Proving Shapes with Coordinates

Slope: parallel (equal) and perpendicular (negative reciprocals). Distance: equal sides. Midpoint: diagonals that bisect each other. Use the checklist, then write the evidence in sentences.

1 THE VOCABULARY
Words we use

Parallelogram opposite sides parallel; diagonals share a midpoint.
Rectangle a parallelogram with a right angle.
Rhombus four equal sides.
Square a rectangle and a rhombus.
Diagonal joins two corners that are not next to each other.
Prove show it must be true with math reasons.

- Watch out for these.
- Calling it a rectangle after one right angle without checking it is a parallelogram.
- Calling four equal sides a square without checking an angle.
- Eyeballing the picture instead of using a tool.
- Writing the answer with no tool named.

2 THE METHOD
Prove a shape

1. PLOT and guess what it might be.
2. SIDES distance on each side: which are equal?
3. ANGLES slopes of neighbors: negative reciprocals mean a right angle; equal slopes mean parallel.
4. DIAGONALS midpoints: the same point means they bisect each other.
5. WRITE IT a few sentences: tool, numbers, result.

WHY THE TOOLS ARE ENOUGH
Each definition on the checklist is about sides, angles, or diagonals, and each of those is one tool: distance, slope, or midpoint.

3 MNPQ
M(3, 0), N(1, 3), P(−2, 1), Q(0, −2)

every side is √13	four equal sides: at least a rhombus
slope MN = −32, slope NP = 23	they multiply to −1
angle N is a right angle	and the slopes alternate, so every angle is
a square	four equal sides and four right angles
rectangle ABCD: midpoint of AC = (5.5, 6) = midpoint of BD	so D = (5, 12)

A PROOF SENTENCE
AB and BC have slopes −25 and 52, which multiply to −1, so angle B is a right angle.

SAY IT OUT LOUD
Slope for angles, distance for sides, midpoint for diagonals. Name the tool, state the result.