**Mathematics**
(www.tiwariacademy.in)
(Chapter 4) (Quadratic Equations)
(Class 10)
Exercise 4.2

**Question 1:**
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) \( 100x^2 - 20x + 1 = 0 \)

**Answer 1:**

(i) \( x^2 - 3x - 10 = 0 \)
Solving the quadratic equation, we get
\[ x^2 - 3x - 10 = 0 \]
\[ \Rightarrow x^2 - 5x + 2x + 10 = 0 \]
\[ \Rightarrow x(x - 5) + 2(x - 5) = 0 \]
\[ \Rightarrow (x - 5)(x + 2) = 0 \]
\[ \Rightarrow (x - 5) = 0 \quad \text{or} \quad (x + 2) = 0 \]
Either \( x = 5 \) or \( x = -2 \)

Hence, the roots of the given quadratic equation are 5 and -2.

(ii) \( 2x^2 + x - 6 = 0 \)
Solving the quadratic equation, we get
\[ 2x^2 + x - 6 = 0 \Rightarrow 2x^2 - 4x + 3x - 6 = 0 \]
\[ \Rightarrow 2x(x - 2) + 3(x - 2) = 0 \]
\[ \Rightarrow (x - 2)(2x + 3) = 0 \]
\[ \Rightarrow (x - 2) = 0 \quad \text{or} \quad (2x + 3) = 0 \]
Either \( x = 2 \) or \( x = -\frac{3}{2} \)

Hence, the roots of the given quadratic equation are 2 and \(-\frac{3}{2}\).

(iii) \( \sqrt{2}x^2 + 7x + 5\sqrt{2} = 0 \)
Solving the quadratic equation, we get
\[ \sqrt{2}x^2 + 7x + 5\sqrt{2} = 0 \]
\[ \Rightarrow \sqrt{2}x^2 + 5x + 2x + 5\sqrt{2} = 0 \]
\[ \Rightarrow x(\sqrt{2}x + 5) + \sqrt{2}(\sqrt{2}x + 5) = 0 \]
\[ \Rightarrow (\sqrt{2}x + 5)(x + \sqrt{2}) = 0 \]
\[ \Rightarrow (\sqrt{2}x + 5) = 0 \quad \text{or} \quad (x + \sqrt{2}) = 0 \]
Either \( x = -\frac{5}{\sqrt{2}} \) or \( x = -\sqrt{2} \)

Hence, the roots of the given quadratic equation are \(-\frac{5}{\sqrt{2}}\) and \(-\sqrt{2}\).

(iv) \( 2x^2 - x + \frac{1}{8} = 0 \)
Solving the quadratic equation, we get
\[ 16x^2 - 8x + 1 = 0 \]
\[ \Rightarrow 16x^2 - 4x - 4x + 1 = 0 \]
\[ \Rightarrow 4x(4x - 1) - 1(4x - 1) = 0 \]
\[ \Rightarrow (4x - 1)(4x - 1) = 0 \]
\[ \Rightarrow (4x - 1) = 0 \quad \text{or} \quad (4x - 1) = 0 \]
Either \( x = \frac{1}{4} \) or \( x = \frac{1}{4} \)

Hence, the roots of the given quadratic equation are \( \frac{1}{4} \) and \( \frac{1}{4} \).
Mathematics

(www.tiwariacademy.in)

(Chapter 4) (Quadratic Equations)

(Class 10)

(v) \(100x^2 - 20x + 1 = 0\)
Solving the quadratic equation, we get,
\[100x^2 - 20x + 1 = 0\]
\[\Rightarrow 100x^2 - 10x - 10x + 1 = 0\]
\[\Rightarrow 10x(10x - 1) - 10(10x - 1) = 0\]
\[\Rightarrow (10x - 1)(10x - 1) = 0\]
\[\Rightarrow (10x - 1) = 0 \text{ or } (10x - 1) = 0\]
Either \(x = \frac{1}{10}\) or \(x = \frac{1}{10}\)

Hence, the roots of the given quadratic equation are \(\frac{1}{10}\) and \(\frac{1}{10}\).

Question 2:
Solve the problems given in Example 1. [The problems given in the example 1 are \(x^2 - 45x + 324 = 0\) and \(x^2 - 55x + 750 = 0\).]

Answer 2:
\(x^2 - 45x + 324 = 0\)
Solving the quadratic equation, we get, \(x^2 - 45x + 324 = 0\)
\[\Rightarrow x^2 - 36x - 9x + 324 = 0\]
\[\Rightarrow x(x - 36) - 9(x - 36) = 0\]
\[\Rightarrow (x - 36)(x - 9) = 0\]
\[\Rightarrow (x - 36) = 0 \text{ or } (x - 9) = 0\]
Either \(x = 36\) or \(x = 9\)

Hence, John and Jivanti have 36 and 9 marbles respectively in the beginning.

