Maths formula

James Blackburn

September 2022

1 The Original Formula

$$t_f = \frac{(c_1 \times m_1 \times t_1) + (c_2 \times m_2 \times t_2)}{(c_1 \times m_1) + (c_2 \times m_2)}$$

Where:

- t_f is the final temperature of the mixture ($^\circ C$)
- c is the specific heat capacity of the substance (J/kgK)
- m is the mass of the substance (kg)
- t is the temperature of the substance ($^\circ C$)

You can use this term with as many substances as you like (simply add each term in the pattern shown).

2 Simplifying for water

Because the c is common to both substances (water has a specific heat capacity of 4184 J/kgK, we can simplify the above equation:

$$\begin{aligned} t_f &= \frac{c \times m_1 \times t_1 + c \times m_2 \times t_2}{c \times m_1 + c \times m_2} \\ &= \frac{c(m_1 \times t_1 + m_2 \times t_2)}{c(m_1 + m_2)} \\ &= \frac{m_1 \times t_1 + m_2 \times t_2}{m_1 + m_2} \end{aligned}$$

In relation to the above statement "c is common to both substances", this is not strictly true, but it is a good enough approximation for us engineers!