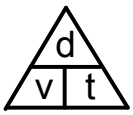
Applications of Linear Systems: dvt Problems

Feb 15/2011

Some strategies:

1. Identify what the question wants. This may tell you one or both of your variables.
2. Remember d = v t



3. Use a table to fill in known and unknown values to help form your equations.
4. Make sure your units are all consistent.

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Ex.1. Alex drove 500 km from Ottawa to Toronto in 5 1/2 h. He drove part of the way at 100 km/h, and the rest of the way at 80 km/h. How far did he drive at each speed?

	distance (d)	speed (v)	time (t)
Trip 1	x	100	$\frac{x}{100}$
Trip 2	y	80	$\frac{y}{80}$
Total	500		5.5

$x+y=500$ ① $\frac{x}{100}+\frac{y}{80}=5.5$ ②

② $\times 400$: $\frac{400x}{100}+\frac{400y}{80}=400(5.5)$

$4x+5y=2200$ ③

① $\times 4$: $4x+4y=2000$

Subtract $y=200$

Sub $y=200$ into ①

$x+200=500$

$x=300$

∴ he drove 300 km at 100 km/h and 200 km at 80 km/h

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Ex.2 Emily travelled 95 km from Oakville to Oshawa by car and GO train. The car averaged 60 km/h, and the train averaged 90 km/h. The whole trip took 1.5 hours. How long was she in the car?

d v t

$d = vt$

	distance (d)	speed (v)	time (t)
GO Train	$90x$	$= 90$	x
Car	$60y$	$= 60$	y
Total	95		1.5

$90x + 60y = 95$ ① $\quad x + y = 1.5$ ②

$x = -y + 1.5$ ③

Sub ③ into ①

$90(-y + 1.5) + 60y = 95$

$-90y + 135 + 60y = 95$

$-30y = -40$

$y = \frac{-40}{-30}$

$y = \frac{4}{3}$

$y = 1\frac{1}{3}$

$\frac{3}{3} + \frac{1}{3}$

$= 1\frac{1}{3}$

④

∴ time in car was 1h 20 min.

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Ex.3. A boat took 2 h to travel 24 km down a river with the current and 3 h to make the return trip against the current. Find the speed of the boat in still water and the speed of the current.

x

y

	distance (d)	speed (v)	time (t)
down river	24	$x + y$	2
up river	24	$x - y$	3
Total	48		5

Let x be speed of boat in still water

Let y be speed of the current

$d = vt$

$24 = (x+y)(2)$

$24 = 2x + 2y$ ①

$24 = (x-y)(3)$

$24 = 3x - 3y$ ②

①÷2: $12 = x + y$ ③

②÷3: $8 = x - y$ ④

add $20 = 2x$

$x = 10$

Sub $x = 10$ into ③

$12 = 10 + y$

$y = 2$

∴ Speed of boat is 10 km/h

Speed of current is 2 km/h

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Assigned Work:

