AB distance d and rate r_1, r_2

6 hour $= t_1 + t_2$ total distance $= 2d$

Since $d = r_1 t_1$, $d = r_2 t_2$ therefore;

$t_1 = \frac{d}{r_1}$, $t_2 = \frac{d}{r_2}$

1.)

$\boxed{2d = r.(t_1 + t_2)} \Leftrightarrow 2d = r\left(\frac{d}{r_1} + \frac{d}{r_2}\right)$

$2d \cdot \frac{1}{d} = r\left(\frac{d}{r_1} + \frac{d}{r_2}\right) \cdot \frac{1}{d}$

$2 = r\left(\frac{1}{r_1} + \frac{1}{r_2}\right) \cdot \frac{1}{2} \Rightarrow 1 = \frac{r}{2}\left(\frac{1}{r_1} + \frac{1}{r_2}\right)$

$1 = \frac{r}{2}\left(\frac{1}{r_1} + \frac{1}{r_2}\right) \cdot \frac{1}{r} = \frac{1}{r} = \frac{1}{2}\left(\frac{1}{r_1} + \frac{1}{r_2}\right) = \left(\frac{1}{r} = \frac{r_1 + r_2}{2 r_1 r_2}\right)^{-1}$

$= r = \frac{2 r_1 r_2}{r_1 + r_2}$

North / South	4 km/h	$r_1 = \frac{2.4.4}{8} = 4$
East	3 km/h	
West	6 km/h	$r_2 = \frac{2.6.3}{9} = 4$

$2d = 4(\underbrace{t_1 + t_2}_{6 \text{ hour}})$ $2d = 24$ $\boxed{d = 12}$

2.) As seen from the figure A to B distance must involve N/S direction

Fastest possible path:

$r = \frac{2 r_1 r_2}{r_1 + r_2}$ $\frac{12 \text{ km}}{4.8} = \underline{2.5 \text{ hours}}$

$\frac{2.4.6}{4+6} = \frac{48}{10} \Leftrightarrow 4.8 \text{ km/h}$

$\boxed{2 \text{ hour} - 2.5 \text{ hour}}$

Slowest possible path:

$\frac{2.4.3}{4+3} = \frac{24}{7} = 3.4 \text{ km/h}$ $\frac{12}{3.4} = \boxed{3.5 \text{ hour}}$

4 hour