MATHS

BOOKS - NAGEEN MATHS (HINGLISH)

QUADRATIC EQUATIONS

Solved Examples

1. Check whether the following are quadratic equation

(i) $(x + 1)^2 = 2(x - 3)$

(ii) $x^2 - 2x = (-2)(3 - x)$

(iii) $(x - 2)(x + 1) = (x - 1)(x + 3)$

(iv) $(x - 3)(2x + 1) = x(x + 5)$

(v) $(2x1)(x3) = (x + 5)(x1)$

(vi) $x^2 + 3x + 1 = (x - 2)^2$

(vii) $(x + 2)^3 = 2x(x^2 - 1)$

(viii) $x^3 - 4x^2 - x + 1 = (x - 2)^3$

▶ Watch Video Solution

2. Represent the following situations in the form of quadratic equations:

(i) The area of a rectangular plot is $528m^2$. The length of the plot (in metre) is one more than twice its breadth. We need to find the length and breadth of the plot.

(ii) The product of two consecutive positive integers is 306. We need to find the integers.

(iii) Rohan's mother is 26 years elder than him. The product of their ages (in years) 3 years from now will be 360. We would like to find Rohan's present age.

(iv) A train travels a distance of 480 km at a uniform speed. If the speed has been $8kmh^{-1}$ less, then it would have taken 3 hours more to cover the same distance. We need to find the speed of the train.

▶ **Watch Video Solution**

3. Which of the following are the solutions of $2x^2 - 5x - 3 = 0$?

(i) $x = 2$

(ii) $x = 3$

(iii) $x = \dfrac{-1}{2}$

A. only (i)

B. (i) and (ii)

C. (ii) and (iii)

D. (i) , (ii) and (iii)

Answer: C

▶ **Watch Video Solution**

4. If x=2 and x=3 are roots of the equation $3x^2 - mx + 2n = 0$, then find the values of m and m.

    A. m =-15 and n = 9

    B. m =9 and n = 15

    C. m =15 and n = 9

    D. m =15 and n = -9

Answer: C

5. Solve the following quadratic equation:

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

A. $x = 5$ and $x = -3$

B. $x = \dfrac{5}{3}$ and $x = \dfrac{3}{2}$

C. $x = \dfrac{5}{3}$ and $x = \dfrac{-3}{2}$

D. none of these

Answer: C

▶ **Watch Video Solution**

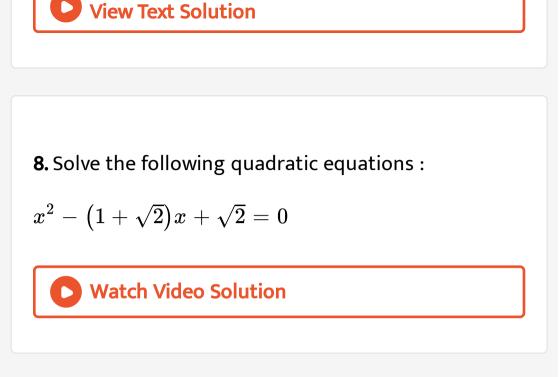**6.** Find the roots of the following quadratic equations by factorisation :

(i) $x^2 - 3x - 10 = 0$ (ii) $2x^2 + x - 6 = 0$ (iii)

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

(iv) $2x^2 - x + \dfrac{1}{8} = 0$ (v) $100x^2 - 20x + 1 = 0$ (vi)

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

▶ Watch Video Solution

7. Solve the following quadratic equations by factorisation :

(i) $4 - 11x = 3x^2$

(ii) $x^2 - \dfrac{11}{4}x + \dfrac{15}{8} = 0$

8. Solve the following quadratic equations :

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

9. Solve the following quadratic equation :

$$4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$$

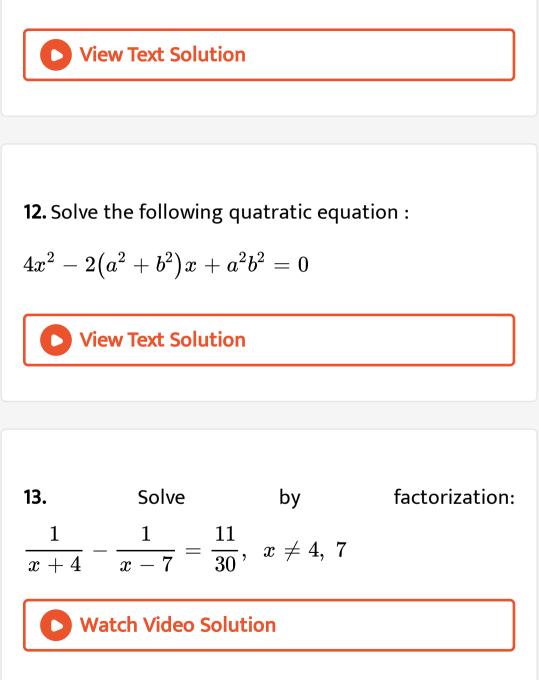**10.** Solve the following quadratic equation :

