099 §6.6 #s 2, 5, 13, 25, 27, 32, 33, 34, 39, 44, 45

#s 1-18 Solve each eq'n for the specified variable.

(2) $V = \frac{1}{3}\pi r^2 h$ for $h$

$\frac{1}{3}\pi r^2 h = V$

$\pi r^2 h = 3V$

$$\boxed{h = \frac{3V}{\pi r^2}}$$

(5) $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$ for $R$

$LCD = RR_1R_2$

$$\frac{1}{R}\cdot\frac{RR_1R_2}{1} = \frac{1}{R_1}\cdot\frac{RR_1R_2}{1} + \frac{1}{R_2}\cdot\frac{RR_1R_2}{1}$$

$R_1R_2 = RR_2 + RR_1$

$RR_2 + RR_1 = R_1R_2$

$R(R_2 + R_1) = R_1R_2$

$$\boxed{R = \frac{R_1R_2}{R_2 + R_1}}$$

(13) $f = \frac{f_1 f_2}{f_1 + f_2}$ for $f_2$

$LCD = f_1 + f_2$

$f(f_1 + f_2) = \frac{f_1 f_2}{f_1 + f_2}\cdot\frac{f_1 + f_2}{1}$

$ff_1 + ff_2 = f_1 f_2$

$-f_1 f_2 = -f_1 f_2$

$ff_1 + ff_2 - f_1 f_2 = 0$

$-ff_1 = -ff_1$

$ff_2 - f_1 f_2 = -ff_1$

$f_2(f - f_1) = -ff_1$

$$\boxed{f_2 = \frac{-ff_1}{f - f_1}}$$

OR $f_2 = \frac{ff_1}{f_1 - f}$

#s 19 - END SOLVE

(25) A camel can travel 20 miles in 8 hrs, with a load on. How far can it travel in 10 hrs?

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

| | | |
|---|---|---|
| D | 20 mi | D |
| r | r | r |
| t | 8 hrs | 10 hrs |

D = distance in 10 hrs (miles)

r = rate (in miles/hr)

$r = \frac{20\text{ mi}}{8\text{ hr}} = \frac{5}{2}\text{ mi/hr}$

$D = rt = \frac{5}{2}\cdot 10 = 25$ miles $= D$

099 §6.6 #s 27, 32, 33, 34, 39, 44, 45

(27) A good roofer can roof a house in 26 hrs.
" young " " " " " " " 39 " .
Find how long it takes if they work together.

Let x = the # of hours the good one uses
and x = " " " " " " bad " " ,
since they'll start and finish together.

In one hour, the good one is $\frac{1}{26}$ done
" " " " bad " " $\frac{1}{39}$ done

The amt of the job done in x hours by the good one is $\frac{1}{26}x$ and by the bad one is $\frac{1}{39}x$. We want them to finish 1 job:

$\frac{1}{39}x + \frac{1}{26}x = 1$ job done $\quad 3\overline{)39}\ \overline{13} \quad 2\overline{)26}\ \overline{13}$

$\frac{x}{39}\cdot\frac{2\cdot3\cdot13}{1} + \frac{x}{26}\cdot\frac{2\cdot3\cdot13}{1} = (1)(2\cdot3\cdot13) \qquad LCD = 2\cdot3\cdot13$

$(x)(2) + (x)(3) = 78$

$2x + 3x = 5x = 78$

$x = \frac{78}{5} = \boxed{15.6 \text{ hrs.}}$

This is NOT the book way. MY way allows for cases where they start at different times.

From the last exam:

099 § 6.6 #s 32, 33, 34, 39, 44, 45

TEST 4, Chapter 5:

Amanda can finish a 12 hrs, starts @ 6am

Steve " " " 15 hrs, starts @ 9am

When do they finish?

Let $x$ = the # of hours Amanda works

$y$ = " " " " Steve works.

Since Steve starts @ 9am, we see that

$y = x - 3$. This gives

$$\frac{1}{12}x + \frac{1}{15}(x-3) = 1 \text{ job}$$

$12 = 2 \cdot 2 \cdot 3$, $15 = 3 \cdot 5$

LCD $= 2 \cdot 2 \cdot 3 \cdot 5$

$15 = 3 \cdot 5$, $12 = 2 \cdot 2 \cdot 3$, $6 = 2 \cdot 3$

$$\frac{1x}{2 \cdot 2 \cdot 3} \cdot \frac{2 \cdot 2 \cdot 3 \cdot 5}{1} + \frac{x-3}{3 \cdot 5} \cdot \frac{2 \cdot 2 \cdot 3 \cdot 5}{1} = (1)(2 \cdot 2 \cdot 3 \cdot 5)$$

$$(x)(5) + (x-3)(2 \cdot 2) = 60$$

$$5x + 4(x-3) = 60$$

$$5x + 4x - 12 = 60$$

$$9x - 12 = 60$$

$$9x = 72$$

$x = 8$ hrs

Amanda starts @ 6 am, and works 8 hrs. This means they finish at 2pm

099 § 6.6 #s 32, 33, 34, 39, 44, 45

(32) Plane and truck leave @ same time and go 450 miles. The plane is 3 times faster than the truck. The plane arrives 6 hours sooner. Find speed of the truck.

