7 Rational Equations part 2

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PRE-CALCULUS 11 Ch 6 – Day 7: RATIONAL EQUATIONS (Part 2)

SOLVING PROBLEMS WITH RATIONAL EQUATIONS

Solving problems using algebra:

1) ***Define the variable*** introduced and write expressions for all important quantities.
2) ***Write the equation*** that models the situation described in the problem.
3) ***Solve*** the equation.
4) ***Answer the problem***. Your answer must be what the problem is asking you to find.

Example 1: One cyclist averages 3 km/h faster than a second cyclist. The faster cyclist rode 270 km in the same time the slower cyclist rode 225 km. What was the average speed of each cyclist?

	faster guy	slower guy
d	270 km	225 km
s	$x+3$ km/hr	x km/hr
t	$\frac{270}{x+3}$	$\frac{225}{x}$

These are equal!

$$\frac{270}{x+3} = \frac{225}{x}$$

Restrictions: $x \neq 0, -3$

LCD = $x(x+3)$

$$\frac{270}{(x+3)} \times \frac{x}{x} = \frac{225}{x} \times \frac{(x+3)}{(x+3)}$$

$$270x = 225x + 675$$

$$-225x \quad -225x$$

$$45x = 675$$

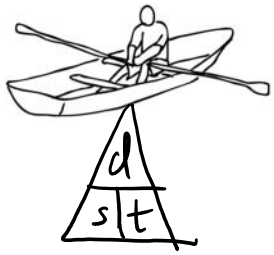
$$\frac{45x}{45} = \frac{675}{45}$$

$$x = 15$$

Sentence:

The speed of the slower cyclist is 15 km/hr & the speed of the faster cyclist is $15+3 = 18$ km/hr.

Example 2: The speed of the current in a river was 2 km/h. A boat made a round trip to a town 24 km away in a total of 5 hours. What is the speed of the boat in still water?



$c = 2$ km/h

Let x = speed in still water

$t = \frac{d}{s}$

	upriver (against current)	downriver (with current)
d	24 km	24 km
s	$x-2$ km/h	$x+2$ km/h
t	$\frac{24}{x-2}$ hours	$\frac{24}{x+2}$ hours

Round trip = upriver + downriver = 5 hours

$$\frac{24}{x-2} + \frac{24}{x+2} = 5$$

$(a+b)(a-b) = a^2-b^2$

Restriction: $x \neq 2, -2$

LCD: $(x-2)(x+2)$

$$\frac{24}{x-2}\left(\frac{x+2}{x+2}\right) + \frac{24}{x+2}\left(\frac{x-2}{x-2}\right) = \frac{5}{1}\cdot\frac{(x-2)(x+2)}{(x-2)(x+2)}$$

(x^2-4)

$$24x + 48 + 24x - 48 = 5x^2 - 20$$

$$48x = 5x^2 - 20$$

$$5x^2 - 48x - 20 = 0$$

$+50 \times 2 = -100$

$+50 + 2 = -48$

$(x-10)(5x+2) = 0$

$x - 10 = 0$ OR $5x + 2 = 0$

$x = 10$ $\quad x = -\frac{2}{5}$ (reject (negative speed!))

~~$5x$~~	$5x$
~~-50~~ -10	2

The boat's speed is 10 km/hr.

[Answer: 10 km/h]

$x, x+1, x+2$

↑ smallest

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

F

R: $x \neq 0, -1, -2$

LCD: $x(x+1)(x+2)$

M $\frac{1}{x}\cdot\frac{(x+1)(x+2)}{(x+1)(x+2)} = \frac{1}{x+1}\cdot\frac{(x)(x+2)}{(x)(x+2)} + \frac{1}{x+2}\cdot\frac{(x)(x+1)}{(x)(x+1)}$

N $x^2+3x+2 = x^2+2x+x^2+x$

$\sqrt{2} = \sqrt{x^2}$

S $x = \pm\sqrt{2}$

R The numbers of x are $\pm\sqrt{2}$.