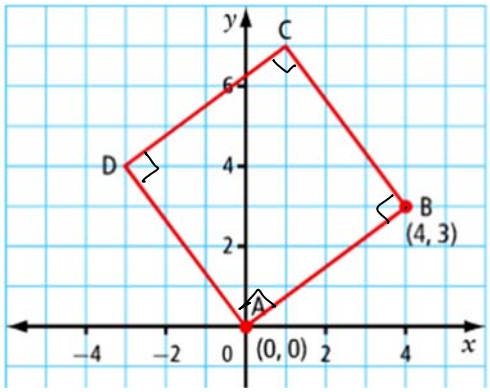
FMP10 Name: _____

Date: _____

5.4 Parallel & Perpendicular Lines

ABCD is a square. Calculate the slope of each line segment.

$m_{AB} = \frac{3}{4}$ $m_{BC} = -\frac{4}{3}$ $m_{CD} = \frac{3}{4}$ $m_{AD} = -\frac{4}{3}$



Compare the slopes of pairs of parallel line segments. What do you notice?

AB || CD: $\frac{3}{4}$ $\frac{3}{4}$ BC || AD: $-\frac{4}{3}$ $-\frac{4}{3}$

|| segments (lines) have equal slope

Compare the slopes of pairs of perpendicular line segments. What do you notice?

AB ⊥ DA: $\frac{3}{4}$ $-\frac{4}{3}$ AB ⊥ BC: $\frac{3}{4}$ $-\frac{4}{3}$ BC ⊥ CD: $-\frac{4}{3}$ $\frac{3}{4}$ CD ⊥ AD: $\frac{3}{4}$ $-\frac{4}{3}$

⊥ slopes are negative reciprocals of each other

Parallel lines: ||

- Lines that are always the same distance apart (never cross)
- Lines with same slope but different intercepts

Perpendicular lines: ⊥

- Two lines that intersect at 90° (right angle)
- Lines with slopes that are negative reciprocals of each other
- perpendicular slopes always multiply to −1 ex. $\frac{3}{4} \cdot -\frac{4}{3} = -1$

Ex. State whether the lines in each pair are parallel, perpendicular, or neither.

a) $y = 3x - 6$
$y = -\frac{1}{3}x + 4$
$m = \frac{3}{1}$ $m = -\frac{1}{3}$
⊥

b) $y = 4x + 3$
$y = 4x - 5$
$m = 4$ $m = 4$
||

c) $y = 2x + 6$ $m = 2$
$6x + 3y + 3 = 0$
$3y = -6x - 3$
$y = -2x - 1$ $m = -2$
neither

d) $y - 4 = 0$ ← $y = 4$ horizontal $m = 0$
$x + 1 = 0$ ← $x = -1$ vertical m = undefined
⊥

e) $y = \frac{2}{5}x - 6$ $m = \frac{2}{5}$
$5x + 2y = 8$
$2y = -5x + 8$
$y = -\frac{5}{2}x + 4$ $m = -\frac{5}{2}$
⊥

f) $y = 3x - 4$ $m = 3$
$y = 3x + \frac{1}{4}$ $m = 3$
||

Ex. Write the equation of a line that is parallel to $2x - y + 4 = 0$ and through $(1, -6)$. Express the equation in slope – intercept form and in general form.

$y = 2x + 4$

$m = 2$

$m_{\parallel} = 2 \quad (1, -6)$

① $y = mx + b$

$y = 2x + b$

$-6 = 2(1) + b$

$-6 = 2 + b$

$-2 \quad -2$

$-8 = b$

$y = 2x - 8$

$2x - y - 8 = 0$

OR

② use point-slope

$y - (-6) = 2(x - 1)$

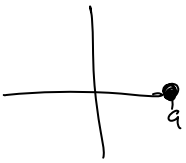
$y + 6 = 2x - 2$

$-6 \quad -6$

$y = 2x - 8$

Ex. Write the equation of a line perpendicular to $3x + 2y - 6 = 0$ with an *x*-intercept of 9. Express the equation in slope – intercept form and in general form.

$(9, 0)$



$2y = -3x + 6$

$y = -\frac{3}{2}x + 3$

$m = -3/2$

$\therefore m_{\perp} = 2/3 \quad (9, 0)$

*slope-point

$y - 0 = 2/3(x - 9)$

$y = 2/3x - 6$

$2/3 \cdot 3/1$

$3(y) = 3(2/3x) - (6)3$

$3y = 2x - 18$

$2x - 3y - 18 = 0$

Ex. For the pair of slopes $-\frac{2}{n}$ and $\frac{5}{2}$, what is the value of n if the lines are parallel? What is the value of n if the lines are perpendicular?

$\parallel$

$-\frac{2}{n} = \frac{5}{2}$

$n = \frac{-2(2)}{5}$

$n = -4/5$

or -0.8

$\perp$

$-\frac{2}{n} = \frac{-2}{5}$

$n = 5$

OR $\frac{n}{2} = \frac{5}{2}$

Practice: pg. 390/# 1acegh, 2bfgh, 3, 4, 5acf, 6aceg, 7bdef, 9 – 11, 13, 15, 16, 19, 20