

ASSIGNMENT #3
SOLUTIONS
943 - DW
APPLIED MATH

1

P. 39

$$\begin{aligned} 16. \quad 8 - 5t &= 18 \\ -5t &= 10 \\ t &= 10 / -5 \\ \boxed{t} &= \boxed{-2} \end{aligned}$$

$$\begin{aligned} 18. \quad 6 + 4L &= 5 - 3L \\ | &= -7L \\ \boxed{L} &= \boxed{-\frac{1}{7}} \end{aligned}$$

$$\begin{aligned} 20. \quad 3(n-2) &= -n \\ 3n - 6 &= -n \\ 4n &= 6 \\ \boxed{n} &= \boxed{6/4 = 3/2} \end{aligned}$$

$$\begin{aligned} 22. \quad 5 - (x+2) &= 5x \\ 5 - x - 2 &= 5x \\ 3 &= 6x \\ \frac{3}{6} &= x \\ \boxed{x} &= \boxed{1/2} \end{aligned}$$

$$\begin{aligned} 24. \quad 4(F+7) &= -7 \\ 4F + 28 &= -7 \\ 4F &= -35 \\ \boxed{F} &= \boxed{-\frac{35}{4}} \end{aligned}$$

$$\begin{aligned} 26. \quad 1.5x - 0.3(x-4) &= 6 \\ 1.5x - 0.3x + 1.2 &= 6 \\ 1.2x &= 4.8 \\ x &= 4.8 / 1.2 \\ \boxed{x} &= \boxed{4} \end{aligned}$$

$$\begin{aligned} 28. \quad 3 - 6(2-3t) &= t - 5 \\ 3 - 12 + 18t &= t - 5 \\ 17t &= -5 - 3 + 12 \\ 17t &= 4 \\ \boxed{t} &= \boxed{4/17} \end{aligned}$$

$$\begin{aligned} 30. \quad 2x &= \frac{3 - 5(7-3x)}{4} \\ 8x &= 3 - 5(7-3x) \\ 8x &= 3 - 35 + 15x \\ -7x &= -32 \\ \boxed{x} &= \boxed{32/7} \end{aligned}$$

P.41

12 $2Q = 2I + A + S$

14 $u = \frac{-eL}{2m}$

$2Q - A - S = 2I$

$I = \frac{2Q - A - S}{2}$

$2um = -eL$

$L = -\frac{2um}{e}$

16 $FL = P_1L - P_1d + P_2L$

$P_1d = P_1L + P_2L - FL$

$d = \frac{P_1L + P_2L - FL}{P_1}$

17 $T = \frac{c+d}{v}$

18 $L = \frac{N\phi}{i}$

$Tv = c+d$
 $d = Tv - c$

$Li = N\phi$
 $\phi = \frac{Li}{N}$

20 $f = \frac{F}{d-F}$

22 $v = \frac{V(m+M)}{m}$

$f(d-F) = F$

$vm = V(m+M)$

$fd - fF = F$

$vm = Vm + VM$

$fd = F + fF$

$vm - Vm = VM$

$d = \frac{F + fF}{f}$

$M = \frac{vm - Vm}{V}$

24 $A_1 = A(M+1)$

$A_1 = AM + A$

$A_1 - A = AM$

$M = \frac{A_1 - A}{A}$

P. 45

9 LET $x = \#$ of ha AT \$20000
 $y = \#$ " " AT \$10000

$$x + y = 70$$

$$20000x + 10000y = 900000$$

SOLVING SYSTEM

$$x = 70 - y$$

$$20000(70 - y) + 10000y = 900000$$

$$1400000 - 20000y + 10000y = 900000$$

$$-10000y = -500000$$

$$y = 50$$

$$\text{So } x = 20$$

20 HA COST \$20000 EACH
& 50 HA COST \$10000 EACH

15 Let $x_1 = \text{current 1}$
 $x_2 = \text{current 2}$
 $x_3 = \text{current 3}$

We know $x_3 = 9.2 + x_1$

& $x_2 = 2x_1$

We also know :

$$x_1 + x_2 + x_3 = 0$$

$$x_1 + 2x_1 + 9.2 + x_1 = 0$$

$$4x_1 = -9.2$$

$$x_1 = -2.3$$

$$\text{So } x_2 = -4.6$$

$$\& x_3 = 9.2 - 2.3 = 6.9$$

The currents are $-2.3\text{mA}, -4.6\text{mA} \& 6.9\text{mA}$

17

Let $x_1 =$ MAIN PIPELINE (length) ④
 x_2, x_3 & x_4 OTHER 3 PIPELINES (lengths)

