• Which of the following is the equation of the line that passes through point (4,-1) and has slope -2?

(A) $x + 2y = 2$
(B) $x - 2y = 6$
(C) $2x - y = 9$
(D) $2x + y = 7$

Solution:
To find the equation of the line, we can use the point-slope form:

$$y - y_1 = m(x - x_1)$$

Given the point $(x_1, y_1) = (4, -1)$ and slope $m = -2$

Substitute given point $(x_1, y_1) = (4, -1)$ and slope $m = -2$ into the point-slope equation:

$$y - (-1) = -2(x - 4)$$

$$y + 1 = -2(x - 4)$$

Now, simplify the equation to match the standard form $Ax + By = C$:

$$y + 1 = -2x + 8$$

$$2x + y + 1 = 8$$

$$2x + y = 7$$

Comparing this result with the given choices, the correct equation is: **(D)** $2x + y = 7$

• In the xy-plane, the graph of the linear function f contains the points $(0, 3)$ and $(7, 31)$. Which equation defines f, where $y = f(x)$?

(A) $f(x) = 28x + 34$
(B) $f(x) = 4x + 3$
(C) $f(x) = -4x + 2$
(D) $f(x) = x + 3$

Solution: A linear function can be written in the slope-intercept form:

$$f(x) = mx + b$$

where m is the slope and b is the y-intercept.
The slope m between two points (x_1, y_1) and (x_2, y_2) is calculated as:

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

Substituting the given points $(0, 3)$ and $(7, 31)$:

$$m = \frac{31 - 3}{7 - 0} = \frac{28}{7} = 4$$

The y-intercept is the value of the function when $x = 0$. Since the point $(0, 3)$ is on the graph, the y-intercept is:

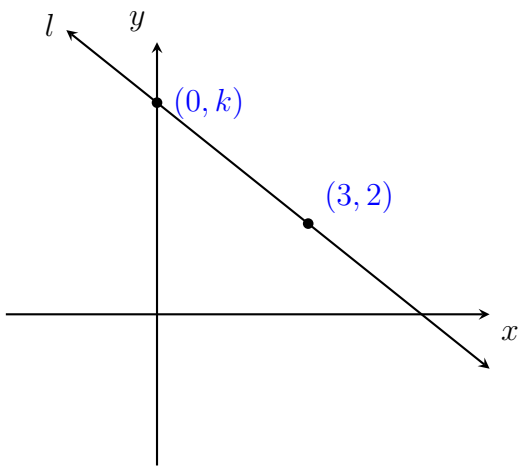
$$b = 3$$

Substituting $m = 4$ and $b = 3$ into the slope-intercept form gives:

$$f(x) = 4x + 3$$

The correct option is (B).

• In the figure below, the slope of the line l is $-\frac{1}{2}$. What is the value of k?



(A) -6
(B) 1/2
(C) 7/2
(D) 5

Solution:

It is given that slope of the line on the graph is $-\frac{1}{2}$

Using the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ with the two given points $(3, 2)$ and $(0, k)$ we get an equation involving k which is

$$\frac{2-k}{3-0} = \frac{-1}{2}$$

Solving for k.

$$\frac{2-k}{3-0} = \frac{-1}{2}$$

$$\frac{2-k}{3} = \frac{-1}{2}$$

$$4 - 2k = -3 \Rightarrow 7 = 2k$$

$$k = \frac{7}{2}$$

The correct option is (C).

• The point (a, b), where a and b are positive integers, lies on the line given by the equation $y = mx + 3$ where m is a constant. What is the slope of the line in terms of a and b

(A) $\dfrac{b-3}{a}$

(B) $\dfrac{a-3}{b}$

(C) $\dfrac{3-b}{a}$

(D) $\dfrac{3-a}{b}$

Solution:

It is given that point (a, b) lies on the line given by the equation $y = mx + 3$. This means that we can replace a for x and b for y into the equation $y = mx + 3$ which yields $b = ma + 3$.

Now, we can solve for m by subtracting 3 on both sides of the equation $b = ma + 3$ which yields $b - 3 = ma$.

Dividing both sides by 3 we obtain $m = \dfrac{b-3}{a}$

The correct option is **(A)**.

• The table below shows some values for the function f. If f is a linear function, what is the value of $a + b$?

x	0	1	2
$f(x)$	a	12	b

(A) 24
(B) 36
(C) 48
(D) 60

Solution
Since f is a linear function, the rate of change (slope) between any two points is constant. We can use the three points $(0, a)$, $(1, 12)$, and $(2, b)$ to calculate the slope m.

- Slope between $(0, a)$ and $(1, 12)$:

$$m = \frac{12 - a}{1 - 0} = 12 - a$$

- Slope between $(1, 12)$ and $(2, b)$:

$$m = \frac{b - 12}{2 - 1} = b - 12$$

Because the slope is constant for a linear function:

$$12 - a = b - 12$$

Add a and 12 to both sides of the equation:

$$12 + 12 = a + b$$

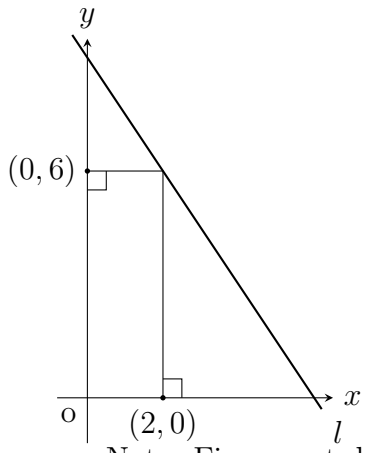
$$a + b = 24$$

Alternatively, for equally spaced x-values, the $f(x)$ values form an arithmetic sequence. The middle term is the average of its neighbors:

$$12 = \frac{a + b}{2} \implies a + b = 24$$

The correct option is (A).

• In the figure below, if line l has a slope of -3, what is the y-intercept of l?



Note: Figure not drawn to scale.

(A) 6
(B) 8
(C) 10
(D) 12

Notice that the shape inscribed in the triangle is a rectangle. Use the point on the line that is also a vertex of the rectangle to figure out an equation for the line in the form of $y = mx + b$.

The point on the line in $(2, 6)$ and the slope in -3 therefore

$$y = mx + b$$

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

$$46 = -6 + b \Rightarrow b = 12$$

The correct option is (D).

Problems adapted from the College Board SAT Question Bank and released SAT practice tests.