Avg Cost
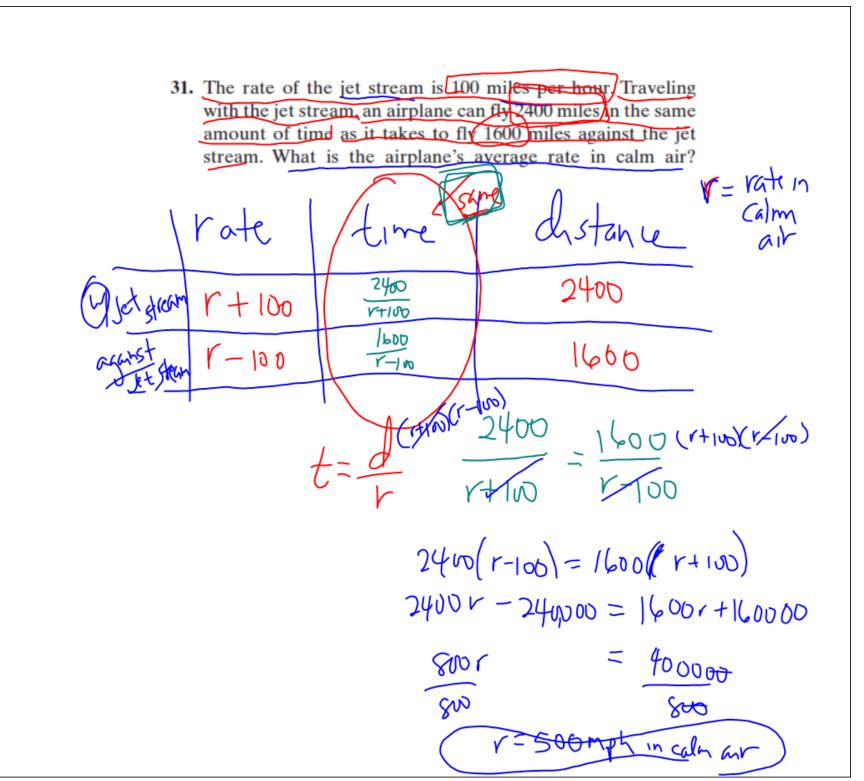
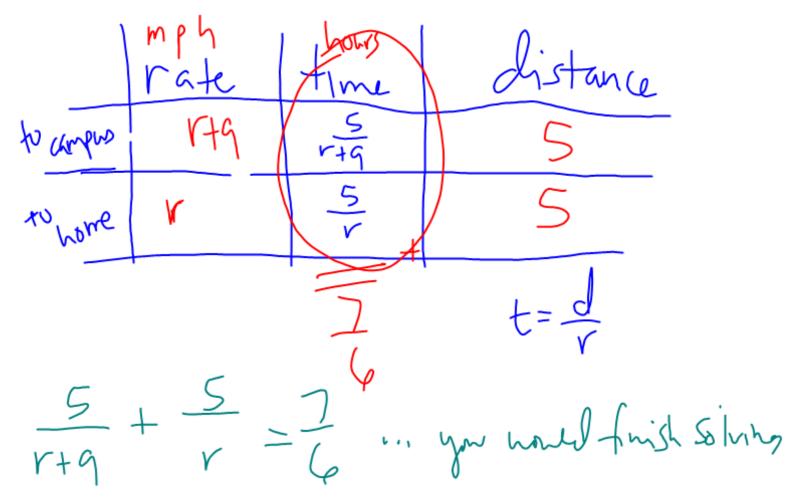Fixed costs are $150,000 and it costs $300 to make 1 robot.