$$10x - \frac{1}{x} = 3$$

11. Solve the following quatratic equation :

$$a^2b^2x^2 + b^2x - a^2x - 1 = 0$$

A. $\dfrac{-1}{a}$ and $\dfrac{1}{b}$

B. $\dfrac{-1}{a^2}$ and $\dfrac{1}{b^2}$

C. $\dfrac{1}{a^2}$ and $\dfrac{1}{b^2}$

D. $\dfrac{-1}{a^2}$ and $\dfrac{-1}{b^2}$

Answer: B

> ▶ View Text Solution

---

12. Solve the following quatratic equation :

$$4x^2 - 2(a^2 + b^2)x + a^2b^2 = 0$$

> ▶ View Text Solution

---

13. Solve by factorization:

$$\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}, \quad x \neq 4, \ 7$$

> ▶ Watch Video Solution

14. Using factorisation method, solve the following quadratic equations.

$$\frac{2x}{x-4} + \frac{2x-5}{x-3} = \frac{25}{3}; x \neq 4, 3$$

15. Solve for x : `1/(x+1)+3/(5x+1)=5/(x+4), x != -1,-1/5,-4

16. Solve the equation :

$$\frac{5}{2-x} + \frac{x-5}{x+2} + \frac{3x+8}{x^2-4} = 0$$

17.   Solve:

$$2\left(\frac{2x - 1}{x + 3}\right) - 3\left(\frac{x + 3}{2x - 1}\right) = 5, x \neq -3, \frac{1}{2}.$$
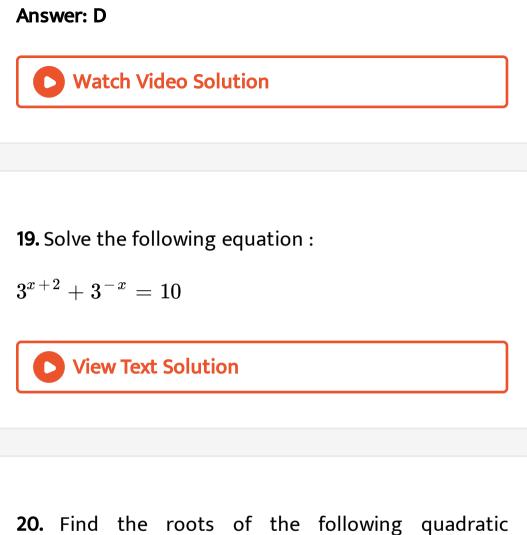
18. Solve the equation :

$$\frac{a}{x - b} + \frac{b}{x - a} = 2 \qquad (x \neq b, a)$$

    A. $x = a - b$ and $x = \dfrac{a - b}{2}$

    B. $x = a - b$ and $x = \dfrac{a + b}{2}$

    C. $x = a + b$ and $x = \dfrac{a - b}{2}$

    D. $x = a + b$ and $x = \dfrac{a + b}{2}$

Answer: D

19. Solve the following equation :

$$3^{x+2} + 3^{-x} = 10$$

20. Find the roots of the following quadratic equations, if they exist by the method of completing the square.

(i) $2x^2 - 7x + 3 = 0$ (ii) $4x^2 + 4\sqrt{3}x + 3 = 0$

21. Find the roots of following quadratic equations by using quadratic formula, if they exist.

(i)$2x^2 + x - 4 = 0$ (ii) $2x^2 + x + 4 = 0$

(iii) $\qquad 2x^2 + 5\sqrt{3}x + 6 = 0 \qquad$ (iv)

$\sqrt{3}x^2 + 11x + 6\sqrt{3} = 0$

22. Find roots of the equation by quadratic formula :

$x^2 + x - (a + 2)(a + 1) = 0$

23. Solved the equation by using quadratic formula $a(x^2 + 1) = (a^2 + 1)x$, $a \neq 0$.

24. Solved the following equation by the method of completing the square :

$$4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$$

25. Solved : $x^2 + x - (a + 2)(a + 1) = 0$ by

(i) factorisation (ii) method of completing the square

▶ Watch Video Solution

26. Let $f(x) = 3x^2 - 5x - 1$. Then solve f(x)=0 by

(i) factroing the quadratic

(ii) using th quadratic formula

(iii) completing the square

and then rewrite f(x) in the form $A(x \pm B)^2 \pm C$.

▶ Watch Video Solution

27. Find the nature of roots of the following quadratic equations. If the real roots exist,

(i) $2x^2 - 3x + 5 = 0$ (ii) $3x^2 - 4\sqrt{3}x + 4 = 0$ (iii) $2x^2 - 6x + 3 = 0$

▶ Watch Video Solution

28. Find the value of k so that the equation $2x^2 - 5x + k = 0$ has two equal roots.

▶ Watch Video Solution

29. The equation $3x^2 - 12x + (n - 5) = 0$ has repeated roots. Find the value of of n.

A. 15

B. 16

C. 17

D. 18

Answer: C

30. Find the value of k for which the equation $x^2 + k(2x + k - 1) + 2 = 0$ has real and equal roots.

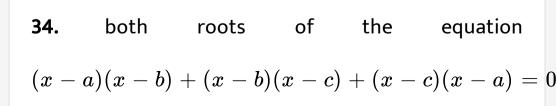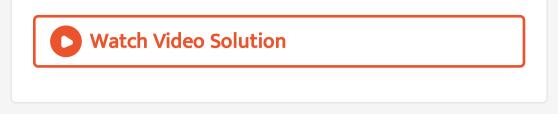**31.** Find the value of p, for which one root of the quadratic equation $px^2 - 14x + 8 = 0$ is 6 times the other.

32. The equation $x^2 + 2(m-1)x + (m+5) = 0$ has real and equal roots. Find the value of m.

33. If -4 is a root of the equation $x^2 + px - 4 = 0$ and the equation $x^2 + px + q = 0$ has coincident roots, find the values of p and q.

34. both roots of the equation

$$(x-a)(x-b) + (x-b)(x-c) + (x-c)(x-a) = 0$$

are

35. Determine the positive values of $'k'$ for which the equation $x^2 + kx + 64 = 0$ and $x^2 - 8x + k = 0$ will both have real roots.

36. Find the value(s) of k for which the given quadratic equations has real and distinct roots :

(i) $2x^2 + kx + 4 = 0$ (ii) $4x^2 - 3kx + 1 = 0$

(iii) $kx^2 + 6x + 1 = 0$ (iv) $x^2 - kx + 9 = 0$

37. For what value(s) of λ the quadratic equation $x^2 + \lambda x + (\lambda + 1.25) = 0$ has :

(i) coincident roots (ii) real and distinct roots (iii) no real roots?

38. For what value(s) of k the quadratic equation $x^2 + kx + 1 = 0$ can be factorised into a product of real linear factors?

39. If the equation

$$\left(1 + m^2\right)x^2 + 2mcx + \left(c^2 - a^2\right) = 0 \quad \text{has} \quad \text{equal}$$

roots, prove that $c^2 = a^2\left(1 + m^2\right)$.

▶ Watch Video Solution

40. In a $\triangle ABC$ the value of $\angle A$ is given by 5 CosA - 3 = 0 then the equation whose roots are sinA and tanA is :

▶ Watch Video Solution

41. For what value of n, the quadratic equation $3^n x^2 + 54x + 81^n = 0$ have coincident roots?
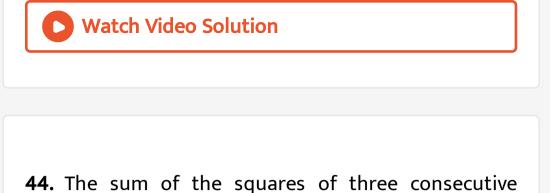
42. The sum of a number and its reciprocal is $\dfrac{10}{3}$, find the number(s).

