Problem:

A person travels by car from one city to another with different constant speeds between pairs of cities. she drives for 30.0 min. at 80.0 km/h, 12.0 min. at 100 km/h, and 45.0 min. at 40.0 km'h and spends 15.0 min. eating lunch and buying gas.
A) determine the average speed for the trip.
B) determine the distance between the initial and final cities along the route.

Solution:

a) Average speed is determined as

$$\vartheta_{ov} = \frac{L}{\tau}$$

L – the whole distance
τ – whole time of trip
Thus

$$\vartheta_{ov} = \frac{0.5h * 80\text{km/h} + \frac{12}{60}\text{h} * 100\text{km/h} + \frac{45}{60}\text{h} * 40\text{km/h}}{0.5\text{h} + \frac{12}{60}\text{h} + \frac{45}{60}\text{h} + \frac{15}{60}\text{h}} = 52.9\ \text{km/h}$$

b) The distance between the initial and final cities is determined as:

$$L = 0.5h * \frac{80\text{km}}{\text{h}} + \frac{12}{60}\text{h} * \frac{100\text{km}}{\text{h}} + \frac{45}{60}\text{h} * \frac{40\text{km}}{\text{h}} = 90\ \text{km}$$

Answer: a) $\vartheta_{ov} = 52.9\ \text{km/h}$
b) $L = 90\ \text{km}$

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