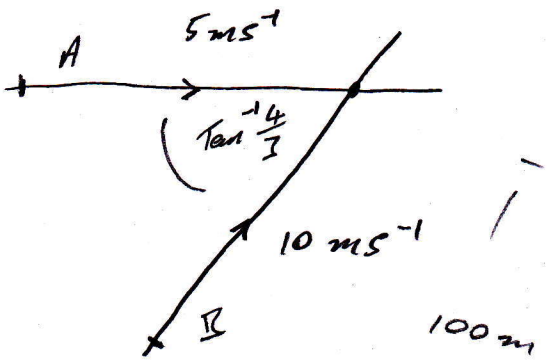
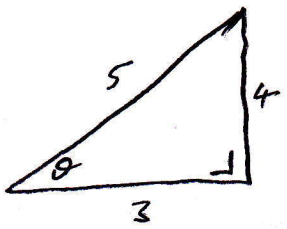
2011 Q2. 100m — 1

(a)





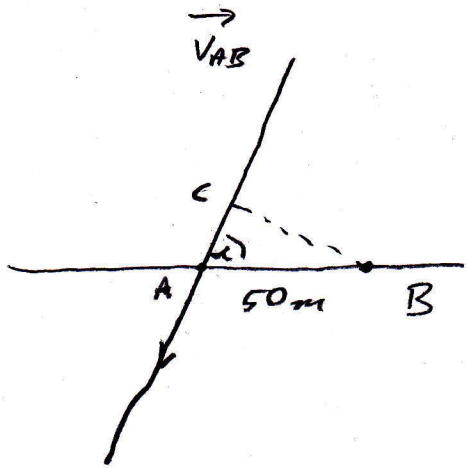
(i) $V_A = 5\vec{i}$ $\quad V_B = 10\cos\theta\,\vec{i} + 10\sin\theta\,\vec{j}$

$= 10\cdot\frac{3}{5}\vec{i} + 10\cdot\frac{4}{5}\vec{j}$

$= 6\vec{i} + 8\vec{j}$

$\Rightarrow \vec{V}_{AB} = \vec{V}_A - \vec{V}_B = -\vec{i} - 8\vec{j}$

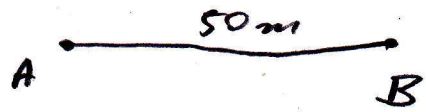
(ii)



Magnitude = $\sqrt{65}$ ms⁻¹

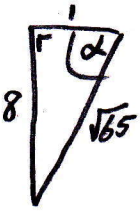
Direction = W Tan⁻¹ 8 S.

When B is at the intersection



since it will take B (Moving faster than A) $\frac{100}{10}$ = 10 sec to reach the intersection. In 10 sec A will be 50 m from the intersection (Dist = S × T or 5 × 10 = 50 m)

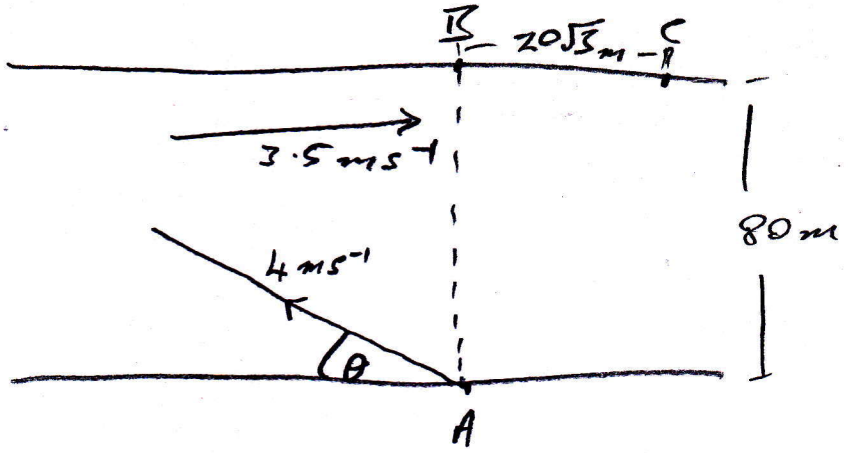
$|BC| = 50\sin\alpha = 50\left(\frac{8}{\sqrt{65}}\right)$

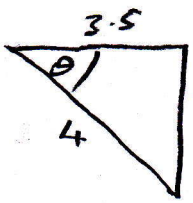


$= 49.6$ m

2011 Q2:

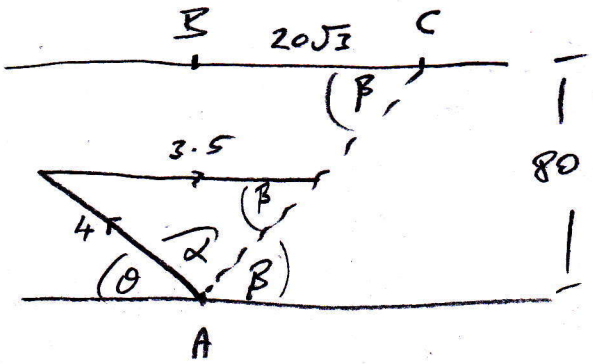
(b)





$\cos\theta = \frac{3.5}{4} \Rightarrow \theta = 28.955^\circ$

= Angle for her to land at B



$\tan\beta = \frac{80}{20\sqrt{3}}$

$\Rightarrow \beta = 66.59^\circ$

$$\frac{\sin\alpha}{3.5} = \frac{\sin 66.59}{4}$$

$$\Rightarrow 4\sin\alpha = 3.5\sin 66.59$$

$$\Rightarrow \sin\alpha = \frac{3.5\sin 66.59}{4}$$

$$\Rightarrow \sin\alpha = 0.8030 \Rightarrow \alpha = 53.41^\circ$$

$$\Rightarrow \theta = 180^\circ - (66.59 + 53.41) = 60^\circ$$

$$28.955^\circ \leq \theta \leq 60^\circ$$