

Lesson 56 Last 24.2 Perpendicular and Angle Bisectors

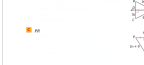
When a point is the same distance from two or more objects, the locus of such points is called the perpendicular bisector of the objects. Through congruence or otherwise, you can find the locus of points equidistant from two or more objects.

Example 1 Find the locus of points equidistant from two points A and B. The locus is the perpendicular bisector of the segment AB.

Construction	Definition	Properties
6.4.1 Perpendicular Bisector A line that is perpendicular to a line segment and bisects it.		$AM = MB$ $\angle AMN = \angle BMN = 90^\circ$
6.4.2 Locus of the Perpendicular Bisector The set of all points equidistant from two points A and B.		$PA = PB$ $\angle PAM = \angle PBM$

EX-1) Applying the Perpendicular Bisector Theorem and Its Converse

Let's $EF \perp AB$
Given $EF \perp AB$
For $EA = EB$
Proof \square



YOUR TURN

Find each measure.
16. Given that EF is the perpendicular bisector of AB and $EA = 14$, find AC.
17. Given that $EF \perp AB$, $EA = 14$, and $EB = 30$, find EF.



Therorem 6.4.3 **Compass and Angle Bisectors**

Construction	Definition	Properties
6.4.3 Angle Bisector Theorem If a point is on the bisector of an angle, then it is equidistant from the sides of the angle.		$AD = DE$
6.4.4 Converse of the Angle Bisector Theorem If a point is equidistant from the sides of an angle, then it lies on the bisector of the angle.		$\angle DAB = \angle DAC$

EX-2) Applying the Angle Bisector Theorem

Let's AD bisects $\angle BAC$
Given AD bisects $\angle BAC$
For $\frac{BD}{DC} = \frac{AB}{AC}$
Proof \square



YOUR TURN

Find each measure.
20. Given that EF bisects $\angle CDE$ and $CE = 10$, find CF .
21. Given that AD bisects $\angle BAC$, $AB = 6$, $AC = 5$, and $BC = 11$, find BD .



EX-3) Perimeter Applications

Read AD bisects $\angle BAC$ and $AD \perp BC$. Find the perimeter of $\triangle ABC$.



EX-4) Using Properties of Medians in the Centroid Theorem

Let's AD is a median of $\triangle ABC$. Find AG .



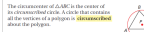
YOUR TURN

When an equilateral triangle is inscribed in a circle, the center of the circle is the centroid of the triangle. Find the radius of the circle.



Therorem 6.4.5 **Compass and Angle Bisectors**

The intersection of a triangle's perpendicular bisectors is equidistant from the vertices of the triangle.
 $PA = PB = PC$



The intersection of $\triangle ABC$'s bisectors is the center of its circumscribed circle. A circle that contains all the vertices of a polygon is **circumscribed** about the polygon.



EX-5) Using Properties of Perpendicular Bisectors

Let's EF and GH are the perpendicular bisectors of AC and AB . Find AE .



YOUR TURN

Find the circumcenter of $\triangle ABC$ with vertices $A(1, 1)$, $B(4, 1)$, and $C(4, 4)$.



EX-6) Finding the Circumcenter of a Triangle

Find the circumcenter of $\triangle ABC$ with vertices $A(1, 1)$, $B(4, 1)$, and $C(4, 4)$.



A triangle has three angles, so it has three angle bisectors. The angle bisectors of a triangle are **concurrent**. The point of concurrency is the **centroid** of the triangle.

Therorem 6.2.1 **Centroid Theorem**

The centroid of a triangle is equidistant from the sides of the triangle.
 $PA = PB = PC$



Unlike the circumcenter, the centroid is always inside the triangle.



The centroid is the center of the triangle's inscribed circle. A circle inscribed in a polygon touches each side of the polygon at exactly one point.

EX-7) Using Properties of Angle Bisectors

Let's AD bisects $\angle BAC$. Find BD .



YOUR TURN

Find the circumcenter of $\triangle ABC$ with vertices $A(1, 1)$, $B(4, 1)$, and $C(4, 4)$.

