Exercise 4.2

1) Find the roots of the following quadratic equations by factorisation:

(i) $x^2 - 3x - 10 = 0$

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

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

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

The roots of this equation $x^2 - 3x - 10 = 0$ are the various values of x for which $(x-5)(x+2) = 0$

Therefore $x - 5 = 0$ or $x + 2 = 0$

$\Rightarrow x = 5$ or $x = (-2)$

(ii) $2x^2 + x - 6 = 0$

Taking LHS,

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

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

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

The roots of this equation, $2x^2 + x - 6 = 0$, are the values of x for which $(x-5)(x+2) = 0$

Therefore, $x+2 = 0$ or $2x - 3 = 0$

$\Rightarrow x = (-2)$ or $x = 3/2$

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

Taking LHS.

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

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

The roots of this equation $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$ are the values of x for which $(x+5)(x+\sqrt{2}) = 0$

Therefore $\sqrt{2}x + 5 = 0$ or $x + \sqrt{2} = 0$

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

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

Taking LHS.

$\Rightarrow 1/8(16x^2 - 8x + 1)$

$= 1/8(16x^2 - 4x - 4x + 1)$

$= 1/8(4x(4x-1) - 1(4x+1))$

$= 1/8(4x-1)^2$

The roots of this equation, $2x^2 - x + 1/8 = 0$ are the values of x for which $(4x-1)^2 = 0$

Therefore $(4x-1) = 0$ or $(4x-1) = 0$

$\Rightarrow x = 1/4$ or $x = 1/4$.

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

Taking LHS,

$= 100x^2 - 10x - 10x + 1$

$= 10x(10x-1) - 1(10x-1)$

$= (10x-1)^2$

$\Rightarrow 1/10$ or $x = 1/10$

3) Find two numbers whose sum is 27 and product is 182

Ans: First Number be x
Second Number be $27-x$

Therefore the product of two numbers

$$x(27-x) = 182$$
$$\Rightarrow x^2 - 27x - 182 = 0$$
$$\Rightarrow x^2 - 13x - 14x + 182 = 0$$
$$\Rightarrow x(x-13) - 14(x-13) = 0$$
$$\Rightarrow (x-13)(x-14)$$
$$x = 13 \quad \text{and} \quad x = 14$$

first number 13
second Number = $27 - 13$
$= 14$

And if first number 14
second number $= 27 - 14$
$= 13$

Hence the numbers are 13 and 14.

4) Find two consecutive positive integers, sum of whose squares is 365.

Ans: Let, the two consecutive positive integers be x and $x+1$.

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

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

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

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

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

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

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

Thus the integer are positive

$\therefore x+1 = 13+1 = 14.$

5) The altitude of a right triangle is 7 cm less than its base. If the hypotenous is 13cm, Find the other two sides.

Ans: The base of the right triangle be x cm

Given the altitude of right triangle $= (x-7)$ c

From Phythagoreas theorem, we know

Base^2 + Altude^2 = Hypotenous^2

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

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

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

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

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

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

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

$x = 12$ or $x = -5$

6) A cottage industry produces a certain number of pottery articles in a day. It was observed on a day, that the cost of production of each article (in rupees) was 3 more than twice the number of articles produced on that day. If the total cost of production on a day is Rs 90, find the number of articles produced and the cost of each article.

Ans⇒ Let us say the number of articles produced be x.

Therefore, cost of production of each article $= Rs\,(2x+3)$.

Given total cost of production is Rs 90.

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

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

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

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

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

Thus either $2x+15=0$ or $x-6=0$

$\Rightarrow x=-15/2$ or $x=6$

Cost of each article $= 2\times 6+3 =$ ₹15.