Chapter-Quadratic Equations
Question bank

Q1.

If x =-1/2 , is a solution of the quadratic equation $3x^2 + 2kx - 3 = 0$, find the value of K .

Q2.

If the quadratic equation $px^2 - 2\sqrt{5}px + 15 = 0$ has two equal roots, then find the value of p.

Q3.

The difference of two natural numbers is 5 and the difference of their reciprocals is 1/10. find the numbers.

Q4.

The sum of the squares of two consecutive odd numbers is 394. Find the numbers.

Q5.

The present age of a father is equal to the square of the present age of his son. One year ago, the age of the father was 8 times the age of his son. Find their present ages.

Q6.

Solve for x

$$\frac{1}{x-3} + \frac{2}{x-2} = \frac{8}{x}; x \neq 0, 2, 3.$$

Q7.

Find the value of p so that the quadratic equation $px(x - 3) + 9 = 0$ has equal roots.

Q8.

Find the values of p for which the quadratic equation $4x^2 + px + 3 = 0$ has equal roots.

Q9.

Solve the quadratic equation $2x^2 + ax - a^2 = 0$ for x.

Q10.

The diagonal of a rectangular field is 16 metres more than the shorter side. If the longer side is 14 metres more than the shorter side, then find the lengths of the sides of the field.

Solution 1.

$\because x = \frac{-1}{2}$ is the solution of $3x^2 + 2kx - 3 = 0$

So, $3\left(\frac{-1}{2}\right)^2 + 2k\left(\frac{-1}{2}\right) - 3 = 0 \Rightarrow \frac{3}{4} - k - 3 = 0 \Rightarrow k = \frac{3}{4} - 3 \Rightarrow k = \frac{-9}{4}$

Solution 2.

For equal roots, $D = 0 \Rightarrow (-2\sqrt{5}p)^2 - 4 \times p \times 15 = 0$

$20p^2 - 60p = 0 \Rightarrow 20p(p-3) = 0$

$\Rightarrow p = 3$ or $p = 0$ (Rejected)

Hence, value of p is 3.

Solution 3.

Let the two required numbers be x and $x + 5$.

According to question,

$$\frac{1}{x} - \frac{1}{x+5} = \frac{1}{10} \Rightarrow \frac{x+5-x}{x(x+5)} = \frac{1}{10}$$

$$\Rightarrow \frac{5}{x^2+5x} = \frac{1}{10} \Rightarrow x^2 + 5x = 50$$

$\Rightarrow x^2 + 5x - 50 = 0 \Rightarrow (x + 10)(x - 5) = 0$

$\Rightarrow x = 5$ or $x = -10$ (which is rejected)

$\therefore$ Hence, required numbers are 5 and 10.

Solution 4.

Let two consecutive odd numbers be x and $x + 2$.

$\therefore x^2 + (x + 2)^2 = 394 \Rightarrow x^2 + x^2 + 4x + 4 = 394$

$\Rightarrow 2x^2 + 4x - 390 = 0 \Rightarrow x^2 + 2x - 195 = 0$

$\Rightarrow x^2 + 15x - 13x - 195 = 0 \Rightarrow x(x + 15) - 13(x + 15) = 0$

$\Rightarrow (x - 13)(x + 15) = 0$

$\Rightarrow x - 13 = 0$ or $x + 15 = 0$

$\Rightarrow x = 13$ or $x = -15$

$\therefore$ Numbers are 13 and 13 + 2 = 15, i.e. 13 and 15 or –15 and –15 + 3 = –13, i.e. –15 and –13.

Solution 5.

Let present age of son $= x$

Present age of father $= x^2$

One year ago, age of son $= x - 1$

One year ago, age of father $= x^2 - 1$

As per condition, $x^2 - 1 = 8(x - 1)$

$\Rightarrow \quad x^2 - 1 = 8x - 8$

$\Rightarrow \quad x^2 - 8x + 7 = 0$

$\Rightarrow \quad x^2 - 7x - x + 7 = 0$

$\Rightarrow \quad x(x - 7) - 1(x - 7) = 0$

$\Rightarrow \quad (x - 7)(x - 1) = 0$

$\Rightarrow$ Either $x - 7 = 0$ or $x - 1 = 0$

$\Rightarrow \quad x = 7$ or $x = 1$ (not possible)

$\therefore$ Present age of son $= 7$ years

Present age of father $= (7)^2 = 49$ years

Solution 6.

Given that: $\frac{1}{x-3} + \frac{2}{x-2} = \frac{8}{x}; x \neq 0, 2, 3$

$\Rightarrow \quad \frac{x - 2 + 2(x-3)}{(x-3)(x-2)} = \frac{8}{x} \Rightarrow \frac{x - 2 + 2x - 6}{(x-3)(x-2)} = \frac{8}{x}$

$\Rightarrow \quad \frac{3x - 8}{x^2 - 5x + 6} = \frac{8}{x}$

$\Rightarrow \quad 3x^2 - 8x = 8x^2 - 40x + 48$

$\Rightarrow \quad 5x^2 - 32x + 48 = 0$

$\Rightarrow \quad 5x^2 - 20x - 12x + 48 = 0$

$\Rightarrow \quad 5x(x - 4) - 12(x - 4) = 0$

$\Rightarrow \quad (x - 4)(5x - 12) = 0$

$\Rightarrow \quad x = 4 \text{ or } x = \frac{12}{5}$

$\therefore \quad x = 4 \text{ or } x = \frac{12}{5}$

Solution 7.

Consider, $px(x-3)+9 = 0$

$\therefore$ $px^2-3px+9 = 0$

For equal roots, $D = 0$

$\Rightarrow$ $(-3p)^2-4\times p\times 9 = 0$

$\Rightarrow$ $9p^2-36p = 0$

$\Rightarrow$ $9p(p-4) = 0$

$\Rightarrow$ $p = 0$ or $p-4=0$

$\Rightarrow$ $p = 0$ or $p = 4$

But from (i), we notice $p \neq 0$

$\therefore$ $p = 4$

Solution 8.

Since quadratic equation $4x^2+px+3=0$ has equal roots, therefore, $D = 0$.

$\Rightarrow$ $(p)^2-4\times 4\times 3 = 0$

$\Rightarrow$ $p^2 = 48 \Rightarrow p = \pm\sqrt{48} = \pm 4\sqrt{3}$

Solution 9.

$2x^2+ax-a^2 = 0$

$\Rightarrow$ $2x^2+2ax-ax-a^2 = 0 \Rightarrow 2x(x+a)-a(x+a)=0$

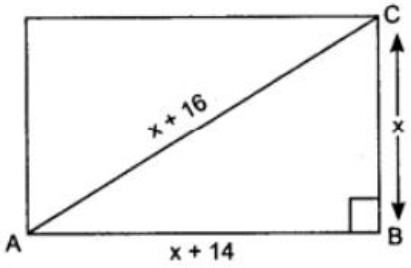
$\Rightarrow$ $(2x-a)(x+a) = 0 \Rightarrow x = \frac{a}{2}$ or $x = -a$

Solution 10.

Let shorter side $= x$ m

$\therefore$ Diagonal $= (x+16)$ m

and longer side $= (x+14)$ m



Now, by Pythagoras Theorem,

$(x+16)^2 = (x+14)^2+x^2$

$x^2+32x+256 = x^2+28x+196+x^2$

$\Rightarrow$ $x^2-4x-60 = 0$

$\Rightarrow$ $(x-10)(x+6) = 0$

$\Rightarrow$ $x = 10$ or $x = -6$ (Rejected)

$\therefore$ Shorter side = 10 m, diagonal = 26 m and longer side = 24 m