WE KNOW $x_2 = x_3 = x_4 = x_1 + 2.6$

WE ALSO KNOW THAT $x_1 + x_2 + x_3 + x_4 = 35.4$

So $x_1 + (x_1 + 2.6) + (x_1 + 2.6) + (x_1 + 2.6) = 35.4$

$$4x_1 + 7.8 = 35.4$$

$$4x_1 = 27.6$$

$$x_1 = 6.9$$

MAIN PIPELINE IS 6.9 KM
 OTHER THREE PIPELINES ARE $6.9 + 2.6 = 9.5$ KM / EACH

24

Let $t_1 =$ time spent travelling
 IN SCENARIO 1 (IN HRS)

$t_2 =$ time " " " 2 (IN HRS)

WE KNOW IN BOTH SCENARIOS THE SAME
 DISTANCE IS TRAVELLED

(distance = time · speed) SO $60 \cdot t_1 = 50 t_2$ ①

WE ALSO KNOW THE TOTAL AMOUNT OF TIME
 UNTIL APPOINTMENT IS

EITHER $t_1 + \frac{10}{60}$ (TRAVEL time + WAITING time)
 OR $t_2 + \frac{5}{60}$ (IN HOURS)

$$t_1 + \frac{1}{6} = t_2 + \frac{1}{12} \quad \text{②}$$

BUT $t_1 = \frac{5}{6} t_2$

$$\frac{5}{6} t_2 + \frac{1}{6} = t_2 + \frac{1}{12}$$

$$10 t_2 + 2 = 12 t_2 + 1$$

$$1 = 2 t_2$$

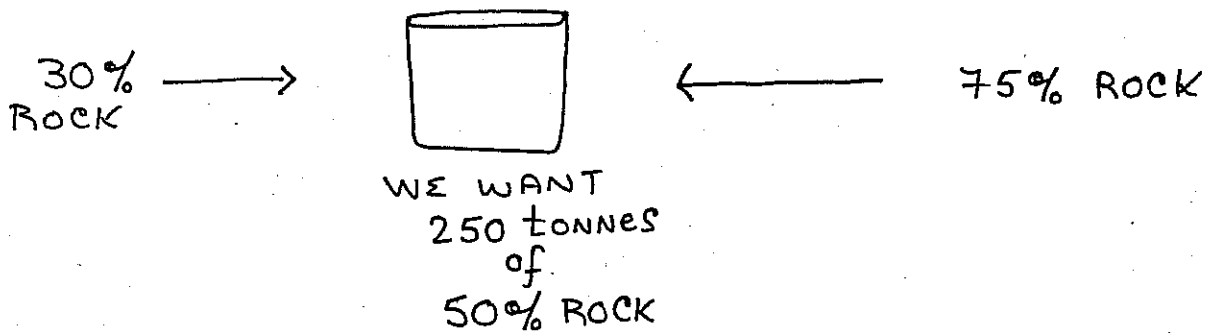
$$t_2 = .5 \text{ hrs} \\ = 30 \text{ minutes}$$

SO TIME BEFORE
 APPOINTMENT IS

$$30 + 5 \text{ minutes}$$

30

(5)



Let x = AMOUNT of 30% rock
 y = " " of 75% rock

$$x + y = 250$$

$$0.3x + 0.75y = 0.5(250)$$

so

$$0.3(250 - y) + 0.75y = 125$$

$$75 - 0.3y + 0.75y = 125$$

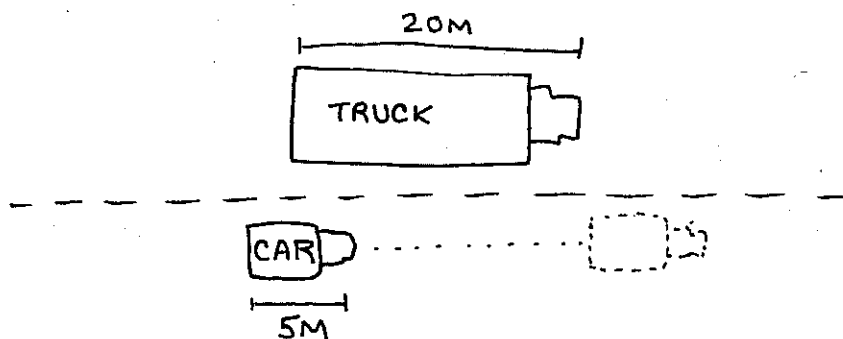
$$0.45y = 50$$

$$y = 111.111 \text{ tonnes}$$

$$x = 138.89 \text{ tonnes}$$

31

overhead view



How much distance must car travel
 in order to completely pass truck? 25m or 0.025km
 (see for yourself on drawing)
 IF THE TRUCK WERE STATIONARY!