How many robots need to be made to have an avg cost of $500 per robot?

$$\overline{C} = \cdot \frac{150000 + 300X}{X} = 500$$

$$150000 + 300X = 500X$$

$$150000 = 200X$$

$$750 \text{ robots} = X$$

Skipping 11.8 "varies"

11.7 Day 2

① motion $r \cdot t = d$

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

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

3 forms

31. The rate of the jet stream is 100 miles per hour. Traveling with the jet stream, an airplane can fly 2400 miles in the same amount of time as it takes to fly 1600 miles against the jet stream. What is the airplane's average rate in calm air?

r = rate in calm air

	rate	time	distance
jet stream	$r + 100$	$\dfrac{2400}{r+100}$	2400
against jet stream	$r - 100$	$\dfrac{1600}{r-100}$	1600

same

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

$$\frac{2400}{r+100} (r+100)(r-100) = \frac{1600}{r-100}(r+100)(r-100)$$

$$2400(r-100) = 1600(r+100)$$

$$2400r - 240000 = 1600r + 160000$$

$$\frac{800r}{800} = \frac{400000}{800}$$

$$r = 500\,mph \text{ in calm air}$$

27. You ride your bike to campus a distance of 5 miles and return home on the same route. Going to campus, you ride mostly downhill and average 9 miles per hour faster than on your return trip home. If the round trip takes one hour and ten minutes—that is $\frac{7}{6}$ hours—what is your average rate on the return trip?

rate (mph)	time (hours)	distance
to campus	$r+9$	$\frac{5}{r+9}$	5
to home	r	$\frac{5}{r}$	5

$$\frac{7}{6}$$

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

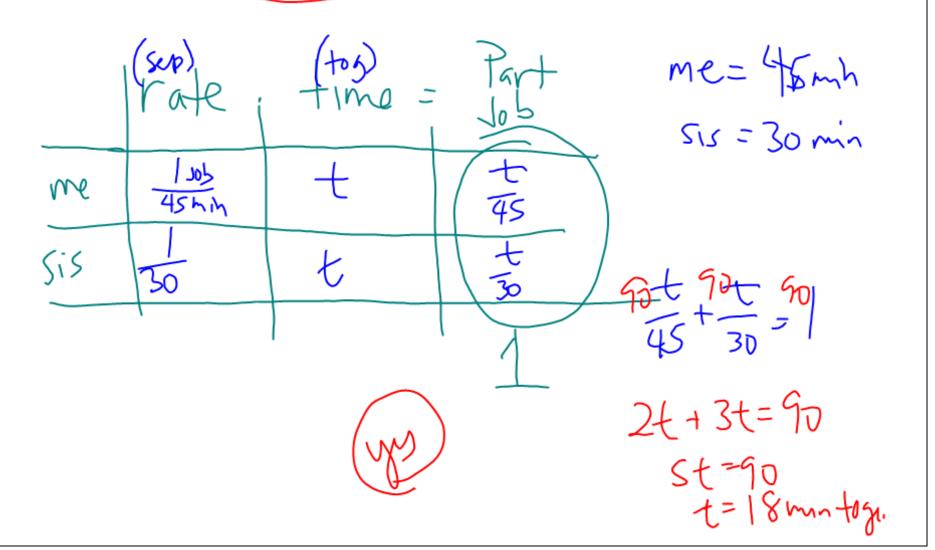$$\frac{5}{r+9} + \frac{5}{r} = \frac{7}{6} \quad \cdots \text{ you would finish solving}$$

35. Two runners, one averaging 8 miles per hour and the other 6 miles per hour, start at the same place and run along the same trail. The slower runner arrives at the end of the trail a half hour after the faster runner. How far did each person run?

