QUADRATIC EQUATIONS

STD 10 MATHEMATICS PART I

CHAPTER 2

LONG QUESTIONS

Q. 1 (n39)

Find the value of p. If $x = 5$ is one root of the equation $p x^2 - 10 x + 100 = 0$,

SOLUTION:

$x = 5$ is the root of the given equation. Therefore, substituting $x = 5$ in given equation we get,

$p (5)^2 - 10 (5) + 100 = 0$

$25 p - 50 + 100 = 0$

$25 p - 50 = 0$

$25 p = 50$

$\therefore p = 2$

Ans.: The value of p is 2

Q. 2 (n40)

By factorization method.

Solve the following quadratic equation

$x^2 + x - 12 = 0$

SOLUTION:

$x^2 + x - 12 = 0$

$\therefore\ x^2 + 4x - 3x - 12 = 0$

$\therefore\ x(x + 4) - 3(x + 4) = 0$

$\therefore\ (x + 4)(x - 3) = 0$

$\therefore\ x - 4 = 0$ or $x - 3 = 0$

$\therefore\ x = -4$ or $x = 3$

Ans.: - 4 or 3 are the roots of the given quadratic equation.

Q. 3 (n41)

Complete the following activity to solve the quadratic equation by factorization method

$$\sqrt{2}\,x^2 + 12x + 20\sqrt{2} = 0$$

SOLUTION:

$$\sqrt{2}\,x^2 + 12x + 10\sqrt{2} = 0$$

$$\therefore \sqrt{2}\,x^2 + 10x + 2x + 20\sqrt{2} = 0$$

$$\therefore x(\sqrt{2}x + 10) + \sqrt{2}(\sqrt{2}x + 10) = 0$$

$$\therefore \left(\sqrt{2}x + 10\right)\left(x + \sqrt{2}\right) = 0$$

$$\therefore \sqrt{2}x + 10 = 0 \text{ OR } \left(x + \sqrt{2}\right) = 0$$

$$\therefore x = \frac{-10}{\sqrt{2}} \text{ OR } x = -\sqrt{2}$$

Ans.: The roots of quadratic eqn. are $\frac{-10}{\sqrt{2}}$ and $-\sqrt{2}$

Q. 4

Determine whether the values given against following quadratic equations are the root of the quadratic equation or not.

$2p^2 - 5p = 0, \left(p = 3, \frac{5}{2}\right)$

SOLUTION:

Substituting p = 3,

LHS = 2 $(3)^2$ – 5 (3)

= 2 (9) – 15

= 18 – 15

= 3

∴ LHS ≠ RHS

Therefore, m = 3 is not the root of the given quadratic equation

Substituting m = $\frac{5}{2}$,

LHS = $2\left(\frac{5}{2}\right)^2 - 5\left(\frac{5}{2}\right)$

$$= 2\left(\frac{25}{4}\right) - \frac{25}{2}$$

$$= \frac{25}{2} - \frac{25}{2}$$

$$= 0$$

∴ LHS = RHS

∴ m = $\frac{5}{2}$ is the root of the given quadratic equation.

Ans.: 2 is not the root; $\frac{5}{2}$ is the root

Q. 5

Write the following quadratic equation in the form $ax^2 + bx + c = 0$. Write the value of a, b, c for the equation.

$x^2 - 8 = 14$

SOLUTION:

$x^2 - 8 = 14$

$\therefore x^2 - 8 - 14 = 0$

$\therefore x^2 - 22 = 0$

$\therefore x^2 + 0x - 22 = 0$

Comparing with $ax^2 + bx + c = 0$ we get, a = 1, b = 0 c = -22

Ans: The required equation is $x^2 + 0x - 22 = 0$, a = 1, b = 0, c = -22

Q. 6 (n52)

The sum of square of two consecutive even numbers is 16. Find the numbers.

SOLUTION:

Let the numbers be x and $x + 2$

$\therefore\ x^2 + (x + 2)^2 = 16$

$\therefore\ x^2 + x^2 + 4x + 4 = 16$

$\therefore\ x^2 + x^2 + 2x + 4 = 16$

$\therefore\ 2x^2 + 2x - 12 = 0$

$\therefore\ x^2 + x - 6 = 0$

$\therefore\ x^2 - 2x + 3x - 6 = 0$

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

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

$\therefore\ x = -3$, or $x = 2$

But $x = -3$ is not a natural number therefore $x = -3$ is not acceptable.

Ans.: The required two consecutive even natural numbers are 2 and 4

Q. 7

Vinay scored 6 marks more in the second unit test than first. 3 times the marks scored in second unit test is equal to the square of marks in the first unit test (n53)

SOLUTION:

Let the marks scored by Vinay in the first unit test be x

Therefore, he scored 3 (x + 6) marks in second unit test

3 times the marks in first unit test 3 (x + 6) is equal to square of marks in first unit test is (x^2)

Therefore the equation will be

$$x^2 = 3(x + 6)$$

$$\therefore x^2 = 3x + 18$$

$$\therefore x^2 - 3x - 18 = 0$$

$$\therefore x^2 - 6x + 3x - 18 = 0$$

$$\therefore x(x - 6) + 3(x - 6) = 0$$

$\therefore$ $(x - 6)(x + 3) = 0$

$\therefore$ $x = 6$ or $x = -3$

But the marks cannot be negative. Hence $x = 6$

Ans.: Vinay scored 6 marks in first unit test

Q. 8

Amir runs a small business of flowerpots. He makes certain number of flower pots on daily basis, Production cost of each pot is ₹ 80 more than the 10 times total number of pots he makes in one day. If production cost of all pots per day is ₹ 480. Find the production cost of one pot and the number of pots he makes per day. (n 52)

SOLUTION:

Let Amir make x earthen pots per day

The cost of each earthen pot is ₹ $(10x + 80)$

Then from the given condition,

$x(10x + 80) = 480$

$\therefore\ 10x^2 + 80x = 480$

$\therefore\ 10x^2 + 80x - 480 = 0$

$\therefore\ x^2 + 8x - 48 = 0$

$\therefore\ x^2 + 12x - 4x - 48 = 0$

$\therefore\ x(x + 12) - 4(x + 12) = 0$

$\therefore\ (x + 12)(x - 4) = 0$

$\therefore\ (x + 12) = 0$ **or** $(x - 4) = 0$

$\therefore\ x = -12$ **or** $x = 4$

But the number of earthen pots cannot be negative

Ans.: Karan makes 4 earthen pots per day and cost of each earthen pot is ₹ 120

Q. 9

Sameer calculates sum of square of two consecutive even natural numbers as 244. Find the numbers (n52)

SOLUTION:

Let the numbers be x and $x + 2$

Then $x^2 + (x + 2)^2 = 244$

$\therefore\ x^2 + x^2 + 2x + 4 = 244$

$\therefore\ x^2 + x^2 + 2x + 4 = 244$

$\therefore\ 2x^2 + 2x - 240 = 0$

$\therefore\ x^2 + 2x - 120 = 0$

$\therefore\ x^2 + 12x - 10x - 120 = 0$

$\therefore\ x\ (x + 12) - 10\ (x + 12) = 0$

$\therefore\ (x - 10)\ (x + 12) = 0$

$\therefore\ x = 10$, or $x = -12$

But $x = -12$ is not a natural number therefore $x = -12$ is not acceptable

$\therefore$ $x = 10$ is first even number and ($x + 2 = 12$) is the next even consecutive number

Ans.: The required two consecutive even natural numbers are 10 and 12

Q. 10

Amar is 6 years older than Akbar. If the addition of multiplicative inverses of their ages is $\frac{1}{6}$ .What are their present ages?

