Answer on Question #74947, Physics / Mechanics | Relativity

a small car is moving towards a house at a distance of 1500 metres from the car. the car is moving with a constant velocity of 5 metre per second a crazy bird sitting on the top of the house starts moving towards the car. on reaching the car it reverses its direction of motion and flies back towards the house. on reaching the house, it reverses its direction and starts moving towards the car. this continues. if the bird is flying with a constant speed of 10 metre per second, the calculate distance covered by the bird

Solution.

$\boldsymbol{t = \frac{s}{v}}$,

where s - distance from a house to a car

$v = v_{bird} + v_{car} = 5 + 10 = 15\ \frac{m}{s}$

$t = \frac{1500}{15} = 100\ s$

After 100 seconds, they'll meet. And another 100 seconds it flies back towards the house.

That is, on the way she will spend 200 seconds and fly 2000 metres, and the car will pass $s = v_{car} \cdot t = 5 \cdot 200 = 1000\ metres$,

so distance from a house to a car will be

$s_1 = s - 1000 = 1500 - 1000 = 500$ metres

$\mathrm{t}_1 = \boldsymbol{\frac{s_1}{v}}$,

where s_1 - distance from a house to a car

$v = v_{bird} + v_{car} = 5 + 10 = 15\ \frac{m}{s}$

$t_1 = \frac{500}{15} = 33.333\ s$

After 33,333 seconds, they'll meet. And another 33.333 seconds it flies back towards the house.

That is, on the way she will spend 66.666 seconds and fly 666.66 metres, and the car will pass $s = v_{car} \cdot t = 5 \cdot 66.666 = 333.333\ metres$.

We can make a geometric progression

$b_{n+1} = b_n \cdot q$,

Where q - denominator of progression,

$q = \frac{b_{n+1}}{b_n} = \frac{66.66}{2000} = \frac{1}{3}$,

Find the amount of progression

$S = \frac{b_n \cdot q - b_1}{q-1} = \frac{-2000}{-\frac{2}{3}} = 3000$ metres,

Where b_n approach zero,

b_1= 2000 metres

Distance covered by the bird is 3000 metres

Answer: $s = 3000\ metres$