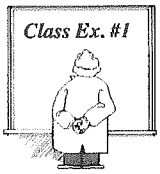
Systems of Linear Equations Lesson #7:

Distance, Speed, and Time Applications



A student drove the 1245 km from Edmonton to Vancouver in 16½ hours. This included a one hour stop in Golden and a 30 minute stop in Kamloops. She averaged 100 km/h on the divided highways and 75 km/h on the non-divided mountainous roads. How much time did she spend on the divided highways?

driving time $= 16\frac{1}{2} - 1 - \frac{1}{2} = 15$ hours

	Distance (km)	Speed (km/h)	Time (h)
Highway	$100x$	100	x
Mountainous Roads	$75y$	75	y

$x + y = 15 \rightarrow y = 15 - x$

$100x + 75y = 1245$

$100x + 75(15 - x) = 1245$

$100x + 1125 - 75x = 1245$

$25x = 120$

$x = 4.8$

$y = 15 - x$

$y = 15 - 4.8$

$y = 10.2$

CHECK: $x + y = 15$

LS: $(4.8) + (10.2)$

$= 15$

RS: 15

LS = RS

$100x + 75y = 1245$

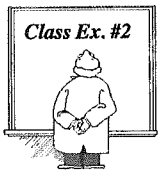
LS: $100(4.8) + 75(10.2)$

$= 1245$

RS: 1245

LS = RS

She spent 4.8 hours on the divided highways



A small cruise boat took 3 hours to travel 36 km down a river with the current. On the return trip it took 4 hours against the current. Find the speed of the current and the speed of the small cruise boat in still water.

Let x km/h be the speed of the boat in still water

Let y km/h be the speed of the current

	Distance (km)	Speed (km/h)	Time (h)
Downstream	$3(x+y)$	$x+y$	3
Upstream	$4(x+y)$	$x-y$	4

$3(x+y) = 36 \Rightarrow 3x + 3y = 36 \quad (\times 4)$

$4(x-y) = 36 \quad\quad 4x - 4y = 36 \quad (\times 3)$

subtracted b/c when going against the current (upstream) the speed will be lower than going downstream.

$12x + 12y = 144$

$+ \; 12x - 12y = 108$

$24x = 252$

$x = 10.5$

$3x + 3y = 36$

$3(10.5) + 3y = 36$

$3y = 4.5$

$y = 1.5$

CHECK: $3(x+y) = 36$

LS: $3(10.5 + 1.5)$

$= 3(12) = 36$

RS: 36

LS = RS

$4(x-y) = 36$

LS: $4(10.5 - 1.5)$

$= 4(9) = 36$

RS: 36

LS = RS

Still water speed = 10.5 km/h

Current speed = 1.5 km/h

Complete Assignment questions #1 - #6