Coffee cup has $m = 350\,g$ at $93°C$, with specific heat $4.2\ J/g·°C$
Person adds $16\,g$ sugar and does $160\,J$ of work stirring the coffee
Sugar starts at $20°C$ and has specific heat $1.2\ J/g·°C$
What is final temperature of coffee?

Correct answer $$T_f = \frac{W + m_c c_c T_{ci} + m_s c_s T_{si}}{m_c c_c + m_s c_s}$$

$$= 92.16°C$$

Analytic: $$\Delta E = \Delta E_{\text{thermal coffee}} + \Delta E_{\text{thermal sugar}} = W$$

$$m_c c_c (T_f - T_{ci}) + m_s c_s (T_f - T_{si}) = W$$

Distributed $m_c c_c$ wrong −10%. $$m_c c_c T_{ci} - m_c c_c T_f + m_s c_s T_f - m_s c_s T_{si} = W$$

$$m_c c_c T_{ci} - m_s c_s T_{si} - W = m_c c_c T_f - m_s c_s T_f = (m_c c_c - m_s c_s) T_f$$

$$T_f = \frac{m_c c_c T_{ci} - m_s c_s T_{si} - W}{m_c c_c - m_s c_s}$$

$$= \frac{350 \cdot 4.2 \cdot 93 - 16 \cdot 1.2 \cdot 20 - 160}{350 \cdot 4.2 - 16 \cdot 1.2} = 93.86°C$$

Numeric $$350 \cdot 4.2 (T_f - 93) + 16 \cdot 1.2 (T_f - 20) = 160$$

$$130710 - 1470 T_f + 19.2 T_f - \boxed{960} = 160$$

$$-1450.8 T_f = -135590$$

$$T_f = 93.46$$ −80%.

3 errors: distributed $m_c c_c$ wrong as above
also had a calculator error in second line (boxed)
no units