Same, Parallel, or Perpendicular?

Get both slopes. Equal slopes: parallel, or the same line if the y-intercepts match too. Slopes that multiply to -1: perpendicular. Anything else: neither. Then choose the move to write a line through a point.

Name _____ Date _____

Words we use

say the math word, then the plain English

WORD	PLAIN ENGLISH	WHAT YOU DO
Same line	Equal slope and equal y-intercept: one line written twice.	When slopes match, check b before saying parallel.
Parallel	Equal slopes, different y-intercepts. Never cross.	Same m, different b.
Perpendicular	Cross at a right angle. Slopes are negative reciprocals, product –1.	Multiply the slopes and look for –1.
Neither	Different slopes that do not multiply to –1. The lines cross, but not squarely.	Everything that is not the other three.
Slope (m)	Rise over run, the steepness and direction.	The one number that decides all four cases.
Negative reciprocal	Flip the fraction and change the sign.	The perpendicular slope.

Part A Classify from equations

Rewrite when needed. Write same, parallel, perpendicular, or neither, with the slopes.

PAIR	SLOPES	ANSWER
$y = 4x + 3$ and $y = 4x - 6$		
$y = -2x + 5$ and $y = 1/2\ x + 5$		
$y = 3x - 1$ and $6x - 2y = 2$		
$y = 2/5\ x + 1$ and $y = 5/2\ x + 1$		
$y = -x + 4$ and $y = x + 4$		
$y = 7$ and $x = 7$		

Part B Classify from points

Find each slope (second minus first, both times), then decide. If the slopes match, test a point.

1. Line 1: (0, 0) and (3, 6). Line 2: (1, 5) and (3, 4).

2. Line 1: (2, 1) and (4, 5). Line 2: (0, –1) and (1, 1).

Part C Choose the move

Say the move (keep m, or flip and change the sign), then write the line.

1. Parallel to y = –4x + 1 through (1, 3)
3. Line 1: (–1, 2) and (1, 8). Line 2: (0, 4) and (2, 10).

2. Perpendicular to y = –4x + 1 through (4, 3)

3. Parallel to 2x + 3y = 9 through (3, 0)

4. Perpendicular to 2x + 3y = 9 through (2, 4)

Part D In your own words

1. When the slopes match, how do you tell parallel from the same line?

2. Why are $y = 3x$ and $y = -3x$ not perpendicular?

3. What is the only difference between writing a parallel line and writing a perpendicular line through a point?

Part E Exit ticket

1. $y = -3/4\ x + 2$ and $y = 4/3\ x - 1$: related how, and why?

2. Through $(4, 1)$: the line perpendicular to $y = 4x$, and the line parallel to it.

Answer key

Part A. 4, 4: parallel. –2, 1/2: perpendicular. 3, 3 with b = –1 both (6x – 2y = 2 is y = 3x – 1): same line. 2/5, 5/2: neither (product 1). –1, 1: perpendicular. Horizontal and vertical: perpendicular.

Part B. 1. 2 and –1/2: perpendicular. 2. 2 and 2; line 1 is y = 2x – 3 and (0, –1) does not fit: parallel. 3. 3 and 3; line 1 is y = 3x + 5 and (0, 4) does not fit: parallel.

Part C. 1. Keep m: y = –4x + 7. 2. New m = 1/4: y = 1/4 x + 2. 3. Given line is y = –2/3 x + 3; keep m: y = –2/3 x + 2. 4. New m = 3/2: y = 3/2 x + 1.

Part D. 1. Compare b (or test a point). 2. Their product is –9, not –1: a sign change is not a quarter turn. 3. The first move: keep m, or flip and change the sign.

Part E. 1. Perpendicular: product –1. 2. y = –1/4 x + 2 and y = 4x – 15.