

Answer on Question #47687, Physics, Mechanics - Kinematics - Dynamics

Sally travels by car from one city to another. She drives for 24.0 min at 54.0 km/h, 41.0 min at 33.0 km/h, and 24.0 min at 33.0 km/h, and she spends 13.0 min eating lunch and buying gas.

(a) Determine the average speed for the trip.

(b) Determine the total distance traveled.

By the definition, average speed is:

$$v_{av} = \frac{S_{total}}{t_{total}}$$

To find time in hours:

$$t_h = \frac{t_{min}}{60}$$

Traveled distance:

$$S = vt$$

So, average speed is:

$$v_{av} = \frac{v_1 \frac{t_1}{60} + v_2 \frac{t_2}{60} + v_2 \frac{t_2}{60}}{\frac{t_1}{60} + \frac{t_2}{60} + \frac{t_3}{60} + \frac{t_4}{60}}$$

$$v_{av} = \frac{54.0 \frac{km}{h} \cdot \frac{24.0}{60} h + 33.0 \frac{km}{h} \cdot \frac{41.0}{60} h + 33.0 \frac{km}{h} \cdot \frac{24.0}{60} h}{\frac{24.0}{60} h + \frac{41.0}{60} h + \frac{24.0}{60} h + \frac{13.0}{60} h} \approx 33.7 \frac{km}{h}$$

Total distance traveled

$$s = v_1 \frac{t_1}{60} + v_2 \frac{t_2}{60} + v_2 \frac{t_2}{60} = 54.0 \frac{km}{h} \cdot \frac{24.0}{60} h + 33.0 \frac{km}{h} \cdot \frac{41.0}{60} h + 33.0 \frac{km}{h} \cdot \frac{24.0}{60} h = 57.4 \text{ km}$$

Answer: Average speed: $v_{av} \approx 33.7 \frac{km}{h}$

Traveled distance is $s = 57.4 \text{ km}$