Let $x$ = speed of truck in mph.

| | truck | plane |
|---|---|---|
| D | 450 | 450 |
| r | $x$ | $3x$ |
| t | $t$ | $t-6$ |

$450 = xt$

$450 = 3x(t-6)$

Use $450 = xt$:

$\frac{450}{x} = t$

Plug in for $t$ in the other equation

$450 = 3x\left(\frac{450}{x} - 6\right)$

$450 = \frac{3x(450)}{x} - (3x)(6)$

$450 = (3)(450) - 18x$

$18x = \quad + 18x$

$450 + 18x = 3(450)$

$18x = 3(450) - 450$

$18x = 2(450)$

$x = \frac{2(450)}{18}$

$= \frac{450}{9} = 50$

$x = 50$ mph

ALTERNATE:

$\frac{450}{3x} = \frac{450}{x} - 6$

Time for plane | Time for truck | − 6

099 §6.6 #s 33, 34, 39, 44, 45

(33) Current is 5 mph. It takes a boat same time to travel downstream 20 miles as it takes to travel upstream 10 miles. Find speed of boat in still water.

| | with | against |
|---|---|---|
| D | 20 | 10 |
| r | r+5 | r-5 |
| t | t | t |

Let r = rate of boat in still water (mph)

Times are the same. $t = \frac{D}{r}$

$$t = t$$

$$\frac{20}{r+5} = \frac{10}{r-5}$$

$$20(r-5) = 10(r+5)$$

$$20r - 100 = 10r + 50$$

$$10r = 150$$

$$\boxed{r = 15 \text{ mph}}$$

099 §6.6 #s 34, 39, 44, 45—

(34) SEE G14's 101026 lecture.

(39) Two trains leave @ same time and go in opposite directions. One is 15mph faster. In 6 hrs, they are 630 miles apart. Find the speed of each.

Let $x$ = speed of fast train (mph)

Then $x-15$ = " " slower " "

| | slow | fast |
|---|---|---|
| D | D | 630−D |
| r | x−15 | x |
| t | 6 | 6 |

$$\frac{D}{x-15} = 6 \qquad \frac{630-D}{x} = 6$$

$D = 6(x-15)$

Send this to the other one

$$\frac{630-6(x-15)}{x} = 6$$

$630 - 6x + 90 = 6x$

$-12x = -720$

$x = \frac{720}{12} = 60$ mph fast one

$\Rightarrow$ 45 mph slow one

099 §6.6 #s 44, 45

(44) Working @ cross-purposes

Inlet pipe fills tank in 1 hour, 30 min.
Outlet " empties " " 1 hour. How long does it take to empty a full tank if both pipes are open?

Let $x$ = time it takes to empty tank, with both pipes open (hrs)

1 hr, 30 min

$(30 \text{ min})\left(\frac{1 \text{ hour}}{60 \text{ min}}\right) = \frac{1}{2}$ hr

1 hr, 30 min $= 1 + \frac{1}{2}$ hrs $= \frac{3}{2}$ hrs

$\frac{1}{1}$ in one hour. tank is emptied

$\frac{\frac{1}{3}}{\frac{3}{2}}$ In one hour, $\frac{2}{3}$ of tank is filled

$$\frac{1}{1}x - \frac{\frac{1}{3}}{\frac{3}{2}}x = 1 \text{ job.}$$

$$x - \frac{2}{3}x = 1$$

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

$$\boxed{x = 3 \text{ hrs}}$$

(45) Plane flies 465 miles with wind and 345 miles against it in the same time. The speed of the wind is 20 mph. Find the " " " plane in still air.

Let $x$ = speed of plane in still air (mph)

| | with | against | $t = t$ |
|---|---|---|---|
| D | 465 | 345 | $\frac{465}{x+20} = \frac{345}{x-20}$ |
| r | $x+20$ | $x-20$ | |
| t | t | t | |

$$465(x-20) = 345(x+20)$$

099 § 6.6 # 45

(45) cnt'd

$$465x - 9300 = 345x + 6900$$

$$-345x + 9300 = -345x + 9300$$

$$120x = 16200$$

$$x = \frac{16200}{120} = \frac{1620}{12} = \frac{810}{6} = \frac{405}{3} = 135 \text{ mph}$$

$$\boxed{x = 135 \text{ mph}}$$