

Question #57**Answer: E**

Subscripts A and B here just distinguish between the tools and do not represent ages.

We have to find ${}^o\overline{e}_{AB}$

$${}^o e_A = \int_0^{10} \left(1 - \frac{t}{10}\right) dt = t - \frac{t^2}{20} \Big|_0^{10} = 10 - 5 = 5$$

$${}^o e_B = \int_0^7 \left(1 - \frac{t}{7}\right) dt = t - \frac{t^2}{14} \Big|_0^7 = 49 - \frac{49}{14} = 3.5$$

$${}^o e_{AB} = \int_0^7 \left(1 - \frac{t}{7}\right) \left(1 - \frac{t}{10}\right) dt = \int_0^7 \left(1 - \frac{t}{10} - \frac{t}{7} + \frac{t^2}{70}\right) dt$$

$$= t - \frac{t^2}{20} - \frac{t^2}{14} + \frac{t^3}{210} \Big|_0^7$$

$$= 7 - \frac{49}{20} - \frac{49}{14} + \frac{343}{210} = 2.683$$

$${}^o\overline{e}_{AB} = {}^o e_A + {}^o e_B - {}^o e_{AB}$$

$$= 5 + 3.5 - 2.683 = 5.817$$