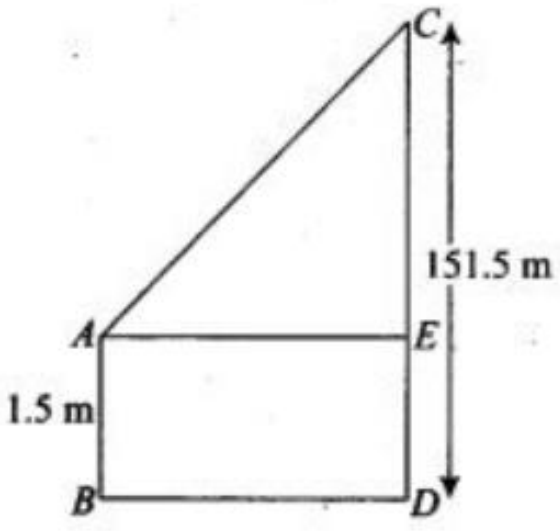
3. A kite is moving horizontally at a height of 151.5 meters. If the speed of kite is 10 m/s, how fast is the string being led out; when the kite is 250 m away from the boy who is flying the kite? The height of boy is 1.5 m.

Sol.



We have, height (h) = 151.5 m, speed of kite (v) = 10 m/s

Let CD be the height of kite and AB be the height of body.

$$\therefore \quad \frac{dx}{dt} = 10$$

From the figure, we have

$$EC = 151.5 - 1.5 = 150 \text{ m}$$

and $AE = x$

Also, $AC = 250$ m

In right angled ΔCEA,

$$AE^2 + EC^2 = AC^2$$

$$\Rightarrow \quad x^2 + (150)^2 = y^2$$

Differentiating w.r.t. x, we get

$$2x \cdot \frac{dx}{dt} + 0 = 2y \frac{dx}{dt}$$

$$\Rightarrow \quad 2y \cdot \frac{dy}{dt} = 2x \cdot \frac{dx}{dt}$$

$$\Rightarrow \quad \frac{dy}{dt} = \frac{x}{y} \cdot \frac{dx}{dt}$$

When $y = 250$ m,

$$x^2 + (150)^2 = (250)^2$$

$$\Rightarrow \quad x = 200$$

$$\Rightarrow \quad \left(\frac{dy}{dt}\right)_{y=250\text{m}} = \frac{200}{250} \cdot 10 = 8 \text{ m/s} \qquad \left[\because \frac{dx}{dt} = 10 \text{ m/s}\right]$$

So, the required rate at which the string is being led out is 8 m/s.