- TRUCK TRAVELS 70km/h for 10 s
- $$10 \text{ s} = \frac{10}{60 \cdot 60} \text{ hrs}$$

(6)

$$\begin{aligned} \text{TRUCK TRAVELS} &= 70 \cdot \frac{10}{60 \cdot 60} \\ &= 0.194 \text{ KM} \end{aligned}$$

CAR MUST TRAVEL

$$0.194 + 0.025 \text{ KM}$$

$$= 0.219 \text{ KM}$$

$$\text{IN } 10 \text{ S OR } \frac{1}{360} \text{ hrs}$$

$$\text{SPEED} = \frac{0.219 \text{ KM}}{\frac{1}{360} \text{ hr}} = \boxed{78.84 \text{ KM/hr}}$$

FACTORS EXERCISES

a. $3x^2 + 8x + 5$
 $= 3x^2 + 3x + 5x + 5$
 $= 3x(x+1) + 5(x+1)$
 $= \boxed{(x+1)(3x+5)}$

b. $6x^2 + 7x - 10$
 $= 6x^2 + 12x - 5x - 10$
 $= 6x(x+2) - 5(x+2)$
 $= \boxed{(x+2)(6x-5)}$

c. $28x^5 + 14x^4 - 21x^3$
 $= \boxed{7x^3(4x^2 + 2x - 3)}$

d. $15x^5 - 18x^4 + 21x^3 - 48x^2$
 $= \boxed{3x^2(5x^3 - 6x^2 + 7x - 16)}$

e. $x^2 + x - 20$
 $= \boxed{(x+5)(x-4)}$

f. $x^2 - 13x + 42$
 $= \boxed{(x-6)(x-7)}$

g. $x^3 - 125$
 $= \boxed{(x-5)(x^2 + 5x + 25)}$

h. $64x^3 + 27$
 $= \boxed{(4x+3)(16x^2 - 12x + 9)}$

$$i. 64x^3 - 27$$

$$= (4x-3)(16x^2+12x+9)$$

$$j. 18x^2 - 9x - 5$$

$$= 18x^2 - 15x + 6x - 5$$

$$= 3x(6x-5) + 1(6x-5)$$

$$= (6x-5)(3x+1)$$

(7)

$$k. 49 - 9x^2$$

$$= (7-3x)(7+3x)$$

$$l. x^4 - 1$$

$$= (x^2-1)(x^2+1)$$

$$= (x+1)(x-1)(x^2+1)$$

$$m. 16x^2 - 1$$

$$= (4x-1)(4x+1)$$

$$n. x^4 - 2x^2 + 1$$

$$= (x^2-1)(x^2-1)$$

$$= (x+1)(x-1)(x+1)(x-1)$$

$$o. 20x^2 - 39x - 11$$

$$= 20x^2 - 44x + 5x - 11$$

$$= 4x(5x-11) + 1(5x-11)$$

$$= (5x-11)(4x+1)$$

$$p. 12x^2 + 8x - 15$$

$$= 12x^2 + 18x - 10x - 15$$

$$= 6x(2x+3) - 5(2x+3)$$

$$= (2x+3)(6x-5)$$

$$q. 7x^2 - 27x - 4$$

$$= 7x^2 - 28x + x - 4$$

$$= 7x(x-4) + 1(x-4)$$

$$= (x-4)(7x+1)$$

$$r. 7x^2(x+1)^2 + 8x(x+1)^2$$

$$= (x+1)^2(7x^2+8x)$$

$$= (x+1)^2 x(7x+8)$$

P. 233

26 $x^2 + 3x + 1 = 0$

$$x = \frac{-3 \pm \sqrt{3^2 - 4(1)(1)}}{2(1)}$$

$$= \frac{-3 \pm \sqrt{5}}{2}$$

$$x = \frac{-3 + \sqrt{5}}{2} \quad \& \quad \frac{-3 - \sqrt{5}}{2}$$

28 $3p^2 = 28 - 5p$

$3p^2 + 5p - 28 = 0$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(3)(-28)}}{2(3)}$$

$$= \frac{-5 \pm 19}{6}$$

$$x = \frac{-5 - 19}{6} = \boxed{-4} \quad \& \quad \frac{-5 + 19}{6} = \boxed{\frac{7}{3}}$$

