

Determining the Equation of a Line

Recall: The equation of a straight line is $y=mx+b$

slope \nearrow
y-intercept \nearrow

There are 4 different types of problems when determining the equation of a line.

Type 1 - given slope and y-intercept

1. Sub m and b values into $y=mx+b$

Example: What is the equation of the line that has a slope of 4, and y-intercept of -2?

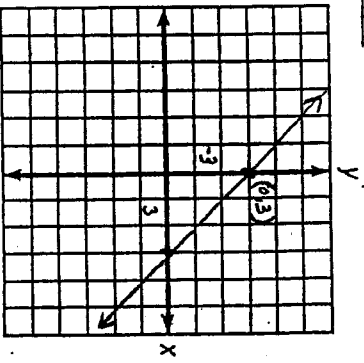
$$y=mx+b$$

$$y=4x-2$$

Type 2 - given graph of the line

1. locate y-intercept
2. calculate slope using triangle $m = \frac{\text{rise}}{\text{run}}$
3. sub m and b values into $y=mx+b$

Example: What is the equation of the line on the graph below?



y-int is (0, 3) $\therefore b=3$

$$m = \frac{\text{rise}}{\text{run}} = \frac{-3}{3} = -1$$

$$y = mx + b$$

$$y = -1x + 3$$

$$y = -x + 3$$

Type 3 - given slope and one point (not y-intercept)

1. sub m value and (x, y) point into $y=mx+b$
2. solve for b
3. sub m and b into $y=mx+b$

Example: What is the equation of the line that has a slope of 4 and passes through the point (-2, 5)?

$$y = mx + b$$

$$5 = 4(-2) + b$$

$$5 = -8 + b$$

$$5 + 8 = b$$

$$13 = b$$

$$y = mx + b$$

$$y = 4x + 13$$

Type 4 - given 2 points on the line (similar to Type 3)

1. Calculate slope using $m = \frac{y_2 - y_1}{x_2 - x_1}$
2. Sub m value and (x, y) point (use either point) into $y=mx+b$
3. Solve for b
4. Sub m and b values into $y=mx+b$

Example: What is the equation of the line that passes through the points (10, -3) and (5, -5)?

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-5 - (-3)}{5 - 10} = \frac{-2}{-5} = \frac{2}{5}$$

$$y = mx + b$$

$$-3 = \frac{2}{5}(10) + b$$

$$-3 = \frac{20}{5} + b$$

$$-3 = 4 + b$$

$$-3 - 4 = b$$

$$-7 = b$$

$$y = mx + b$$

$$y = \frac{2}{5}x - 7$$

MPPM2D0 Review Co-ordinate Geometry

Part A Short answer and Explanations.

- Answer in the spaces provided.
 - The point where the x-axis and y-axis meet is called the _____.
 - The x-axis has a slope value of _____ and for the y-axis it is _____.
 - The x co-ordinate at the y-intercept is always _____.
 - Parallel lines never meet because their slopes are _____.
 - Perpendicular lines have slopes that are _____ of each other.
- State the slope formula.
- Determine the slope between the points (5, 4) and (-3, 2) using the slope formula.
- Complete the chart.

Equation of line	Slope	Co-ordinates of the Y - Intercept	Slope of a parallel line	Slope of a perpendicular line
$y = 2x - 5$				
$y = -3x$				
$y = \frac{2}{3}x - 1$				

Part B Graphing Skills and Knowledge Use your own graph paper.

- Graph the equation $y = 2x - 6$ using the table of values provided.

X	Y
0	
2	
5	
-1	
-3	

 - Graph line A, parallel to the one in a) that passes through the point (2, 5).
 - Graph a line B, perpendicular to the one in a) going through the same y-intercept.
 - Graph the equation $y = -\frac{3}{4}x + 4$ using the y-intercept and a triangle for slope.
 - Determine if the point (-2, 10) lies on the line $y = 5x - 7$ without use of a graph.

- Determine the equation of a line in the form $y = mx + b$ in each problem.
 - slope is -3 and y-intercept is (0, 5). _____
 - the line has a slope of 2 and passes through the point (3, -5). _____
 - the line passes through the points (2, 7) and (4, -1). _____

- Determine the point of intersection between the lines $y = -3x + 5$ and $y = x - 3$ without use of a graph. Write a final statement as well.

