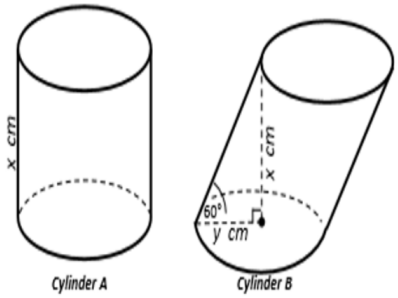
Two different cylinders are shown. Both cylinders have the same height, x cm, and same radius, y cm. The only difference is Cylinder B has been slanted by 60°. Which statement below is true?

A. Cylinder A has a greater volume than Cylinder B

B. Cylinder A has a lower volume than Cylinder B

C. Cylinder A has the same volume than Cylinder B

D. Not enough information is provided to determine which has a larger volume.




Learning Target: I can determine if lines are parallel or perpendicular from their equations.

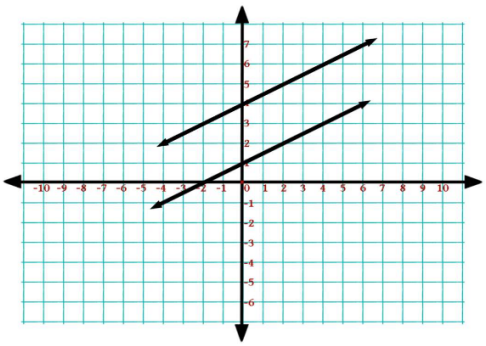
# PARALLEL LINES

- **Graphs:** Lines Never Intersect and are in the same plane (coplanar)

- **Equations:**

- same slope

- different y-intercept

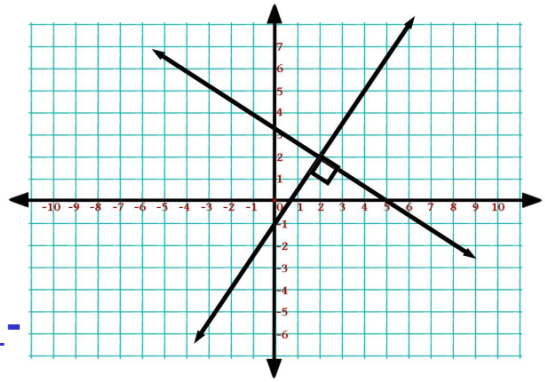


Learning Target: I can determine if lines are parallel or perpendicular from their equations.

Learning Target: I can determine if lines are parallel or perpendicular from their equations.

# PERPENDICULAR LINES

- **Graphs: Lines Intersect at right angles (90° angles)**
- **Equations:**
  - opposite (change signs) reciprocal slopes
  - Can have the same or different intercepts



(x, y)

Rot (-y, x)

# Find the Opposite (negative) Reciprocal Slopes

1. $-\frac{2}{3}$ $+\frac{3}{2}$

2. $\frac{11}{12}$ $-\frac{12}{11}$

3. $\frac{7}{1}$ $-\frac{1}{7}$

4. $-\frac{1}{9}$ $+\frac{9}{1} = 9$

Learning Target: I can determine if lines are parallel or perpendicular from their equations.

$y = mx + b$ same $m$ opp. rec.

Are these lines parallel, perpendicular, or neither?

1. $y = -2x + 1$
   $y = -2x - 4$
   Parallel //

2. $y = 3x - 4$ $m = 3$
   $y = -3x + 1$ $m = -3$
   Neither

3. $y = 1/5\,x + 2$ $m = \frac{1}{5}$
   $y = -5x + 6$ $m = -\frac{5}{1}$
   Perpendicular ⊥

Learning Target: I can determine if lines are parallel or perpendicular from their equations.

y=mx+b

- Are these lines parallel, perpendicular, or neither?

4. $y = -2x + 1$ $m = -2$ Neither

$y = -1/2x - 4$ $m = -\frac{1}{2}$

y=mx+b

5. $2y - 3x = -4$

$+3x \quad +3x$

$\frac{2y}{2} = \frac{3x - 4}{2} \rightarrow y = \frac{3}{2}x - 2$ (m, b)

$-6x + 4y = 4$

$+6x \quad +6x$

$\frac{4y}{4} = \frac{6x + 4}{4}$

$y = \frac{3}{2}x + 1$ (m, b)

$m = 3/2$

$m = 3/2$

Parallel //

6. Line through (-6, -3) and (0,2)

Line through (-5,12) and (5, 0)

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

$\frac{-12}{+10} = -\frac{6}{5}$

Perp.