43. Divide 16 into two parts such that twice the square of the larger part exceeds the square of the smaller part by 164.

44. The sum of the squares of three consecutive natural numbers is 149. Find the numbers.

45. A two digit number is such that the product of its digits is 8. When 63 is subtracted from the number digits interchange their places. Find the number.

46. The denominator of a fraction is one more than twice the numerator. If the sum of the fraction and its reciprocal is $2\dfrac{16}{21}$, find the fraction.

▶ **Watch Video Solution**

47. The hypotenuse of a right triangle is 6m more than the twice of the shortest side. If the third side is 2m less than the hypotenuse, find the sides of the triangle.

▶ **Watch Video Solution**

48. a, b and c are the integral sides of a right angled triangle in which c is the hypotenuse measuring $3\sqrt{5}$ metres. If side 'a' is increased by $\dfrac{400}{3}$ % and side 'b' is increased by $\dfrac{50}{3}$ % , then their total becomes 14 metres. Find the area of triangle.

49. The age of a father is twice the square of the age of his son. Eight years hence, the age of his father will be 4 years more than 3 times the age of the son. Find their present ages.

50. The sum of the reciprocals of Rehmans ages, (in years) 3 years ago and 5 years from now is $\frac{1}{3}$.Find his present age.

51. Two taps running together can fill a tank in $3\left(\frac{1}{13}\right)$ hours. If one tap takes 3 hours more than the other to fill the tank, then how much time will each tap take to fill the tank ?

52. A takes 6 hours less than B to complete a work. If together they complete the work in 13 hours 20 minutes, find how much time will B alone take to complete the work.

▶ **Watch Video Solution**

53. The diagonal of a rectangular field 60 metres more than the shorter side. If the longer side is 30 metres more than the shorter side, find the sides the field.

▶ **Watch Video Solution**

54. An aeroplane takes 1 hour less for a journey of 1200 km if its speed is increased by 100 km/hr from its usual speed. Find its usual speed.

▶ **Watch Video Solution**

55. A train travels a distance of 300km at constant speed . If the speed of the train is increased by 5km/h; the journey would have taken 2 hr less. Find the original speed of the train.

▶ **Watch Video Solution**

56. The speed of a boat in still water is 15 km/hr. It can go 30 km upstream and return downstream to the original point in 4 hours 30 minutes. Find the speed of the stream.

▶ **Watch Video Solution**

57. A dealer sells an article for Rs. 24 and gains as much percent as the cost price of the article. Find the cost price of the article.

▶ **Watch Video Solution**

58. One fourth of a herd of camels was seen in the forest. Twice the square root of the herd had gone to mountains and the remaining 15 camels were seen on the bank of a river. Find the total number of camels.

59. Out of a number of saras birds, one-fourth of the number are moving about in lotus plants, 1/9th coupled along with 1/4th as well as 7 times the square root of the number move on a hill. 56 birds remain in vakula trees. What is the total number of birds?

60. The total cost of a certain length of cloth is $Rs200$. If the piece was 5 m longer and each metre of cloth costs $Rs2$ less, the cost of the piece would have remained unchanged. How longer is the piece and what is its original rate per metre?

61. Some students planned a picnic.The budget for food was Rs.480. But , 8 of these failed to go and thus the cost of food for each member increased by Rs 10. How many students attended the picnic?

62. A peacock is sitting on the top of a pillar, which is 9m high. From a point 27m away from the bottom of the pillar, a snake is coming to its hole at the base of the pillar. Seeing the snake the peacock pounces on it. If their speeds are equal, at what distance from the whole is the snake caught?

Watch Video Solution

63. A group of students decided to buy an. F.M. Radio (transistor) from 256 to 300 rupees. But at the last moment two students backed out of the decision so
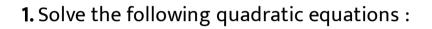
that the remaining students had to pay one rupee each more than they had planned. What was the price of F.M. Radio, if the students paid equal shares?

64. A swimming pool is filled by three pipes with uniform flow. The first two pipes operating simultaneously fill the pool in the same time during which the pool is filled by the third pipe alone. The second pipe fills the pool 5 hours faster than the first pipe and 4 hours slower than the third pipe. The time required by the first pipe is $6\ hrs$ b. $10\ hrs$ c. $15\ hrs$ d. $30\ hrs$

Problems From Ncert Exemplar

1. Solve the following quadratic equations :

(i) $x^2 - 45x + 324 = 0$ (ii) $x^2 - 55x + 750 = 0$

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

3. 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 to

4. Find the roots of the following equations : (i) $x - \dfrac{1}{x} = 3, x \neq 0$ (ii) $\dfrac{1}{x+4} - \dfrac{1}{x-7} = \dfrac{11}{30}, x \neq -4, 7$

5. The difference of squares of two numbers is 180. The square of the smaller number is 8 times the larger number. Find the two numbers.

6. Find the values of k for each of the following quadratic equations, so that they have two equal roots.(i) $2x^2 + kx + 3 = 0$ (ii) $kx(x - 2) + 6 = 0$

7. Which of the following is a quadratic equation?

(i) $\qquad x^2 + 2x + 1 = (4 - x)^2 + 3$ $\qquad$ (ii)

$-2x^2 = (5 - x)\left(2x - \dfrac{2}{5}\right)$

(iii) $\qquad (k + 1)x^2 + \dfrac{3}{2}x = 7 \;\; \text{where} k = -1$ $\qquad$ (iv)

$x^3 - x^2 = (x - 1)^3$

> ▶ **Watch Video Solution**

8. Find the roots of the following quadratic equations

by factorisation method :

(i) $2x^2 + \dfrac{5}{3}x - 2 = 0$ (ii) $\dfrac{2}{5}x^2 - x - \dfrac{3}{5} = 0$ (iii)

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

(iv) $3x^2 + 5\sqrt{5}x - 10 = 0$

(v) $21x^2 - 2x + \dfrac{1}{21} = 0$

> ▶ **Watch Video Solution**

9. A natural number when increased by 12, equals 160 times its reciprocal. Find number.

> ▶ **Watch Video Solution**

10. A train, travelling at a uniform speed for 360 km, would have taken 48 minutes less to travel the same distance if its speed were 5 km/h more. Find the original speed of the train.

