Question: A car of mass 1000 kg is moving with a constant speed of 20 m/s on a straight horizontal road with an output power of 20 kW. I f the output power is suddenly increased to 60 kW, what is the acceleration of the car at this instant?

Solution:

$P = \frac{A}{t} = \frac{F \cdot S}{t} = F \cdot V, \quad where$
$A - work,$
$t - time,$
$F - force,$
$V - speed.$
$P_1 = 20000\,W, \qquad V_1 = 20\frac{m}{s}$
$P_2 = 60000\,W$
$The\ first\ power\ is:$
$P_1 = F \cdot V_1$
$F = 1000\,N$
$The\ second\ speed:$
$V_2 = \frac{P_2}{F}$
$V_2 = \frac{60000}{1000} = 60\frac{m}{s}$
$\Delta P = \frac{\Delta A}{t}$
Time is:
$t = \frac{\Delta A}{\Delta P} = \frac{\frac{m \cdot (\Delta V)^2}{2}}{\Delta P} = 20\ s,$
$where$
$m - mass\ of\ car,$
$\Delta V = (V_2 - V_1),$
$\Delta P = (P_2 - P_1).$

ANSWER:
$a = \frac{\Delta V}{t} = \frac{40}{20} = 2\ m/s^2$