EXERCISE 4.3

1(i) $2x^2 - 7x + 3 = 0$

$a = 2 \quad b = -7 \quad c = 3$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-7) + \sqrt{(-7)^2 - 4(2)(3)}}{2(2)}$$

$$= \frac{7 + \sqrt{49 - 24}}{4}$$

$$= \frac{7 \pm 5}{4}$$

$$= \frac{+2^{3}}{4} \quad \Big| \quad \frac{2^{1}}{4_{2}}$$

$$= -3 \quad \Big| \quad = \frac{1}{2}$$

(ii) $2x^2 + x - 4 = 0$

$a = 2 \quad b = 1 \quad c = -4$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

$$= \frac{-1 \pm \sqrt{1 + 18}}{4}$$

$$= \frac{-1 \pm \sqrt{19}}{4}$$

(iii) $4x^2 + 4\sqrt{3}x + 3 = 0$

$a = 4 \quad b = 4\sqrt{3} \quad c = 3$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

$$= \frac{-4\sqrt{3} \pm \sqrt{48 - 48}}{8}$$

$$= \frac{-4\sqrt{3} \pm 0}{8}$$

(iv) $2x^2 + x + 4 = 0$

$a = 2 \quad b = 1 \quad c = 4$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

$$= \frac{-1 \pm \sqrt{1 - 32}}{4}$$

$$= \frac{-1 \pm \sqrt{-31}}{4}$$

2 (i) $2x^2 - 7x + 3$

$a = 2 \quad b = -7 \quad c = 3$

$D = b^2 - 4ac$

$= (-7)^2 - 4(2)(3)$

$= (-7 \times -7) - (4 \times 2 \times 3)$

$= 49 - 24$

$= 25$

$x = \frac{-b \pm \sqrt{D}}{2a}$

$= \frac{-(-7) \pm \sqrt{25}}{2 \times 2}$

$= \frac{7 \pm \sqrt{5^2}}{4}$

$= \frac{7 \pm 5}{4}$

$= \frac{7 + 5}{4}$

$= \frac{12}{4}$

$= 3$

$x = \frac{7 - 5}{4}$

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

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

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

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

$= x^2 - 1 = 3x$

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

$a = 1 \quad b = -3 \quad c = -1$

$D = b^2 - 4ac$

$= (-3)^2 - 4(1)(-1)$

$= 9 + 4$

$= 13$

$x = \frac{-b \pm \sqrt{D}}{2a}$

$= \frac{-(-3) \pm \sqrt{13}}{2 \times 1}$

$= \frac{3 \pm \sqrt{13}}{2}$

(11) $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$

$= \frac{(x-7)-(x+4)}{(x+4)(x-7)} = \frac{11}{30}$

$= \frac{-11}{(x+4)(x-7)} = \frac{11}{30}$

$= \frac{-11 \times 30}{11} = (x+4)(x-7)$

$= -30 = (x+4)(x-7)$

$= (x+4)(x-7) = -30$

$= x(x-7) + 4(x-7) = -30$

$= x^2 - 7x + 4x - 28 = -30$

$= x^2 - 3x + 4 - 28 + 30 = 0$

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

$a = 1 \quad b = -3 \quad c = 2$

$D = b^2 - 4ac$

$= (-3)^2 - 4(1)(2)$

$= 9 - 8$

$= 1$

4 Let present age = x

3 yrs ago = x - 3

5 yrs after = x + 5

So,

$$\frac{1}{x-3} + \frac{1}{x+5} = \frac{1}{3}$$

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

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

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

$$\Rightarrow 2x + 2 \times 3 = (x-3)(x+5)$$

$$\Rightarrow 6x + 6 = (x)(x+5) - (3)(x+5)$$

$$\Rightarrow 6x + 6 = x^2 + 2x - 15$$

$$\Rightarrow x^2 + 2x - 15 - 6x - 6 = 0$$

$$\Rightarrow x^2 - 4x - 21 = 0$$

$$\Rightarrow x^2 + 3x - 7x - 21 = 0$$

$$\Rightarrow x(x+3) - 7(x+3)$$

$$\Rightarrow (x+3)(x-7)$$

5 Let marks in mathematics = x
90 marks in English = 30 - x

ATQ

$(x + 2)(30 - x - 3) = 210$

$\Rightarrow (x + 2)(27 - x) = 210$

$\Rightarrow (x)(27 - x) + (2)(27 - x) = 210$

$\Rightarrow 27x - x^2 + 54 - 2x = 210$

$\Rightarrow -x^2 + 27x - 2x + 54 - 210 = 0$

$\Rightarrow -x^2 + 25x - 196 = 0$

$\Rightarrow -(x^2 - 25x + 196) = 0$

$\Rightarrow x^2 - 13x - 12x + 196 = 0$

$\Rightarrow x(x - 13) - 12(x - 13) = 0$

$\Rightarrow (x - 13)(x - 12)$

So $x = 13$ or and $x = 12$

8 Let shorter side = x
so larger side = x + 30
and diagonal = x + 60

$h^2 = b^2 + p^2$

$\Rightarrow (x + 60)^2 = (x + 30)^2 + (x)^2$

$\Rightarrow (x)^2 + 2(x)(60) + 60^2 = (x)^2 + 2(x)(30) + 30^2 + (x)^2$

$\Rightarrow x^2 + 120x + 3600 = x^2 + 60x + 900 + x^2$

$\Rightarrow x^2 + 120x + 3600 = x^2 + 60x + 900 + x^2$

$\Rightarrow x^2 + 120x + 3600 - 2x^2 - 60x - 900 = 0$

$= -x^2 - 60x + 2700$

$= -(x^2 + 60x - 2700)$

$= x(x + 90) - 30(x + 90)$

$= (x + 90)(x - 30)$

$90 \quad x = -90, \quad x = 30$

$x + 30 = 30 + 30 = 60$

$x + 60 = 30 + 60 = 90$

8 Total dis by train = 360 km

Let the speed = x km/hr

Time taken = $\frac{360}{x}$

New speed = $x + 3$ km/hr

Time taken = $\frac{360}{x} - 1$

90,

$(x + 3) \times \left(\frac{360}{x} - 1\right) = 360$

$= (x + 3)\left(\frac{360}{x} - 1\right) = 360$

$= (x)\left(\frac{360}{x} - 1\right) + (3)\left(\frac{360}{x} - 1\right) = 360$

$= 360 - x + \frac{1800}{x} - 3 = 960$

$= \frac{360x - x^2 + 1800 - 3x}{x} = 960$

$= 360x - x^2 + 1800 - 3x = 360x$

$= -x^2 - 3x + 1800$

$$= -(x^2 + 5x - 1800)$$

$$= x^2 + 45x - 40x - 1800 = 0$$

$$= x(x + 45) - 40(x + 45)$$

$$= (x + 45) - 40(x + 45)$$

$$= (x + 45)(x - 40)$$

$x = -45$, $x = 40$

So speed of train = 40 km/hr.