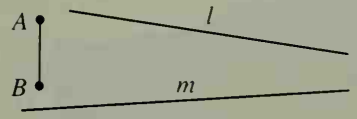
9. P is an arbitrary point inside rectangle $ABCD$. Prove the following: $(PA)^2 + (PC)^2 = (PB)^2 + (PD)^2$

10. Find the area of a quadrilateral with vertices $A(-1, -1)$, $B(9, 4)$, $C(20, 6)$, and $D(10, 1)$.

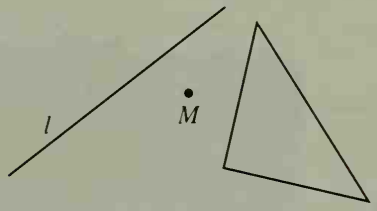
11. $ABCD$ is a quadrilateral such that if sides $\overline{AB}$ and $\overline{CD}$ are extended they will meet at a right angle. Prove that $(AC)^2 + (BD)^2 = (AD)^2 + (BC)^2$.

12. A ray of light is reflected successively in two perpendicular mirrors. Prove that the final ray is parallel to the initial ray.

★ **13.** Find a point X on l and a point Y on m so that $\overline{XY}$ is parallel and congruent to $\overline{AB}$.



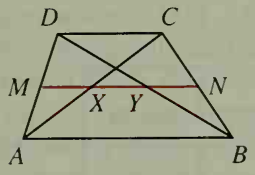
★ **14.** Find a point X on the triangle and a point Y on line l so that M is the midpoint of $\overline{XY}$.



★ **15.** Construct three parallel lines so that the middle line is not equidistant from the other two. Then construct an equilateral triangle with one vertex on each of the three lines.

16. Find the length of the tangent line segment from (9, 13) to the circle $x^2 + y^2 = 25$.

17. Given: $\overline{MN}$ is the median of trapezoid $ABCD$; $\overline{MN}$ intersects the diagonals at X and Y.
Prove: $XY = \frac{1}{2}(AB - DC)$



18. Given: $ABCD$ is a parallelogram whose diagonals meet at O; P and Q are midpoints of $\overline{AB}$ and $\overline{CD}$; R and S are midpoints of $\overline{AO}$ and $\overline{CO}$.
Prove: $PRQS$ is a parallelogram.

★ **19.** Graph the circles whose equations are $(x + 9)^2 + (y - 5)^2 = 25$ and $(x - 2)^2 + (y - 4)^2 = 25$. Find a point X on one circle and a point Y on the other such that the y-axis is the perpendicular bisector of $\overline{XY}$.

★ **20.** A and B are fixed points 12 units apart. P is an arbitrary point. Once P is chosen, find points X and Y such that $PA = AX$, $\overline{PA} \perp \overline{AX}$, $PB = BY$, and $\overline{PB} \perp \overline{BY}$ as shown. Now locate M, the midpoint of $\overline{XY}$. Show that the position of M does not depend on the position of P.