Name: ___________________________

Date: ___________________________

Period: _________________________

Geometry Lesson 38

Objective: TSW use perpendicular and angle bisectors of triangles.

An angle ______________________ divides an angle into two congruent angles.

_____________________ of the Triangle – The point of concurrency when all three angles of a triangle are bisected.

The _________________________ of the triangle is equidistant from all of the sides of the triangle.

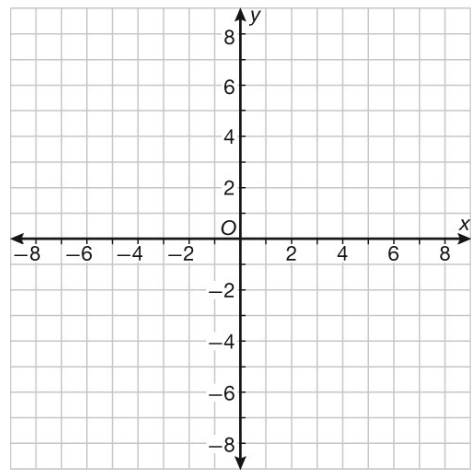
Example 1 Finding an Incenter in the Coordinate Plane

Use a compass and a straightedge to find the incenter of a triangle whose vertices are at (-2, 1), (1, 2), and (2, -2) in a coordinate plane.

SOLUTION

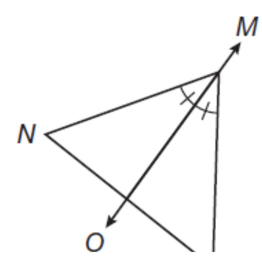
Hint

Refer to Construction Lab 3 to see how to construct an angle bisector.



In addition to finding the ________________ of a triangle, angle bisectors can also be used to find the lengths of segments in the triangle. When an angle bisector intersects the side of a triangle, it makes a ________________________ relationship, given by Theorem 38-1.

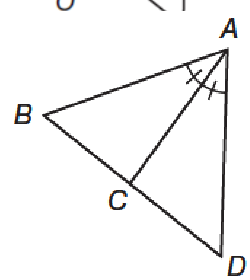
Theorem 38-1: Triangle Angle Bisector Theorem - If a line bisects an angle of a triangle, then it divides the opposite side proportionally to the other two sides of the triangle. In the diagram, $\frac{PM}{PO} = \frac{NM}{NO}$.



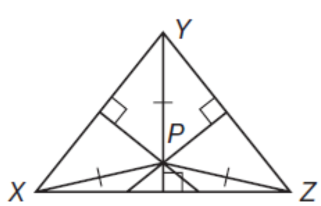
Example 2 Using the Triangle Angle Bisector Theorem

Using the diagram at the right, find *BC* if *AD* = 15, *DC* = 8, and *AB* = 20.

SOLUTION



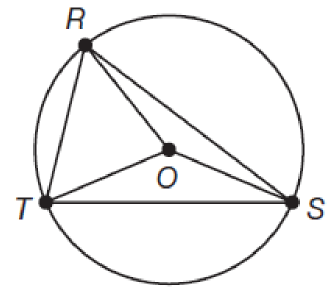
__________________________ of the Triangle – The point of concurrency when perpendicular bisectors are drawn for every side of a triangle. The circumcenter of a triangle is ______________________ from every vertex in the triangle. In the diagram below, point *P* is the circumcenter of the triangle, so ___ = ___ = ___.



Math Language

The circumcenter, orthocenter, and centroid of a triangle will always be collinear. The line that all three points lie on is known as the **Euler Line**.

The circumcenter is not always _______________ a triangle. A right triangle's circumcenter lies on the ________________________, and an obtuse triangle's circumcenter is outside the triangle.