11. The quadratic equation $2x^2 - \sqrt{5}x + 1 = 0$ has

(a) two distinct real roots (b) two equal real roots

(c) no real roots (d) more than 2 real roots

12. $\left(x^2 + 1\right)^2 - x^2 = 0$ has

(i) four real roots (ii) two real roots

(iii) no real roots (iv) one real root

13. Does there exist a quadratic equation whose coefficients are rational but both of its roots are irrational? Justify you answer.

▶ **Watch Video Solution**

14. Does there exist a quadratic equation whose coefficients are all distinct irrationals but both the roots are rationals? Why?
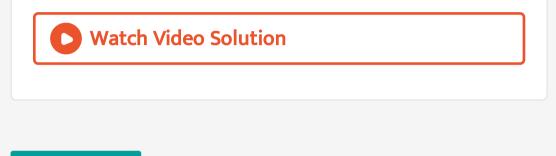
▶ **Watch Video Solution**

15. Find a natural number whose square diminished by 84 is equal to thrice of 8 more than the given number.

▶ **Watch Video Solution**

16. If Zeba were younger by 5 years than what she really is, then the square of her age (in years) would have been 1 more than five times her actual age. What is her age now?

▶ **Watch Video Solution**

17. At t minutes past 2 pm, the time needed by the minutes hand of a clock to show 3pm was found to be 3 minutes less than `(t^2)/4 minutes. Find t.
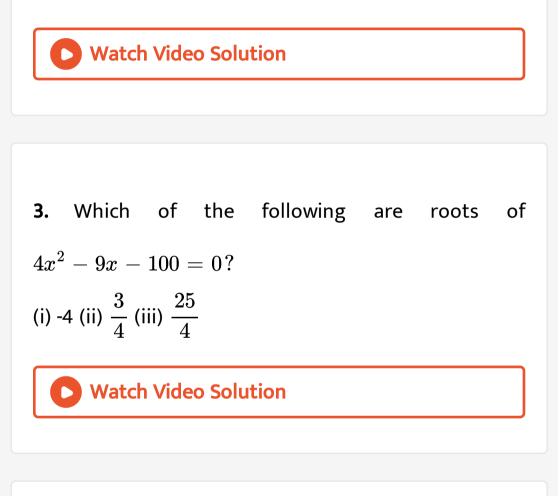
Exercise 4 A

1. Which of the following are quadratic equations?

(i)$x^2 8x + 12 = 0$ (ii) $x + \dfrac{1}{x} = 5$ (iii) $x + \dfrac{5}{x} = x^2$

(iv) $x^2 - 5\sqrt{x} + 7 = 0$ (v) $x^2 - 5x - \sqrt{x} + 4 = 0$ (vi) $x^2 - \dfrac{1}{x^2} = 4$

(vii) $\qquad$ $5x^2 - 7x = 3x^2 - 7x + 3$ $\qquad$ (viii)
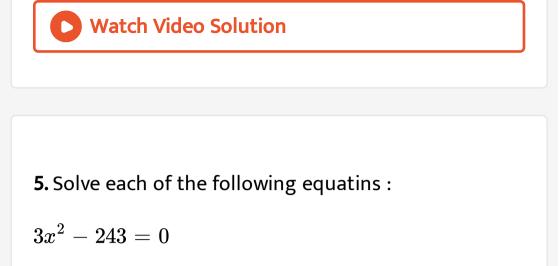
$$\frac{1}{4}x^2 + \frac{7}{6}x - 2 = 0$$

▶ **Watch Video Solution**

2. Represent the following situations mathematically:

(i) John and Jivanti together have 45 marbles. Both of them lost 5 marbles each and the product of the number of marbles they now have is 124. We would like to find out how many marbles they had to start with.

A cottage industry produces a certain number of toys in a day. The cost of production of each toy (in rupees) was found to be 55 minus the number of toys

produced in a day. On a particaular day, the total cost of production was RS.750. We would like to find out the number of toys produced on that day.

3. Which of the following are roots of $4x^2 - 9x - 100 = 0$?

(i) -4 (ii) $\dfrac{3}{4}$ (iii) $\dfrac{25}{4}$

4. If one root of the quadratic equation $6x^2 - x - k = 0$ is $\dfrac{2}{3}$, then find the value of k.

5. Solve each of the following equatins :

$$3x^2 - 243 = 0$$

6. Solve each of the following equatins :

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

7. Solve each of the following equatins :

$$x^2 + 12x + 35 = 0$$

▶ **Watch Video Solution**

8. Solve each of the following equatins :

$$2x^2 - 5x + 3 = 0$$

▶ **Watch Video Solution**

9. Solve each of the following equatins :

$$6x^2 - x - 2 = 0$$

▶ **Watch Video Solution**

10. Solve each of the following equatins :

$$x = 8x^2 - 22x - 21 = 0$$

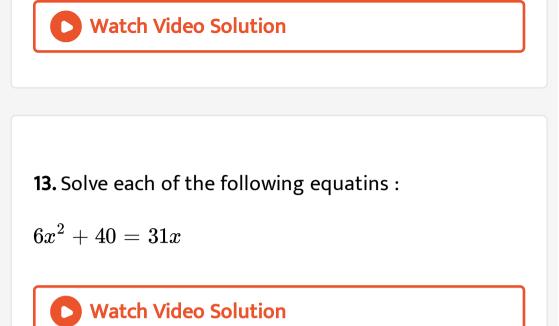**11.** Solve each of the following equatins :

$$9x^2 + 6x + 1 = 0$$

12. Solve each of the following equatins :

$$48x^2 - 13x - 1 = 0$$

13. Solve each of the following equatins :

$$6x^2 + 40 = 31x$$

14. Factorize $\sqrt{3}x^2 + 11x + 6\sqrt{3}$

15. Solve each of the following equatins :

$$3\sqrt{7}x^2 + 4x - \sqrt{7} = 0$$

16. Solve each of the following equatins :

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

17. Solve each of the following equatins :

$$x^2 + 5 = \frac{9}{2}x$$

18. Solve each of the following equatins :

$$x = \frac{3x + 1}{4x}$$

19. Solve each of the following equatins :

$$x + \frac{1}{x} = 2.5$$

20. Solve each of the following equatins :

$$5x - \frac{35}{x} = 18, x \neq 0$$

21. Solve each of the following equatins :
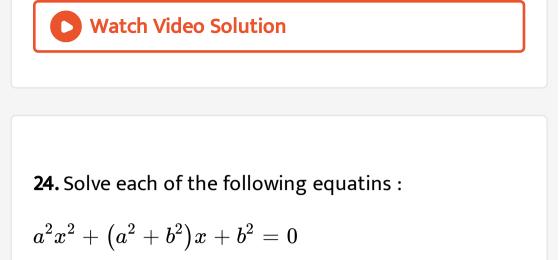
$$\frac{2}{x^2} - \frac{5}{x} + = 0, x \neq 0$$

