MCQ WORKSHEET-I
QUADRATIC EQUATIONS

1. The roots of the equation $x^2 + 7x + 10 = 0$ are
(a) 2 and 5 (b) –2 and 5 (c) –2 and –5 (d) 2 and –5

2. If α, β are the roots of the quadratic equation $x^2 + x + 1 = 0$, then $\frac{1}{\alpha} + \frac{1}{\beta}$
(a) 0 (b) 1 (c) –1 (d) none of these

3. If the equation $x^2 + 4x + k = 0$ has real and distinct roots then
(a) $k < 4$ (b) $k > 4$ (c) $k \leq 4$ (d) $k \geq 4$

4. If the equation $x^2 - ax + 1 = 0$ has two distinct roots then
(a) $|a| = 2$ (b) $|a| < 2$ (c) $|a| > 2$ (d) none of these

5. If the equation $9x^2 + 6kx + 4 = 0$ has equal roots then the roots are both equal to
(a) $\pm\frac{2}{3}$ (b) $\pm\frac{3}{2}$ (c) 0 (d) ± 3

6. If the equation $(a^2 + b^2)x^2 - 2b(a + c)x + b^2 + c^2 = 0$ has equal roots then
(a) $2b = a + c$ (b) $b^2 = ac$ (c) $b = \frac{2ac}{a+c}$ (d) $b = ac$

7. If the equation $x^2 - bx + 1 = 0$ has two distinct roots then
(a) $-3 < b < 3$ (b) $-2 < b < 2$ (c) $b > 2$ (d) $b < -2$

8. If $x = 1$ is a common root of the equations $ax^2 + ax + 3 = 0$ and $x^2 + x + b = 0$ then $ab =$
(a) 6 (b) 3 (c) –3 (d) $\frac{7}{2}$

9. If p and q are the roots of the equation $x^2 - px + q = 0$, then
(a) $p = 1, q = -2$ (b) $p = -2, q = 0$ (c) $b = 0, q = 1$ (d) $p = -2, q = 1$

10. If the equation $ax^2 + bx + c = 0$ has equal roots then $c =$
(a) $\frac{-b}{2a}$ (b) $\frac{b}{2a}$ (c) $\frac{-b^2}{4a}$ (d) $\frac{b^2}{4a}$

11. If the equation $ax^2 + 2x + a = 0$ has two distinct roots if
(a) $a = \pm 1$ (b) $a = 0$ (c) $a = 0, 1$ (d) $a = -1, 0$

12. The possible value of k for which the equation $x^2 + kx + 64 = 0$ and $x^2 - 8x + k = 0$ will both have real roots, is
(a) 4 (b) 8 (c) 12 (d) 16

MCQ WORKSHEET-II
QUADRATIC EQUATIONS

1. The value of $\sqrt{6+\sqrt{6+\sqrt{6+....}}}$ is

(a) 4 (b) 3 (c) –2 (d) $\frac{7}{2}$

2. If 2 is the root of the equation $x^2 + bx + 12 = 0$ and the equation $x^2 + bx + q = 0$ has equal roots then q =

(a) 8 (b) 16 (c) –8 (d) –16

3. If the equation $(a^2 + b^2)x^2 – 2(ac + bd)x + c^2 + d^2 = 0$ has equal roots then

(a) ab = cd (b) ad = bc (c) ad = $\sqrt{bc}$ (d) ab = $\sqrt{cd}$

4. If a and b can take values 1, 2, 3, 4. Then the number of the equations of the form $ax^2 + bx + c = 0$ having real roots is