- Finding the Equation of a Line. Given the slope of the line and one point on the line.
 - Point is (4, -3) and $m = 2$. _____
 - Point is (-1, 6) and $m = 5$. _____
 - Point is (-2, -5) and $m = -3$. _____
 - Point is (-4, -1) and $m = \frac{1}{2}$. _____
 - Point is (10, 2) and $m = -\frac{3}{5}$. _____

- Finding the Equation of a Line. Given two points.
 - Points are (2, 7) and (1, 4). _____
 - Points are (-1, 5) and (1, 1). _____
 - Points are (2, -4) and (3, -4). _____
 - Points are $(\frac{1}{2}, 2)$ and $(\frac{3}{4}, \frac{2}{3})$. _____
 - Points are $(\frac{2}{3}, \frac{5}{4})$ and $(-\frac{1}{6}, \frac{1}{4})$. _____

MPM2D0 Review Co-ordinate Geometry

Part A Short answer and Explanations.

1. Answer in the spaces provided.
 - a) The point where the x-axis and y-axis meet is called the ORIGIN.
 - b) The x-axis has a slope value of 0 and for the y-axis it is UNDEFINED.
 - c) The x co-ordinate at the y-intercept is always 0.
 - d) Parallel lines never meet because their slopes are EQUAL.
 - e) Perpendicular lines have slopes that are NEGATIVE RECIPROCALs of each other.
2. State the slope formula. $m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$
3. Determine the slope between the points (5, 4) and (-3, 2) using the slope formula.
4. Complete the chart. $m = \frac{2-4}{-3-5} = \frac{-2}{-8} = \frac{1}{4}$

Equation of line	Slope	Co-ordinates of the Y - intercept	Slope of a parallel line	Slope of a perpendicular line
$y = 2x - 5$	2	(0, -5)	2	$-\frac{1}{2}$
$y = -3x$	-3	(0, 0)	-3	$\frac{1}{3}$
$y = \frac{2}{3}x - 1$	$\frac{2}{3}$	(0, -1)	$\frac{2}{3}$	$-\frac{3}{2}$

Part B Graphing Skills and Knowledge Use your own graph paper.

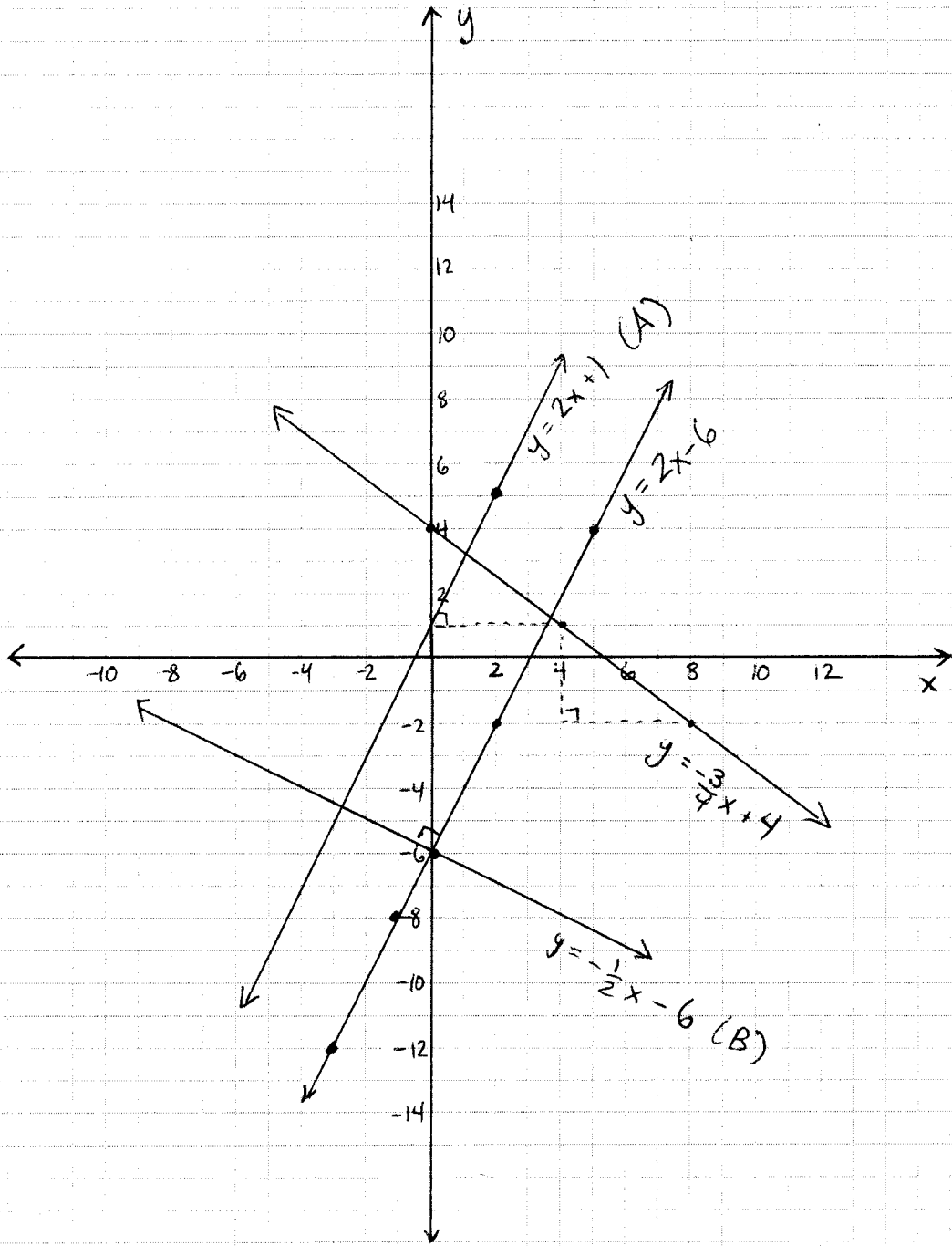
- 1) a) Graph the equation $y = 2x - 6$ using the table of values provided.