22. Solve each of the following equatins :

$$a^2 x^2 + 2ax + 1 = 0$$

23. Solve each of the following equatins :

$$x^2 - (p + q)x + pq = 0$$

24. Solve each of the following equatins :

$$a^2 x^2 + \left(a^2 + b^2\right) x + b^2 = 0$$

25. 5. Solve $12abx^2 - 9a^2 x + 8b^2 x - 6ab = 0$

26. Solve each of the following equatins :

$$4x^2 - 4ax + \left(a^2 - b^2\right) = 0$$

27. Solve each of the following equatins :

$$\frac{x + 1}{x - 1} = \frac{3x - 7}{2x - 3}$$

28. Solve each of the following equatins :

$$\frac{5}{2x + 1} + \frac{6}{x + 1} = 3$$

29. Solve each of the following equatins :

$$\frac{x+3}{x-2} - \frac{1-x}{x} = 4\frac{1}{4}$$

▶ Watch Video Solution

30. Solve the following equations :

$$2\left(\frac{x}{x+1}\right)^2 - 5\left(\frac{x}{x+1}\right) + 2 = 0 \, x \neq -1$$

▶ Watch Video Solution

31. Solve each of the following equatins :

$$\sqrt{\frac{x}{1-x}} + \sqrt{\frac{1-x}{x}} = 2\frac{1}{6}, \, x \neq 0, 1$$

▶ Vi

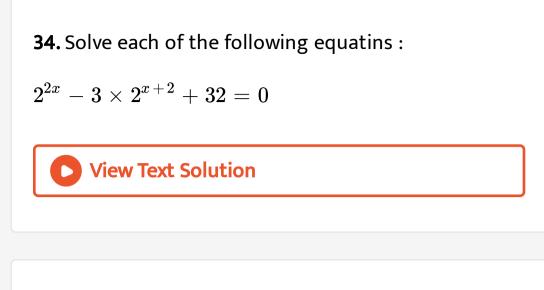**32.** Solve each of the following equatins :

$$\left(\frac{2x-3}{x-1}\right) - 4\left(\frac{x-1}{2x-3}\right) = 3, x \neq 1, \frac{3}{2}$$

33. Solve each of the following equatins :

$$2^{2x+3} - 57 = 65(2^x - 1)$$

34. Solve each of the following equatins :

$$2^{2x} - 3 \times 2^{x+2} + 32 = 0$$

35. Solve each of the following equatins :

$$x^{2/3} + x^{1/3} - 2 = 0$$

36. Solve for x:

$$\frac{a}{ax-1} + \frac{b}{bx-1} = a + b; x \neq \frac{1}{a}, \frac{1}{b}$$

37. Solve the following quadratic equations by factorization method:

$$\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}, \quad a+b \neq 0$$

Exercise 4 B

1. Find the roots of the following quadratic equations by the method of completing the square :

(i) $x^2 - 10 - 24 = 0$ (ii) $2x^2 - 7x - 39 = 0$

(iii) $5x^2 + 6x - 8 = 0$ (iv) $\sqrt{3}x^2 + 11x + 6\sqrt{3} = 0$

2. Solve the following quations by using qardratic formula:

$$2x^2 - 9x + 7 = 0$$

3. Solve the following quations by using qardratic formula:

$$5x^2 - 19x + 17 = 0$$

4. Solve the following quations by using qardratic formula:

$$x^2 - 18x + 77 = 0$$

5. Solve the following quations by using qardratic formula:

$$\frac{2}{3}x = -\frac{1}{6}x^2 - \frac{1}{3}$$

6. Solve the following quations by using qardratic formula:

$$\frac{1}{15}x^2 + \frac{5}{3} = \frac{2}{3}x$$

> ▶ **Watch Video Solution**

7. Solve the following quations by using qardratic formula:

$$\sqrt{6}x^2 - 4x - 2\sqrt{6} = 0$$

> ▶ **Watch Video Solution**

8. Solve the following quations by using qardratic formula:

$$256x^2 - 32x + 1 = 0$$

▶ **Watch Video Solution**

9. Solve the following quations by using qardratic formula:

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

▶ **Watch Video Solution**

10. Solve the following quations by using qardratic formula:

$$\frac{x-2}{x+2} + \frac{x+2}{x-1} = 4$$

▶ **Watch Video Solution**

11. Solve the following quations by using qardratic formula:

$$\frac{1}{x-2} + \frac{1}{x-3} + \frac{1}{x-4} = 0$$

▶ **Watch Video Solution**

12. Solve the following quations by using qardratic formula:

$$x^2 - 16 = 0$$

13. Solve the following quations by using qardratic formula:

$$36x^2 - 12ax + (a^2 - b^2) = 0$$

14. Solve the following quations by using qardratic formula:

$$p^2 x^2 + \left(p^2 - q^2\right)x - q^2 = 0$$

▶ Watch Video Solution

15. Solve the following quations by using qardratic formula:

$$abx^2 + \left(b^2 - ac\right)x - bc = 0$$

▶ Watch Video Solution

16. Solve the following quations by using qardratic formula:

$$12abx^2 - (9a^2 - 8^2)x - 6ab = 0$$

Exercise 4 C

1. Determine the nature of roots of the following quadratic equations:

(i) $2x^2 + 5x - 4 = 0$ (ii) $9x^2 - 6x + 1 = 0$

(iii) $3x^2 + 4x + 2 = 0$ (iv) $x^2 + 2\sqrt{2}x + 1 = 0$

(v) $x^2 + x + 1 = 0$ (vi) $x^2 + ax - 4 = 0$

(vii) $3x^2 + 7x + \dfrac{1}{2} = 0$

(viii) $3x^2 - 4\sqrt{3}x + 4 = 0$

(ix) $\qquad 2\sqrt{3}x^2 - 5x + \sqrt{3} = 0 \qquad$ (x)

