4.73

$v_{seagull-air} = 9.00\ m/s$

$v_{seagull-air} + v_{air-ground} = v_{seagull-ground}$

a) $t = 20\ min \times \frac{60\ s}{1\ min} = 1200\ s$

$d = 6\ km \times 1000\ \frac{m}{km} = 6000\ m$

So v_{net} for seagull, in oncoming wind, is

$$v = \frac{d}{t} = \frac{6000\ m}{1200\ s} = \underline{\underline{5.0\ m/s}}$$

That's $v_{seagull-ground}$.

So what must $v_{air-ground}$ be?

$$v_{seagull-air} + v_{air-ground} = v_{seagull-ground}$$

$$9\ m/s + v_{air-ground} = 5.0\ m/s$$

$$v_{air-ground} = \boxed{-4.0\ m/s}$$

In the opposite direction of seagull.

b) $v_{seagull-air} + v_{air-ground} = v_{seagull-ground}$

$9\ m/s + 4\ m/s = \underline{\underline{13\ m/s}}$

$$v_{seagull-ground} = \frac{d}{t}$$

$$t = \frac{d}{v_{seagull-ground}} = \frac{6000\ m}{13\ m/s} = \boxed{462\ s}$$

4.75 $v_{boat-water} = 8.0\ km/h$

a) $v_{boat-water} + v_{water-shore} = v_{boat-shore}$

$8\ km/h + 3\ km/h = 11.0\ km/h$

$t = \frac{\Delta x}{v} = \frac{1.5\ km}{11\ km/h} = \boxed{0.136\ hrs}$

b) $v_{return\ trip} = 8 - 3\ (upstream) = 5\ km/h$

$t = \frac{\Delta x}{v} = \frac{1.5\ km}{5\ km/h} = \boxed{0.3\ hrs}$

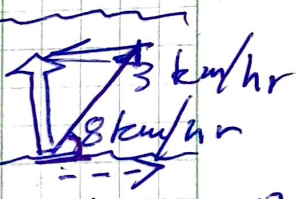
c) How to row straight across river?

See diagram

$v_{boat}\cos\theta\ (x\text{-component}) = 3\ km/h$

$8\cos\theta = 3$

$\theta = \cos^{-1}\left(\frac{3}{8}\right) = \boxed{68.0°}$ relative to upstream shore



d) If boat from (c) is crossing 0.8 km wide river...

$t = \frac{d}{v} = \frac{0.8\ km}{7.42\ km/h} = \boxed{0.108\ hrs}$

$\Delta y = 0.8\ km$

$v_y = v\sin 68 = 8\sin 68 = 7.42\ km/h$

e) 3 km/h ← ↑ $v = 8\ km/h$

To get across, $t = \frac{d}{v} = \frac{0.8\ km}{8\ km/h} = \boxed{0.075\ hrs}$

Used wrong distance across

$\boxed{0.10\ hrs}$

Downstream distance $= vt$

$= (3\ km/hr)(0.075\ hr)$

$= \boxed{0.225\ km}$

$0.300\ km$