X	Y
0	-6
2	-2
5	4
-1	-8
-3	-12

 - b) Graph line A , parallel to the one in a) that passes through the point (2, 5). $y = 2x + 1$
 - c) Graph a line B, perpendicular to the one in a) going through the same y-intercept. $y = -\frac{1}{2}x - 6$
- 2) Graph the equation $y = -\frac{3}{4}x + 4$ using the y-intercept and a triangle for slope.
- 3) Determine if the point (-2, 10) lies on the line $y = 5x - 7$ without use of a graph.

$$\begin{aligned} LS &= y & RS &= 5x - 7 \\ &= 10 & &= 5(-2) - 7 \\ & & &= -17 \end{aligned}$$

REVIEW: COORDINATE GEOMETRY



4) Determine the equation of a line in the form $y = mx + b$ in each problem.

a) slope is -3 and y -intercept is $(0, 5)$. $y = -3x + 5$

b) the line has a slope of 2 and passes through the point $(3, -5)$. $y = 2x - 11$

c) the line passes through the points $(2, 7)$ and $(4, -1)$. $y = -4x + 15$

5. Determine the point of intersection between the lines $y = -3x + 5$ and $y = x - 3$ without use of a graph. Write a final statement as well. $(2, -1)$

6. Finding the Equation of a Line. Given the slope of the line and one point on the line.

a. Point is $(4, -3)$ and $m = 2$. $y = 2x - 11$

b. Point is $(-1, 6)$ and $m = 5$. $y = 5x + 11$

c. Point is $(-2, -5)$ and $m = -3$. $y = -3x - 11$

d. Point is $(-4, -1)$ and $m = \frac{1}{2}$. $y = \frac{1}{2}x + 1$

e. Point is $(10, 2)$ and $m = -\frac{3}{5}$. $y = -\frac{3}{5}x + 8$

7. Finding the Equation of a Line. Given two points.

a. Points are $(2, 7)$ and $(1, 4)$. $y = 3x + 1$

b. Points are $(-1, 5)$ and $(1, 1)$. $y = -2x + 3$

c. Points are $(2, -4)$ and $(3, -4)$. $y = -4$

d. Points are $(\frac{1}{2}, 2)$ and $(\frac{3}{4}, \frac{2}{3})$. $y = -\frac{16}{3}x + \frac{14}{3}$

e. Points are $(\frac{2}{3}, \frac{5}{4})$ and $(-\frac{1}{6}, \frac{1}{4})$. $y = \frac{6}{5}x + \frac{9}{20}$

