



Name: _____ () Class: _____ Date: _____

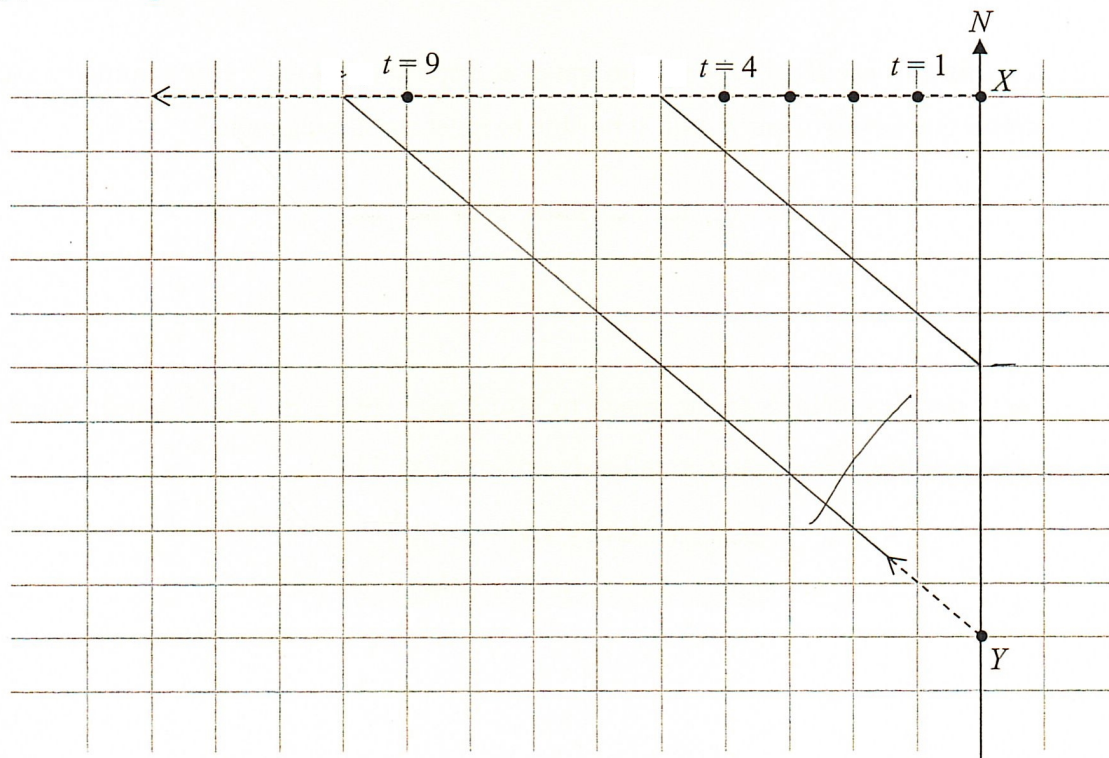
MA304.4.X2 – Angle of Interception

Ever wonder how a missile is fired to intercept another which approaching or flying towards another target? Some questions to ponder:

- Does the angle of interception (angle of firing) depend on the speed of both missiles?
- Does the angle of interception depend on the distance between the missiles?

Consider a car X which is 100 metres due North of another Y . Let t be the time measured in seconds and initially ($t = 0$) car X starts to move to the West at a speed of 10 ms^{-1} .

(a) The 'map' below shows the location of car X at different time t .



Each grid line represents a distance of 10 metres from the next grid line.

If car Y is to move at a bearing of 315° , at a speed of $10\sqrt{2} \text{ ms}^{-1}$, plot its location at different times. Will car Y meet car X ?

- (b) Another car Z is initially 50 metres due South of car X (i.e. halfway between cars X and Y). It starts to move also at a speed of $10\sqrt{2} \text{ ms}^{-1}$ to meet car X . Should the bearing of travel of car Z be smaller, larger or equal to 315° ?
- (c) As cars Y and Z move to meet car X , both move off at the same time as car X . Which car will meet X first? How much faster would the first car meet car X before the second car?
- (d) A fourth car, car W , is only able to travel at a speed of 10 ms^{-1} . If it is initially also 50 metres due South of car X , will it be able to meet car X eventually?
- (e) Car Y decides to increase its speed to $20\sqrt{2} \text{ ms}^{-1}$, twice its initial speed. Should its bearing of travel be greater, smaller or still equal to 315° ?

In interception problems, if the speeds of the two objects are fixed, the angle of interception does not depend on the distance between the two points.

S1. Ship A which was originally due north of Ship B at a distance of 80 km travels at a speed of 100 km/h at a bearing of 049° . Ship B sets out at the same time in an attempt to intercept Ship A . If Ship B travels at 150 km/h, determine the bearing at which Ship B must set sail. Determine also the time taken for the interception to take place.