Ex 7C

(1)(i) $\frac{2x}{7} - \frac{x}{4} = 3$

$\times 7 \times 4$

$\frac{7 \times 4 \times 2x}{7} - \frac{7 \times 4 \times x}{4} = 7 \times 4 \times 3$

$8x - 7x = 84$

$x = 84$

(ii) $\frac{5}{4x} + \frac{3}{2x} = \frac{11}{16}$

$\times 16x$

$\frac{4 \times 4x \times 5}{4x} + \frac{16x \times 3}{2x} = \frac{16x \times 11}{16}$

$20 + 24 = 11x$

$44 = 11x$

$x = 4$

(iii) $\frac{2}{x} - \frac{5}{2x-1} = 0$

$\times x(2x-1)$

$\frac{x(2x-1)2}{x} - \frac{x(2x-1)(5)}{2x-1} = x(2x-1)(0)$

$4x - 2 - 5x = 0$

$-2 - x = 0$

$x = -2$

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

$x(x-2)$

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

$x^2-3x-2x+6 = x+2$

$x^2-5x+6-x-2=0$

$x^2-6x+4=0$

$(x-3)^2-5=0$

$(x-3)^2=5$

$x-3=\pm\sqrt{5}$

$x=3\pm\sqrt{5}$

$x=5.24$ or $x=0.76$

(v) $\frac{1}{3x}+x+1=\frac{13}{3}$

$\times 3x$ $\quad \frac{3x\times 1}{x}+3x\times x+3x\times 1 = \frac{3x\times 13}{3}$

$3+3x^2+3x=13x$

$3x^2-10x+3=0$

~~$x=3$ or $x=0.10$~~

$(3x-1)(x-3)=0$

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

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

$\times (x+1)(x-1)$

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

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

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

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

$x^2 - 3x = 0$

$x(x-3) = 0$ ∴ either $x = 0$ or $x = 3$

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

$\times x(x-1)$

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

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

$x^2 - x^2 + 2x - 1 - 2x^2 + 2x = 0$

$-2x^2 + 4x - 1 = 0$

$\times -1$

$2x^2 - 4x + 1 = 0$

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

$= \frac{4 \pm \sqrt{16 - 8}}{4} = \frac{4 \pm \sqrt{8}}{4} = \frac{4 \pm 2\sqrt{2}}{4} = 1 \pm \frac{\sqrt{2}}{2}$

either $x = 1 + \frac{\sqrt{2}}{2} = 1.71$ or $x = 1 - \frac{\sqrt{2}}{2} = 0.29$

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

$\times (p+1)(1-3p)$

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

$2(1-3p) - 3(p+1) = 0$

$2 - 6p - 3p - 3 = 0$

$-1 = 9p$

$p = -\frac{1}{9}$

(ix) $\frac{18}{4a-1} - \frac{1}{a+1} = 1$

$\times (4a-1)(a+1)$

$(4a-1)(a+1)\frac{18}{4a-1} - (4a-1)(a+1)\frac{1}{a+1} = (4a-1)(a+1)$

$18(a+1) - 1(4a-1) = (4a-1)(a+1)$

$18a + 18 - 4a + 1 = 4a^2 + 3a - 1$

$14a + 19 = 4a^2 + 3a - 1$

$4a^2 - 11a - 20 = 0$

$a = \frac{-(-11) \pm \sqrt{(-11)^2 - 4 \times 4 \times -20}}{2 \times 4}$

$a = \frac{11 \pm \sqrt{121 + 320}}{8} = \frac{11 \pm \sqrt{441}}{8} = \frac{11 \pm 21}{8}$

