Class X : MATH
Chapter - 4 : Quadratic Equation
Questions & Answers - Exercise : 4.2 - NCERT Book

Q1. Find the roots of the following quadratic equations by factorisation :

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

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

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

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

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

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

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

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

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

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

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

Hence, the two roots are -2 and 5.

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

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

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

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

$\Rightarrow x + 2 = 0$ or $2x - 3 = 0$

$\Rightarrow x = -2$ or $x = \frac{3}{2}$

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

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

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

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

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

Hence, the two roots are $-\sqrt{2}$ and $-\frac{5}{\sqrt{2}}$

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

or $16x^2 - 8x + 1 = 0$

or $(4x - 1)^2 = 0$

$\Rightarrow$ Both roots are given by $4x - 1 = 0$,

i.e., $x = \frac{1}{4}$. Hence, the roots are $\frac{1}{4}, \frac{1}{4}$.

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

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

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

$\Rightarrow (10x - 1)^2 = 0$

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

$\Rightarrow x = \frac{1}{10}$ or $x = \frac{1}{10}$

Q2. Solve the problem given in example 1.
(i) - x2 – 45x + 324 = 0 (ii) x2 – 55x + 750 = 0

Sol (i) We found the equation as x2 – 45x + 324 = 0 We factorize by splitting the middle term method x2 – 9x – 36x + 324 = 0 x (x – 9) – 36 (x – 9) = 0 (x – 36) (x – 9) = 0 Thus, x = 36 & x = 9 are the roots of equation

Sol (ii) We found the equation as x2 – 55x + 750 = 0 We factorize this by splitting the middle term method x2 – 30x – 25 x + 750 = 0 x (x – 30) – 25 (x – 30) = 0 (x – 25) (x – 30) = 0 Hence, 25 & 30 are the roots of the equation

Q3. Find two numbers whose sum is 27 and product is 182.

Sol. Let one number be x, then second number = 27 – x

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

$\Rightarrow$ $27x - x^2 = 182$
$\Rightarrow$ $x^2 - 27x + 182 = 0$
$\Rightarrow$ $x^2 - 14x - 13x + 182 = 0$

$\Rightarrow$ $x(x - 14) - 13(x - 14) = 0$
$\Rightarrow$ $(x - 13)(x - 14) = 0$
$\Rightarrow$ $x = 13$ or 14
$\Rightarrow$ $27x = 14$ or 13
Hence, the two marbles are 13 and 14.

Q4. Find two consecutive positive integers, sum of whose squares is 365.

Sol. Let the consecutive positive integers be x and x + 1.
Given that $x^2 + (x + 1)^2 = 365$
$\Rightarrow$ $x^2 + x^2 + 1 + 2x = 365$
$\Rightarrow$ $2x^2 + 2x - 364 = 0$
$\Rightarrow$ $x^2 + x - 182 = 0$
$\Rightarrow$ $x^2 + 14x - 13x - 182 = 0$
$\Rightarrow$ $x(x + 14) - 13(x + 14) = 0$
$\Rightarrow$ $(x + 14)(x - 13) = 0$
Either $x + 14 = 0$ or $x - 13 = 0$,
i.e., $x = -14$ or $x = 13$
Since the integers are positive, x can only be 13.
$\therefore$ $x + 1 = 13 + 1 = 14$
Therefore, two consecutive positive integers will be 13 and 14.

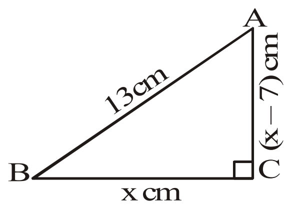
Q5. The altitude of a right triangle is 7 cm less than its base. If the hypotenuse is 13 cm, find the other two sides.

Sol. In ΔABC, base BC = x cm and altitude AC = (x – 7) cm

$\angle ACB = 90°$

AB = 13 cm

By Pythagoras theorem, we have



$BC^2 + AC^2 = AB^2$

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

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

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

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

$\Rightarrow x^2 - 12x + 5x - 60 = 0$

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

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

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

We reject $x = -5$

$\Rightarrow x = 12$

Therefore, BC = 12 cm and AC = 5 cm.

Q6. A cottage industry produces a certain number of pottery articles in a day. It was observed on a particular 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 of that day was Rs. 90, find the number of articles produced and the cost of each article.

Sol. Let the number of articles produced be x.

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

It is given that the total production is Rs 90.

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

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

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

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

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

Either $2x + 15 = 0$ or $x - 6 = 0$,

i.e., $x = \frac{-15}{2}$ or $x = 6$

As the number of articles produced can only be a positive integer, therefore, x can only be 6.

Hence, number of articles produced = 6

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