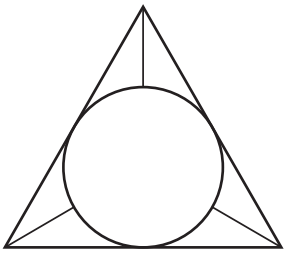
6.2 Start Thinking

A manufacturing company's logo is created with a circle inside an equiangular triangle, as shown in the figure. Extend the line segments coming from each of the vertices so they pass through the circle. What do you notice about these line segments?



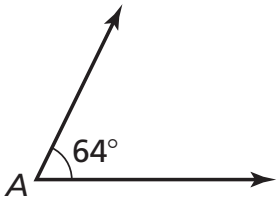
6.2 Warm Up

Use a compass and a straightedge to bisect the geometric figure.

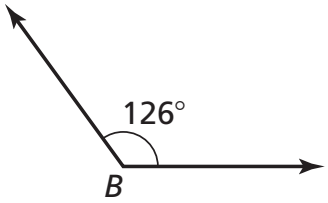
1.

2.

3.



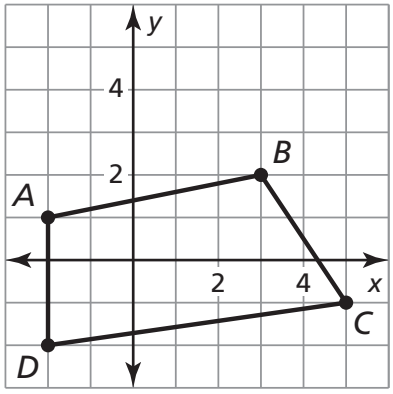
4.



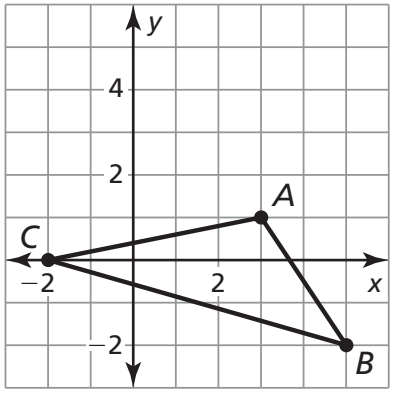
6.2 Cumulative Review Warm Up

Graph the polygon and its image after a reflection in the given line.

1. $y = x$



2. $y = 2$

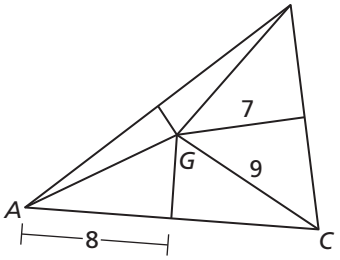


Name _____ Date _____

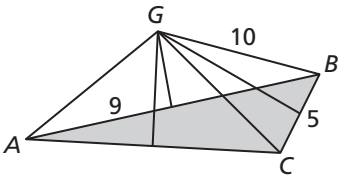
6.2 Practice A

In Exercises 1–3, the perpendicular bisectors of $\triangle ABC$ intersect at point G, or the angle bisectors of $\triangle XYZ$ intersect at point P. Find the indicated measure. Tell which theorem you used.

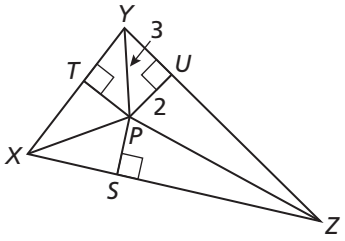
1. BG



2. CG



3. PS



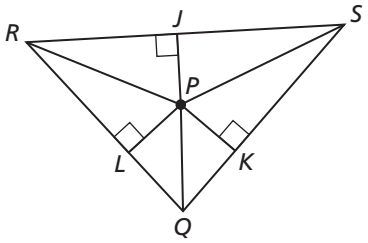
In Exercises 4 and 5, find the coordinates of the circumcenter of the triangle with the given vertices.

4. $J(6, 0), K(0, 0), L(0, 4)$

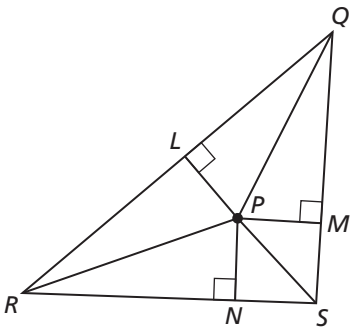
5. $U(0, 0), V(-4, 0), W(-6, 6)$

In Exercises 6 and 7, P is the incenter of $\triangle QRS$. Use the given information to find the indicated measure.

