

Practice Problem 1.1

a.) Distance 1 \rightarrow 2500 km
 Distance 2 \rightarrow 1500 km
 Speed 1 \rightarrow 100 km/h
 Speed 2 \rightarrow 150 km/h

$$S = \frac{1}{(1-\alpha) + (\alpha/k)}$$

$\alpha \rightarrow$ Distance improvement
 $= \frac{1500}{2500} = \frac{3}{5} = 0,6$

$k \rightarrow$ speedup factor

$$= \frac{150}{100} = 1,5$$

$$S = \frac{1}{(1-0,6) + (\frac{0,6}{1,5})} \Rightarrow S = \frac{1}{0,4 + 0,4} = \frac{1}{0,8}$$

$$= \frac{10}{8} = 1,25 \times$$

b) $\alpha \rightarrow$ Distance improvement $= \frac{d_2}{d_1} = \frac{1500}{2500} = 0,6$

$$S = 1,67 \times$$

$$v_1 = 100 \text{ km/h} \quad v_2 = ?$$

$$S = \frac{1}{(1-\alpha) + (\alpha/k)} \Rightarrow 1,67 = \frac{1}{(0,4) + (\frac{0,6}{k})}$$

$$1,67 = \frac{1}{\frac{2}{5} + \frac{3}{5k}} \Rightarrow 1,67 = \frac{1}{\frac{2k+3}{5k}} = \frac{5k}{2k+3}$$

$$\Rightarrow 5k = 3,34k + 5,01 \Rightarrow 1,66k = 5,01$$

$$k = 3,018$$

$$\rightarrow k = \frac{v_2}{v_1} \Rightarrow 3,018 = \frac{v_2}{100} \Rightarrow v_2 = 301,8 \text{ km/h}$$

Practice Problem 1.2

$$\alpha = 90\% = 0,9 \quad S = 4$$

$$S = \frac{1}{(1-\alpha) + (\frac{\alpha}{k})} = \frac{1}{(1-0,9) + \frac{0,9}{k}}$$

$$4 = \frac{1}{0,1 + \frac{0,9}{k}} \Rightarrow 0,4 + \frac{3,6}{k} = 1$$

$$\Rightarrow k = \frac{3,6}{0,6} = 6$$