SOLUTION:

Let the present age of Akbar be *x* years. The present age of Amar is (*x* + 6) years. The multiplicative inverses of their ages are $\frac{1}{x}$ and $\frac{1}{x+6}$

For the given condition,

$$\frac{1}{x} + \frac{1}{x+6} = \frac{1}{6}$$

$$\therefore \frac{x+6+x}{x(x+5)} = \frac{1}{6}$$

$$\therefore 6(2x+6) = x(x+5)$$

$$\therefore 12x + 36 = \left(x^2 + 5x\right)$$

$$\therefore x^2 + 5x - 12x - 36 = 0$$

$$\therefore x^2 + 9x - 36 = 0$$

$\therefore\ x^2 + 12x - 3x - 36 = 0$

$\therefore\ x(x + 12) - 3(x + 12) = 0$

$\therefore\ (x + 12)(x - 3) = 0$

$\therefore\ (x + 12) = 0$ or $(x - 3) = 0$

$\therefore (x + 12) = 0$ or $(x - 3) = 0$

$\therefore\ x = -12$ or $x = 3$

But age cannot be negative hence $x = -12$ not acceptable

$\therefore\ x = 3$,

Now, $x + 6 = 3 + 6 = 9$

Ans.: Age of Amar is 9 yrs. and that of Akbar is 3 yrs.

Q. 11

Find the value of k, if the roots of the following quadratic equations are real and equal

$3y^2 + ky + 3 = 0$ **(n 51)**

SOLUTION:

$3y^2 + ky + 3 = 0$

Here a = 3, b = k, c = 3

$\Delta = b^2 - 4ac$

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

$= k^2 - 36$

The roots are real and equal as given

$\therefore \Delta = 0$

$\therefore \mathrm{k}^2 - 36 = 0$

$\therefore (\mathrm{k} - 6)(\mathrm{k} + 6) = 0$

$\therefore$ **k – 6 = 0 or k + 6 = 0**

$\therefore$ **k = 6 or k = -6**

Ans.: The value of k is 6 or -6

Q. 12

Find the value of k, if the roots of the following quadratic equation $x^2 - 4ky + k + 6 = 0$ is double their product (n 50)

SOLUTION:

$x^2 - 4ky + k + 6 = 0$

i.e. $x^2 - 4ky + (k + 6) = 0$

Here a = 1, b = - 4k, c = k + 6

If α and β are the roots of the given equation,

$\alpha + \beta = 2\alpha\beta$ given … (1)

$\alpha + \beta = -\frac{b}{a} = -\frac{-4k}{1} = 4k$ … (2)

$\alpha\beta = \frac{c}{a} = \frac{k+6}{1} = k + 6$ … (3)

From (1), (2) & (3)

$4k = 2(k + 6)$

$4k - 2k = 12$

$2k = 12$

$k = 6$

Ans.: The value of k is 6

Q. 13

By using formula method ,solve the following quadratic equation $x^2 + 5x + 4 = 0$

SOLUTION:

$x^2 + 5x + 4 = 0$

Comparing with $ax^2 + bx + c = 0$

a = 1, b = 5, c = 4

$\therefore\ b^2 - 4ac = 5^2 - 4(1)(4) = 25 - 16 = 9$

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

$$\therefore\ x = \frac{-5 \pm \sqrt{9}}{(2)(1)}$$

$$\therefore\ x = \frac{-5 \pm 3}{(2)(1)}$$

$$\therefore\ x = \frac{-5 + 3}{(2)(1)} \text{ or } x = \frac{-5 - 3}{(2)(1)}$$

$$\therefore\ x = \frac{-2}{2} \text{ or } x = \frac{-8}{2}$$

$$\therefore\ x = -1 \text{ or } x = -4$$

Ans.: $x = -1$ or $x = -4$

Q. 14

Determine the values given against equation are the roots of the equation

$x^2 + 2x - 3 = 0$ **where** $x = 5, x = -4$

SOLUTION:

On putting $x = 5$ **in equation** $x^2 + 2x - 3 = 0$

LHS $= 5^2 + 2(5) - 3$

$= 25 + 10 - 3$

$= 35 - 3$

$= 32$

$\therefore$ LHS $\neq$ RHS

Hence $x = 5$ **is not the root of equation**

On putting $x = -4$ **in equation** $x^2 + 2x - 3 = 0$

LHS $= (-4)^2 + 2(-4) - 3$

$= 16 - 8 - 3$

$= 5$

$\neq 0$

Hence $x = -4$ also is not the root of equation

Q. 15

Solve the following quadratic equations by using formula method $3m^2 + 2m - 7 = 0$ (t60)

SOLUTION:

Given Equation is $3m^2 + 2m - 7 = 0$

Comparing the same with $ax^2 + bx + c = 0$

a = 3, b = 2, c = -7

$\therefore b^2 - 4ac = 2^2 - 4(3)(-7) = 4 + 84 = 88$

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

$$\therefore m = \frac{-2 \pm \sqrt{88}}{(2)(3)}$$

$$\therefore m = \frac{-2 \pm \sqrt{4 \times 22}}{6}$$

$$\therefore m = \frac{-2 \pm 2\sqrt{22}}{6}$$

$$\therefore\ m = \frac{2(-1\ \pm\ \sqrt{22}\ )}{6}$$

$$\therefore\ m = \frac{-1\ \pm\ \sqrt{22}}{3}$$

$$\therefore\ m = \frac{-1\ +\ \sqrt{22}}{3} \quad \text{or} \quad m = \frac{-1\ -\ \sqrt{22}}{3}$$

Ans.: The given roots of quadratic equation are

$$m = \frac{-1 + \sqrt{22}}{3} \quad \text{Or} \quad m = \frac{-1 - \sqrt{22}}{3}$$

Q. 16

Solve the following quadratic equations by factorization method $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$ (v69)

SOLUTION:

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

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

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

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

$$\therefore (x + \sqrt{2}) = 0 \text{ or } (\sqrt{2}\,x + 5) = 0$$

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

Ans.: $-\sqrt{2}$ **and** $\frac{-5}{\sqrt{2}}$ **are the roots of the given equation**

Q. 17

Determine the values given against equation are the roots of the equation

$x^2 + 4x - 5 = 0$ where $x = 1, x = -1$

SOLUTION:

