Milli makes magical measurements: Student worksheet

http://topdrawer.aamt.edu.au/Geometric-reasoning/Assessment/Assessment-approaches/Working-collaboratively/Milli-makes-magical-measurements

Milli loves measuring. Maybe it has something to do with her name! Sometimes she gets very, very angry because she knows that all measurements are approximations. No matter how hard she tries, it is impossible for her (or anyone else) to measure anything exactly.

One day, while measuring things in the garden shed, she found an old bottle with a cork stuck in the top. She pulled the cork out so that she could measure it and a genie magically appeared. "I will grant you three wishes," said the genie.

"Fantastic," said Milli. "I would like a perfect ruler that measures lengths perfectly and a perfect protractor, which measures angles precisely. I would also like a pair of glasses that I can use to tell whether or not lines are parallel."

Her three wishes were granted immediately but the genie said, "Use these tools carefully. If you use them too often, they will wear out and stop working."

The next day, Milli went to the park. She saw a young woman sitting on a bench crying. She was holding a four-sided shape. Milli asked her why she was crying. The young woman replied, "A wicked witch kidnapped my daughter and said she would only free her if I could somehow prove that this shape is a square. I don't know how to do it!"

"I can do that!" said Milli. She picked up the shape and said, "It has four sides, so it is definitely a quadrilateral." She put on her glasses and said, "These two sides are definitely parallel, so this quadrilateral is a trapezium." Then she looked at the other two sides and said, "These sides are also parallel, so this trapezium is a parallelogram."

Milli then measured the four angles and found that they were each exactly 90 degrees. "This parallelogram is definitely a rectangle," she said.

Finally she took out her ruler and measured all four sides and declared, "This rectangle is definitely a square but it is also a rectangle, a parallelogram, a trapezium and a quadrilateral."

Milli did a lot of measuring. She took ten different measurements. At that rate her magic measuring instruments will soon stop working!

1. Is there a way she could have proved it to be a square without doing so much measuring?
2. What is the least amount of measuring that Milli could have done?

Write a set of step-by-step instructions to help Milli prove that a quadrilateral is a square. You may refer to the square *ABCD*.