

HOTS (Higher Order Thinking Skills)

Que 1. At what point does the graph of the linear equation $2x + 3y = 9$ meet a line which is parallel to the y-axis, at a distance of 4 units from the origin and on the right of the y-axis?

Sol. The line parallel to the y-axis at a distance of 4 units from the origin and on the right of the y-axis is given by $x = 4$.

Putting $x = 4$ in $2x + 3y = 9$, we get

$$2x \times 4 + 3y = 9 \quad \Rightarrow \quad 3y = 9 - 8 \quad \Rightarrow \quad y = \frac{1}{3}$$

$\therefore$ The required point is $\left(4, \frac{1}{3}\right)$.

Que 2. The temperature of a liquid can be measured in Kelvin units as x K or in Fahrenheit units as $y^{\circ}\text{F}$. The relation between the two system of measurement of temperature is given by the linear equation $y = \frac{9}{5}(x - 273) + 32$

(i) Find the temperature of the liquid in Fahrenheit if the temperature of the body is 313K.

(ii) If the temperature is 158°F , then find the temperature in Kelvin.

Sol. (i) When $x = 313\text{K}$, $y = \frac{9}{5}(313 - 273) + 32 = \frac{9}{5}(40) + 32 = 72 + 32 = 104^{\circ}\text{F}$

(ii) When $y = 158^{\circ}\text{F}$, then $158 = \frac{9}{5}(x - 273) + 32$

$$\Rightarrow 158 - 32 = \frac{9}{5}(x - 273) \quad \Rightarrow \quad 126 = \frac{9}{5}(x - 273)$$

$$\Rightarrow 126 \times \frac{5}{9} = x - 273 \quad \Rightarrow \quad 70 = x - 273$$

$$\Rightarrow x = 70 + 273 \quad \Rightarrow \quad x = 343 \text{ K}$$

Que 3. The work done by a body on application of a constant force is the product of the constant force and distance travelled by the body in the direction of force. Express this in the form of a linear equation in two variables and draw its graph by taking the constant force as 3 units. What is the work done when the distance travelled is 2 units? Verify it by plotting the graph.

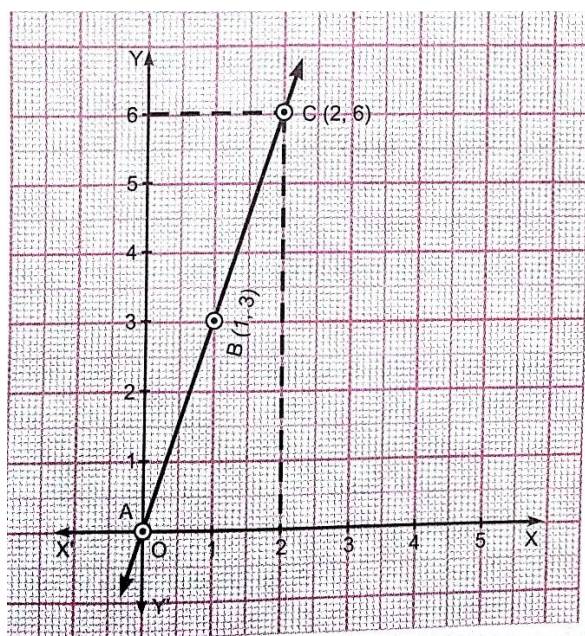


Fig. 3.17

Sol. Work done = (constant force) $\times$ (distance) = $3 \times$ (distance) i.e., $y = 3x$, where y (units) is the work done and x (units) is the distance travelled. Since $x = 2$ units (given), therefore, work done = 6 units. To plot the graph of the linear equation $y = 3x$, we need at least two solution of the equation. $x = 0$, $y = 0$ satisfies the given equation. Also $x = 1$, $y = 3$ and $x = 2$, $y = 6$ satisfies the equation.

Now we plot the points

A (0, 0), B (1, 3) and C (2, 6) and join A, B and C [Fig. 3.17]. The graph of the equation is a straight line.

To verify from the graph, draw a perpendicular to the x -axis at the point (2, 0) meeting the graph at the point C. Clearly the coordinates of C are (2, 6) It means the work done is 6 units.