6. $PJ = 4x - 8$, $PL = x + 7$
Find PK.

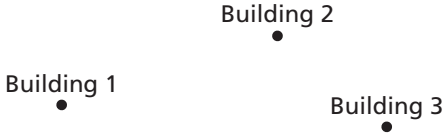


7. $PN = 6x + 2$, $PM = 8x - 14$
Find PL.



8. Draw an obtuse isosceles triangle. Find the circumcenter C. Then construct the circumscribed circle.

9. A cellular phone company is building a tower at an equal distance from three large apartment buildings. Explain how you can use the figure at the right to determine the location of the cell tower.



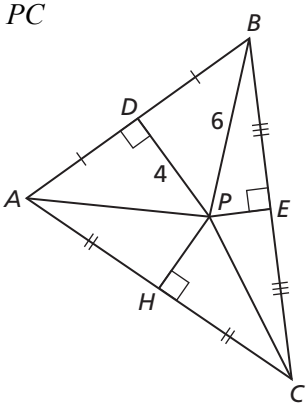
10. Your friend says that it is impossible for the circumcenter of a triangle to lie outside the triangle. Is your friend correct? Explain your reasoning.

Name_____ Date _____

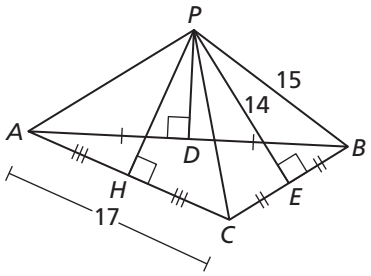
6.2 Practice B

In Exercises 1–3, find the indicated measure. Tell which theorem you used.

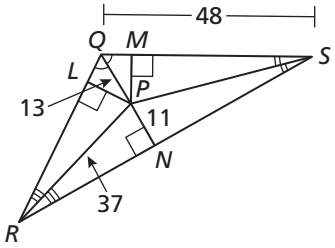
1. PC



2. AP



3. MP

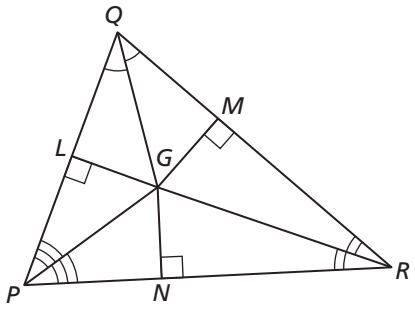


4. Find the coordinates of the circumcenter of the triangle with the vertices $A(4, 12)$, $B(14, 6)$, and $C(-6, 2)$.

In Exercises 5 and 6, use the diagram and the given information to find the indicated measures.

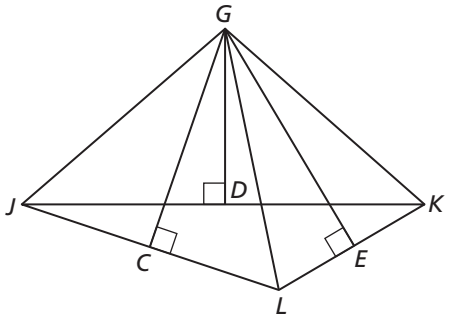
5. $LG = 6x - 14$, $NG = -3x + 22$

Find MG and NG.

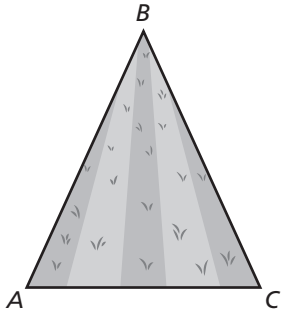


6. $GL = 4x - 2$, $GE = 3x + 2$, $GK = 2x + 8$

Find GJ and GE.



7. You are using a rotary sprinkler to water the triangular lawn.



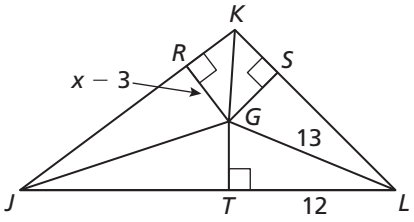
a. Explain how to locate the sprinkler the same distance from each side of the triangular lawn.

b. Explain how to locate the sprinkler the same distance from each vertex of the triangular lawn.

c. Which is closer to vertex B, the *incenter* or the *circumcenter*? Explain your reasoning.

