Lesson Title 3.5 Equations of Parallel & Perpendicular Lines DAY TWO Notes   HGEO Date

TASK 5: Writing Equations of Parallel & Perpendicular Lines

a) Write the equation of the line in slope-intercept form $\longrightarrow y=mx+b$ going through points (4, 6) and (-2, -5).

$$m = \frac{-5-6}{-2-4} = \frac{-11}{-6} = \frac{11}{6}$$

$$3\left[6 = \frac{11}{6}(4)+b\right]$$
$$18 = 22+3b$$
$$-4 = 3b$$
$$-\frac{4}{3} = b$$

$$\boxed{y = \frac{11}{6}x - \frac{4}{3}}$$

b) Now write the parallel line to the line above through the point (-1, 1). $(x_1,y_1)=(-1,1)$

$//m: \frac{11}{6}$

$$y-y_1 = m(x-x_1)$$
$$\boxed{y-1 = \frac{11}{6}(x+1)}$$

c) Now write the perpendicular line to the line above through the point (2, 3). $(x_1,y_1)=(2,3)$

$\perp m: -\frac{6}{11}$

$$y-y_1 = m(x-x_1)$$
$$\boxed{y-3 = -\frac{6}{11}(x-2)}$$

TASK 6: Writing Equations of Parallel & Perpendicular Lines

a) Write the equation of the line in slope-intercept form $y=mx+b$ going through points (3, 1) and (-2, -5).

$$m = \frac{6}{5}$$

$$1 = \frac{6}{5}(3)+b$$
$$5 = 18+5b \implies -13 = 5b \implies b = \frac{-13}{5}$$

$$\boxed{y = \frac{6}{5}x - \frac{13}{5}}$$

b) Now write the parallel line to the line above through the point (-1, 1).

$//m = \frac{6}{5}$

$$\boxed{y-1 = \frac{6}{5}(x+1)}$$

c) Now write the perpendicular line to the line above through the point (2, 3).

$\perp m: -\frac{5}{6}$

$$\boxed{y-3 = -\frac{5}{6}(x-2)}$$

TASK 7: Writing Equations of Parallel & Perpendicular Lines

Write the equation of the line that passes through the point (1, 5) and is ___

a) Parallel to the line $-3x + y = -5$.

$-3x + y = -5$
$\quad +3x \qquad +3x$
$\qquad y = 3x - 5$

$\parallel m = 3$

$(x_1, y_1) = (1, 5)$

$$\boxed{y - 5 = 3(x - 1)}$$

b) Perpendicular to the line $y = 3x - 5$.

$\perp m = -\dfrac{1}{3}$

$(x_1, y_1) = (1, 5)$

$$\boxed{y - 5 = -\dfrac{1}{3}(x - 1)}$$

Still need help with:

TASK 8: Finding the Distance from a Point to a Line

Step 1: Write the line perpendicular

Step 2: Solve the system of equations using your perpendicular lines — *substitution or elimination*

Step 3: Use the distance formula to find the length from the coordinate given and the solution to the system.

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

a) Find the distance from the point (6, 4) to the line $y = |x +$ ___

4. $\perp m: -1 \Rightarrow y - 4 = -1(x - 6)$

$d = \sqrt{(6-3)^2 + (4-7)^2}$
$\quad = \sqrt{3^2 + (-3)^2}$
$\quad = \sqrt{9 + 9} = \sqrt{18}$

⑨ $\sqrt{18} < \boxed{3\sqrt{2}}$ 4

$\begin{cases} y = x + 4 \\ y - 4 = -x + 6 \end{cases}$

$x + 4 - 4 = -x + 6$
$x = -x + 6$
$2x = 6 \quad \boxed{x = 3}$
$\boxed{y = 3 + 4 = 7}$

b) Find the distance from the point (-1, 6) to the line $y = -\underline{}2x$.

$\perp m: \dfrac{1}{2} \Rightarrow y - 6 = \dfrac{1}{2}(x + 1)$

$\begin{cases} y = -2x \\ y - 6 = \dfrac{1}{2}x + \dfrac{1}{2} \end{cases}$

$y = -2x$
$y - 6 = \dfrac{1}{2}x + \dfrac{1}{2}$

$(-2x - 6 = \dfrac{1}{2}x + \dfrac{1}{2})2$
$-4x - 12 = x + 1$
$-12 = 5x + 1$
$-13 = 5x$
$\boxed{x = \dfrac{-13}{5}}$ $\quad$ $\boxed{y = -2\left(\dfrac{-13}{5}\right) = \dfrac{26}{5}}$

$d = \sqrt{\left(-\dfrac{13}{5} + \dfrac{5}{5}\right)^2 + \left(\dfrac{26}{5} - \dfrac{30}{5}\right)^2}$
$\quad = \sqrt{\left(-\dfrac{8}{5}\right)^2 + \left(-\dfrac{4}{5}\right)^2}$
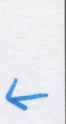$\quad = \sqrt{\dfrac{64}{25} + \dfrac{16}{25}}$
$\quad = \sqrt{\dfrac{80}{25}} = \sqrt{80} < \dfrac{5}{5}$ ⑩

$$\boxed{\dfrac{4\sqrt{5}}{5}} \ 4$$