# 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 10km per hour. The second goes at a speed of 8 km per hour in the first hour and increases the speed ½ km each succeeding hour. After how many hours the second cyclist overtake the first if both go non-stop?

### <u>Solution</u>

#### Method 1

$$10x = 8 \cdot 1 + 8.5 \cdot 1 + 9 \cdot 1 + \dots + \left(8 + \frac{1}{2} \cdot (x - 1)\right) \cdot 1 =$$

$$= \left(8 + \frac{1}{2} \cdot 0\right) + \left(8 + \frac{1}{2} \cdot 1\right) + \left(8 + \frac{1}{2} \cdot 2\right) \cdot 1 + \dots + \left(8 + \frac{1}{2}(x - 1)\right) =$$

$$|\text{the sum of arithmetic progression}| = \frac{8 + 8 + \frac{1}{2}(x - 1)}{2}x;$$

$$10x = \frac{16 + \frac{1}{2}(x - 1)}{2}x;$$

$$10 = \frac{16 + \frac{1}{2}(x - 1)}{2};$$

$$10 = 8 + \frac{1}{4}(x - 1);$$

$$2 = \frac{1}{4}(x - 1);$$

$$8 = x - 1;$$

$$9 = x;$$

*x* = 9

## Method 2

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

Hour	1 <sup>st</sup> cyclist		2 <sup>nd</sup> 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<sup>th</sup> hour the second cyclist will overtake the first cyclist.

Answer: after 9 hours.

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