VENTILATOR CALCULATIONS
1. Given an inspiratory time of 1.2 seconds and an expiratory time of 3 seconds, calculate the I:E ratio and the respiratory rate.
   \[ TCT = T_I + T_E = 3 + 1.2 = 4.2 \text{ sec} \]
   \[ f = \frac{60}{TCT} = \frac{60}{4.2} = 14.29 \approx 14 \text{ min}^{-1} \]
   \[ \frac{T_E}{T_I} = \frac{3}{1.2} \text{ (bigger on top)} = 2.5, I:E = 1:2.5 \]

2. Given an inspiratory time of 0.8 seconds and an expiratory time of 1.5 seconds, calculate the I:E ratio and the rate.
   \[ \frac{T_E}{T_I} = \frac{1.5}{0.8} = 1.875, I:E = 1:1.9 \]
   \[ TCT = T_I + T_E = 0.8 + 1.5 = 2.3 \text{ sec} \]
   \[ f = \frac{60}{TCT} = \frac{60}{2.3} = 26.08 \approx 26 \text{ min}^{-1} \]

3. Given an expiratory time of 1.75 seconds and an inspiratory time of 1 second, calculate the I:E ratio and the rate.
   \[ \frac{T_E}{T_I} = \frac{1.75}{1} = 1.75, I:E = 1:1.8 \]
   \[ TCT = 1.8 + 1 = 2.8 \text{ sec} \]
   \[ f = \frac{60}{TCT} = \frac{60}{2.75} = 21.8 \approx 22 \text{ min}^{-1} \]

4. Given a f of 40/min and an I:E ratio of 1:2, calculate the inspiratory and expiratory time.
   \[ TCT = \frac{60}{f} = \frac{60}{40} = 1.5 \text{ sec} \]
   \[ T_I = \frac{TCT}{1+2} = \frac{1.5}{3} = 0.5 \text{ sec} \]
   \[ T_E = TCT - T_I = 1.5 - 0.5 = 1.0 \text{ sec} \]

5. A newborn is being ventilated on a time-cycled, pressure limited ventilator. The ventilatory parameters are as follows:
   \[ \text{Rate: 40/min} \]
   \[ \text{Peak Pressure 32 cm H}_2\text{O} \]
   \[ \text{PEEP 5 cm H}_2\text{O} \]
   \[ \text{Inspiratory Time 0.4 seconds} \]
   \[ TCT = \frac{60}{40} = 1.5 \text{ sec} \]
   \[ T_E = TCT - T_I = 1.5 - 0.4 = 1.1 \text{ sec} \]
   \[ T_E = \frac{1.1}{0.4} = 2.75, I:E = 1:2.8 \]
   What is the I:E ratio?

6. The respiratory care practitioner receives an order to initiate mechanical ventilation at a rate of 45 and an I:E ratio of 1:2. Which of the following times would achieve the specified ratio?
   A. 0.54
   B. 0.48
   C. 0.44
   D. 0.40
   E. 0.20
7. The doctor orders a \( f \) of 50/minute and an I:E ration of 1:1.5. Calculate the Inspiratory and expiratory time.

\[
TCT = \frac{60}{f} = \frac{60}{50} = 1.2 \text{ sec}
\]

\[
T_i = \frac{TCT}{I + E} = \frac{TCT}{1 + 1.5} = 1.2 \approx 0.48 \approx 0.5 \text{ sec}
\]

\[
T_e = TCT - T_i = 1.2 - 0.5 = 0.7 \text{ sec}
\]

8. The doctor orders a \( f \) of 60/min and an I:E ratio of 1:1. Calculate the inspiratory and expiratory time.

\[
TCT = \frac{60}{f} = \frac{60}{60} = 1.0 \text{ sec}
\]

\[
T_i = \frac{TCT}{I + E} = \frac{TCT}{1 + 1} = 1.0 \approx 0.5 \text{ sec}
\]

\[
T_e = TCT - T_i = 1.0 - 0.5 = 0.5 \text{ sec}
\]

9. The doctor orders a \( f \) of 30/min and an I:E ratio of 1:3. Calculate the inspiratory and expiratory time.

\[
TCT = \frac{60}{f} = \frac{60}{30} = 2 \text{ sec}
\]

\[
T_i = \frac{TCT}{I + E} = \frac{TCT}{1 + 3} = 2 \approx 0.5 \text{ sec}
\]

\[
T_e = TCT - T_i = 2 - 0.5 = 1.5 \text{ sec}
\]

10. The doctor orders a respiratory rate of 35/min and an inspiratory time of 0.75 seconds. What is the I:E ratio?

\[
f = \frac{60}{TCT} = \frac{60}{35} = 1.71 \text{ sec}
\]

\[
T_e = TCT - T_i = 1.71 - 0.75 = 0.96 \approx 1 \text{ sec}
\]

\[
I:E = 0.75 : 1 = \frac{1}{0.75} = 1.33, I:E = 1:1.3
\]