Question

1. The number of volunteers of a worldwide organization has increased from
    5.2 million in 2004 to 11.6 million in 2010.
    (a) Find an equation for the line containing the given points. Let x represent
    the number of years after 2000 and y the number of volunteers, in millions.
    (b) Estimate the number of volunteers in 2009 and in 2014

Solution

(a) Let the number of volunteers in the organization increases linearly.

Let y(x) = A + Bx, where y(x) is the number of volunteers in the year x after 2000.
Then

$$\begin{cases} A + 4B = 5.2, \\ A + 10B = 11.6. \end{cases}$$

Subtract the first equation from the second one

$$\begin{cases} A + 4B = 5.2, \\ A + 10B - A - 4B = 11.6 - 5.2; \end{cases}$$

$$\begin{cases} A + 4B = 5.2, \\ 6B = 6.4; \end{cases}$$

$$\begin{cases} A = 5.2 - 4B, \\ B = \dfrac{6.4}{6}; \end{cases}$$

$$\begin{cases} A = 5.2 - \dfrac{16 \cdot 4}{15}, \\ B = \dfrac{16}{15}; \end{cases}$$

$$\begin{cases} A = 14/15, \\ B = 16/15. \end{cases}$$

Then

$$y(x) = A + Bx = \frac{14}{15} + \frac{16}{15}x, \text{ hence } y(x) \approx 0.93 + 1.07x.$$

(b) Estimated number of volunteers in 2009:

$$y(9) = \frac{14}{15} + \frac{16}{15} \cdot 9 = \frac{158}{15} \approx 10.53 \text{ (million)}.$$

Estimated number of volunteers in 2014:

$$y(14) = \frac{14}{15} + \frac{16}{15} \cdot 14 = \frac{238}{15} \approx 15.87 \text{ (million)}.$$

Answer:

(a) $y(x) = \frac{14}{15} + \frac{16}{15}x$;

(b) 10.53 million; 15.87 million.