On putting $x = 1$ in equation $x^2 + 4x - 5 = 0$

LHS $= 1^2 + 4(1) - 5$

= 1 + 4 – 5

= 5 – 5

= 0

∴ LHS = RHS

Hence $x = 1$ is root of equation

On putting $x = 1$ in equation $x^2 + 4x - 5 = 0$

LHS $= (-1)^2 + 4(-1) - 5$

= 1 – 4 – 5

= - 8

$\neq 0$

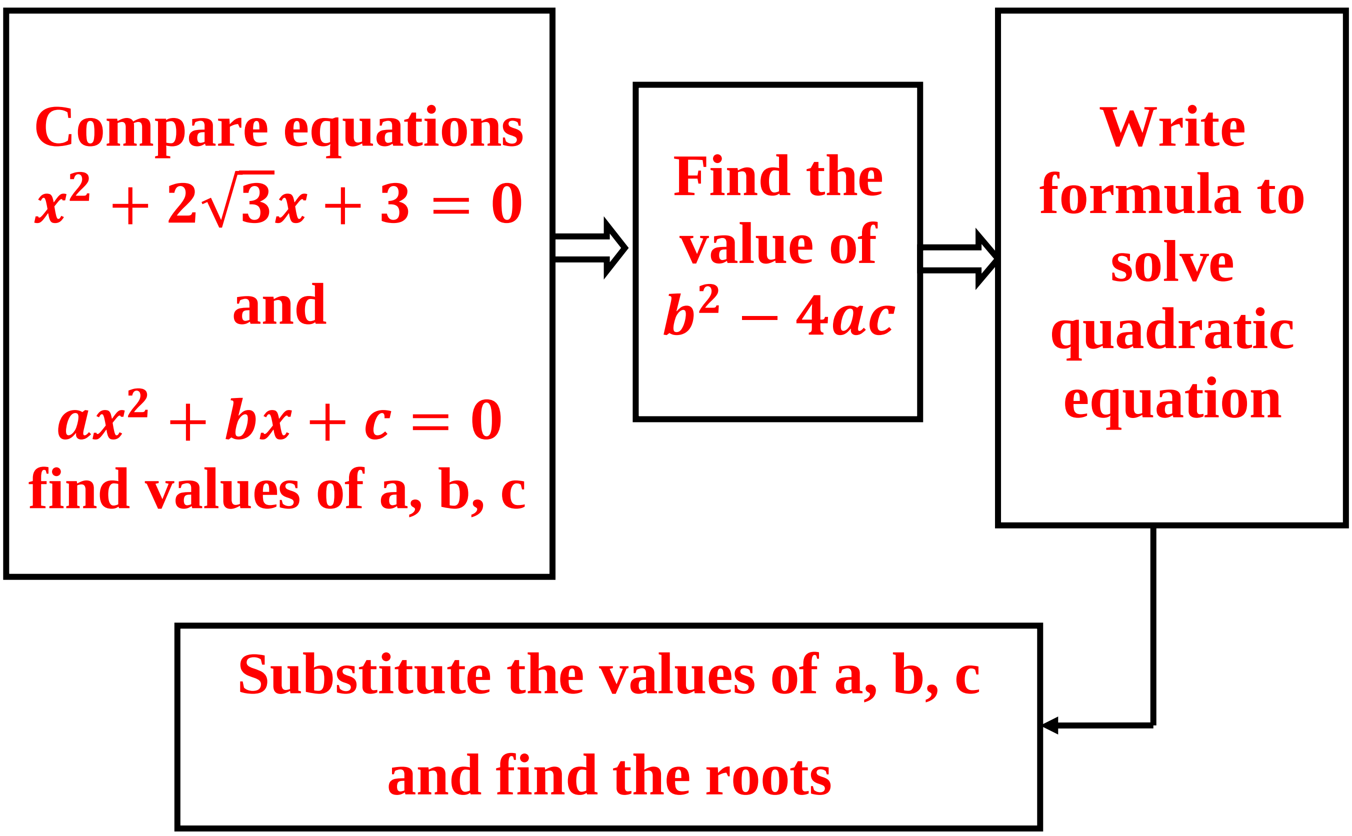
LHS $\neq$ RHS

Hence $x = -1$ is not root of equation

Ans.: $x = 1$ is root of equation

Q. 18

With the help of flow chart given below solve the equation $x^2 + 2\sqrt{3}x + 3 = 0$ by using the formula (v81)



SOLUTION:

$$x^2 + 2\sqrt{3}x + 3 = 0$$

$$a = 1, b = 2\sqrt{3}, c = 3$$

$$b^2 - 4ac = (2\sqrt{3})^2 - 4 \times 1 \times 3 = 12 - 12 = 0$$

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

$$\therefore x = \frac{-2\sqrt{3} \pm \sqrt{0}}{(2) \times (1)}$$

$$\therefore x = \frac{-2\sqrt{3} \pm \sqrt{0}}{2}$$

$$\therefore x = \frac{-2\sqrt{3}}{2}$$

$$\therefore x = -\sqrt{3}$$

Ans.: $x = -\sqrt{3}$

Q. 19 (n56)

The roots of quadratic equation are given; frame the equation. Roots are $(2 - 3\sqrt{5})$ and $(2 + 3\sqrt{5})$.

SOLUTION:

Let $\alpha = 2 - 3\sqrt{5}$ and $\beta = 2 + 3\sqrt{5}$

$\alpha + \beta = 2 - 3\sqrt{5} + 2 + 3\sqrt{5} = 4$

$\alpha\beta = (2 - 3\sqrt{5})(2 + 3\sqrt{5})$

$= (2)^2 - (3\sqrt{5})^2$

$= 4 - 45$

$= -41$

The required quadratic equation is

$x^2 - (\alpha + \beta)x + \alpha\beta = 0$

$\therefore x^2 - (2)x + (-41) = 0$

$\therefore x^2 - 2x - 41 = 0$

Ans.: $x^2 - 2x - 41 = 0$ is the required equation.

Q. 20 (n56)

Determine the nature of the root for the following quadratic eqn.

$m^2 - 2m + 1 = 0$

SOLUTION:

Comparing $m^2 - 2m + 2 = 0$ **with standard form of equation** $ax^2 + bx + c = 0$

a = 1, b = - 2, c = 2,

$\Delta = b^2 - 4ac$

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

$\Delta = 4 - 8 = -4$

$b^2 - 4ac < 0$

Ans: The roots of equation are not real

Q. 21 n57

Solve the following quadratic equation:

$\frac{1}{x+3} = \frac{1}{x^2}$, $x \neq -3$, $x \neq 0$

SOLUTION:

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

$$\therefore x^2 = x + 3$$

$$\therefore x^2 - x - 3 = 0$$

Comparing it with $ax^2 + bx + c = 0$

a = 1, b = -1, c = - 3

$$b^2 - 4ac = (-1)^2 - 4(1)(-3) = 1 + 12 = 13$$

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

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

$$= \frac{1 \pm \sqrt{13}}{2}$$

$$\therefore x = \frac{1 + \sqrt{13}}{2} \text{ or } \frac{1 - \sqrt{13}}{2}$$

Ans.: $\frac{1 + \sqrt{13}}{2}$, $\frac{1 - \sqrt{13}}{2}$ **are the roots of the given quadratic eqn.**

Q. 22 n59

Arvind possesses ₹ 5 more than what Vijay possesses. The product of the numbers of amount they have is 150. Find the amount each has.

