$x+5 = 3(y+5)$

$\Rightarrow x+5 = 3y+15$

$\Rightarrow x-3y = 15-5$

$\Rightarrow x-3y = 10$ ——— (1)

Five years ago

Jacobs age $= x-5$

Jacobs sons age $= y-5$

$x-5 = 7(y-5)$

$\Rightarrow x-5 = 7y-35$

$\Rightarrow x-7y = -35+5$

$\Rightarrow x-7y = -30$ ——— (2)

for (1) $x = 3y+10$ ——— (*)

Substitute eq (*) in eq (2)

$3y+10-7y = -30$

$\Rightarrow 10-4y = -30$

$\Rightarrow 4y = 40 \Rightarrow y = 10$

$x = 3\times 10+10 = 40$ yrs.

Ex-3.4

(i) $x+y = 5$ & $2x-3y = 4$

Elimination

$x+y = 5$ ——— (1)

$2x-3y = 4$ ——— (2)

$2x+2y = 10$

$2x-3y = 4$

$2x+2y = 10$

$(-)\quad (-)\quad (-)$

$-5y = -6 \Rightarrow 5y = 6 \Rightarrow y = \frac{6}{5}$

$x+y=5$

$x+\frac{6}{5}=5 \Rightarrow x=5-\frac{6}{5} \Rightarrow x=\frac{25-6}{5}$

$\Rightarrow x=\frac{19}{5}$

Substitution

$x-y=5$ —— ①

$2x-3y=4$ —— ②

$x=5-y$

$\Rightarrow 2-(5-y)-3y=4$

$\Rightarrow 10-2y-3y=4$

$\Rightarrow 10-5y=4$

$\Rightarrow -5y=4-10$

$\Rightarrow -5y=-6 \Rightarrow y=\frac{+6}{+5}$

$x+y=5$

$\Rightarrow x+\frac{6}{5}=5$

$\Rightarrow x=5-\frac{6}{5}$

$\Rightarrow x=\frac{25-6}{5} \Rightarrow x=\frac{19}{5}$

(ii) $3x+4y=10$ & $2x-2y=2$

Elimination

$2(3x+4y)=10$ $\quad$ $3(2x-2y)=2$

$\Rightarrow 6x+8y=20$ $\quad$ $\Rightarrow 6x-6y=6$

$6x+8y=20$

$6x-6y=6$

(-) (-)

$14y=14$

$\Rightarrow 14y=14 \Rightarrow y=\frac{14}{14}=1$

Substitution

$3x+4y=10$ —— ①

$2x+2y=2$ —— ②

$3x=10-4y$

$\Rightarrow x=\frac{10-4y}{3}$

$2\left(\frac{10-4y}{3}\right)-2y=2$

$\Rightarrow 2(10-4y)=6y=6$

$\Rightarrow 20-8y-6y=6$

$\Rightarrow -8y-6y=6-20 \Rightarrow -14y=-14 \Rightarrow y=\frac{-14}{-14}=1$

$2x-2y=2$

$\Rightarrow 2x-2(1)=2$

$\Rightarrow 2x-2=2 \Rightarrow 2x=2+2 \Rightarrow 2x=4 \Rightarrow x=\frac{4}{2}=2$

(iii) $3x-5y-4=0$ & $9x=2y+7$

Elimination

$3x-5y=4$ —— ①

$9x-2y=7$ —— ②

We multiply first eq by 3

$3(3x-5y)=3\times 4$

$\Rightarrow 9x-15y=12$ —— ③

$9x-2y=7$

$9x-15y=12$

(-) (+) (-)

$13y=-5 \Rightarrow y=\frac{-5}{13}$

putting $y=\frac{-5}{13}$ in eq ②

$9x-2y=7$

$\Rightarrow 9x - 2\left(\frac{-5}{13}\right) = 7$

$\Rightarrow 9x + \frac{10}{13} = 7$

$\Rightarrow 9x = 7 - \frac{10}{13}$

$\Rightarrow 9x = \frac{7\times13 - 10}{13} \Rightarrow 9x = \frac{91-10}{13} \Rightarrow 9x = \frac{81}{13}$

$\Rightarrow x = \frac{81}{13} \times \frac{1}{9} \Rightarrow x = \frac{9}{13}$

Substitution

$3x - 5y - 4 = 0$ —— ①

$9x = 2y + 7$ —— ②

From ①

$3x - 5y - 4 = 0$

$3x = 4 + 5y$

$\Rightarrow x = \frac{4+5y}{3}$

putting x in eq ②

$9x = 2y + 7$

$9\left(\frac{4+5y}{3}\right) = 2y + 7$

$\Rightarrow 3(4+5y) = 2y + 7 \Rightarrow 12 + 15y = 2y + 7 \Rightarrow 15y - 2y = 7 - 12$

$\Rightarrow 13y = -5 \Rightarrow y = \frac{-5}{13}$

putting $y = \frac{-5}{13}$ in eq ①

$3x - 5y - 4 = 0$

$\Rightarrow 3x - 5\left(\frac{-5}{13}\right) - 4 = 0 \Rightarrow 3x + \frac{25}{13} - 4 = 0 \Rightarrow 3x = 4 - \frac{25}{13}$

$\Rightarrow 3x = \frac{4(13) - 25}{13} \Rightarrow 3x = \frac{52-25}{13} \Rightarrow 3x = \frac{27}{13}$

$\Rightarrow x = \frac{27}{13\times3} \Rightarrow x = \frac{9}{13}$

Q) $\frac{x}{2} + \frac{2y}{3} = -1$ & $x - \frac{y}{3} = 3$

Elimination

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

$\frac{3(x) + 2(2y)}{2\times3} = -1 \Rightarrow \frac{3x+4y}{6} = -1 \Rightarrow 3x + 4y = -1\times6$