1) Find slopes rise/run

Learning Target: I can determine if lines are parallel or perpendicular from their equations.

Learning Target: I can determine if lines are parallel or perpendicular from their equations.

## How to Write an Equation of a Line PARALLEL to another and given a point

1. Given equation should be solved for y. ($y = mx + b$)
2. Identify the m of that line (same slope)
3. Substitute m and (x, y) into $y=mx+b$.
4. Solve for b.
5. Write Parallel equation using m and b.



Learning Target: I can determine if lines are parallel or perpendicular from their equations.

Ex. 1 Write a line parallel to the line $y = 3x - 5$ and passes through the point (-5, -2).

① $y = mx + b$

$y = 3x - 5$

$m = 3$

② $y = mx + b$

$-2 = 3(-5) + b$

$-2 = -15 + b$

$+15 \quad +15$

$13 = b$

x y

$y = mx + b$

$y = 3x + 13$

Learning Target: I can determine if lines are parallel or perpendicular from their equations.

Ex. 2 Write a line parallel to the line 2x + y = 3 and passes through the point (-2, 5).

$y = mx + b$ $x$ $y$

① $2x + y = 3$
$-2x \quad -2x$
$y = -2x + 3$
$m = -2$

② $y = mx + b$
$5 = -2(-2) + b$
$5 = 4 + b$
$-4 \quad -4$
$1 = b$

$y = mx + b$
$y = -2x + 1$

Learning Target: I can determine if lines are parallel or perpendicular from their equations.

Ex. 3 A line passes through the points (2, -7) and (1, -3). Write the equation of a line that is parallel to it and passes through the point (2, -1).

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{+4}{-1} = -4$ x y

② $y = mx + b$

$-1 = -4(2) + b$

$-1 = -8 + b$

$+8 \quad +8$

$7 = b$

$y = mx + b$

$y = -4x + 7$

## How to Write an Equation of a Line
## PERPENDICULAR to another and given a point

1. Given equation should be solved for y.
   ($y = mx + b$)
2. Identify the opposite reciprocal slope of that line. (m for the ⊥ line)
3. Substitute $\perp m$ and ($x$, $y$) in $y = mx + b$.
4. Solve for $b$.
5. Write the equation using m and b.

Learning Target: I can determine if lines are parallel or perpendicular from their equations.

Learning Target: I can determine if lines are parallel or perpendicular from their equations.

Ex. 4 Write a line perpendicular to the line $y = \frac{1}{2}x - 2$ and passes through the point (1, 0).