SOLUTION:

Let Vijay have ₹ x, therefore Arvind has ₹ $(x + 5)$

From the given condition,

$x\,(x+5) = 150$

$\therefore x^2 + 5x - 150 = 0$

$\therefore x^2 + 15x - 10x - 150 = 0$

$\therefore x\,(x+15) - 10(x+15) = 0$

$\therefore (x+15)\,(x-10) = 0$

$\therefore x + 15 = 0 \text{ or } x - 10 = 0$

$\therefore x = -15 \text{ or } x = 10$

But the amount cannot be negative therefore x = -15 is not acceptable.

$\therefore$ $x = 10$ is the possible solution

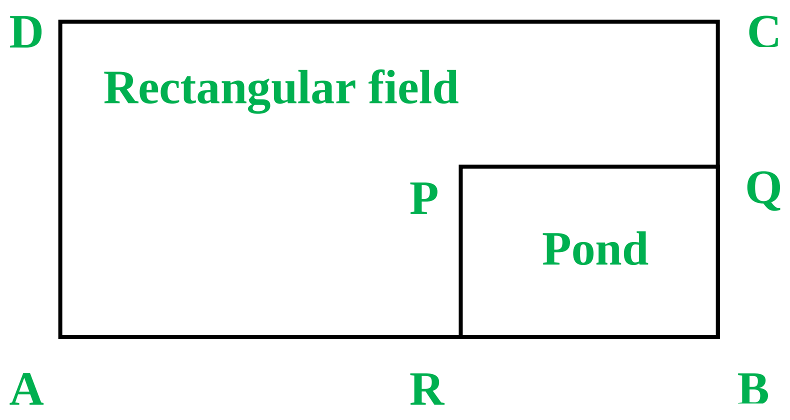
Thus $x + 5 = 10 + 5 = 15$

Ans.: Vijay has ₹ 10 & Arvind has ₹ 15

Q. 23 n60

Mr. Suresh owns an agricultural farm at village Kodoli, the length of the farm is 10 meters more than twice the breadth. In order to harvest rainwater, he dug a square shaped pond inside the farm. The side of pond is $\frac{1}{3}$ of the breadth of the farm. The area of the farm is 10 times the area of the pond. Find the length & breadth of the farm & of the pond.

SOLUTION:



Let breadth of the field be x meters, therefore the length of the field will be $(2x + 10)$ meters

The area of the field = (length) x (breadth)

$$= (2x + 10) \times x \quad m^2$$

The side of the square shaped pond = $\frac{1}{3}x$ m

The area of the pond = $\left(\frac{1}{3}x\right)^2$ m^2

From the given condition:

$$(2x + 10) \times x = 10 \times \left(\frac{1}{3}x\right)^2$$

$$\therefore 2x^2 + 10x = 10 \times \left(\frac{1}{9}x^2\right)$$

$$\therefore 18x^2 + 90x = 10x^2$$ ...Multiplying both sides 9

$$\therefore 10x^2 = 18x^2 + 90x$$

$$\therefore 18x^2 - 10x^2 + 90x = 0$$

$$\therefore 8x^2 - 90x = 0$$

$$\therefore x(8x - 90) = 0$$

$$\therefore x = 0 \text{ or } 8x - 90 = 0$$

$$\therefore x = 0 \text{ or } x = \frac{90}{8}$$

But length cannot be 0 so $x = 0$ is unacceptable.

$$x = \frac{90}{8}$$

Breadth $x = \frac{90}{8}$

Length$=\left(2 \text{ x} \frac{90}{8}\right) + 10$

Length$=\left(\frac{45}{2}\right) + 10$

Length$=\left(\frac{45+20}{2}\right)$

Length$=\left(\frac{65}{2}\right)$

Side of pond $= \frac{1}{3}x = \frac{30}{8}$

Ans.: The length & breadth of the field are $\frac{65}{2}$**m &** $\frac{90}{8}$ **m respectively.**

The side of the pond is $\frac{30}{8}$ **m.**

Q. 24 n49

Find the values of discriminate for the quadratic equation: $p^2 - p + 10 = 0$

SOLUTION:

Comparing $p^2 - p + 10 = 0 = 0$

With $ax^2 + bx + c = 0$, a = 1, b = -1, c = 10

$\Delta = b^2 - 4ac$

$= (-1)^2 - 4(-1)(10)$

$= 1 + 40$

$= 41$

Here, $\Delta = 41$

Ans.: $\Delta = 41$

Q. 25 n50

Form the quadratic equation if the roots are 2 & -5.

SOLUTION:

Let α = 2, β = - 5

$\alpha + \beta = 2 + (-5) = 2 - 5 = -3$

$\alpha\beta = 2 \times (-5) = -10$

The required quadratic equation is

$x^2 - (\alpha + \beta)x + \alpha\beta = 0$

$\therefore x^2 - (-3)x + (-10) = 0$

$\therefore x^2 + 3x - 10 = 0$

Ans.: $x^2 + 3x - 10 = 0$ **is the required quadratic equation.**

Q. 26 t72

The sum of two roots of a quadratic equation is 5 and the sum of their cubes is 35, find the equation.

SOLUTION:

Let α and β be the roots of a quadratic equation

According to the given condition,

$\alpha + \beta = 5 \quad \& \quad \alpha^3 + \beta^3 = 35$

Now $(\alpha + \beta)^3 = \alpha^3 + 3\alpha^2\beta + 3\alpha\beta^2 + \beta^3$

$\therefore (\alpha + \beta)^3 = \alpha^3 + 3\alpha\beta(\alpha + \beta) + \beta^3$

$\therefore 5^3 = 35 + 3\alpha\beta(5)$

$\therefore 125 = 35 + 15\alpha\beta$

$\therefore 125 - 35 = 15\alpha\beta$

$\therefore 15\alpha\beta = 90$

$\therefore \alpha\beta = \frac{90}{15} = 6$

$\therefore$ **The required quadratic equation is**

$x^2 - (\alpha + \beta)x + \alpha\beta = 0$

Ans.: $x^2 - 5x + 6 = 0$

Q. 27 n57

Solve the following quadratic equation.

$$2x^2 - \frac{3x}{5} - \frac{1}{5} = 0$$

SOLUTION:

$$2x^2 - \frac{3x}{5} - \frac{1}{5} = 0$$

$$\therefore\ 10x^2 - 3x - 1 = 0$$

$$\therefore\ 10x^2 - 5x + 2x - 1 = 0$$

$$\therefore\ 5x(2x - 1) + 1(2x - 1) = 0$$

$$\therefore\ (2x - 1)(5x + 1) = 0$$

$$\therefore\ (2x - 1) = 0 \ \text{ or } \ (5x + 1) = 0$$

$$\therefore\ x = 1 \ \text{ or } \ 5x = -1$$

$$\therefore\ x = 1 \ \text{ or } \ x = -\frac{1}{5}$$

Ans: $1, -\frac{1}{5}$ **are the roots of the given quadratic equation.**

Q. 28 (v88)

In the orange garden of Mr. Madhusudan there are 150 orange trees. The number of trees in each row is 5 more than that in each column. Find the number of trees in each row and each column.

