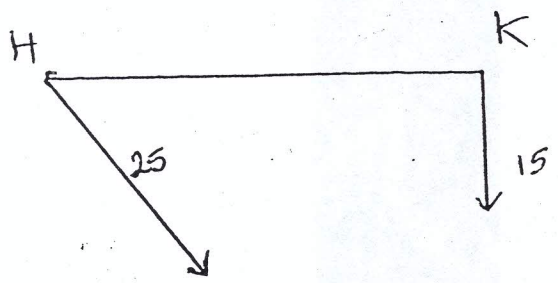
(1) 1987 Relative Velocity (1) Oliver Murphy ©

at a certain instant a ship H is 37.5 km due West of a ship K. Ship H in travelling SE at 25 km/h and ship K is travelling South at 15 km/h.

(i) Draw a diagram to show the velocity of K relative to H and calculate its magnitude and direction.

(ii) If H and K can exchange signals when they are not more than 20 km apart, calculate when they can begin to exchange signals and for how long they can continue to exchange signals.



$\vec{V_H} = 25\cos 45°\vec{i} - 25\sin 45°\vec{j}$

$= 25(.7071)\vec{i} - 25(.7071)\vec{j}$

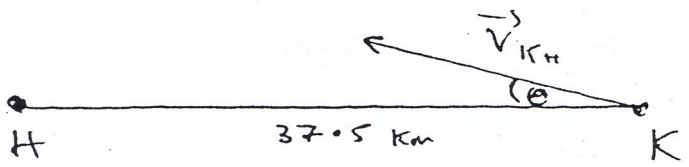
$= 17.68\vec{i} - 17.68\vec{j}$

$\vec{V_K} = -15\vec{j}$

$\therefore \vec{V_{KH}} = \vec{V_K} - \vec{V_H} = -15\vec{j} - (17.68\vec{i} - 17.68\vec{j})$

$= -17.68\vec{i} + 2.68\vec{j}$

(Back a lot up a little)



$|\vec{V_{KH}}| = \sqrt{(-17.68)^2 + (2.68)^2} = \sqrt{319.68} = 17.88$ km/h

$\tan\theta = \frac{2.68}{17.68} = .1516 \Rightarrow \theta = \tan^{-1}(.1516) = 8.61°$

Direction is W 8.61° N.