REVIEW: COORDINATE GEOMETRY

4A, $m = -3, b = 5$

$y = -3x + 5$

B, $m = 2$

$y = 2x + b$

$-5 = 2(3) + b$

$b = -11$

$y = 2x - 11$

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

$= \frac{-1 - 7}{4 - 2}$

$= \frac{-8}{2} = -4$

$y = -4x + b$

$7 = -4(2) + b$

$b = 15$

$y = -4x + 15$

5, $y = -3x + 5$

$y = x - 3$

$-3x + 5 = x - 3$

$-3x - x = -3 - 5$

$-4x = -8$

$x = 2$

$y = (2) - 3$

$y = -1$

∴ THE P.O.I. IS $(2, -1)$

check 1st eq'n

LS = $y = -1$

RS = $-3x + 5$

$= -3(2) + 5$

$= -1$

∴ LS = RS

6C, $m = -3$

$y = -3x + b$

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

$b = -11$

$y = -3x - 11$

6A, $m = 2$

$y = 2x + b$

$-3 = 2(4) + b$

$b = -11$

$y = 2x - 11$

B, $m = 5$

$y = 5x + b$

$6 = 5(-1) + b$

$b = 11$

$y = 5x + 11$

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

$y = \frac{1}{2}x + b$

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

$-1 = -2 + b$

$-1 = -2 + b$

$b = 1$

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

E, $m = -\frac{3}{5}$

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

$2 = -\frac{3}{5}(10) + b$

$2 = -6 + b$

$2 = -6 + b$

$b = 8$

$y = -\frac{3}{5}x + 8$

REVIEW: COORDINATE GEOMETRY

$$7A/ \quad m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{4 - 7}{1 - 2} = \frac{-3}{-1} = 3$$

$$y = 3x + b$$

$$4 = 3(1) + b$$

$$b = 1$$

$$\therefore y = 3x + 1$$

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

$$= \frac{1 - 5}{1 - (-1)} = \frac{-4}{2} = -2$$

$$y = -2x + b$$

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

$$b = 3$$

$$\therefore y = -2x + 3$$

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

$$= \frac{-4 - (-4)}{3 - 2} = \frac{0}{1} = 0$$

\therefore HORIZONTAL LINE

$$y = 0x + b$$

$$y = b$$

$$b = -4$$

$$\therefore y = -4$$

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

$$= \frac{\frac{2}{3} - 2}{\frac{3}{4} - \frac{1}{2}} = \frac{\frac{2}{3} - \frac{6}{3}}{\frac{3}{4} - \frac{2}{4}} = \frac{-\frac{4}{3}}{\frac{1}{4}} = -\frac{4}{3} \times \frac{4}{1} = -\frac{16}{3}$$

$$y = -\frac{16}{3}x + b$$

$$2 = -\frac{16}{3}\left(\frac{1}{2}\right) + b$$

$$2 = -\frac{16}{6} + b$$

$$2 + \frac{16}{6} = b$$

$$2 + \frac{8}{3} = b$$

$$\frac{6}{3} + \frac{8}{3} = b$$

$$b = \frac{14}{3}$$

$$\therefore y = -\frac{16}{3}x + \frac{14}{3}$$

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

$$= \frac{\frac{1}{4} - \frac{5}{4}}{-\frac{1}{6} - \frac{2}{3}} = \frac{-\frac{4}{4}}{-\frac{1}{6} - \frac{4}{6}} = \frac{-\frac{4}{4}}{-\frac{5}{6}} = \frac{-1}{-\frac{5}{6}} = -1 \times \left(-\frac{6}{5}\right) = \frac{6}{5}$$

$$y = \frac{6}{5}x + b$$

$$\frac{5}{4} = \frac{6}{5}\left(\frac{2}{3}\right) + b$$

$$\frac{5}{4} = \frac{12}{15} + b$$

$$\frac{5}{4} = \frac{4}{5} + b$$

$$\frac{5}{4} - \frac{4}{5} = b$$

$$\frac{25}{20} - \frac{16}{20} = b$$

$$b = \frac{9}{20}$$

$$\therefore y = \frac{6}{5}x + \frac{9}{20}$$