2 **(a)** The drag force F_d on a car moving through air is given by the formula:

$$F_d = \frac{1}{2}\rho C_d A v^2$$

where ρ is the air density,

C_d is the unitless drag coefficient,

A is the frontal area of the car, and

v is the velocity of the car.

Table 2.1 shows the data measured for car A.

Table 2.1

ρ / kg m^{-3}	1.20 ± 0.05
C_d	0.30 ± 0.02
A / m^2	2.50 ± 0.05
v / km h^{-1}	108 ± 2

Use this data to calculate the drag force F_d on car A and its associated uncertainty.

$F_d \pm \Delta F_d$ = ... N [3]

(b) Cars A and B approach a junction as shown in Fig. 2.2.

Car A travels east at a constant speed of 40.0 km h^{-1} while car B travels northwest at a constant speed of 50.0 km h^{-1}.

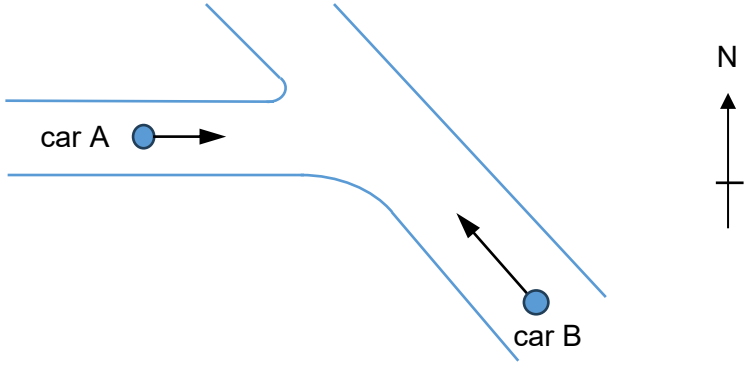

Fig. 2.2

With the aid of a vector diagram, determine the velocity of car A relative to car B.

velocity of car A relative to car B = ... km h^{-1}

direction: .....

[3]

[Total: 6 marks]