$y = mx + b$

$m = \frac{1}{2}$

$m = -2$

(2) $y = mx + b$

$0 = -2(1) + b$

$0 = -2 + b$

$+2 \quad +2$

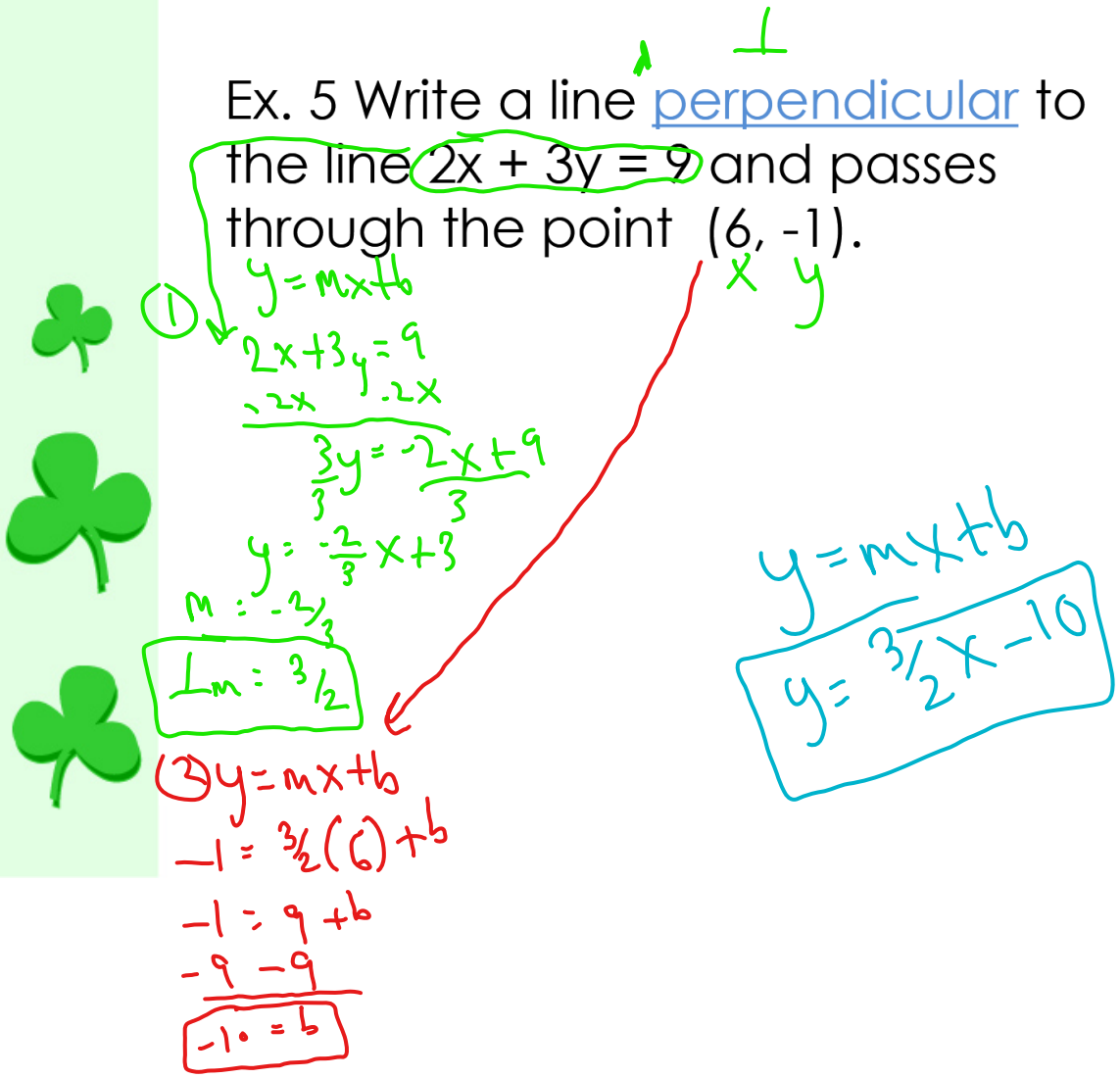
$2 = b$

$y = mx + b$

$y = -2x + 2$

Learning Target: I can determine if lines are parallel or perpendicular from their equations.

Ex. 5 Write a line perpendicular to the line $2x + 3y = 9$ and passes through the point (6, -1).



Learning Target: I can determine if lines are parallel or perpendicular from their equations.

Ex. 6 A line passes through the points (3, 5) and (6, 11). Write the equation a line that is perpendicular to it and passes through the point (2, 4).

m

x y

① $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{+6}{+3} = 2$

$\perp m = -\frac{1}{2}$

② $y = mx + b$

$4 = -\frac{1}{2}(2) + b$

$4 = -1 + b$

$+1 \quad +1$

$5 = b$

$y = mx + b$

$y = -\frac{1}{2}x + 5$

Geometry 5-Coordinate Geometry Notes
Name: _____ Date: _____

## Parallel Lines

- **Graphs:**
  - Lines never intersect and are in the same plane.
- **Equations:**
  - same slopes
  - different y - intercepts

$y = mx + b$

Are these lines parallel?

1. $y = -3x + 1$ and $y = -3x - 4$
   $m = -3$ $m = -3$ // yes
2. $y = x - 4$ and $y = 1 + x$
   $m = 1$ $m = 1$ // yes

**Writing an Equation of a Line PARALLEL to another and given a point.**

A. Given equation should be solved for y (y = mx + b).
B. Write down the slope of that line.
C. Substitute m and (x, y) in y = mx + b. Solve for b.
D. Write the equation using the slope and y-intercept.

3. Write a line parallel to $-x + y = 3$ that passes through the point (-4, 2).
   $y = mx + b$
   $-x + y = 3$
   $+x \quad +x$
   $y = x + 3$
   $m = 1$
   $y = mx + b$
   $2 = 1(-4) + b$
   $+4 \quad +4$
   $6 = b$
   $y = 1x + 6$

4. Write a line parallel to $y = \frac{1}{2}x - 1$ and passes through the point (6, -2).
   $m = \frac{1}{2}$
   $b = -5$
   $y = \frac{1}{2}x - 5$

5. Write a line parallel $2y + 6x = 2$ that passes through the point (3, -1).
   $m = -3$
   $b = 8$
   $y = -3x + 8$

6. A line goes through (-2,3) and (4,-3). Write the equation of a parallel line that passes through the point (8, -4).
   $m = -1$
   $b = 4$
   $y = -1x + 4$

GSE Geometry Unit 5 – Modeling and the Coordinate Plane 8.2 - Notes

**Perpendicular Lines**

- Graphs:
  - Lines intersect at a right angle.
- Equations:
  - opposite reciprocal slopes
  - same or different y - intercepts

**Writing an Equation of a Line PERPENDICULAR to another and given a point.**

A. Given equation should be solved for y. (y = mx + b).
B. Write down the perpendicular slope of that line.
C. Substitute the new slope and (x, y) in y = mx + b. Solve for b.
D. Write the equation using m and b.

