Exercise 4.2

1) i. $x^2 - 3x - 10 = 0$

$\Rightarrow x^2 - 5x + 2x - 10 = 0$

$\Rightarrow (x^2 - 5x) + (2x - 10) = 0$

$\Rightarrow x(x-5) + 2(x-5) = 0$

$\Rightarrow (x+2)(x+5)$

$\Rightarrow x+2 = 0$ and $x - 5 = 0$

$\Rightarrow x = 2$ and

$x = 5$

The two roots of the given equation are 2 and 5.

ii. $2x^2 + x - 6 = 0$

$\Rightarrow 2x^2 + 4x - 3x - 6 = 0$

$\Rightarrow (2x^2 + 4x) - (3x + 6) = 0$

$\Rightarrow 2x(x+2) - 3(x+2) = 0$

$\Rightarrow (2x - 3)(x+2)$

$\Rightarrow 2x - 3 = 0$ and

$x + 2 = 0$

$\Rightarrow x = 3/2$ and

$x = -2$.

The two roots of the given equation are $3/2$ and -2

iii. $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$

$\Rightarrow \sqrt{2}x^2 + 5x + 2x + 5\sqrt{2} = 0$

$\Rightarrow (\sqrt{2}x^2 + 2x) + (5x + 5\sqrt{2}) = 0$

$\Rightarrow \sqrt{2}x(x + \sqrt{2}) + 5(x + \sqrt{2}) = 0$

$\Rightarrow (\sqrt{2} + 5)(x + \sqrt{2}) = 0$

$\Rightarrow \sqrt{2}x + 5 = 0$ and

$x + \sqrt{2} = 0$.

$\Rightarrow x = -5/\sqrt{2}$ and $x = -\sqrt{2}$

The two roots of the given equation are $-5\sqrt{2}$ and $(-\sqrt{2}$

1. iv. $2x^2 - x + \frac{1}{8} = 0$

$\Rightarrow 16x^2 - 8x + 1 = 0$.

$\Rightarrow 16x^2 - 4x - 4x + 1 = 0$

$\Rightarrow 4x(4x-1) - 1(4x-1) = 0$

$\Rightarrow (4x-1)(4x-1) = 0$

$\Rightarrow 4x - 1 = 0$ and $4x - 1 = 0$.

$x = 1/4$ and $x = 1/4$.

So the two roots of the given equations are $1/4$ and $1/4$

v. $100x^2 - 20x + 1 = 0$

$\Rightarrow 100x^2 - 10x - 10x + 1 = 0$

$\Rightarrow 10x(10x-1) - 1(10x-1) = 0$

$\Rightarrow (10x-1)(10x-1) = 0$

$\Rightarrow$ ~~$(x-1)$~~ $(10x-1) = 0$ and $10x - 1 = 0$.

$\Rightarrow x = \frac{1}{10}$ and $x = \frac{1}{10}$.

The two roots of the given equation are $\frac{1}{10}$ and $\frac{1}{10}$.

2. i. Let one of them have x marbles.

Other one have $= (45 - x)$ marbles

$\Rightarrow (x-5)(45-x-5) = 124$.

$\Rightarrow (x-5)(40-x) = 124$

$\Rightarrow x^2 - 45x + 324 = 0$

$\Rightarrow x^2 - 9x - 36x + 324 = 0$

$\Rightarrow x(x-9) - 36(x-9) = 0$

$\Rightarrow (x-9)(x-36) = 0$.

$\Rightarrow x - 9 = 0$ and $x - 36 = 0$

$\Rightarrow x = 9$ and $x = 36$.

So if John had 9 marbles then Jivanti had 36 marbles vice versa.

11. let the no. of toys produced = x.

cost of 1 toys - $₹\frac{750}{x}$.

ATQ

$$\frac{750}{x} = 55 - x$$

$$\Rightarrow 750 = 55x - x^2$$

$$\Rightarrow x^2 - 55x + 750 = 0$$

$$\Rightarrow x^2 - 25x - 30x + 750 = 0$$

$$\Rightarrow x(x-25) - 30(x-25) = 0$$

$$\Rightarrow (x-30)(x-25) = 0$$

$$\Rightarrow x - 30 = 0 \text{ and } x - 25 = 0.$$

$$\Rightarrow x - 30 \text{ and } x - 25$$

3. Let the two no. be a and 0ther one by - $27 - x$

ATQ

$$x(27-x) = 182$$

$$\Rightarrow -x^2 + 27x - 182 = 0$$

$$\Rightarrow x^2 - 27x + 182 = 0$$

$$\Rightarrow x^2 - 13x - 14x + 182 = 0$$

$$\Rightarrow (x^2 - 13x) - (14x - 182) = 0$$

$$\Rightarrow x(x-13) - 14(x-13) = 0$$

$$\Rightarrow (x-14)(x-13) = 0$$

$$\Rightarrow x - 14 = 0$$

$$x - 13 = 0$$

$$\Rightarrow x = 14 \text{ and } x = 14.$$

The two numbers are = $x = 13$.

$$27 - x = 27 - 13 = 14$$

4. let the positive integer be x and other be $x+1$.

ATQ

$x^2 + (x+1)^2 = 365$

$\Rightarrow x^2 + x^2 + 1 + 2x = 365$

$\Rightarrow 2x^2 + 2x + 1 = 365$

$\Rightarrow 2x^2 + 2x + 1 - 365 = 0$

$\Rightarrow 2x^2 + 2x - 364 = 0$

$\Rightarrow x^2 + x - 182 = 0$

$\Rightarrow x^2 + 14x - 13x - 182 = 0$

$\Rightarrow x(x+14) - 13(x+14) = 0$

$\Rightarrow (x-13)(x+14) = 0$

$\Rightarrow x - 13 = 0$ and $x + 14 = 0$.

$\Rightarrow x = 13$ and $x = 14$.

One no. = 13.

Other = 13 + 1 = 14

5. let the base of the right angle of Δ be x.

$\therefore$ altitude = $(x-7)$ cm.

Hypotenuse = 13 cm.

$x^2 + (x-7)^2 = (13)^2$

$\Rightarrow x^2 + x^2 + 49 - 14x = 169$

$\Rightarrow 2x^2 - 14x + 49 = 169$

$\Rightarrow 2x^2 - 14x + 49 - 169 = 0$

$\Rightarrow 2x^2 - 14x - 120 = 0$

$\Rightarrow x^2 - 7x - 60 = 0$

$\Rightarrow (x^2 - 12)(x + 5) = 0$

$\Rightarrow x - 12 = 0$ and $x + 5 = 0$

$\Rightarrow x = 12$ and $x = -5$

Base = 12 cm.

altitude = 12 - 7

= 5 cm.

6: Let No of article = x.

cost of Production - ₹ $2x+3$.

Total Production = ₹ 90.

$\therefore x(2x+3) = 90$

$\Rightarrow 2x^2 + 3x - 90 = 0$.

$\Rightarrow 2x^2 + 15x - 12x - 90 = 0$

$\Rightarrow x(2x+5) - 6(2x+15) = 0$

$\Rightarrow (2x+15)(x-6) = 0$

$\Rightarrow 2x + 15 = 0$ and $x - 6 = 0$.

$\Rightarrow x = \frac{15}{6}$ and $x = 6$.

No of articles purchased = 6.

cost = $2 \times 6 + 3 = ₹ 15$.