## Answer on Question \#69435 - Math - Algebra

## Question

Two cyclists start together in the same direction from the same place. The first goes with uniform speed of 10 km per hour. The second goes at a speed of 8 km per hour in the first hour and increases the speed $1 / 2 \mathrm{~km}$ each succeeding hour. After how many hours the second cyclist overtake the first if both go non-stop?

## Solution

## Method 1

$$
\begin{gathered}
10 x=8 \cdot 1+8.5 \cdot 1+9 \cdot 1+\cdots+\left(8+\frac{1}{2} \cdot(x-1)\right) \cdot 1= \\
=\left(8+\frac{1}{2} \cdot 0\right)+\left(8+\frac{1}{2} \cdot 1\right)+\left(8+\frac{1}{2} \cdot 2\right) \cdot 1+\cdots+\left(8+\frac{1}{2}(x-1)\right)= \\
\text { |the sum of arithmetic progression } \left\lvert\,=\frac{8+8+\frac{1}{2}(x-1)}{2} x\right. ;
\end{gathered}
$$

$$
\begin{gathered}
10 x=\frac{16+\frac{1}{2}(x-1)}{2} x ; \\
10=\frac{16+\frac{1}{2}(x-1)}{2} ; \\
10=8+\frac{1}{4}(x-1) ; \\
2=\frac{1}{4}(x-1) ; \\
8=x-1 ; \\
9=x ; \\
x=9
\end{gathered}
$$

## Method 2

Below is the table showing how far both cyclist went after each hour:

| Hour | $1^{\text {st }}$ cyclist |  |  | $2^{\text {nd }}$ cyclist |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
|  | Speed | Distance | Speed | Distance |  |
| 1 | 10 | 10 | 8 | 8 |  |
| 2 | 10 | 20 | 8.5 | 16.5 |  |
| 3 | 10 | 30 | 9 | 25.5 |  |
| 4 | 10 | 40 | 9.5 | 35 |  |
| 5 | 10 | 50 | 10 | 45 |  |
| 6 | 10 | 60 | 10.5 | 55.5 |  |
| 7 | 10 | 70 | 11 | 66.5 |  |
| 8 | 10 | 80 | 11.5 | 78 |  |
| 9 | 10 | 90 | 12 | 90 |  |
| 10 | 10 | 100 | 12.5 | 102.5 |  |

After $9^{\text {th }}$ hour the second cyclist will overtake the first cyclist.
Answer: after 9 hours.