SOLUTION:

Let No. of trees in a column be x

→ No. of trees in a row = $x + 5$

→ Total No. of trees = 150

→ $x(x+5) = 150$

$x^2 + 5x - 150 = 0$

→ $x^2 + 15x - 10x - 150 = 0$

$x(x+15) - 10(x+15) = 0$

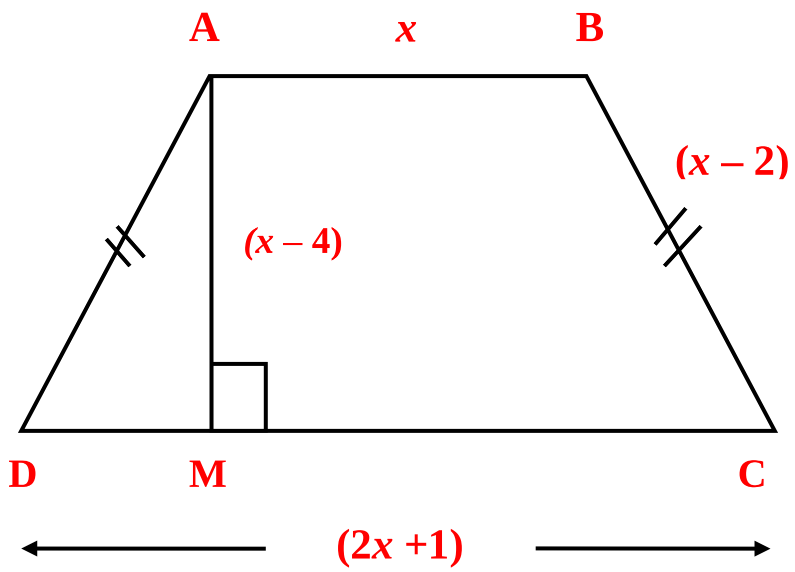
$(x+15)(x-10) = 0$

→ No. of trees in column is 10

→ No. of tress in a row = 10 + 5 = 15

Q. 29 (v94)

In the adjoining figure □ ABCD is a trapezium where AB || CD and its area is 33 cm^2. From the information given in the figure find the lengths of all sides of □ ABCD. Fill in the empty boxes to get solution, given that AB = x, BC = x – 2, AM = x – 4 and DC = 2x + 1



SOLUTION:

□ ABCD is a trapezium and AB || CD

A (□ ABCD) = $\frac{1}{2}(AB + CD) \times AM$

$\therefore 33 = \frac{1}{2}(x + 2x + 1) \times (x - 4)$

$\therefore 66 = (3x + 1) \times (x - 4)$

$\therefore 3x^2 - 12x + x - 4 = 66$

$\therefore 3x^2 - 11x - 70 = 0$

$\therefore 3x(x - 7) + 10(x - 7) = 0$

$\therefore (3x + 10)(x - 7) = 0$

$\therefore (3x + 10) = 0$ OR $(x - 7) = 0$

$\therefore x = -\frac{10}{3}$ or $x = 7$

But length cannot be negative thus, $x \neq -\frac{10}{3}$ $\therefore x = 7$

$\therefore$ AB = 7

CD = 2x + 1 = 14 + 1 = 15

AD = BC = x – 2 = 7 – 2 = 5

Ans.: $x = 7$

Q. 30 (v93)

If 460 is divided by a natural number, quotient is 6 more than five times the divisor and reminder is 1. Find the quotient and the divisor.

SOLUTION:

Let x be the natural number

Divisor = x, Quotient = $5x + 6$

Divisor x Quotient + Reminder = Dividend

$(5x + 6)x + 1 = 460$

$\therefore 5x^2 + 6x + 1 - 460 = 0$

$\therefore 5x^2 + 6x + 459 = 0$

$\therefore 5x^2 + 51x - 45x + 459 = 0$

$\therefore x(5x + 51) - 9(5x + 51) = 0$

$\therefore (5x + 51) = 0$ OR $(x - 9) = 0$

$\therefore 5x = -51$ OR $x = 9$

But $x = -\frac{51}{5}$ **is not a natural number**

$\therefore x = 9$

Putting $x = 9$ in Quotient $5x + 6 = 5 \times 9 + 6 = 51$

Ans: Quotient = 51 and Divisor = 9

Q. 31 (hots79)

Find the roots of the equation

$$\left(x^2 + \frac{1}{x^2} - 2\right) - 7\left(x + \frac{1}{x}\right) + 16 = 0$$

SOLUTION:

$$\left(x^2 + \frac{1}{x^2} - 2\right) - 7\left(x + \frac{1}{x}\right) + 16 = 0$$

$$\therefore \left(x + \frac{1}{x}\right)^2 - 4 - 7\left(x + \frac{1}{x}\right) + 16 = 0$$

Let $x + \frac{1}{x} = \mathrm{a}$

$$\therefore \mathrm{a}^2 - 4 - 7a + 16 = 0$$

$$\therefore \mathrm{a}^2 - 7\mathrm{a} + 12 = 0$$

$$\therefore (a - 3)(a - 4) = 0$$

$$\therefore (a - 3) = 0 \text{ or } (a - 4) = 0$$

$$\therefore a = 3 \text{ or } a = 4$$

By putting $a = 3$ **we get,**

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

$$\therefore x^2 + 1 = 3x$$

$$\therefore\ x^2 - 3x + 1 = 0$$

$\therefore$ a = 1, b = - 3, c = 1

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

$$x = \frac{-(-3)\ \pm \sqrt{(-3)^2 - 4}}{2(1)}$$

$$x = \frac{3\ \pm \sqrt{9 - 4}}{2(1)}$$

$$x = \frac{3\ \pm \sqrt{5}}{2}$$

$$x = \frac{3 + \sqrt{5}}{2}$$

$$x = \frac{3 - \sqrt{5}}{2}$$

By putting $a = 4$

$$x + \frac{1}{x} = 4$$

$$\therefore\ x^2 + 1 = 4x$$

$$\therefore\ x^2 - 4x + 1 = 0$$

$\therefore$ a = 1, b = - 4, c = 1

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

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

$$\therefore x = \frac{4 \pm \sqrt{16 - 4}}{2(1)}$$

$$\therefore x = \frac{4 \pm \sqrt{12}}{2}$$

$$\therefore x = \frac{4 \pm 2\sqrt{3}}{2}$$

$$\therefore x = \frac{4 - 2\sqrt{3}}{2} \quad OR \quad x = \frac{4 + 2\sqrt{3}}{2}$$

$$\therefore x = 2 - \sqrt{3} \text{ OR } x = 2 + \sqrt{3}$$

Ans.: $x = 2 - \sqrt{3}$ **OR** $x = 2 + \sqrt{3}$

Q. 32 (hots 80)

The multiplication of Sagar's age 8 years ago and his age 6 years after is 728. Find his age as on today.

