This is a mathematical representation of a system in order to study its behaviour

3) Methods of obtaining a model
(i) Differential equation
(ii) Use of balance law

(C) From Newton law of cooling

$$\frac{dT}{dt} = k(T - T_m)$$

$$dT = k(T - T_m)dt$$

$$\frac{dT}{T - T_m} = k\,dt$$

integrating both sides

$$\ln(T - T_m) = kt + c$$

$$T - T_m = e^{kt + c}$$

$$T - T_m = e^{kt} \cdot e^{c}$$

let $e^{c} = c$

$$T - T_m = e^{kt} \cdot c$$

$$T - T_m = Ce^{kt}$$

$$T = Ce^{kt} + T_m$$

at $t = 0$, $T = 10°C$, $T_m = 25°C$

$$10 = Ce^{k0} + 25$$

$$10 = C + 25$$

$$C = 10 - 25$$

$$C = -15$$