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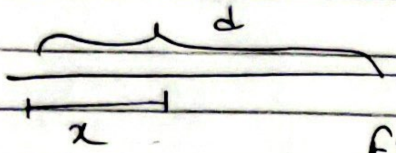
CSE 717

Answer to horse and horse problem

→ m horse n friends problem

lets assum $n=2, m=1$

First friend rides horse for x distance.



They reach destination at same time and ride same distance.

first friend starts walking, horse runs towards 2nd friend, picks him up

So, $d - x = \frac{x}{V_h} \cdot V_m + \frac{x - \frac{x V_m}{V_h}}{V_h + V_m} \times V_m$

$$x = \frac{V_h + V_m}{V_h + 3V_m} \cdot d$$

If, there are $n=3$ friends, then

$$d - x = \frac{x \cdot V_m}{V_h} + \frac{x - \frac{x V_m}{V_h}}{V_h + V_m} + \frac{d-x}{2}$$

$$\therefore x = \frac{V_h + V_m}{V_h + 5V_m} \cdot d$$

Now, if $n = 4$, $\frac{d-x}{3} = x \cdot \frac{V_m}{V_h} + \frac{x - x \cdot \frac{V_m}{V_h}}{V_h + V_m} \cdot V_m$

for $n = n$ $\frac{d-x}{n-1} = x \cdot \frac{V_m}{V_h} + \frac{x - x \cdot \frac{V_m}{V_h}}{V_h + V_m} \cdot V_m$

$$x = \frac{V_h + V_m}{V_h + (2n-1)V_m} \cdot d$$

So, for $n = 1, 2, 3 \cdots n$, $m=1$

distance by horse riding $= x = \frac{V_h + V_m}{V_h + (2n-1)V_m} \cdot d$

So time required $t = \frac{x}{V_h} + \frac{d-x}{V_m}$; where

$$x = \frac{V_h + V_m}{V_h + (2m-1)V_m} \cdot d$$

if $m=2, n=3$

first & 2nd friend start Riding horse, 2nd gets off at y dist and walks.

After dist x 1st friend send horse for friend 2

3rd gets 2nd horse, so everyone walks $d-x$ distance

$$d - x = \frac{y \cdot V_m}{V_h} + \frac{y - y\frac{V_m}{V_h}}{V_h + V_m} \cdot V_m$$

$$y \cdot \frac{2V_m}{V_h + V_m}$$

for first friend, $d - x = \frac{x-y}{V_h} \cdot V_m + \frac{x-y-(x-y)\frac{V_m}{V_h}}{V_h+V_m} \cdot V_m$

$$d - x = x - y \cdot \frac{2V_m}{V_h + V_m}$$

$$\Rightarrow y \frac{2V_m}{V_h + V_m} = (x-y)\frac{2V_m}{V_h + V_m}$$

$$y = x/2$$

$$\Rightarrow d - x = \frac{x}{\cancel{2}} \times \frac{\cancel{2}V_m}{V_m + V_n}$$

$$\Rightarrow d - x = \frac{V_m}{V_m + V_n} \cdot x$$

$$d = x\left(1 + \frac{V_m}{V_h + V_m}\right) = \frac{x \cdot V_h + 2V_m}{V_h + V_m}$$

$$\boxed{x = \frac{V_h + V_m}{V_h + 2V_m} \cdot d}$$ for $m=2$ $n=3$

$$x = \frac{V_h + V_m}{V_h + \left(\frac{2n}{m} - 1\right)V_m} \cdot d$$. ans