SOLUTION:

Suppose x is the age of Sagar as on today

8 years ago age of Sagar = $x - 8$

6 years after age of Sagar = $x + 6$

By given condition,

$(x - 8)(x + 6) = 728$

$\therefore x^2 - 8x + 6x - 48 = 728$

$\therefore x^2 - 2x - 728 = 0$

$\therefore x^2 - 28x + 26x - 728 = 0$

$\therefore x(x - 28) + 26(x - 28) = 0$

$\therefore (x - 28)(x + 26) = 0$

$\therefore x = 28 \quad \text{Or} \quad x = -26$

Ans.: Sagar's age as on today is 28 yrs.

Q. 33 (hots 80)

If the roots of quadratic equation $x^2 - 11x + k = 0$ are in the ratio of 6:5 find the value of k.

SOLUTION:

Given equation is $x^2 - 11x + k = 0$

Comparing it with $ax^2 + bx + c = 0$

a = 1, b = -11, c = k

Suppose α and β are the roots of equation, therefore

α : β = 6 : 5

Let $\frac{\alpha}{\beta} = \frac{6}{5} = p$

$\therefore \frac{\alpha}{6} = \frac{\beta}{5} = p$

$\therefore \alpha = 6p, \beta = 5p$

$\alpha\beta = \frac{c}{a} = \frac{k}{1}$

$\alpha\beta = 6p \times 5p$

$$30p^2 = k$$

$$p^2 = \frac{k}{30} \qquad \ldots (1)$$

$$\alpha + \beta = \frac{-b}{a} = \frac{-(-11)}{1} = \frac{11}{1}$$

$$6p + 5p = 11$$

$$11p = 11$$

$$p = 1$$

Putting in equation (1)

$$1^2 = \frac{k}{30}$$

$$\therefore k = 30$$

Q. 34 (n56)

The roots of quadratic equation are given; frame the equation. Roots are $\left(1-2\sqrt{3}\right)$ and $\left(1+2\sqrt{3}\right)$.

SOLUTION:

Let α = $\left(1-2\sqrt{3}\right)$ and β = $\left(1+2\sqrt{3}\right)$.

$\alpha + \beta = 1-2\sqrt{3}+1+2\sqrt{3}=2$

$\alpha\beta = \left(1-2\sqrt{3}\right)\left(1+2\sqrt{3}\right)$.

$= (1)^2-\left(2\sqrt{3}\right)^2$

$= 1-12$

$= -11$

The required quadratic equation is

$x^2-(\alpha+\ \beta)x+\ \alpha\beta=0$

$\therefore\ x^2-(2)x+(-11)=0$

$\therefore\ x^2-2x-11=0$

Ans.: $x^2-2x-11=0$ is the required equation.

Q. 35 (j 28)

Solve the following quadratic equations by using formula method $m^2 - 3m - 10 = 0$

SOLUTION:

$m^2 - 3m - 10 = 0$

Comparing with equation $am^2 + bm + c = 0$

a = 1, b = -3, c = -10

$$m = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-10)}}{2 \times 1}$$

$$m = \frac{3 \pm \sqrt{9 + 40}}{2}$$

$$m = \frac{3 \pm \sqrt{49}}{2}$$

$$m = \frac{3 \pm \sqrt{49}}{2}$$

$$m = \frac{3 \pm 7}{2}$$

$$m = \frac{10}{2} \text{ or } m = \frac{-4}{2}$$

m = 5 or m = -2

Ans.: Roots of the given equation are 5, -2

Q. 36 (j30)

If roots of equation $4x^2 - 3x + 1 = 0$ are real and equal, find the roots.

SOLUTION:

Given equation is $4x^2 - 3x + 1 = 0$

Comparing the equation with $ax^2 + bx + c = 0$

a = 4, b = - 3k, c = 1

$\Delta = b^2 - 4ac$

$= (-3k)^2 - 4 \times 4 \times 1$

$= 9k^2 - 16$

Since the roots are real and equal,

$\Delta = 0$

$\therefore 9k^2 - 16 = 0$

$\therefore (3k + 4)(3k - 4) = 0$

$$\therefore\ (3k+4)=0 \text{ or } (3k-4)=0$$

$$\therefore\ 3k=-4 \qquad \text{or } 3k=4$$

$$\therefore\ k=\frac{-4}{3} \qquad \text{or } k=\frac{4}{3}$$

Ans.: $k=\frac{-4}{3}$ or $k=\frac{4}{3}$

Q. 37 (j40)

If $x = 3$ is one root of the equation $kx^2 - 7x + 12 = 0$, Find the value of k.

SOLUTION:

$x = 3$ is the root of the given equation. Therefore, substituting $x = 3$ in given equation $kx^2 - 7x + 12 = 0$ we get,

$k(3)^2 - 7(3) + 12 = 0$

$\therefore 9k - 21 + 12 = 0$

$\therefore 9k - 9 = 0$

$\therefore 9k = 9$

$\therefore k = 1$

Ans.: The value of k is 1

Q. 38 (j50)

If equations $3x^2 - 2x + p = 0$ and $6x^2 - 17x + 12 = 0$ have one common root find the value of p.

SOLUTION:

$6x^2 - 17x + 12 = 0$

$6x^2 - 9x - 8x + 12 = 0$

$\therefore 3x(2x - 3) - 4(2x - 3) = 0$

$\therefore (3x - 4)(2x - 3) = 0$

$\therefore (3x - 4) = 0$ or $(2x - 3) = 0$

$\therefore 3x = 4$ or $2x = 3$

$\therefore x = \frac{4}{3}$ or $x = \frac{3}{2}$

If the root $x = \frac{4}{3}$ is common then putting it in

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

$\therefore 3\left(\frac{4}{3}\right)^2 - 2\left(\frac{4}{3}\right) + p = 0$

$$\therefore 3\left(\frac{16}{9}\right) - \left(\frac{8}{3}\right) + p = 0$$

$$\therefore \left(\frac{16}{3}\right) - \left(\frac{8}{3}\right) + \mathrm{p} = 0$$

$$\therefore \left(\frac{8}{3}\right) + \mathrm{p} = 0$$

$$\therefore p = -\frac{8}{3}$$

If the root $x = \frac{3}{2}$ is common, then putting it in

$3x^2 - 2x + \mathrm{p} = 0$

$$\therefore 3\left(\frac{3}{2}\right)^2 - 2\left(\frac{3}{2}\right) + \mathrm{p} = 0$$

$$\therefore 3\left(\frac{9}{4}\right) - 2\left(\frac{3}{2}\right) + \mathrm{p} = 0$$

$$\therefore \frac{27}{4} + \mathrm{p} = 3$$

$$\therefore p = 3 - \frac{27}{4}$$

$$\therefore p = \frac{12 - 27}{4}$$

$$\therefore p = \frac{-15}{4}$$

Ans.: $p = -\frac{8}{3}$ **or** $p = \frac{-15}{4}$

Q. 39 (j59)

Find whether 1 and - 3 are the roots of equation $2p^2 + 5p - 3 = 0$

SOLUTION:

1) By putting p = 1 in equation $2p^2 + 5p - 3 = 0$

$$\text{LHS} = 2p^2 + 5p - 3$$

$$= 2(1)^2 + 5(1) - 3$$

$$= 2 + 5 - 3$$

$$\text{LHS} = 4$$

$$\text{But RHS} = 0$$

$$\therefore \text{LHS} \neq \text{RHS}$$

2) By putting p = - 3 in equation $2p^2 + 5p - 3 = 0$

$$\text{LHS} = 2p^2 + 5p - 3$$

$$= 2(-3)^2 + 5(-3) - 3$$

$$= 2 \times 9 - 15 - 3$$

= 18 – 18

LHS = 0 = RHS

Ans.: 1 is not the root of equation, -3 is the root of the given equation because LHS = RHS = 0

Q. 40 (t56)

Find the roots of the equation by complete square method $9y^2 - 12y + 2 = 0$

SOLUTION:

$9y^2 - 12y + 2 = 0$

Dividing the equation by 9 we get,

$$y^2 - \frac{12}{9}y + \frac{2}{9} = 0$$

$$y^2 - \frac{4}{3}y + k = (y + a)^2$$

Then,

$$y^2 - \frac{4}{3}y + k = y^2 + 2ay + a^2$$

Comparing coefficients, $-\frac{4}{3} = 2a$ **and** $k = a^2$ **we get**

$a = -\frac{2}{3}$ **and** $k = a^2$

$$k = \left(-\frac{2}{3}\right)^2 = \frac{4}{9}$$

Now,

$$y^2 - \frac{4}{3}y + \frac{2}{9} = 0$$

$$y^2 - \frac{4}{3}y + \frac{4}{9} - \frac{4}{9} + \frac{2}{9} = 0$$

$$\left(y - \frac{2}{3}\right)^2 - \frac{2}{9} = 0$$

$$\left(y - \frac{2}{3}\right)^2 = \frac{2}{9}$$

Taking square root of both sides, we get

$$y - \frac{2}{3} = +/- \frac{\sqrt{2}}{3}$$

$$\therefore\ y - \frac{2}{3} = \frac{\sqrt{2}}{3} \text{ or } y - \frac{2}{3} = -\frac{\sqrt{2}}{3}$$

$$\therefore\ y = \frac{\sqrt{2} + 2}{3} \text{ or } y = \frac{-\sqrt{2} + 2}{3}$$

Ans.: The roots of the given equation are

$$y = \frac{\sqrt{2} + 2}{3} \text{ or } y = \frac{-\sqrt{2} + 2}{3}$$

Q. 41 (t 66)

The sum of square of two consecutive even natural numbers is 244, find the numbers.

SOLUTION:

Let the first even natural number be x therefore, the next even natural number will be $(x + 2)$

According to given condition,

$x^2 + (x + 2)^2 = 244$

$\therefore x^2 + x^2 + 4x + 4 - 244 = 0$

$\therefore 2x^2 + 4x - 240 = 0$

Dividing both sides by 2 we get,

$x^2 + 2x - 120 = 0$

$\therefore x^2 + 12x - 10x - 120 = 0$

$\therefore x(x + 12) - 10(x + 12) = 0$

$\therefore (x + 12)(x - 10) = 0$

$\therefore x + 12 = 0$ or $x - 10 = 0$

$\therefore x = -12$ or $x = 10$

But the natural number cannot be negative

$\therefore x = 10$ And

$x + 2 = 10 + 2 = 12$

Ans.: The two consecutive natural numbers are 10 and 12

Q. 42 (T71)

Find m if $(m-12)x^2+2(m-12)x+2=0$ has a real and equal root.

SOLUTION:

$(m-12)x^2+2(m-12)x+2=0$

Comparing the equation with $ax^2+bx+c=0$

$a = m-12, b = 2(m-12), c = 2$

$\Delta = b^2 - 4ac$

$\Delta = [2(m-12)]^2 - 4(m-12) \times 2$

$= 4(m-12)^2 - 4(m-12) \times 2$

$= 4(m-12)^2 - 8(m-12)$

$= 4(m-12)(m-12-2)$

$= 4(m-12)(m-14)$

Since roots are real and equal

$\Delta = 0$

$[m-12][m-14] = 0$

$\therefore m-12=0$ or $m-14=0$

$\therefore\ m = 12$ or $m = 14$

Ans.: $m = 12$ or $m = 14$

Q. 43 (T70)

Two roots of the quadratic equation are given below; frame the equation.

$1 - 3\sqrt{5},\ 1 + 3\sqrt{5}$

SOLUTION:

$\alpha = 1 - 3\sqrt{5},\ \beta = 1 + 3\sqrt{5}$

$\alpha + \beta = 1 - 3\sqrt{5} + 1 + 3\sqrt{5} = 2$

$\alpha\beta = \left(1 - 3\sqrt{5}\right)\left(1 + 3\sqrt{5}\right)$

$\alpha\beta = 1^2 - \left(3\sqrt{5}\right)^2$

$\alpha\beta = 1 - 45$

$\alpha\beta = -44$

Ans.: The required quadratic equation is as follows

$$x^2 - (\alpha + \beta)x + \alpha\beta = 0$$

$$x^2 - 2x - 44 = 0$$

Q. 44 (T70)

Determine nature of roots for quadratic equation

$\sqrt{3}x^2 + \sqrt{2}x - 2\sqrt{3} = 0$

SOLUTION:

$\sqrt{3}x^2 + \sqrt{2}x - 2\sqrt{3} = 0$

Comparing the equation with $ax^2 + bx + c = 0$

$a = \sqrt{3}\,,\ \ b = \sqrt{2}\,,\ \ c = -2\sqrt{3}$

$\Delta = b^2 - 4ac$

$\Delta = \left(\sqrt{2}\right)^2 - 4 \times \sqrt{3} \times \left(-2\sqrt{3}\right)$

$= 2 + 24$

$= 26$

$\Delta > 0$

Ans.: Roots of quadratic equation are real and unequal

Q. 45 (T70)

Solve the quadratic equation $x^2 - \frac{3x}{10} - \frac{1}{10} = 0$

SOLUTION:

$$x^2 - \frac{3x}{10} - \frac{1}{10} = 0$$

Multiplying both sides by 10 we get,

$$10x^2 - 3x - 1 = 0$$

$$\therefore\ 10x^2 - 5x + 2x - 1 = 0$$

$$\therefore\ 5x\,(2x - 1) + 1\,(2x - 1) = 0$$

$$\therefore\ (2x - 1)\,(5x + 1) = 0$$

$$\therefore\ 2x - 1 = 0 \quad or \quad 5x + 1 = 0$$

$$\therefore\ 2x = 1 \quad or \quad 5x + 1 = 0$$

$$\therefore\ x = \frac{1}{2} \quad or \quad 5x = -1$$

$$\therefore\ x = \frac{1}{2} \quad or \quad x = \frac{-1}{5}$$

Ans.: Roots of the given quadratic equation are $\frac{1}{2}$ $\ and\ $ $\frac{-1}{5}$

