6.2 - Slopes of Parallel & Perpendicular Lines

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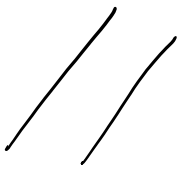
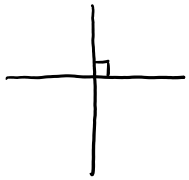
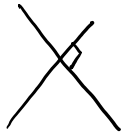
Parallel lines run next to each other. If we extend them to infinity, they will NEVER touch.

ie.  are parallel.

Perpendicular lines form 90° angles:

 and  are perpendicular.

★ Slopes of parallel lines are the same.

if $m_1 = m_2$, lines 1 and 2 are parallel.

★ Slopes of perpendicular lines are NEGATIVE RECIPROCALS.

ie. The negative reciprocal of $\frac{7}{8}$ is $-8/7$

$-3/2$ is $-(-2/3) = 2/3$

2 is $-1/2$

$-1/4$ is $-(-4/1) = 4/1 = 4$

Ex: Line GH goes through $G(\overset{x_1}{-4}, \overset{y_1}{2})$ and $H(\overset{x_2}{2}, \overset{y_2}{-1})$

" JK " " $J(-1, 7)$ " $K(7, 3)$

" MN " " $M(-4, 5)$ " $N(5, 1)$

Are any of these lines parallel?

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

$m_{GH} = \frac{(-1)-(2)}{(2)-(-4)} = \frac{-3}{6} = \frac{-1}{2}$ $\quad m_{JK} = \frac{(3)-(7)}{(7)-(-1)} = \frac{-4}{8} = \frac{-1}{2}$

$m_{MN} = \frac{(1)-(5)}{(5)-(-4)} = \frac{-4}{9}$

∴ Lines GH and JK are parallel ∵ $m_{GH} = m_{JK}$.

Ex: Line PQ goes through P(-7,2) and Q(-2,10)
" RS " " R(-3,-4) " S(5,1)

Are these 2 lines parallel, perpendicular, or neither?

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

$m_{PQ} = \frac{(10)-(2)}{(-2)-(-7)} = \frac{8}{5}$ $m_{RS} = \frac{(1)-(-4)}{(5)-(-3)} = \frac{5}{8}$

Although the slopes of lines PQ and RS are reciprocals, they are not NEGATIVE reciprocals.

∴ They are neither parallel nor perpendicular.

Ex: Determine the slope of a line that is perpendicular to the line that goes through the points E(2,3) and F(-4,-1).

$m_{EF} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{(-1)-(3)}{(-4)-(2)} = \frac{-4}{-6} = 2/3$

★ a line that is perpendicular to a line with a slope of $m = 2/3$ MUST have a NEGATIVE RECIPROCAL slope of $m = -3/2$ ★

What are the coordinates of G such that a second line "EG" is perpendicular to line EF?

Slope must be: $m = \frac{-3}{2}$ → rise, → run

From point $E(2, 3)$

run 2 → $G(4, 0)$ ← rise -3

$\therefore$ The perpendicular line runs through $E(2,3)$ and $G(4,0)$.

HW: Pg. 349 # 3-6, 8-10, 13, 16, 22