A particle is projected from rest from the top of a vertical tower. In the final 2 seconds it moves a distance 3/4th the height of the tower. Find the height of the tower. (g = 10 ms^-2)

Input Data:

$\dfrac{dh}{H} = \dfrac{3}{4}$, where dh is the distance traveled in the last 2 seconds, and h is the height of the tower

$$g = 10 \dfrac{m}{s^2}$$

Solution:

Let the tower height be:

$$H = \dfrac{gt^2}{2};$$

The distance that the body will pass without the last 2 seconds:

$$h = \dfrac{g(t-2)^2}{2};$$

Then the distance traveled by the body in the last 2 seconds is equal to:

$$dh = H - h;$$

$$\dfrac{dh}{H} = \dfrac{H-h}{H} = 1 - \dfrac{h}{H} = \dfrac{3}{4};$$

$$\dfrac{h}{H} = \dfrac{1}{4} \ ; \ \ H = 4h;$$

Substituting the values, we obtain the quadratic equation:
$$\dfrac{gt^2}{2} = \dfrac{4g(t-2)^2}{2};$$
$$3t^2 - 16t + 16 = 0$$
Solving the equation, we get the time of falling from the tower:
t=4s;

Whence the height of the tower is:
$$h = \dfrac{10 * 4^2}{2} = 80m$$
Answer:

Height of the tower is 80m