Question #53440, Physics / Other |

An 800 kg police boat slows down uniformly from 50 km/h [E] to 20 km/h [E] as it enters a harbor. If the boat slows down over a 30 m distance, what is the force of friction on the boat? (Hint: You will need to convert the velocities into m/s.)

Answer:

The acceleration of the boat is found from the equation:

$v^2 = v_0^2 + 2(a \times s)$, where v – the final velocity, v_0 – the initial velocity and s – the distance.

After converting the velocities into m/s: v_0 = 50 km/h = 50000/3600 m/s = 13.89 m/s and v = 20 km/h = 20000/3600 m/s = 5.56 m/s, the acceleration equals:

$a = (v^2 - v_0^2)/(2s) = (30.86 – 192.93)/60 \text{ m s}^{-2} = -2.701 \text{ m s}^{-2}$

The force of friction is defined:

$F = m \times a = 800 \text{ kg} \times (-2.7 \text{ m s}^{-2}) = -2160.96 \text{ N}$