Task:

A takes 3 days longer than B to finish a work. But if they work together, then work is completed in 2 days. How long would each take to do it separately? A takes 3 days longer than B to finish a work. But if they work together, then work is completed in 2 days. How long would each take to do it separately?

Solution:

Let A takes x days to finish a work and B takes y days to finish a work:

$$x - y = 3$$

If they work together they'll do $\frac{1}{2}$ of all work in one day:

$$\frac{1}{x} + \frac{1}{y} = \frac{1}{2}.$$

We get the equation: $\begin{cases} x - y = 3 \\ \frac{1}{x} + \frac{1}{y} = \frac{1}{2} \end{cases}$

Let's solve it: $\begin{cases} x - y = 3 \\ \frac{1}{x} + \frac{1}{y} = \frac{1}{2} \end{cases} \begin{cases} x = 3 + y \\ \frac{1}{3+y} + \frac{1}{y} = \frac{1}{2} \end{cases} \begin{cases} x = 3 + y \\ \frac{y+3+y}{y(3+y)} = \frac{1}{2} \end{cases} \begin{cases} x = 3 + y \\ \frac{2y+3}{y^2+3y} = \frac{1}{2} \end{cases} \begin{cases} x = 3 + y \\ y^2 + 3y = 2(2y+3) \end{cases}$

$$\begin{cases} x = 3 + y \\ y^2 + 3y - 2(2y+3) = 0 \end{cases} \begin{cases} x = 3 + y \\ y^2 - y - 6 = 0 \end{cases} \begin{cases} x_1 = 1 \\ y_1 = -2 \end{cases} \begin{cases} x_2 = 6 \\ y_2 = 3 \end{cases}$$

Number of days can't be less than zero, so answer is: 6 days for A and 3 days for B.

Answer: 6 days for A and 3 days for B.