(a) 6 (b) 7 (c) 10 (d) 12

5. The number of quadratic equations having real roots and which do not change by squaring their roots is

(a) 4 (b) 3 (c) 2 (d) 1

6. If one of the roots of the quadratic equation $(k^2 + 4)x^2 + 13x + 4k$ is reciprocal of the other then k =

(a) 2 (b) 1 (c) –1 (d) – 2

7. If α, β are the roots of the quadratic equation $4x^2 + 3x + 7 = 0$, then $\frac{1}{\alpha}+\frac{1}{\beta}$

(a) $\frac{7}{3}$ (b) $\frac{-7}{3}$ (c) $\frac{3}{7}$ (d) $\frac{-3}{7}$

8. If α, β are the roots of the quadratic equation $x^2 – p(x + 1) – c = 0$, then $(\alpha+1)(\beta+1)$ =

(a) c – 1 (b) 1 – c (c) c (d) 1 + c

9. Find the values of k for which the quadratic equation $2x^2 + kx + 3 = 0$ has real equal roots.

(a) $\pm 2\sqrt{6}$ (b) $2\sqrt{6}$ (c) 0 (d) ± 2

10. Find the values of k for which the quadratic equation kx(x – 3) + 9 = 0 has real equal roots.

(a) k = 0 or k = 4 (b) k = 1 or k = 4 (c) k = –3 or k = 3 (d) k = –4 or k = 4

11. Find the values of k for which the quadratic equation $4x^2 – 3kx + 1 = 0$ has real and equal roots.

(a) $\pm\frac{4}{3}$ (b) $\pm\frac{2}{3}$ (c) ± 2 (d) none of these

12. Find the values of k for which the quadratic equation $(k – 12)x^2 + 2(k – 12)x + 2 = 0$ has real and equal roots.

(a) k = 0 or k = 14 (b) k = 12 or k = 24 (c) k = 14 or k = 12 (d) k = 1 or k = 12

MCQ WORKSHEET-III
QUADRATIC EQUATIONS

1. The value of k for which equation 9x2 + 8xk + 8 = 0 has equal roots is:
(a) only 3 (b) only –3 (c) ±3 (d) 9

2. Which of the following is not a quadratic equation?
(a) $x-\frac{3}{x}=4$ (b) $3x-\frac{5}{x}=x^2$ (c) $x+\frac{1}{x}=3$ (d) $x^2-3=4x^2-4x$

3. Which of the following is a solution of the quadratic equation $2x^2 + x – 6 = 0$?
(a) x = 2 (b) x = –12 (c) x = $\frac{3}{2}$ (d) x = –3

4. The value of k for which x = –2 is a root of the quadratic equation $kx^2 + x – 6 = 0$
(a) –1 (b) –2 (c) 2 (d) $-\frac{3}{2}$

5. The value of p so that the quadratics equation $x^2 + 5px + 16 = 0$ has no real root, is
(a) p>8 (b) p<5 (c) $\frac{-8}{5}<x<\frac{8}{5}$ (d) $\frac{-8}{5}\le x<0$

6. If $px^2 + 3w + q = 0$ has two roots x = –1 and x = –2, the value of q – p is
(a) –1 (b) –2 (c) 1 (d) 2

7. The common root of the quadratic equation $x^2 – 3x + 2 = 0$ and $2x^2 – 5x + 2 = 0$ is:
(a) x = 2 (b) x = –2 (c) x = $\frac{1}{2}$ (d) x = 1

8. If $x^2 – 5x + 1 = 0$, the value of $\left(x+\frac{1}{x}\right)$ is:
(a) –5 (b) –2 (c) 5 (d) 3

9. If a – 3 = $\frac{10}{a}$, the value of a are
(a) –5, 2 (b) 5, –2 (c) 5, 2 (d) 5, 0

10. If the roots of the quadratic equation $kx^2 + (a + b)x + ab = 0$ are (–1, –b), the value of k is:
(a) –1 (b) –2 (c) 1 (d) 2

11. The quadratic equation with real coefficient whose one root is $2+\sqrt{3}$ is:
(a) $x^2 – 2x + 1 = 0$ (b) $x^2 – 4x + 1 = 0$ (c) $x^2 – 4x + 3 = 0$ (d) $x^2 – 4x + 4 = 0$

12. If the difference of roots of the quadratic equation $x^2 + kx + 12 = 0$ is 1, the positive value of k is:
(a) –7 (b) 7 (c) 4 (d) 8

MCQ WORKSHEET-IV
QUADRATIC EQUATIONS

1. Find the values of k for which the quadratic equation $k^2x^2 - 2(k-1)x + 4 = 0$ has real and equal roots.

(a) $k = 0$ or $k = \frac{1}{3}$ (b) $k = 1$ or $k = \frac{1}{3}$ (c) $k = -1$ or $k = \frac{1}{3}$ (d) $k = -3$ or $k = \frac{1}{3}$

