Same, Parallel, or Perpendicular?

Get both slopes. Equal: parallel, or the same line if b matches too. Product -1: perpendicular. Otherwise neither. To write a line through a point: keep m for parallel, take the negative reciprocal for perpendicular, then find b.

1 THE VOCABULARY
Words we use

Same line equal m and equal b: one line written twice.

Parallel equal m, different b: never cross.

Perpendicular slopes multiply to −1 (negative reciprocals): a square corner.

Neither different slopes with a product other than −1: they cross, not squarely.

Slope, m rise over run; the one number that decides.

- Watch out for these.
- Saying parallel when it is the same line. When m matches, check b.
- Saying perpendicular for opposite slopes like 3 and −3. Product must be −1.
- Comparing before rewriting. Get y = mx + b first.
- From two pairs of points with equal slopes, forgetting to test whether a point of one line fits the other.

2 THE METHOD
The decision, in order

1. GET BOTH SLOPES from y = mx + b (rewrite first), by counting on a graph, or by subtracting two points.
2. EQUAL SLOPES? yes: check b. Different b: parallel. Same b: the same line.
3. PRODUCT −1? yes: perpendicular. (Horizontal and vertical: by sight.)
4. OTHERWISE neither.
5. TO WRITE A LINE THROUGH A POINT parallel: keep m. Perpendicular: negative reciprocal. Then put the point in and solve for b.

WHY ONE NUMBER DOES IT ALL

Slope is the tilt. Same tilt means the lines never close the gap (parallel). Tilts a quarter turn apart make a square corner (perpendicular). Any other pair of tilts meets at some other angle. The y-intercept only matters to tell one line from two.

3 CLASSIFY FROM POINTS
Line 1 through (1, 2) and (4, 8); line 2 through (0, 5) and (2, 4)

$m1 = (8 - 2)/(4 - 1) = 6/3 = 2$	rise over run for line 1
$m2 = (4 - 5)/(2 - 0) = -1/2$	rise over run for line 2
equal? no	so not parallel and not the same line
$2 \times (-1/2) = -1$	the product check passes
perpendicular	the lines meet at a square corner

IF THE SLOPES HAD BEEN EQUAL

Write line 1 as y = 2x + 0 (since (1, 2) gives b = 0) and test a point of line 2 in it. Fits: same line. Does not fit: parallel.

SAY IT OUT LOUD

Get both slopes. Equal: parallel or the same line. Product negative one: perpendicular. Else neither.