Answer on Question #37100 – Math - Algebra

Three employees work at a shipping warehouse. Tom can fill an order in s minutes. Paco can fill an order in s - 2 minutes. Carl can fill an order in s + 1 minutes. When Tom and Paco work together, they take about 1 minute and 20 seconds to fill an order. When Paco and Carl work together, they take about 1 minute and 30 seconds to fill an order.

       a) How long does each person take to fill an order?
       b) How long would all three of them, working together, take to fill an order

SOLUTION

Lets all work is 1, and it is the product of the productivity and time of workers. Than Tom's productivity will be $\frac{1}{s}$, Paco's productivity will be $\frac{1}{s-2}$ or $\frac{1}{s-120}$ in seconds. Together they can do work for 1 minute and 20 seconds ($1\frac{1}{3} = \frac{4}{3}$ minute or 80 seconds).

If they work together we summarize their productivities: $\left(\frac{1}{s} + \frac{1}{s-120}\right)$.

Work = 1=sum. productivities * time = $\left(\frac{1}{s} + \frac{1}{s-120}\right)*80$;

$$\left(\frac{1}{s} + \frac{1}{s-120}\right)*80 = 1$$

$$\left(\frac{s-120+s}{s(s-120)}\right)*80 = 1$$

$$\left(\frac{2s-120}{s^2-120s}\right)*80 = 1$$

$$80(2s-120) = (s^2-120s)$$

$$160s - 9600 = s^2 - 120s$$

$$s^2 - 280s + 9600 = 0$$

Using Vieta's formulas roots are s=240 and 40 ($b = 240+40 = -(-280) = 280$) and (c=240*40=9600)

s can't be 40 seconds, because Paco's time less than Tom's on 120 seconds, but time can't be negative number.

So Tom take 240 second or 4 minutes to fill an order, Paco takes 4-2=2 minutes and Carl takes 4+1=5 minutes.

If they will work together we must summarize their productivities:

$(\frac{1}{4} + \frac{1}{2} + \frac{1}{5} = 0,25 + 0,2 + 0,5 = 0,95)$

Full work will be 1= sum. productivities * time=0.95*time, than time

$$= \frac{1}{sum.productibities} = \frac{1}{0.95} = 1.05 \text{ minutes or 63 seconds}$$

Answers: a) 4, 2, 5; b) 1.05 minutes or 63 seconds