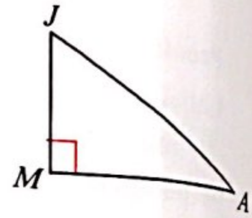
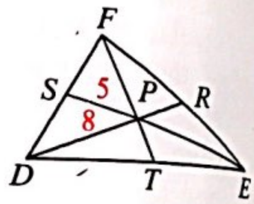
Classroom Exercises

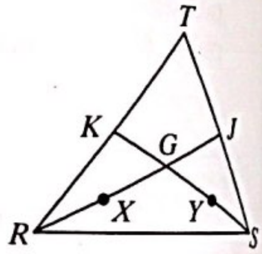
1. Draw, if possible, a triangle in which the perpendicular bisectors of the sides intersect in the point described.
   a. A point inside the triangle
   b. A point outside the triangle
   c. A point on the triangle
2. Repeat Exercise 1, but work with angle bisectors.
3. Is there some kind of triangle such that the perpendicular bisector of each side is also an angle bisector, a median, and an altitude?
4. $\triangle JAM$ is a right triangle.



   a. Is $\overline{JM}$ an altitude of $\triangle JAM$?
   b. Name another altitude shown.
   c. In what point do the three altitudes of $\triangle JAM$ meet?
   d. Where do the perpendicular bisectors of the sides of $\triangle JAM$ meet?
   e. Does your answer to (d) agree with Theorem 8–2?
5. The medians of $\triangle DEF$ are shown. Find the lengths indicated.



   a. $EP =$ __?__
   b. $PR =$ __?__
   c. If $FT = 9$, then $PT =$ __?__ and $FP =$ __?__.
6. Given: $\overline{RJ}$ and $\overline{SK}$ are medians of $\triangle RST$;
   X and Y are the midpoints of $\overline{RG}$ and $\overline{SG}$.



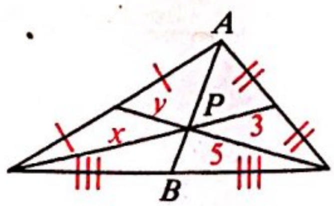
   a. How are $\overline{XY}$ and $\overline{RS}$ related? Why?
   b. How are $\overline{KJ}$ and $\overline{RS}$ related? Why?
   c. How are $\overline{KJ}$ and $\overline{XY}$ related? Why?
   d. What special kind of quadrilateral is $XYJK$? Why?
   e. Why does $XG = GJ$?
   f. Explain why $RG = \frac{2}{3}RJ$.

Written Exercises

A

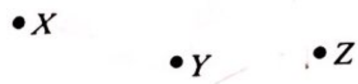
1. Draw a triangle such that the lines containing the three altitudes intersect in the point described.
   a. A point inside the triangle
   b. A point outside the triangle
   c. A point on the triangle

Exercises 2–5 refer to the diagram.



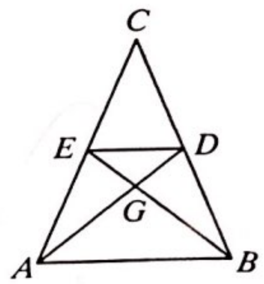
2. Find the values of x and y.
3. If $AB = 6$, then $BP =$ __?__ and $AP =$ __?__.
4. If $AB = 7$, then $BP =$ __?__ and $AP =$ __?__.
5. If $PB = 1.9$, then $AP =$ __?__ and $AB =$ __?__.
6. Use a ruler and a protractor to draw a regular pentagon. Then construct the perpendicular bisectors of the five sides.
7. Draw a regular pentagon as in Exercise 6. Construct the angle bisectors.

B 8. Three towns, located as shown, plan to build one recreation center to serve all three towns. They decide that the fair thing to do is to build the hall equidistant from the three towns. Comment about the wisdom of the plan.

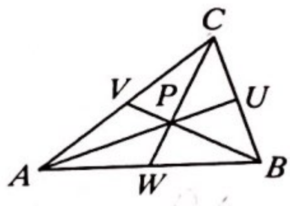


9. See Exercise 8. Locate three towns so that it isn't possible to find a spot equidistant from the three towns.

10. In the figure, $\overline{AD}$ and $\overline{BE}$ are congruent medians of $\triangle ABC$.
   a. Explain why $GD = GE$.
   b. $GA =$ __?__
   c. Name three angles congruent to $\angle GAB$.



$\overline{AU}$, $\overline{BV}$, and $\overline{CW}$ are the medians of $\triangle ABC$.

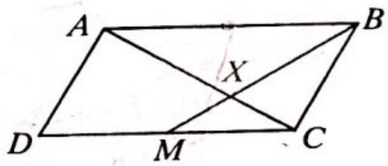


11. If $AP = x^2$ and $PU = 2x$, then $x =$ __?__.

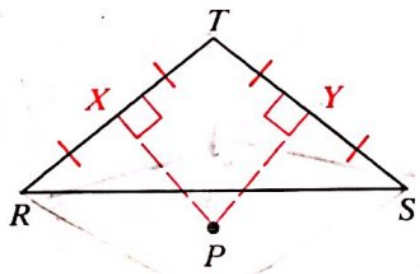
12. If $BP = y^2 + 1$ and $PV = y + 2$, then $y =$ __?__ or $y =$ __?__.

13. If $CW = 2z^2 - 5z - 12$ and $CP = z^2 - 15$, then $z =$ __?__ and $PW =$ __?__.

14. $ABCD$ is a parallelogram with M the midpoint of $\overline{CD}$. If $\overline{BM}$ intersects $\overline{AC}$ at X, prove that $CX = \frac{1}{3}AC$. (*Hint:* Draw $\overline{BD}$.)



C 15. In the plane figure, point P is equidistant from R, S, and T. Describe the location of the following points in the plane.
   a. Points farther from both R and S than from T
   b. Points closer to both R and S than to T



Ex. 15

16. Prove: If two of the medians of a triangle are congruent, then the triangle is isosceles.

Application

CENTER OF GRAVITY

The *center of gravity* of an object is the point where the weight of the object is focused. If you lift or support an object, you can do this most easily under its center of gravity.

A mobile is either hung or supported at its center of gravity. In planning a mobile, a sculptor must take into account the centers of gravity of the component parts.