Every line segment has a unique perpendicular bisector.
3. $\overline{AP} \cong \overline{BP}$	3. P is on the perpendicular bisector of $\overline{AB}$; points on the perpendicular bisector of a segment are equidistant from the endpoints.
4. ______________________________	4. (Same as above.)
5. ______________________________	5. ____
6. P is on the perpendicular bisector of $\overline{BC}$	6. It is equidistant from the endpoints (5)
7. The perpendicular bisectors of the sides of ΔABC are concurrent.	7. ____

7. Fill in the missing statements in the proof below.

Given: ΔABC

Prove: The angle bisectors of ΔABC are concurrent



Statement	Reason
1. ______________________________	1. ____
2. Construct the angle bisectors of $\angle A$ and $\angle B$; label the intersection P	2. ____
3. Construct perpendiculars from P to each side of ΔABC, label the intersections with the sides D, E and F	3. ____ ____
3. $\overline{DP} \cong \overline{FP}$	3. P is on the angle bisector of A; points on an angle bisector are equidistant from the sides of the angle.
4. ______________________________	4. (Same as above.)
5. ______________________________	5. ____
6. P is on the angle bisector of C	6. It is equidistant from the sides of $\angle C$ (5)
7. The angle bisectors of ΔABC are concurrent.	7. ____