

## MPM 1D

### USING POINTS TO DETERMINE THE EQUATION OF A LINE

#### WRITING LINEAR RELATIONS in the form $y = mx + b$

##### STEPS:

1. Determine the slope of the line using  $m = \frac{\text{rise}}{\text{run}}$  or  $m = \frac{y_2 - y_1}{x_2 - x_1}$
2. Using the equation  $y = mx + b$ , substitute the slope  $m$ , and the  $x$  and  $y$  values of the given point to find the value of  $b$ .
3. Write the equation in the form  $y = mx + b$ .

**EXAMPLES:** Determine the equation of the linear relation with the given information.

- ① having slope  $2/5$  and with  $y$ -intercept  $-4$ .

- Since we are already given the slope and the  $y$ -intercept, we substitute both values into the equation of a line  $y = mx + b$

$$y = \frac{2}{5}x - 4$$

- ② having slope  $-3/2$  and passing through  $(5, -1)$ .

- Substitute  $m = -\frac{3}{2}$ ,  $x = 5$  and  $y = -1$  into  $y = mx + b$  to solve for  $b$ .

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

$$-1 = -\frac{15}{2} + b$$

$$-1 + \frac{15}{2} = b$$

$$\frac{13}{2} = b$$

Therefore,  $y = -\frac{3}{2}x + \frac{13}{2}$  is the equation of the line.

③ passing through A(-2, 7) and B(4, 5)

- Determine the slope of the line using the formula  $m = \frac{y_2 - y_1}{x_2 - x_1}$

$$m = \frac{5-7}{4-(-2)} = \frac{-2}{6} = -\frac{1}{3}$$

- Substitute  $m$  and one of the given points into the equation of the line to find  $b$ .

Using the second point (4, 5):

$$5 = -\frac{1}{3}(4) + b$$

$$5 = -\frac{4}{3} + b$$

$$5 + \frac{4}{3} = b$$

$$\frac{19}{3} = b \quad \text{Therefore, } y = -\frac{1}{3}x + \frac{19}{3} \text{ is the equation of the line.}$$

**EXERCISE:** Determine the equation of each line.

- |   |  |
|---|--|
| 1. line with slope $\frac{4}{3}$ and with y-intercept -3.                 | 2. line with slope 4 and passing through the point (-2, 1).    |
| 3. line passing through the points (-4, 7) and (-2, 1).                   | 4. line passing through the points (2, 6) and (5, 2).          |
| 5. line with x-intercept -1 and with y-intercept 5.                       | 6. line having y-intercept 8 and passing through (1, -1).      |
| 7. line passing through (-4, -2) and (1, 1).                              | 8. line passing through (3, -6) and (3, 2).                    |
| 9. line having slope $-\frac{5}{6}$ and passing through the point (4, 2). | 10. line having slope 0 and passing through the point (-3, 8). |

**ANSWERS:** (in no particular order)

$y = -9x + 8$	$x = -5$	$y = 4x + 9$	$y = 5x + 5$	$x = 3$	$y = 8$
$y = -\frac{4}{3}x + \frac{26}{3}$	$y = -\frac{1}{2}x - \frac{7}{2}$	$y = -\frac{5}{6}x + \frac{16}{3}$	$y = \frac{4}{3}x - 3$	$y = \frac{3}{5}x + \frac{2}{5}$	$y = -3x - 5$