

Problem 39 (you need it for Problem 38). If D and D' are points between A and B and $|AD|^2 - |AD'|^2 = |BD|^2 - |BD'|^2$ then $D = D'$.

Hint: Prove by contradiction, assume that $D \neq D'$ and $|AD|^2 - |AD'|^2 = |BD|^2 - |BD'|^2$, look at the signs of the expression on the right and left sides.

Problem 40. Let $ABCD$ is a parallelogram. Prove that:

$$|AB|^2 + |BC|^2 + |CD|^2 + |DA|^2 = |AC|^2 + |BD|^2$$

In other words, the sum of squares of the sides is equal to the sum of squares of the diagonals.

Problem 41. The sides of a triangle are a, b and c . Prove that the length of the median to the side c is

$$\frac{\sqrt{2a^2 + 2b^2 - c^2}}{2}$$

Problem 42. The sides of a triangle are 5, 8 and 10. Is it an acute triangle?

Problem 43. Inscribed angle based on the chord with length equal to the radius. What is this angle?

Problem 44. Two sides of a triangle are 5 and 8. The angle between them is 60° . Find the radius of a circle circumscribed around this triangle.