Name Key Date

Math 8A

Slopes of Parallel and Perpendicular Lines

Directions: Following the instructions below and use the graph provided.

1. Graph A(3,-2) and B(1,4). Connect the points to make $\overline{AB}$ (Line segment AB)
2. Graph C(9,-2) and D(7,4). Connect the points to make $\overline{CD}$ (Line segment CD)
3. What do you notice about the two line segment? They are parallel
4. Find the slope of both $\overline{AB}$ and $\overline{CD}$.

   Slope of $\overline{AB}$ $m = \frac{rise}{run}$ $m = \frac{-6}{2}$ $m = -3$ Slope of $\overline{CD}$ $m = \frac{rise}{run}$ $m = \frac{-6}{2}$ $m = -3$

   What do you notice? The slopes are the same

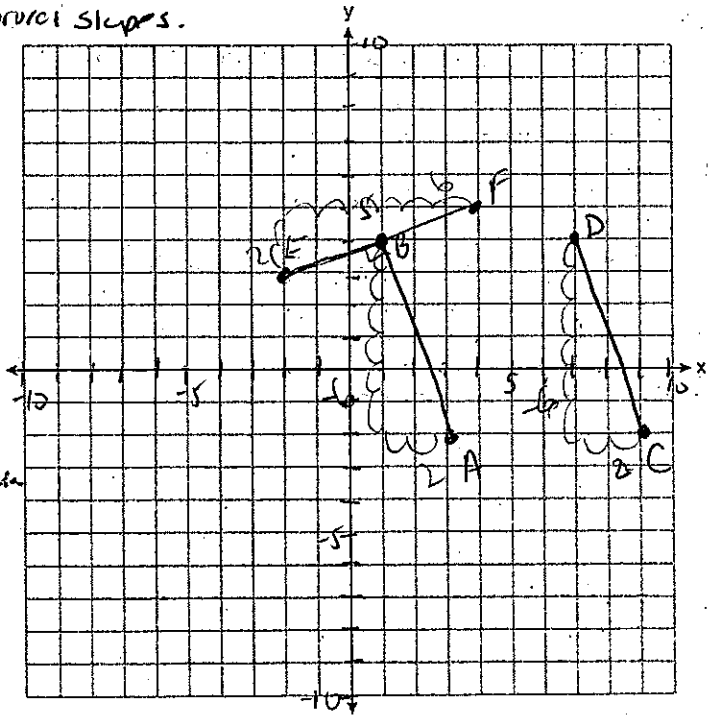
   Will that always happen? Explain Yes! B/c parallel lines always have the same slope that is why they will never intersect.
5. Graph E(-2,3) and F(4,5). Connect the points to make $\overline{EF}$ (Line segment EF)
6. What do you notice about line segments $\overline{AB}$ and $\overline{EF}$? They are perpendicular
7. Find the slope of $\overline{EF}$.

   Slope of $\overline{AB}$ $m = \frac{rise}{run}$ $m = \frac{-6}{2}$ $m = -3$ Slope of $\overline{EF}$ $m = \frac{rise}{run}$ $m = \frac{2}{6}$ $m = \frac{1}{3}$

   What do you notice? They are Negative reciprocals

   Will that always happen? Explain Yes! B/c perpendicular lines will always have negative reciprocal slopes.

change sign flip fraction



Symbols:

|| means parallel

⊥ means perpendicular

- If two lines are parallel, then their slopes are equal.
- They have different y-intercepts

Examples:

1) Write the equation of a line parallel to $y = 3x - 5$. $y = 3x + 2$

2) Write the equation of a line parallel to $18x + 2y = 10$ $y = -9x + 4$

$-18x \quad -18x$

$\frac{2y}{2} = \frac{-18x}{2} + \frac{10}{2}$

$y = -9x + 5$

3) Which line is parallel to $y = \frac{4}{7}x + 7$?

(a) $y = \frac{7}{4}x + 7$ (b) $y = -\frac{4}{7}x + 2$ (c) $y = -\frac{7}{4}x - 7$ (d) $y = \frac{4}{7}x + 5$

4) Which line is parallel to $9 - 3y = 15x$?

$-9 \quad -9$

$\frac{-3y}{-3} = \frac{15x}{-3} - \frac{9}{-3}$ $y = -5x + 3$

(a) $y = 15x + 3$ (b) $y = 15x - 9$ (c) $y = -5x + 5$ (d) $y = 5x + 3$

5) If two lines are parallel and the slope of one line is w, what is the sum of their slopes?

$m = w$ $m = w$ $w + w$ add

(a) w^2 product (b) $w + x$ (c) $w + 2$ (d) $2w$

- If two lines are perpendicular, then their slopes are negative reciprocal. (switch the sign, flip the fraction)
- Their y-intercepts may or may not be the same

Ex $\frac{1}{3} \to -\frac{3}{1}$, $-\frac{2}{3} \to \frac{3}{2}$, $5 \to -\frac{1}{5}$

Examples:

1) Write the equation of a line that is perpendicular to $y = \frac{3}{5}x + 10$. $y = -\frac{5}{3}x + 10$

2) Write the equation of a line that is perpendicular to $y = -\frac{2}{7}x + 10$. $y = \frac{7}{2}x + 7$

3) Which line is perpendicular to $y = \frac{1}{4}x - 8$? $\frac{1}{4} \to -\frac{4}{1} = -4$

(a) $y = -\frac{1}{4}x - 8$ (b) $y = -4x - 10$ (c) $y = \frac{1}{4}x - 10$ (d) $y = 4x - 8$

4) If Line A is represented by $y = \frac{3}{7}x + 4$ and Line B is represented by $y = -\frac{7}{3}x - 10$, then Line A and Line B are:

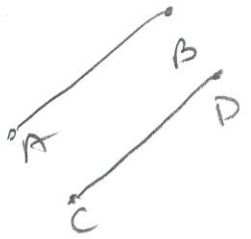
(a) parallel (b) perpendicular (c) vertical lines (d) parallel to the x - axis

B/C their slopes are negative reciprocal

(c) $y = \#$ (d) $x = \#$

parallel

5) Using the given coordinates of A, B, C, and D, use the slope to determine whether or not $\overline{AB} \parallel \overline{CD}$.
A(1,5), B(3,9), C(2,2), D(4,6)



$\overline{AB}$

A(1,5) B(3,9)
x_1, y_1 x_2, y_2

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

$m = \frac{9-5}{3-1}$

$m = \frac{4}{2}$

$m = 2$

$\overline{CD}$

C(2,2) D(4,6)
x_1, y_1 x_2, y_2

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

$m = \frac{6-2}{4-2}$

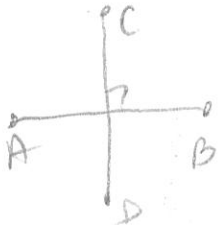
$m = \frac{4}{2}$

$m = 2$

They are parallel B/C their slopes are the same

6) Using the given coordinates of A, B, C, and D, use the slope to determine whether or not $\overline{AB} \perp \overline{CD}$.
A(1,7), B(4,9), C(4,0), D(0,6)

perp



$\overline{AB}$

A(1,7) B(4,9)
x_1, y_1 x_2, y_2

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

$m = \frac{9-7}{4-1}$

$m = \frac{2}{3}$

$\overline{CD}$

C(4,0) D(0,6)
x_1, y_1 x_2, y_2

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

$m = \frac{6-0}{0-4}$

$m = \frac{6}{-4}$

$m = -\frac{3}{2}$

They are perpendicular B/C their slopes are Negative reciprocals