Q. 46 (T70)

The product of Wasim's age 2 years ago and 3 years hence is 84. Find his present age

SOLUTION:

Let the present age of Wasim be *x* years

Her age 2 years ago was $(x-2)$ years and 3 years hence will be $(x+3)$

From given condition,

$(x-2)\,(x+3) = 84$

$\therefore\ x^2 + 3x - 2x - 6 - 84 = 0$

$\therefore\ x^2 + x - 90 = 0$

$\therefore\ x^2 + 10x - 9x - 90 = 0$

$\therefore\ x(x+10) - 9(x+10) = 0$

$\therefore\ (x+10)(x-9) = 0$

$\therefore\ x + 10 = 0$ or $x - 9 = 0$

$\therefore\ x = -10$ or $x = 9$

But the age cannot be negative thus x = -10 is not acceptable

$\therefore x = 9$

Ans.: Wasim's present age is 9 years

Q. 47 (n 57)

Solve the quadratic equation $(2x+3)^2 = 25$

SOLUTION:

$(2x+3)^2 = 25$

$\therefore (2x+3)^2 - 25 = 0$

$\therefore (2x+3)^2 - (5)^2 = 0$

$\therefore (2x+3+5)(2x+3-5) = 0$

$\therefore (2x+8)(2x-2) = 0$

$\therefore 2x+8 = 0 \text{ or } 2x-2 = 0$

$\therefore 2x = -8 \quad \text{or } 2x = 2$

$\therefore x = -4 \quad \text{or } x = 1$

Ans.: - 4 and 1 are the roots of the given equation.

Q. 48 (n 59)

Difference between square of two numbers is 120. The square of smaller number is twice the greater number. Find the numbers.

SOLUTION:

Let the greater of the two numbers be *x*   (1)

Square of smaller number = twice the greater number = 2*x*   (2)

The difference between the square of two numbers is 120

Square of greater number – the square of smaller number = 120   (3)

From (1), (2) and (3)

$x^2 - 2x = 120$

$\therefore x^2 - 2x - 120 = 0$

$\therefore x^2 - 12x + 10x - 120 = 0$

$\therefore x(x - 12) + 10\,(x - 12) = 0$

$\therefore (x + 10)(x - 12) = 0$

$\therefore\ (x + 10\ ) = 0$ or $(x - 12)\ = 0$

$\therefore\ x\ = -10$ or $x\ = 12$

$x\ = -10$ is not acceptable

As per condition given in the example,

$x^2 - y^2 = 120$

$\therefore\ (-10\ )^2 - (\mathrm{y})^2 = 120$

$\therefore\ 100 - \mathrm{y}^2 = 120$

$\therefore\ 100 - \mathrm{y}^2 = 120$

$\therefore\ -\mathrm{y}^2 = 120 - 100$

$\therefore\ -\mathrm{y}^2 = 20$

$\therefore\ \mathrm{y}^2 = -20$

But the square of number cannot be negative

$\therefore\ x\ = 12$ is the possible solution

$(\text{smaller number})^2 = 2x = 2 \times 12 = 24$

smaller number = +/-$\sqrt{24}$

Ans.: The required numbers are (12 and $\sqrt{24}$) or (12 and $-\sqrt{24}$)

Q. 49 (T 64)

Sum of the roots of quadratic equation is double of their product. Find k if the equation is

$x^2 - 4kx + k + 3 = 0$

SOLUTION:

$x^2 - 4kx + k + 3 = 0$

Comparing the above equation with $ax^2 + bx + c = 0$ **we get,**

a = 1, b = - 4k , c = k + 3

Let α and β be the roots of the given quadratic equation

Then $\alpha + \beta = \frac{-b}{a}$, $\alpha\beta = \frac{c}{a}$

According to the given condition,

$\alpha + \beta = 2\alpha\beta$

$$\frac{-b}{a} = \frac{2c}{a}$$

$\therefore -b = 2c$

$\therefore$ $-(-4k) = 2(k + 3)$

$\therefore$ $4k = 2k + 6$

$\therefore$ $4k - 2k = 6$

$\therefore$ $2k = 6$

$\therefore$ $k = 3$

Ans.: $k = 3$

Q. 50 (T 64)

Form quadratic equation from the roots given below $2-\sqrt{5}$, $2+\sqrt{5}$

SOLUTION:

$\alpha + \beta = 2 - \sqrt{5} + 2 + \sqrt{5} = 4$

$\alpha\beta = (2 - \sqrt{5})(2 + \sqrt{5})$

$\alpha\beta = (2)^2 - (\sqrt{5})^2$

$\alpha\beta = 4 - 5 = -1$

The required quadratic equation is

$x^2 - (\alpha + \beta)x + \alpha\beta = 0$

$x^2 - 4x - 1 = 0$

Ans.: $x^2 - 4x - 1 = 0$

Q. 51 (ape 54)

If roots of the Quadratic equation

$k^2x^2 - 2(k-1)x + 4 = 0$ are real and equal find the value of k.

SOLUTION:

$k^2x^2 - 2(k-1)x + 4 = 0$

Comparing the equation with $ax^2 + bx + c = 0$

$a = k^2, b = -2(k-1), c = 4$

Roots are real and equal therefore,

$\Delta = 0$

$b^2 - 4ac = 0$

$\therefore [(-2(k-1))]^2 - 4 \times k^2 \times 4 = 0$

$\therefore 4(k-1)^2 - 4k^2 \times 4 = 0$

$\therefore 4(k^2 - 2k + 1) - 16k^2 = 0$

$\therefore 4k^2 - 8k + 4 - 16k^2 = 0$

$\therefore -12k^2 - 8k + 4 = 0$

$\therefore 3k^2 + 2k - 1 = 0$

$\therefore\ 3k^2 + 3k - k - 1 = 0$

$\therefore$ 3k (k + 1) – 1 (k + 1) = 0

$\therefore$ (k + 1) (3k – 1) = 0

$\therefore$ k + 1 = 0 or 3k – 1 = 0

$\therefore$ k = -1 or k $= \frac{1}{3}$

Ans.: value of k = -1 or k $= \frac{1}{3}$

Q. 52 (apexit 56)

Summation of square of two consecutive natural numbers is 113, find the numbers.

SOLUTION:

Let numbers be x and $x + 1$

$\therefore x^2 + (x + 1)^2 = 113$

$\therefore x^2 + (x^2 + 2x + 1) = 113$

$\therefore 2x^2 + 2x + 1 = 113$

$\therefore 2x^2 + 2x - 112 = 0$

$\therefore x^2 + x - 56 = 0$

$\therefore (x + 8)(x - 7) = 0$

$\therefore (x + 8) = 0$ **or** $(x - 7) = 0$

$\therefore (x + 8) = 0$ **or** $(x - 7) = 0$

$\therefore x = -8$ **or** $x = 7$

But $x = -8$ is not acceptable

Hence $x = 7, \; x + 1 = 8$

Ans.: The numbers are 7 and 8