Applications of Rational Functions

Distance = rate/speed · Time

$D = S \cdot t$

so $S = \frac{D}{t}$ or $\frac{S}{D} = t$

Work = Rate · Time

$W = r \cdot t$

so $r = \frac{W}{t}$ or $t = \frac{W}{r}$

1) A boat can go 10 miles upstream in 30 minutes. The return trip downstream takes only 20 minutes. What is the speed of the boat in still water and the speed of the current (in mph)?

Let b = speed of boat in still water

c = speed of current

or $d = r \cdot t$, $r = d/t$

	Distance (mi)	Rate of Speed (mph)	Time (t)
Upstream	10	$b - c$	$\frac{30}{60} = \frac{1}{2}$ or .5
Downstream	10	$b + c$	$\frac{20}{60} = \frac{1}{3}$ or $.\overline{33}$

$d = r \cdot t$

$10 = (b-c)(\frac{1}{2})$ ②

$10 = (b+c)(\frac{1}{3})$ ③

② $(\frac{1}{2})(b-c) = 10$

③ $(\frac{1}{3})(b+c) = 10$

$b - c = 20$

$b + c = 30$

$2b = 50$

$b = 25$ mph

$25 - c = 20$

$-c = -5$

$c = 5$ mph

2) Garth can row 5 miles per hour in still water. It takes him as long to row 4 miles upstream as it does 16 miles downstream. How fast is the current.

Let speed in still water = speed in still water (x)

Let speed of the current = speed of current (c)

$t = \frac{D}{r}$

upstream time = downstream time

$\frac{4}{5-c} = \frac{16}{5+c}$

r = d/t	Distance (mi)	Rate of Speed (mph)	Time (t)
Upstream	4	$5 - c$	$\frac{4}{5-c}$
Downstream	16	$5 + c$	$\frac{16}{5+c}$

$4(5+c) = 16(5-c)$

$20 + 4c = 80 - 16c$

$20c = 60$

$c = 3$ mph

3. Myra takes 2 hours to plant 500 flower bulbs. Francis takes 3 hours to plant 450 flower bulbs. Working together, how long should it take them to plant 1500 bulbs?

$r = \frac{W}{t}$

W = (r)(t)	Work (Planting Bulbs)	Rate of Speed (Bulbs/hour)	Time (hours)
Myra	500	$\frac{500}{2} = 250$	2
Francis	450	$\frac{450}{3} = 150$	3
Together	1500	$\frac{1500}{t}$	t

Myra's rate + Francis' rate = Together rate

$250 + 150 = \frac{1500}{t}$

$400 = \frac{1500}{t}$

$3.75 = t$

so 3 hrs 45 min