7. Write a line perpendicular to the line y = ½x – 4 and passes through the point (3, 0).

x y

① $y = \frac{1}{2}x - 4$, $m = \frac{1}{2}$, $\perp m = -2$

② $0 = -2(3) + b$, $0 = -6 + b$, $+6 = +b$, $6 = b$

$y = mx + b$, $y = -2x + 6$

8. Write a line perpendicular to the line y = -3x +2 and passes through the point (6, 5).

$m = -3$, $\perp m = \frac{1}{3}$

$5 = \frac{1}{3}(6) + b$, $5 = 2 + b$, $-2 \quad -2$, $3 = b$

$y = \frac{1}{3}x + 3$

9. Write a line perpendicular to the line 2x + 3y = 9 and passes through the point (6, -1).

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

$-1 = \frac{3}{2}(6) + b$, $-1 = 9 + b$, $-9 \quad -9$, $-10 = b$

$y = \frac{3}{2}x - 10$

10. A line passes through the points (-1, -3) and (2, 3). Write the equation of a perpendicular line that passes through the point (2, 4).

$m = \frac{6}{3} = 2$, $\perp m = -\frac{1}{2}$

$4 = -\frac{1}{2}(2) + b$, $4 = -1 + b$, $+1 \quad +1$, $5 = b$

$y = -\frac{1}{2}x + 5$

Geometry 5 - Connecting Algebra and Geometry Though Coordinates Practice

Name: _____ Date: _____

## Equations of Parallel and Perpendicular Lines Classwork

**A. Determine whether the lines are parallel, perpendicular, or neither given the equations. Explain how you know.**

1) $y = -2x + 5$; $y = 2x - 3$

$m = -2$ $m = 2$ neither

2) $3x - 8y = -16$; $32x + 12y = -18$

$m = 3/8$ $m = -\frac{8}{3}$ perpendicular ⊥

3) $9x + 3y = 12$; $27x + 9y = 40$

$3y = -9x + 12$, $y = -3x + 4$, $m = -3$

$9y = -27x + 40$, $y = -3x + \frac{40}{9}$, $m = -3$ Parallel ∥

4) $3x - 4y = 19$; $8x + 6y = 12$

$m = 3/4$ $m = -\frac{4}{3}$ perpendicular ⊥

**B. Determine whether the lines through the pairs of points are parallel, perpendicular, or neither.**

5) (2, 5) and (-2, 7); (0, 4) and (1, 6)

$m = -\frac{1}{2}$ $m = \frac{2}{1} = 2$ Perpendicular

6) (1, 2) and (5, 4); (0, 3) and (2, 4)

$m = \frac{2}{4} = \frac{1}{2}$ $m = \frac{1}{2}$ Parallel

7) (0, -5) and (2, -4); (-1, -5) and (1, -6)

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{+1}{+2} = \frac{1}{2}$

$m = \frac{-1}{2} = -\frac{1}{2}$ Neither

8) (0, 2) and (-4, 8); (-4, 0) and (4, -12)

$m = \frac{6}{-4} = -\frac{3}{2}$ $m = \frac{-12}{8} = -\frac{3}{2}$ Parallel

Adapted from: Mathematics Vision Project

**C. Find the equation of a line through the given point A that satisfies the given condition.**

9) Point A (4, -5); Parallel to the line that goes through (5,6) and (3, 9)

10) Point A(-3, 7); Perpendicular to the line that goes through (-2, 6) and (-7, 9)

**D. Find the equation of a line through the given point A that satisfies the given condition. Check your answers on your graphing calculator.**

11) Point A (2,1)

a. parallel to the y-axis

b. perpendicular to the y-axis

12) Point A(2,-4); parallel to the line 5x – 2y = 4.

13) Point A(4,5); perpendicular to the line 3x + 2y = 7

Adapted from: Mathematics Vision Project