Set up an equation

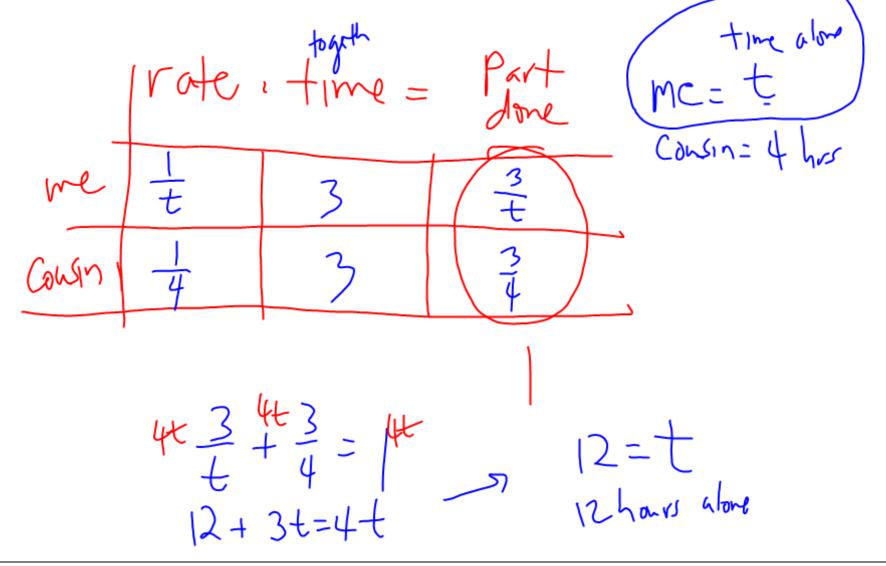|	rate	· time = $\frac{hrs}{}$	distance — same
run 1 (fast)	8	t	$8t$
run 2 (slow)	6	$t + \frac{1}{2}$	$6t + 3$

$d = r \cdot t$

$8t = 6t + 3$
$2t = 3$

$t = \frac{3}{2}$ or 1.5 hrs

$d = 12$ miles

Work problems

Q: It take me 6 hrs to mow the yard. It takes Lee 2 hrs to mow the yard. How long would it take together?

Yard

In 1 hr I get $\frac{1}{6}$ job (yard) done

$$\text{rate} = \frac{1\,job}{6\,hrs} \cdot \frac{2\,hrs}{1} = \frac{2}{6} = \frac{1}{3}\,job\,done$$

individual $\cdot$ toy = Part

$$\text{rate} \cdot \text{time} = \text{job done}$$

	rate	time	=	job done
me	$\frac{1}{6}$	t	=	$\frac{t}{6}$
Lee	$\frac{1}{2}$	t	=	$\frac{t}{2}$

$$\frac{1}{1}$$

me = 6 hrs
Lee = 2 hrs

$$\frac{t}{6} + \frac{t}{2} = 1$$

$$t + 3t = 6$$

$$4t = 6$$

$$t = \frac{6}{4} = \frac{3}{2} = 1.5\,hrs$$

37. You promised your parents that you would wash the family car. You have not started the job and they are due home in 20 minutes. You can wash the car in 45 minutes and your sister claims she can do it in 30 minutes. If you work together, how long will it take to do the job? Will this give you enough time before your parents return?

$$\frac{(sep)}{rate} \cdot \frac{(tog)}{time} = \frac{Part}{Job}$$

	rate	time	Part Job
me	$\frac{1\ job}{45\,min}$	t	$\frac{t}{45}$
sis	$\frac{1}{30}$	t	$\frac{t}{30}$

$me = 45\,mih$

$sis = 30\,min$

$$\frac{90t}{45} + \frac{90t}{30} = 90$$

$$2t + 3t = 90$$

$$5t = 90$$

$$t = 18\,min\,tog.$$

(we)

41. Working with your cousin, you can refinish a table in 3 hours. Working alone, your cousin can complete the job in 4 hours. How long would it take you to refinish the table working alone?

together

$$rate \cdot time = \frac{Part}{done}$$

$$MC = t \quad \text{(time alone)}$$

Cousin = 4 hrs

	rate	time	part done
me	$\frac{1}{t}$	3	$\frac{3}{t}$
Cousin	$\frac{1}{4}$	3	$\frac{3}{4}$

$$4t \cdot \frac{3}{t} + \frac{4t \cdot 3}{4} = 4t$$

$$12 + 3t = 4t$$

$$12 = t$$

12 hours alone

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