$(x - 2a)(x - 2b) = 4ab$

▶ **Watch Video Solution**

2. Without determining the roots of the following equations comment their nature:

(i) $\qquad 6\sqrt{3}x^2 - 4x + \sqrt{3} = 0 \qquad$ (ii)

$9a^2b^2x^2 - 48abcdx + 64c^2d^2 = 0$

(iii) $\qquad a^2x^2 + 2abx = b^2,\ a^2 \neq 0 \qquad$ (iv)

$2(a^2 + b^2)x^2 + 2(a + b)x + 1 = 0$

(v) $(b + c)x^2 - (a + b + c)x + a = 0$

3. Find the values of k for which roots of the following equations are real and equal:

(i) $12x^2 + 4kx + 3 = 0$ (ii) $kx^2 - 5x + k = 0$

(iii) $\qquad x^2 + k(4x + k - 1) + 2 = 0$ (iv)

$x^2 - 2(5 + 2k)x + 3(7 + 10k) = 0$

(v) $\quad 5x^2 - 4x + 2 + k(4x^2 - 2x - 1) = 0$ (vi)

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

(vii) $\quad x^2 - (3k - 1)x + 2k^2 + 2k - 11 = 0$ (viii)

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

4. In the following determine the set of values of k for which the given quadratic equation has real roots :

(i) $2x^2 + 5x - k = 0$ (ii) $kx^2 - 6x - 2 = 0$

(iii) $9x^2 + 3kx + 4 = 0$ (iv) $kx^2 + 2x - 3 = 0$

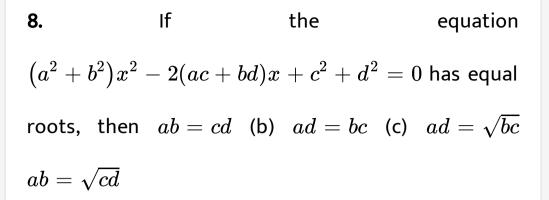**5.** If the roots of the equation $(b - c)x^2 + (c - a)x + (a - b) = 0$ are equal, then prove that $2b = a + \cdot$

6. If -5 is a root of the quadratic equation $2x^2 + px - 15 = 0$ and the quadratic equation $p(x^2 + x) + k = 0$ has equal roots, find the value of k.
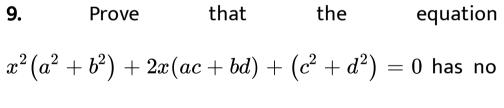
7. If 1 is a root of the quadratic equation $3x^2 + ax - 2 = 0$ and the quadratic equation $a(x^2 + 6x) - b = 0$ has equal roots, find the value of b.
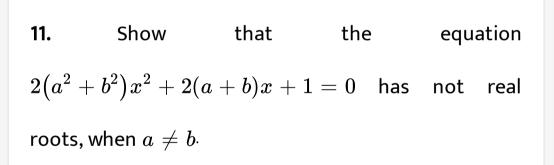
8. If the equation

$$\left(a^2 + b^2\right)x^2 - 2(ac + bd)x + c^2 + d^2 = 0 \text{ has equal}$$

roots, then $ab = cd$ (b) $ad = bc$ (c) $ad = \sqrt{bc}$

$ab = \sqrt{cd}$

9. Prove that the equation

$$x^2\left(a^2 + b^2\right) + 2x(ac + bd) + \left(c^2 + d^2\right) = 0 \text{ has no}$$

real root, if $ad \neq b \cdot$

10. If the roots of the equation $\left(c^2 - ab\right)x^2 - 2\left(a^2 - bc\right)x + b^2 - ac = 0$ are equal, prove that either $a = 0$ or $a^3 + b^3 + c^3 = 3ab \cdot$

> ▶ Watch Video Solution

11. Show that the equation $2\left(a^2 + b^2\right)x^2 + 2(a + b)x + 1 = 0$ has not real roots, when $a \neq b.$

> ▶ Watch Video Solution

12. If $a, b, c \in R$, show that roots of the equation

$(a - b)x^2 + (b + c - a)x - c = 0$ are   real   and

unequal,

Exercise 4 D

1. the sum of a number and its reciprocal is $\dfrac{61}{30}$ Find

the number

2. Divide 15 into two parts such that the sum of their

reciprocals is `(3)/(10).

> ▶ **Watch Video Solution**

3. Find two natural numbers which differ by 3 and

whose squares have the sum 117.

> ▶ **Watch Video Solution**

4. Divide 57 into two parts whose product is 782.

> ▶ **Watch Video Solution**

5. The sum of the squares of three consecutive natural numbers is 77. Find the numbers.

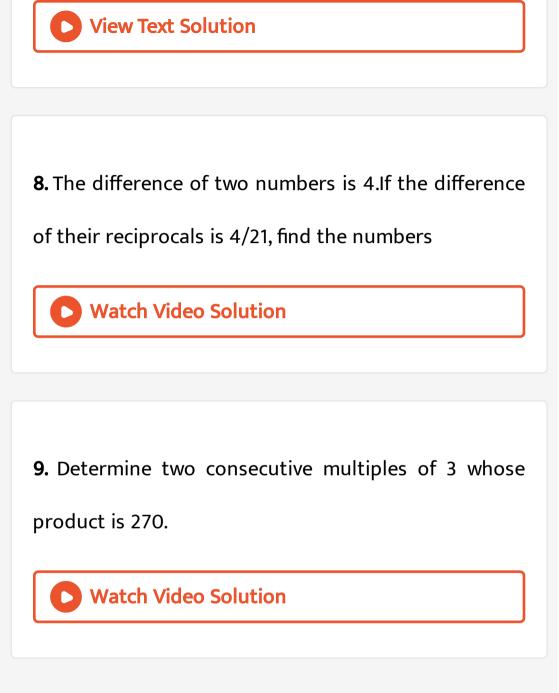**6.** Find two consecutive odd natural numbers whose product is 323.