$\Rightarrow 3x + 4y = -6$ —— ①

$x - \frac{y}{3} = 3$

$\Rightarrow \frac{3x - y}{3} = 3 \Rightarrow 3x - y = 3(3) \Rightarrow 3x - y = 9$ —— ②

$3x + 4y = -6$

$3x - y = 9$

$(-)\quad(+)\quad(=)$

$5y = -15 \Rightarrow y = -3$

Putting $y = -3$ in eq ②

$3x - y = 9 \Rightarrow 3x - (-3) = 9 \Rightarrow 3x + 3 = 9$

$\Rightarrow 3x = 9 - 3 \Rightarrow 3x = 6 \Rightarrow x = \frac{6}{3} = 2$

Substitution

$3x - 4y = -6$ —— ① & $3x - y = 9$ —— ②

putting value of $3x$ in ②

$3x - y = 9$

$\Rightarrow (-6 - 4y) - y = 9$

$\Rightarrow -4y - y = 9 + 6$

$\Rightarrow -5y = 15$

$\Rightarrow y = \frac{-15}{5}$

$\Rightarrow y = -3$

Ex-3.4

2. (i) let the numerator be x
" " denominator be y

fraction $\frac{x}{y}$

$\frac{x+1}{y-1} = 1$

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

$\Rightarrow x - y = -1 - 1$

$\Rightarrow x - y = -2$ ——— (1)

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

$\Rightarrow 2x = y + 1$

$\rightarrow 2x - y = 1$ ——— (2)

$x - y = -2$
$2x - y = 1$
$(+)\ (+)\ (-)$
$-x = -3$

$x = 3$

$(3) - y = -2$

$\Rightarrow -y = -2 - 3 \Rightarrow -y = -5 \Rightarrow y = 5$

$\frac{x}{y} = \frac{3}{5}$

(ii) let present age of Nuri be x
" " " " Sunu y

Five yrs ago
Nuri's age $= x - 5$
Sunu's age $= y - 5$

$x - 5 = 3(y - 5)$

$\Rightarrow x - 5 = 3y - 15$

$\Rightarrow x - 3y = -15 + 5$

$\Rightarrow x - 3y = -10$ ——— (1)

Ten yrs later
Nuri's age $= x + 10$
Sunu's age $= y + 10$

$x + 10 = 2(y + 10)$

$\Rightarrow x + 10 = 2y + 20$

$\rightarrow x - 2y = 20 - 10$

$\rightarrow x - 2y = 10$ ——— (2)

$x - 3y = -10$
$x - 2y = +10$
$-1y = -20 \quad \Rightarrow +y = +20$

$x - 3(20) = -10$

$\rightarrow x - 60 = -10$

$\Rightarrow x = -10 + 60$

$\Rightarrow x = 50$

So present age of Nuri = 50 yrs
Present age of Sunu = 20 yrs

(iii) let unit digit $= x$
let Tens digit $= y$
~~No = 10y + x~~
$x + y = 9$ ——— (1)

9 × (No.) = 2 × (Reversed no.)

$9(10x + y) = 2(10y + x)$

$90x + 9y = 20y + 2x$

$90x - 2x + 9y - 20y = 0$

$88x - 11y = 0$

$11(8x - y) = 0$

$(8x - y) = \frac{0}{11}$

$8x - y = 0$ ——— (2)

$x+y=9$
$8x-y=0$
$9x=9$
$x=\frac{9}{9}=1$

$x+y=9$
$1+y=9 \Rightarrow y=9-1 \Rightarrow y=8$

No. $10x+y=10(1)+8=10+8=18$

(iv) let ₹ 50 notes be x
" ₹100 notes be y
Total = 25
$x+y=25$ ——— (1)
Total amount withdrawn = 2000
$50x+100y=2000$
$\Rightarrow 50(x+2y)=2000$
$\Rightarrow x+2y=\frac{2000}{50}$

$\Rightarrow x+2y=40$ ——— (2)
$x+y=25$
$x+2y=40$
$(-1)\ (-1)\ (-)$
$-y=-15$

$\Rightarrow y=15 \Rightarrow y=15$
$x+15=25$
$\Rightarrow x=25-15 \Rightarrow x=10$

(v) Fixed charge = ₹ x
Additional charge = ₹ y

Rupees paid for a book kept for seven day by Sarita = ₹ 27

Rupees paid for a book kept for five day by Sunil = ₹ 21

$x+4y=27$
$-x+2y=21$
$(-1)\ (-x)\ (+)$
$2y=6$
$y=3$

$x=21-6$
$\Rightarrow x=15$

Ex-3.5

1. (i) $x-3y-3=0$
$3x-9y-2=0$

$a_1=1, b_1=-3, c_1=-3$
$a_2=3, b_2=-9, c_2=-2$

$\frac{x}{b_1c_2-b_2c_1} = \frac{y}{c_1a_2-c_2a_1} = \frac{1}{a_1b_2-a_2b_1}$

$\frac{x}{(-3)(-2)-(-9)(-3)} = \frac{y}{(-3)(3)-(-2)(1)} = \frac{1}{(1)(-9)-(3)(-3)}$

$\frac{x}{6-27} = \frac{y}{-9-(-2)} = \frac{1}{-9-(-9)}$

$\frac{x}{-21} = \frac{y}{-7} = \frac{1}{0}$

$\frac{x}{-21} = \frac{1}{0}$ | $\frac{-y}{-7} = \frac{1}{0}$
$\Rightarrow x=0$ | $\Rightarrow y=0$

(No Solution)