\(x^2 - 55x + 750 = 0\)
Solving the quadratic equation, we get
\(x^2 - 55x + 750 = 0\)
\[\Rightarrow x^2 - 30x - 25x + 750 = 0\]
\[\Rightarrow x(x - 30) - 25(x - 30) = 0\]
\[\Rightarrow (x - 30)(x - 25) = 0\]
\[\Rightarrow (x - 30) = 0 \text{ or } (x - 25) = 0\]
Either \(x = 30\) or \(x = 25\)

Hence, the number of toys on that day was 30 or 25.

Question 3:
Find two numbers whose sum is 27 and product is 182.

Answer 3:
Let the first number = \(x\)
Therefore, the second number = \(27 - x\)

According to question,
Product = \(x(27 - x) = 182\)
\[\Rightarrow 27x - x^2 = 182\]
\[\Rightarrow x^2 - 27x + 182 = 0\]
\[\Rightarrow x^2 - 13x - 14x + 182 = 0\]
\[\Rightarrow x(x - 13) - 14(x - 13) = 0\]
\[\Rightarrow (x - 13)(x - 14) = 0\]
\[\Rightarrow (x - 13) = 0 \text{ or } (x - 14) = 0\]
Either \(x = 13\) or \(x = 14\)

Hence, the two required numbers are 13 and 14.

www.tiwariacademy.in

A Free web support in Education
**Question 4:**
Find two consecutive positive integers, sum of whose squares is 365.

**Answer 4:**
Let the first number = \( x \), Therefore, the second number = \( x + 1 \)
According to questions, \( x^2 + (x + 1)^2 = 365 \)
\[
\Rightarrow x^2 + x^2 + 2x + 1 = 365 \\
\Rightarrow 2x^2 + 2x + 1 = 365 \\
\Rightarrow 2x^2 + 2x - 364 = 0 \\
\Rightarrow x^2 + x - 182 = 0 \\
\Rightarrow x^2 - 13x + 14x + 182 = 0 \\
\Rightarrow x(x - 13) + 14(x - 13) = 0 \\
\Rightarrow (x - 13)(x + 14) = 0 \\
\Rightarrow x = 13 \quad \text{or} \quad x = -14
\]
Hence, the two consecutive positive integers are 13 and 14.

**Question 5:**
The altitude of a right triangle is 7 cm less than its base. If the hypotenuse is 13 cm, find the other two sides.

**Answer 5:**
Let the base = \( x \) cm Therefore, the height = \( x - 7 \) cm
Given that: Hypotenuse = 13 cm
Using Pythagoras theorem, \( x^2 + (x - 7)^2 = 13^2 \)
\[
\Rightarrow x^2 + x^2 - 14x + 49 = 169 \\
\Rightarrow 2x^2 - 14x - 120 = 0 \\
\Rightarrow x^2 - 7x - 60 = 0 \\
\Rightarrow x^2 - 12x + 5x - 60 = 0 \\
\Rightarrow x(x - 12) + 5(x - 12) = 0 \\
\Rightarrow (x - 12)(x + 5) = 0 \\
\Rightarrow x = 12 \quad \text{or} \quad x = -5
\]
But \( x \neq -5 \), as \( x \) is side of triangle.
Therefore, \( x = 12 \) and the second side = \( x - 7 = 12 - 7 = 5 \)
Hence, the other two sides are 5 cm and 12 cm.

**Question 6:**
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 on that day was ₹90, find the number of articles produced and the cost of each article.

**Answer 6:**
Let, the number of article = \( x \)
Therefore, the cost of one article = \( 2x + 3 \)
According to question, the total cost = \( x(2x + 3) = 90 \)
\[
\Rightarrow 2x^2 + 3x = 90 \\
\Rightarrow 2x^2 + 3x - 90 = 0 \\
\Rightarrow 2x^2 + 15x - 12x - 90 = 0 \\
\Rightarrow x(2x + 15) - 6(2x + 15) = 0 \\
\Rightarrow (2x + 15)(x - 6) = 0 \\
\Rightarrow (2x + 15) = 0 \quad \text{or} \quad (x - 6) = 0 \\
\Rightarrow x = -\frac{15}{2} \quad \text{or} \quad x = 6
\]
But, \( x \neq -\frac{15}{2} \), as \( x \) is number of articles.
Therefore, \( x = 6 \) and the cost of each article = \( 2x + 3 = 2 \times 6 + 3 = 15 \)
Hence, the number of articles = 6 and the cost of each article is ₹15.