8. Explain when the circumcenter of a triangle lies outside the triangle.

9. In the figure at the right, what value of x makes G the incenter of $\triangle JKL$?



Name _____ Date _____

6.2 Enrichment and Extension

Bisectors of Triangles

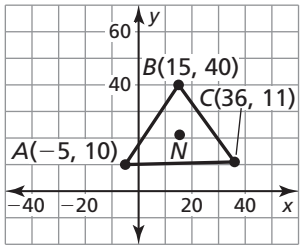
1. Consider the point $P(-1, 3)$. Find the point Q for which the line $2x + y = 5$ serves as the perpendicular bisector of $\overline{PQ}$.

2. A triangle has sides lengths of 24, 10, and 26 units. What is the radius of the circumscribed circle?

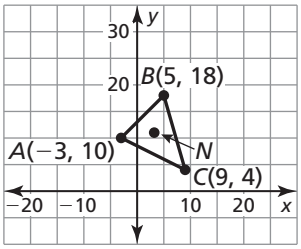
In Exercises 3 and 4, use the following information to find the coordinates of the incenter *N* of the triangle. Round to the nearest tenth, if necessary.

For $\triangle ABC$, with vertices $A(x_1, y_1)$, $B(x_2, y_2)$, and $C(x_3, y_3)$, the coordinates of the incenter N are given by $N\left(\frac{ax_1 + bx_2 + cx_3}{a + b + c}, \frac{ay_1 + by_2 + cy_3}{a + b + c}\right)$, where a, b, and c are the lengths of the sides opposite of A, B, and C respectively.

3.



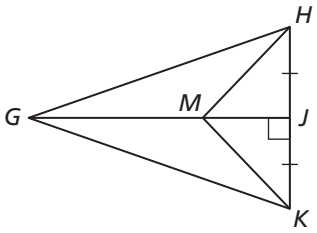
4.



5. Write a two-column proof.

Given: $\overline{GJ}$ is the perpendicular bisector of $\overline{HK}$.

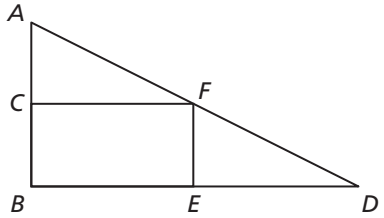
Prove: $\angle GHM \cong \angle GKM$



6. Write a paragraph proof.

Given: $\overline{FC}$ is the perpendicular bisector of $\overline{AB}$.
$\overline{FE}$ is the perpendicular bisector of $\overline{BD}$.

Prove: $\overline{AF} \cong \overline{FD}$



Name_____ Date _____

6.2 Puzzle Time

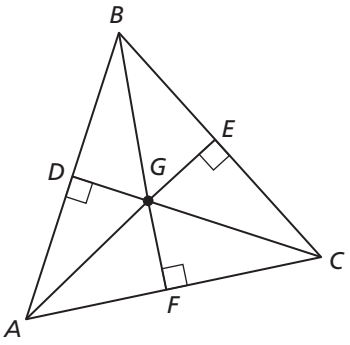
What Did The Computer Do At Lunchtime? It . . .

Write the letter of each answer in the box containing the exercise number.

Complete the sentence.

1. When three or more lines, rays, or segments intersect in the same point, they are called _____ lines, rays, or segments.
2. The circumcenter of a triangle is _____ from the vertices of the triangle.
3. The angle _____ of a triangle are congruent.
4. The _____ of the triangle is the point of intersection of angle bisectors.
5. The incenter of a triangle always lies _____ the triangle.

Find the indicated measure using the diagram. The perpendicular bisectors are at points *D*, *E*, and *F*. Angle bisectors are at *A*, *B*, and *C*.



6. $AG = 13$, $BD = 5$; Find GD.
7. $GF = 8$, $GC = 17$; Find AF.
8. G is the incenter, $GD = 4x - 1$, and $GE = 3x + 5$; Find GF.

Answers

H. 12
U. circumcenter
D. inside
T. equiangular
N. measurements
A. concurrent
M. 5
R. outside
E. 15
Y. 23
E. 6
B. bisectors
O. congruent
S. 18
T. equidistant
A. incenter

6	1	5		4		3	8	2	7