7. The product of two numbers is 12. If their sum added to the sum of their squares is 32, find the numbers.

8. The difference of two numbers is 4.If the difference of their reciprocals is 4/21, find the numbers

9. Determine two consecutive multiples of 3 whose product is 270.

10. Three consecutive positive integers are such that the sum of the square of the first and the product of other two is 46, fond the integers.

11. A number consists of two digits. The product of these digits is 14. If 45 is subtracated from the number, the digits interchange their places. Find the number.

12. A two digit number is four times the sum and three times the product of its digits.

13. In a two digit number, the ten's digit is bigger. The product of the digits is 27 and the difference between two digits is 6. Find the number.

14. A two digit number is made of two consccutive digits such that the sum of their squares is 4 less

than the number. Find the two digit number.

15. In a certain positive fraction, the denominator is greater than the numerator by 3. If 1 subtracted from both the numerator and denominator, the fraction is decreased by $\dfrac{1}{14}$. Find the fraction.

16. The denominator of a positive fraction is one more than twice the numerator. If the sum of the fraction and its reciprocal is 2.9, find the fraction,

17. The numerator of a fraction is 4 less than

denominator. If 1 is added to both its numerator and

denominator, it becomes . Find the fraction.

18. The numerator of a fraction is 4 less than

denominator. If 1 is added to both its numerator and

denominator, it becomes . Find the fraction.

19. The sides of a right angled triangle containing the right angle are 4x cm and (2x-1) cm. If the area of the triangle is $30cm^2$ calculate the lengths of its sides.

20. The hypotenuse of a right triangle is 13 cm and the difference between the other two sides is 7cm. Find the two unknown side of the triangle.

21. The longest side of a right angled triangle is 4cm longer than one side and 2 cm longer than the other side. Find the longest side.

22. In a tringle the measure of the greatest angle is square of measure of the smallest angle and the other angle is double of the smaller angle. Find the greatest angle of the triangle.

23. The hypotenuse of a right triangle is $3\sqrt{10}cm$. If the smaller leg is tripled and the longer leg doubled, new hypotenuse will be $9\sqrt{5}cm$. How long are the legs of the triangle?

> ▶ **Watch Video Solution**

24. A square lawn has a path 2m wide around it. The area of the path is 196 sq. m. Find the length of the side of the lawn.

> ▶ **Watch Video Solution**

25. The number of seats in a row is equal to the total number of rows in a hall. The total number of seats in the hall will increase by 375, if the number of rows in the hall.

26. The area of a recangular field is $260m^2$. Had its length been 5 m less and the breadth 2m more, the field would have heen in the shape of a square. Find the perimeter of the field.

27. A chess board contains 64 equal squares and the area of each square is $6.25\ cm^2$. A border round the board is 2 cm wide. Find the length of the side of the chess board.

28. A girl is twice as old as her sister. Four years hence, the product of their ages (in years) will be 160. Find their present ages.

29. The product of Ramus age (in years) five years ago with his age (in years) years later is 15. Find Ramus present age.

30. Mrs. Mehra has two sons, one being exactly one year older than the other. At present, her age is equal to the sum of squares of ages of her sons. If 4 years hence her age becomes five times the age of the elder son then find the present ages of her sons.

31. The sum of ages of a boy and his brother is 25 years, and the product of their ages in years is 126. Find their ages.

▶ **Watch Video Solution**

32. A takes 6 days less than the time taken by B to finish a piece of work. If both A and B together can finish it in 4 days . Find the time taken by B to finish the work.

▶ **Watch Video Solution**

33. One pipe can fill a cistren in 3 hours less than the other. The two pipes together can fill the cistern in 6 hours 40 minutes. Find the time that each pipe will take to fill the cistern.

▶ **Watch Video Solution**

34. A train travels a distance of 300km at constant speed. If the speed of the train is increased by 5 km/kr, the journey would have taken 2 hours less. Find the original speed of the train.

▶ **Watch Video Solution**

35. A plane left 30 minutes late than its scheduled time and in order to reach the destination1500 km away in time, it had to increase the speed by 250 km/h from the usual speed.Find its usual speed.

36. Two trains leave a railway station at the same time. The first train travels towards west and the second train towards north. The first train travels 5 km/hr faster than the second train. If after two hours they are 50 km apart find the average speed of each train.

37. Car A travels x km for every litre of petrol, while car B travels (x+5) km for every litre of petrol. Both the cars cover a distance of 400 km each. If car A uses 4 litres of petrol more than car B in covering 400 km. Write down an equation in x and determine the number of litres of petrol used by car B for the journey.

▶ **View Text Solution**

38. The distance by road between two towns A and B, is 216km , by rail it is 208 km. If car travels at a speed of x km/h, and train travel at a speed which is 16 km/h

fastest than the car.Calculate (i) The time taken by the car, to reach town B from A, in terms of x.

39. The speed of a boat in still water is 15 km/hr. It can go 30 km upstream and return downstream to the original point in 4 hours 30 minutes. Find the speed of the stream.

40. The speed of a boat in still water is 9 km/hr. It can go 12 km upstream and 12 km downstream in 3 hours.

Find the speed of the stream.

41. Swati can row her boat at a speed of 5km/hr in still water. if it takes her 1 hour more to row the boat 5.25 km upstream than to return downstream, Find the speed of the stream.

42. A trader bought a number of articles for RS.1200. Ten were damaged and he sold each of the rest at RS. 2 more than what he paid for it, thus clearing a profit

of RS.60 on the whole transaction. Find the number of articles he bought.

43. Mohan sold an article for RS.56 which coste him RS.x. He finds that he has gained x% on his outlay. Find x.

44. A shopkeeper buys a certain number of books for RS.960 would be 4 more. Find the original cost of each book.

45. The hotel bill for a number of people for overnight stay is RS.4800. If there were 4 more people, the bill each person had to pay would have reduced by RS.200. Find the number of people staying overnight.