______________________ Circle - Any circle that contains all the vertices of a polygon.

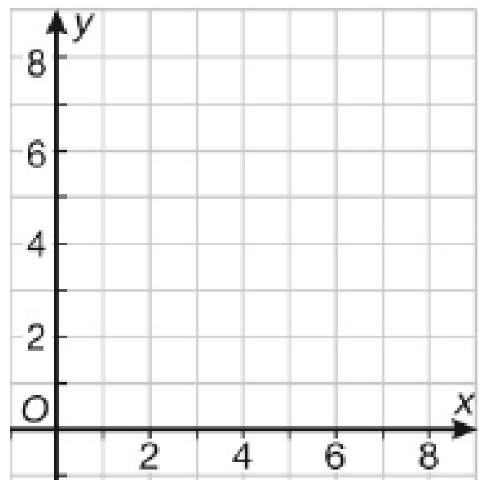
The circumcenter lies at the center of the circle that contains the three vertices of the triangle.

_______________________ Polygon - Any polygon with each vertex on a circle.

Example 3 Finding a Circumcenter in the Coordinate Plane

Find the circumcenter of a triangle with vertices at *A*(2, 2), *B*(8, 2), and *C*(4, 7).

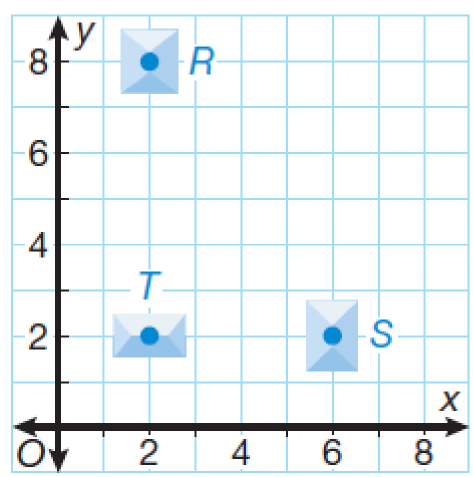
SOLUTION



Example 4 Application: City Planning

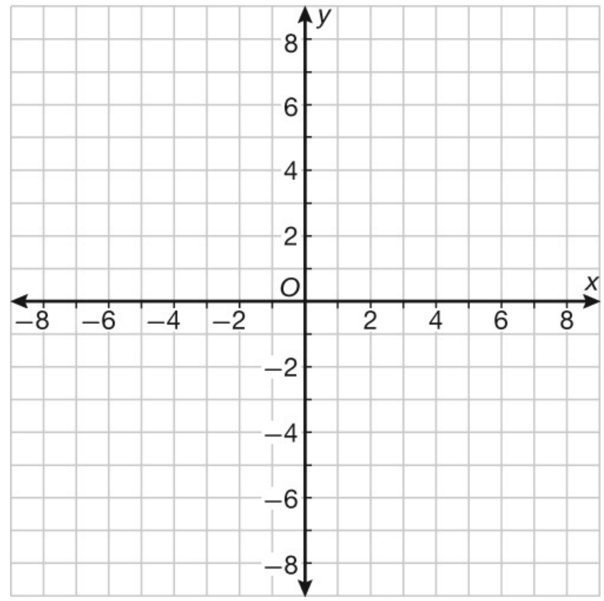
A gas company has three gas stations located at points *R*(2, 8), *S*(6, 2), and *T*(2, 2), as shown. The storage facility is equidistant from the three gas stations. Find the location of the storage facility.

SOLUTION

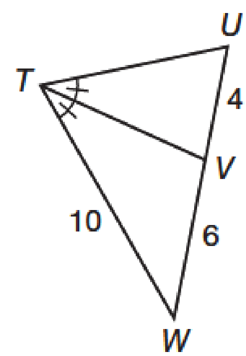


You Try!!!!!

a. Use a compass and a straightedge to find the incenter of a triangle whose vertices are at (-3, 1), (3, -2), and (2, 4) in a coordinate plane.



b. Using the diagram at the right, find the length of $\overline{TU}$ *TU* if *UV* = 4, *TW* = 10, and *WV* = 6.



d. A restaurant owner wants to place his new restaurant equidistant from three nearby grocery stores that will supply him. They are located at *A*(0, 0), *B*(4, 0) and *C*(0, 6). Where should he place his restaurant?