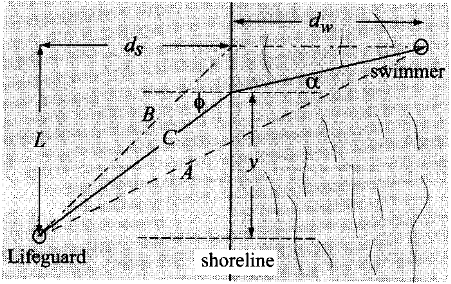
15. A student has a summer job as a lifeguard at the beach. After spotting a swimmer in trouble, he tries to deduce the path by which he can reach the swimmer in the shortest time. The path of shortest distance (path *A*) is obviously not the best since it maximizes the time spent swimming (he can run faster than he can swim). Path *B* minimizes the time spent swimming but is probably not the best since it is the longest (reasonable) path. Clearly the optimal path is somewhere in between paths *A* and *B*.



Consider an intermediate path *C* and determine the time required to reach the swimmer in terms of the running speed v_{run} = 3 m/s the swimming speed v_{swim} = 1 m/s; the distances L = 48 m, d_s = 30 m, and d_w = 42 m; and the lateral distance y at which the lifeguard enters the water. Create a vector y that ranges between path *A* and path *B* (y = 20, 21, 22, …, 48 m) and compute a time t for each y. Use MATLAB built-in function `min` to find the minimum time t_{min} and the entry point y for which it occurs. Determine the angles that correspond to the calculated value of y and investigate whether your result satisfies Snell's law of refraction:

$$\frac{\sin\phi}{\sin\alpha} = \frac{v_{run}}{v_{swim}}$$