46. In an auditorium, seats are arranged in rows was equal to the number of seats in each row. When the number of rows was doubled and the number of seats in each row was reduced by 10, the total number of

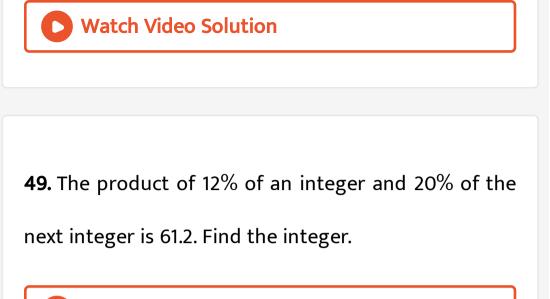seats increased by 300. Find the number of rows in original arrangement.

47. At an annual function of a school each student gives gift to every other student. If the number of gifts is 1980, find the number of students.

48. A line segment AB is 8 cm in length. AB is produced to P such that $BP^2 = AB.\,AP$, find the length of BP.

49. The product of 12% of an integer and 20% of the

next integer is 61.2. Find the integer.

50. Girl! Out of a group of swans. $\dfrac{7}{2}$ times the square

root of the number are playing on the shore of a tank.

The two remaining ones are playing, with amorous

fight, in the water. What is the total number of swans?

51. In a class test, the sum of the marks obtained by P in Mathematics and science is 28. Had he got 3 marks more in Mathematics and 4 marks less in Science. The product of his marks, would have been 180. Find his marks in the two subjects.

52. The angry Arjun carried some arrows of fighting with Bheeshm. With half the arrows, he cut down the arrows thrown by Bheeshm on him and with six other arrows he killed the rath driver (sarthi) of Bheeshm. With one arrow each he knocked down respectively

the rath, flag and the bow of Bheeshm. Finally with one more than four times the square root of arrows he laid Bheeshm uncoscious on an arrow bed. Find the total number of arrows Arjun had.

> ▶ **View Text Solution**

53. A piece of cloth costs RS.75. If the piece were 4 metre longer and each metre costs RS.5 less, the total cost would remain unchanged. How long is the piece?

> ▶ **Watch Video Solution**

54. A meeting was held in a central hall. Each person handshakess with everybody. If total number of handshakes were 66. Find the total numbre of persons in the meeting hall.

55. P & Q are centres of circles of radii 9 cm and 2cm respectively. PQ = 17 cm. R is the centre of the circle of radius x cm which touches the above externally. Given that angle, PRQ is 90. Write an equation in x and solve it.

56. There is a two-digit number whose digits are the same, and has got the following property : when squared, it produces a four-digit number, whose first two digits are the same and equal to the original's minus one, and whose last two digits are the same and equal to half of the original's. Find that number.

▶ **Watch Video Solution**

Revision Exercise Very Short Answer Questions

1. Show that x = 3 is the solution of $2x^2 - 5x - 3 = 0$

2. Show that $x = -2\sqrt{2}$ is the solution of

A. $x^2 + \sqrt{2}x - 4 = 0$

B.

C.

D.

Answer: N/A

3. If $x = -\dfrac{1}{2}$ is a solution of the quadratic equation $3x^2 + 2kx - 3 = 0$, find the velue of k.

4. Solve $(x - 2)(x + 3) = 0$.

5. Solve $8x^2 - 16x = 0$.

6. Solve $6x^2 - x - 2 = 0$.

7. If $x = 1$ is a root of $x^2 + kx + 5 = 0$,

A. $k = 5$

B. $k = 6$

C. $k = -6$

D. none of these

Answer: C

8. Show that the equation $x^2 + 5x - 6 = 0$ has real roots.

9. If the roots of the quadratic equation $2x^2 + 8x + k = 0$ are equal, find the value of k.

   A. $k = 0$

   B. $k = 4$

   C. $k = 8$

   D. $k = 2$

Answer: C

10. Find the nature of roots of the quadratic equation

$4x^2 - 5x + 3 = 0$.

11. Check whether the equation

$(x + 1)^3 = x^3 + x + 6$ is a quadratic equation or

not.

A. yes, it is a quadratic equation

B. it will be cubic equation

C. it will be a linear equation

D. none of these

Answer: A

▶ **Watch Video Solution**

12. Solve the equation $x^2 - 45x + 324 = 0$.

▶ **Watch Video Solution**

13. Find the value of k if the quadratic equation

$kx(x-2) + 6 = 0$ has two equal roots.

14. Find the value(s) of k so that, the quadratic

equation $x^2 - 4kx + k = 0$ has equal roots.

15. If one root of the quadratic equation

$3x^2 - 10x + k = 0$ is reciprocal of the other, find the

value of k.

Revision Exercise Short Answer Questions

1. Solve $4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$.

2. Solve $9x^2 - 9(a + b)x + 5ab + 2b^2 = 0$.

3. Find the value of k for which the quadratic equation $(k+4)x^2 + (k+1)x + 1 = 0$

> ▶ Watch Video Solution

4. Solve by factorization: $2x^2 + ax - a^2 = 0$

> ▶ Watch Video Solution

5. Solve $x^2 - (\sqrt{3} + 1)x + \sqrt{3} = 0.$

> ▶ Watch Video Solution

6. Solve $x^2 + 5x - (a^2 + a - 6) = 0$.

7. Solve the following quadratic equation for x.

$$x^2 - 4ax - b^2 + 4a^2 = 0$$

8. The sum of two natural number is 28 and their product in 192. Find the numbers.

9. Find the value of p for which the quadratic equation

$$(p+1)x^2 + -6(p+1)x + 3(p+q) = 0, p \neq -1$$

has equal roots. Hence, find the roots of the equation.

10. 5. Solve $12abx^2 - 9a^2x + 8b^2x - 6ab = 0$

Revision Exercise Long Answer Questions

1. Solve $\dfrac{1}{a+b+x} = \dfrac{1}{a} + \dfrac{1}{b} + \dfrac{1}{x}, a+b \neq 0$

2. Solve $5^{x+1} + 5^{2-x} = 5^3 + 1$

3. find the roots of the following equation by applying the quadratic formula

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

4. Solve each of the following quadratic equations:

$$\frac{a}{(x-b)} + \frac{b}{(x-a)} = 2, x \neq b, a$$

5. Solve for: $\dfrac{1}{2a+b+2x} = \dfrac{1}{2a} + \dfrac{1}{b} + \dfrac{1}{2x}$

6. Using quadratic formula, solve the following

equation for x: $abx^2 + (b^2 - ac)x - bc = 0$