p.27 # 8
p.55 # 13
p.64 # 7

+ Worksheet

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p.55 # 13

	d	v	t
paved	x	10	$\frac{x}{10}$
rough	y	5	$\frac{y}{5}$
total	12		1.5

d / v t

$x + y = 12$ ①

$\frac{10x}{10} + \frac{10y}{5} = 10(1.5)$ ×10

$1x + 2y = 15$ ②

$x+y=12$
$x+2y=15$
Subtract $-y=-3$
$y=3$

sub $y=3$ into ①
$x+3=12$
$x=9$

∴ the distance over rough ground is 3 km

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p.27 #8

	d	v	t
highway	x	70	$\frac{x}{70}$
* narrow road	y	50	$\frac{y}{50}$
total	393		6

$x+y=393$ ①

$\frac{x}{70}+\frac{y}{50}=6$ $\times 350$

$\frac{350x}{70}+\frac{350y}{50}=6(350)$

$5x+7y=2100$ ②

① $\times 5$: $5x+5y=1965$

Subtract

$2y=135$

$y=67.5$

∴ the distance from NB to T is 67.5 km

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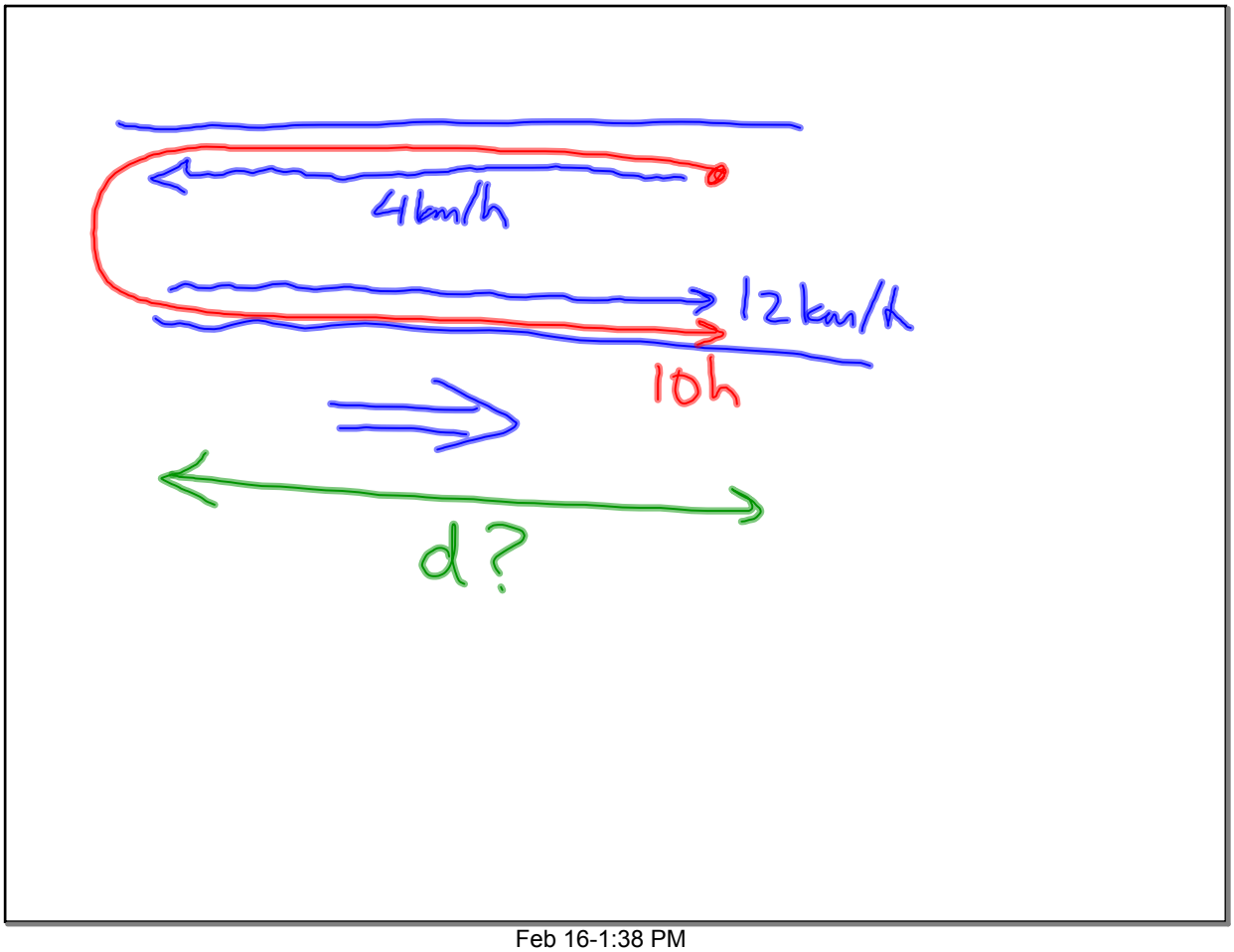

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