$a = \frac{11+21}{8} = 4$ or $\frac{11-21}{8} = -\frac{5}{4}$

(x) $\frac{2}{2r-1} - \frac{6}{r+1} = 11$

$\times (2r-1)(r+1)$

$(2r-1)(r+1)\frac{2}{(2r-1)} - (2r-1)(r+1)\frac{6}{(r+1)} = 11(2r-1)(r+1)$

$2(r+1) - 6(2r-1) = 11(2r-1)(r+1)$

$2r + 2 - 12r + 6 = 22r^2 + 11r - 11$

$22r^2 + 21r - 19 = 0$

$r = \frac{-21 \pm \sqrt{21^2 - 4 \times 22 \times -19}}{2 \times 22}$

$r = \frac{-21 \pm \sqrt{441 + 1672}}{44}$

$r = \frac{-21 \pm \sqrt{2113}}{44}$

either $r = \frac{-21 + \sqrt{2113}}{44} = 0.57$

or $r = \frac{-21 - \sqrt{2113}}{44} = -1.52$

(2) let denominator = $d$

numerator is 5 less = $d-5$

So Fraction $\frac{d-5}{d}$

both increased by 9 $\frac{d-5+9}{d+9} = \frac{3}{4}$

$$\frac{d+4}{d+9} = \frac{3}{4}$$

$$4(d+4) = 3(d+9)$$

$$4d+16 = 3d+27$$

$$d = 27-16 = 11$$

$\therefore$ Fraction $\frac{11-5}{11} = \frac{6}{11}$

(3) let n° of weeks so far $= N$

total hits $= 156$

$\therefore$ Mean hits per week $= \frac{156}{N}$

Next week, $N+1$

total hits $= 156+54 = 210$

$\therefore$ Mean hits per week $= \frac{210}{N+1}$

difference in means $= 4$

ie $\frac{210}{N+1} - \frac{156}{N} = 4$

(3) cont'd $N(N+1)\frac{210}{N+1} - N(N+1)\frac{156}{N} = 4N(N+1)$

$210N - 156N - 156 = 4N^2 + 4N$

$4N^2 - 50N + 156 = 0$

$N = 6$ or $6.5$

N is defined as a whole N° ∴ $N = 6$

(4) (I) 600p, $x$p each, N° of packs $= \frac{600}{x}$

(II) $\frac{600}{x-1}$

(III) $\frac{600}{x} + 1 = \frac{600}{x-1}$

$x(x-1)\frac{600}{x} + x(x-1)(1) = x(x+1)\frac{600}{x+1}$

$600(x-1) + x(x-1) = 600x$

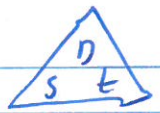
$600x - 600 + x^2 - x - 600x = 0$

$x^2 - x - 600 = 0$

$x = 25$ or $x = -24$

Context is +ve ∴ $x = 25$p.

(5)




(i) Anticipated time $= \frac{270}{x}$

actual time $= \frac{270}{x-10}$

(ii) Difference $= 18 \text{ mins} = \frac{18}{60} = \frac{3}{10}$ hour

So $\frac{270}{x-10} - \frac{270}{x} = \frac{3}{10}$

$10x(x-10)\frac{270}{x-10} - 10x(x-10)\frac{270}{x} = 10x(x-10)\frac{3}{10}$

$2700x - 2700(x-10) = 3x(x-10)$

$2700x - 2700x + 27000 = 3x^2 - 30x$

$3x^2 - 30x - 27000 = 0$

$\div 3 \quad x^2 - 10x - 9000 = 0$

$x = 100$ or $x = -90$

So $x = 100$ kph $=$ 1hr 40 mins

So if left @ 10 am, arrives @ 11:40

So $x = 100$ is anticipated speed $= 100$ kmh

So actual speed $= 90$ kmh

So actual time taken $= \frac{270}{90} = 3$ hrs

So if left @ 10 am, arrives @ 1300

(6) (i) $\frac{x+1}{x-1} - \frac{x-1}{x+1} = \frac{4x}{x^2-1}$

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

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

$\frac{4x}{x^2-1} = \frac{4x}{x^2-1}$

∴ true for all $x$.

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

$\frac{4x}{x^2-1} = \frac{2}{x^2-1}$

$4x = 2$

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

(iii) $\frac{x+1}{x-1} - \frac{x-1}{x+1} = \frac{5}{6}$

$\frac{4x}{x^2-1} = \frac{5}{6}$

$4x(6) = 5(x^2-1)$

$24x = 5x^2 - 5$

$5x^2 - 24x - 5 = 0$

$x = 5$ or $x = -0.2$

(7) Cost of meal was same for all, £x

$\therefore \quad \frac{272}{x+1} = x$

$272 = x(x+1)$

$272 = x^2 + x$

$x^2 + x - 272 = 0$

$x = 16$ or $-17$ $\quad \therefore$ cost of meal = £16

Now N° of meals = N, each costing £16

So $16N = 272$

$N = 17$

So 17 meals bought by 16 students.

(8) each thick slice = $\frac{21}{x}$ cm thick

So each thinner slice = $\left(\frac{21}{x} - \frac{1}{4}\right)$ cm thick

N° of thick slices = $x$

N° of thinner slices = $\frac{21}{\left(\frac{21}{x} - \frac{1}{4}\right)}$

difference = 2 slices

$$\therefore \quad \frac{21}{\frac{21}{x} - \frac{1}{4}} - x = 2$$

$$\times \left(\frac{21}{x} - \frac{1}{4}\right)$$

$$21 - x\left(\frac{21}{x} - \frac{1}{4}\right) = 2\left(\frac{21}{x} - \frac{1}{4}\right)$$

$$21 - 21 + \frac{x}{4} = \frac{42}{x} - \frac{1}{2}$$

$$\frac{x}{4} = \frac{84 - x}{2x}$$

$$2x^2 = 4(84 - x)$$

$$2x^2 = 336 - 4x$$

$$2x^2 + 4x - 336 = 0$$

$x = 12$ or $x = -14$

+ve context $\therefore$ $x = 12$ thick slices.

(a) (i) $\frac{1}{3} + \frac{1}{4} = \frac{1}{R}$

$\frac{4+3}{12} = \frac{1}{R}$

$\frac{7}{12} = \frac{1}{R}$

$R = \frac{12}{7}\ \Omega$

(ii) $\frac{1}{R} + \frac{1}{6} = \frac{1}{2.4}$

$\frac{6+R}{6R} = \frac{1}{2.4}$

$2.4(6+R) = 6R$

$14.4 + 2.4R = 6R$

$14.4 = 3.6R$

$R = \frac{14.4}{3.6} = 4\Omega$

(iii) $\frac{1}{R_1} + \frac{1}{R_1} = \frac{1}{R}$

$\frac{R_1 + R_1}{R_1^2} = \frac{1}{R}$

$\frac{2R_1}{R_1^2} = \frac{1}{R}$

$\frac{2}{R_1} = \frac{1}{R}$

$R = \frac{1}{2}R_1$ equivalent to half the resistance