30 $6n^2 + 2 = n$

$6n^2 - n + 2 = 0$

$$n = \frac{1 \pm \sqrt{1 - 4(6)(2)}}{2(6)}$$

$$= \frac{1 \pm \sqrt{-47}}{12}$$

NO SOLUTIONS

32 $4y^2 - 5y = 8$

$4y^2 - 5y - 8 = 0$

$$y = \frac{5 \pm \sqrt{(-5)^2 - 4(4)(-8)}}{2(4)}$$

$$= \frac{5 \pm \sqrt{153}}{8}$$

34 $16r^2 = 8r - 1$

$16r^2 - 8r + 1 = 0$

$16r^2 - 4r - 4r + 1 = 0$

$4r(4r - 1) + -1(4r - 1) = 0$

$(4r - 1)(4r - 1) = 0$

$$r = \frac{1}{4}$$

36 $2bx = x^2 - 3b$

$x^2 - 2bx - 3b = 0$

$$= \frac{2b \pm \sqrt{(-2b)^2 - 4(1)(-3b)}}{2}$$

$$= \frac{2b \pm \sqrt{4b^2 + 12b}}{2}$$

$$= \frac{2b \pm \sqrt{4b(b+3)}}{2}$$

$$= \boxed{b \pm \sqrt{b(b+3)}}$$

P. 211

#6 $\frac{x}{5} + 2 = \frac{15+x}{10}$

Multiply both sides by 10

$2x + 20 = 15 + x$

$x = -5$

#10 $\frac{2x-7}{3} + 5 = \frac{1}{5}$

Multiply both sides by 15

$10x - 35 + 75 = 3$

$10x = -37$

$x = \frac{-37}{10}$

#14 $\frac{1}{2y} - \frac{1}{2} = 4$

Multiply both sides by 2y

$1 - y = 8y$

$1 = 9y$

$y = \frac{1}{9}$

#18 $\frac{x}{2x-3} = 4$

Multiply both sides by 2x-3

$x = 4(2x-3)$

$x = 8x - 12$

$-7x = -12$

$x = \frac{12}{7}$

#22 $\frac{3}{4x-6} + \frac{1}{4} = \frac{5}{2x-3}$

FACTOR

$\frac{3}{2(2x-3)} + \frac{1}{4} = \frac{5}{2x-3}$

Multiply both sides by 4(2x-3)

$6 + (2x-3) = 20$

$2x = 17$

$x = \frac{17}{2}$

#26 $\frac{3}{t+3} - \frac{1}{t} = \frac{5}{2t+6}$

FACTOR

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

Multiply both sides by 2(t+3)t

$6t - 2(t+3) = 5t$

$6t - 2t - 6 = 5t$

$-t = 6$

$t = -6$

$$\# 30 \quad \frac{2}{x^2-1} - \frac{2}{x+1} = \frac{1}{x-1}$$

FACTOR

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

Multiply both sides by $(x+1)(x-1)$.

$$2 - 2(x-1) = x+1$$

$$2 - 2x + 2 = x + 1$$

$$3 = 3x$$

$$x = 1$$

BUT $x=1$ causes \div by zero so there is

NO SOLUTION

ASIDE

$$\begin{aligned} & 2x^2 + 5x - 3 \\ = & 2x^2 + 6x - x - 3 \\ = & 2x(x+3) - (x+3) \\ = & (x+3)(2x-1) \end{aligned}$$

$$\# 32 \quad \frac{2}{2x^2+5x-3} - \frac{1}{4x-2} + \frac{3}{2x+6} = 0$$

FACTOR:

$$\frac{2}{(x+3)(2x-1)} - \frac{1}{2(2x-1)} + \frac{3}{2(x+3)} = 0$$

Multiply both sides by $2(x+3)(2x-1)$:

$$4 - (x+3) + 3(2x-1) = 0$$

$$4 - x - 3 + 6x - 3 = 0$$

$$5x = 2$$

$$x = 2/5$$