

Topic: Parallel, perpendicular, or neither

Question: Each pair of points in the table below are points that lie on the given line. Which two lines are perpendicular to each other?

Line	Point 1	Point 2
Line AB	(-2,2)	(1,8)
Line CD	(3,6)	(5,2)
Line EF	(3,0)	(7,-2)

Answer choices:

A \overleftrightarrow{AB} and \overleftrightarrow{CD}

B \overleftrightarrow{CD} and \overleftrightarrow{EF}

C \overleftrightarrow{AB} and \overleftrightarrow{EF}

D None are perpendicular



Solution: C

Use the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

for each line.

$$\overleftrightarrow{AB}: m = \frac{8 - 2}{1 - (-2)} = 2$$

$$\overleftrightarrow{CD}: m = \frac{2 - 6}{5 - 3} = -2$$

$$\overleftrightarrow{EF}: m = \frac{-2 - 0}{7 - 3} = -\frac{1}{2}$$

\overleftrightarrow{AB} and \overleftrightarrow{EF} have slopes that are negative reciprocals of each other, so they're perpendicular.



Topic: Parallel, perpendicular, or neither

Question: Each pair of points in the table below are points that lie on the given line. Which lines are parallel to each other?

Line	Point 1	Point 2
Line AB	(0,3)	(6,7)
Line CD	(5,4)	(8,6)
Line EF	(1,-2)	(7,2)

Answer choices:

A \overleftrightarrow{AB} and \overleftrightarrow{CD}

B \overleftrightarrow{CD} and \overleftrightarrow{EF}

C \overleftrightarrow{AB} and \overleftrightarrow{EF}

D All three are parallel



Solution: D

Use the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

for each line.

$$\overleftrightarrow{AB}: m = \frac{7 - 3}{6 - 0} = \frac{2}{3}$$

$$\overleftrightarrow{CD}: m = \frac{6 - 4}{8 - 5} = \frac{2}{3}$$

$$\overleftrightarrow{EF}: m = \frac{2 - (-2)}{7 - 1} = \frac{2}{3}$$

All three lines have the same slope, so all three are parallel unless two of them (or all three) are actually one and the same line.



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Question: Which statement is true?

Point	Coordinates
A	$(-7,2)$
B	$(2,5)$
C	$(4,-1)$
D	$(-5,-4)$

Answer choices:

- A Lines \overleftrightarrow{AB} and \overleftrightarrow{CD} are parallel, and lines \overleftrightarrow{AB} and \overleftrightarrow{BC} are perpendicular.
- B Lines \overleftrightarrow{AB} and \overleftrightarrow{CD} are parallel, and lines \overleftrightarrow{AC} and \overleftrightarrow{BD} are parallel.
- C Lines \overleftrightarrow{AC} and \overleftrightarrow{CD} are perpendicular, and lines \overleftrightarrow{BC} and \overleftrightarrow{BD} are perpendicular.
- D Lines \overleftrightarrow{BC} and \overleftrightarrow{BD} are perpendicular, and lines \overleftrightarrow{AD} and \overleftrightarrow{AB} are perpendicular.



Solution: A

Use the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

to get the slopes of the lines \overleftrightarrow{AB} , \overleftrightarrow{BC} , \overleftrightarrow{CD} , \overleftrightarrow{AC} , \overleftrightarrow{BD} , and \overleftrightarrow{AD} .

$$\overleftrightarrow{AB}: m = \frac{5 - 2}{2 - (-7)} = \frac{1}{3}$$

$$\overleftrightarrow{BC}: m = \frac{-1 - 5}{4 - 2} = -3$$

$$\overleftrightarrow{CD}: m = \frac{-4 - (-1)}{-5 - 4} = \frac{1}{3}$$

$$\overleftrightarrow{AC}: m = \frac{-1 - 2}{4 - (-7)} = \frac{-3}{11}$$

$$\overleftrightarrow{BD}: m = \frac{-4 - 5}{-5 - 2} = \frac{9}{7}$$

$$\overleftrightarrow{AD}: m = \frac{-4 - 2}{-5 - (-7)} = -3$$

Lines \overleftrightarrow{AB} and \overleftrightarrow{CD} have the same slope, so they're parallel, unless they're one and the same line.

Lines \overleftrightarrow{AB} and \overleftrightarrow{BC} have slopes that are negative reciprocals of each other, so they're perpendicular. Combining these two results, we see that answer choice A is correct.



Let's check the other three answer choices.

Answer choice B can't be correct, because lines \overleftrightarrow{AC} and \overleftrightarrow{BD} have different slopes, so they can't be parallel.

Answer choice C can't be correct, because the slopes of the lines \overleftrightarrow{AC} and \overleftrightarrow{CD} aren't negative reciprocals of each other, so they can't be perpendicular.

Answer choice D can't be correct, because the slopes of lines \overleftrightarrow{BC} and \overleftrightarrow{BD} aren't negative reciprocals of each other, so they can't be perpendicular.