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

(a) p =3, q = 9 (b) p =9, q = 3 (c) $p = 3, q = \frac{4}{9}$ (d) $p = 3, q = \frac{9}{4}$

3. If the roots of the equation $(a-b)x^2 + (b-c)x + (c-a) = 0$ are equal, then b + c =

(a) 2a (b) 2bc (c) 2c (d) none of these

4. Find the positive value of k for which the equations $x^2 + kx + 64 = 0$ and $x^2 - 8x + k = 0$ will have real roots.

(a) 8 (b) 16 (c) –8 (d) –16

5. Find the positive value of k for which the equation $kx^2 - 6x - 2 = 0$ has real roots

(a) $k \le \frac{-9}{2}$ (b) $k \ge \frac{-9}{2}$ (c) $k > \frac{-9}{2}$ (d) $k < \frac{-9}{2}$

6. Find the positive value of k for which the equation $3x^2 + 2x + k = 0$ has real roots

(a) $k \ge \frac{1}{3}$ (b) $k \le \frac{1}{3}$ (c) $k > \frac{1}{3}$ (d) $k < \frac{1}{3}$

7. Find the positive value of k for which the equation $2x^2 + kx + 2 = 0$ has real roots

(a) $k \ge 4$ (b) $k \le -4$ (c) both (a) and (c) (d) none of these.

8. The sum of a number and its reciprocal is $\frac{10}{3}$. Find the number.

(a) 3 (b) $\frac{1}{3}$ (c) both (a) and (c) (d) none of these

9. Divide 12 into two parts such that the sum of their squares is 74.

(a) 7 and 5 (b) 8 and 4 (c) 10 and 2 (d) none of these

10. The sum of the squares of two consecutive natural numbers is 421. Find the numbers.

(a) 14 and 5 (b) 14 and 15 (c) 10 and 5 (d) none of these

11. The sum of two numbers is 15 and the sum of their reciprocals is $\frac{3}{10}$. Find the numbers.

(a) 14 and 5 (b) 14 and 15 (c) 10 and 5 (d) none of these

12. Divide 12 into two parts such that their product is 32.

(a) 7 and 5 (b) 8 and 4 (c) 10 and 2 (d) none of these

PRACTICE QUESTIONS
QUADRATIC EQUATIONS
FACTORISATION METHOD

Solve the following quadratic equations:

1. $x^2 + 11x + 30 = 0$

2. $x^2 + 18x + 32 = 0$

3. $x^2 + 7x - 18 = 0$

4. $x^2 + 5x - 6 = 0$

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

6. $x^2 - 21x + 108 = 0$

7. $x^2 - 11x - 80 = 0$

8. $x^2 - x - 156 = 0$

9. $z^2 - 32z - 105 = 0$

10. $40 + 3x - x^2 = 0$

11. $6 - x - x^2 = 0$

12. $7x^2 + 49x + 84 = 0$

13. $m^2 + 17mn - 84n^2 = 0$

14. $5x^2 + 16x + 3 = 0$

15. $6x^2 + 17x + 12 = 0$

16. $9x^2 + 18x + 8 = 0$

17. $14x^2 + 9x + 1 = 0$

18. $2x^2 + 3x - 90 = 0$

19. $2x^2 + 11x - 21 = 0$

20. $3x^2 - 14x + 8 = 0$

21. $18x^2 + 3x - 10 = 0$

22. $15x^2 + 2x - 8 = 0$

23. $6x^2 + 11x - 10 = 0$

24. $30x^2 + 7x - 15 = 0$

25. $24x^2 - 41x + 12 = 0$

26. $2x^2 - 7x - 15 = 0$

27. $6x^2 + 11x - 10 = 0$

28. $10x^2 - 9x - 7 = 0$

29. $5x^2 - 16x - 21 = 0$

30. $2x^2 - x - 21 = 0$

31. $15x^2 - x - 28 = 0$

32. $8a^2 - 27ab + 9b^2 = 0$

33. $5x^2 + 33xy - 14y^2 = 0$

34. $3x^3 - x^2 - 10x = 0$

35. $x^2 + 9x + 18 = 0$

36. $x^2 + 5x - 24 = 0$

37. $x^2 - 4x - 21 = 0$

38. $6x^2 + 7x - 3 = 0$

39. $2x^2 - 7x - 39 = 0$

40. $9x^2 - 22x + 8 = 0$

41. $6x^2 + 40 = 31x$

42. $36x^2 - 12ax + (a^2 - b^2) = 0$

43. $8x^2 - 22x - 21 = 0$

44. $2x^2 - x + \frac{1}{8} = 0$

45. $4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$

Solve the following by Factorisation method:

1. $\sqrt{2}x^2+7x+5\sqrt{2}=0$
2. $2x-\frac{3}{x}=1$
3. $\frac{4}{x}-3=\frac{5}{2x+3}, x\neq 0,\frac{-3}{2}$
4. $\frac{x}{x+1}+\frac{x+1}{x}=\frac{34}{15},\ x\neq -1$ and $x\neq 0$
5. $\frac{x+3}{x+2}=\frac{3x-7}{2x-3}$
6. $\frac{x-1}{x-2}+\frac{x-3}{x-4}=3\frac{1}{3}(x\neq 2,4)$
7. $\frac{1}{a+b+x}=\frac{1}{a}+\frac{1}{b}+\frac{1}{x},[x\neq 0,-(a+b)]$
8. $2\left(\frac{2x-1}{x+3}\right)-3\left(\frac{x+3}{2x-1}\right)=5, x\neq -3,\frac{1}{2}$
9. $5^{(x+1)}+5^{(2-x)}=5^3+1$
10. $5x-\frac{35}{x}=18, x\neq 0$
11. $2^{2x}-3.2^{(x+2)}+32=0$
12. $4^{(x+1)}+4^{(1-x)}=10$
13. $3^{(x+2)}+3^{-x}=10$
14. $10x-\frac{1}{x}=3$
15. $\frac{2}{x^2}-\frac{5}{x}+2=0$
16. $\sqrt{3}x^2+11x+6\sqrt{3}=0$
17. $4\sqrt{3}x^2+5x-2\sqrt{3}=0$
18. $3\sqrt{7}x^2+4x-\sqrt{7}=0$
19. $\sqrt{7}x^2-6x-13\sqrt{7}=0$
20. $4\sqrt{6}x^2-13x-2\sqrt{6}=0$

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

22. $\left(\frac{4x-3}{2x+1}\right)-10\left(\frac{2x+1}{4x-3}\right)=3,\left(x\neq\frac{-1}{2},\frac{3}{4}\right)$

23. $\left(\frac{x}{x+1}\right)^2-5\left(\frac{x}{x+1}\right)+6=0,(x\neq-1)$

24. $2\left(\frac{2x-1}{x+3}\right)-3\left(\frac{x+3}{2x-1}\right)=5,\left(x\neq-3,\frac{1}{2}\right)$

25. $2\left(\frac{x-1}{x+3}\right)-7\left(\frac{x+3}{x-1}\right)=5,(x\neq-3,1)$

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

27. $\frac{a}{ax-1}+\frac{b}{bx-1}=a+b,\left(x\neq\frac{1}{a},\frac{1}{b}\right)$

28. $\frac{x+3}{x-2}-\frac{1-x}{x}=\frac{17}{4},(x\neq0,2)$

29. $\frac{2x}{x-4}+\frac{2x-5}{x-3}=\frac{25}{3},(x\neq4,3)$

30. $\frac{1}{x-3}-\frac{1}{x+5}=\frac{1}{6},(x\neq3,-5)$

31. $\frac{1}{x-2}+\frac{2}{x-1}=\frac{6}{x},(x\neq2,1)$

32. $\frac{1}{x+4}-\frac{1}{x-7}=\frac{11}{30},(x\neq-4,7)$

33. $\frac{1}{x-2}+\frac{1}{x-4}=\frac{4}{3},(x\neq2,4)$

34. $\frac{x-3}{x+3}-\frac{x+3}{x-3}=6\frac{6}{7},(x\neq-3,3)$

35. $\frac{2x}{x-3}+\frac{1}{2x+3}+\frac{3x+9}{(x-3)(2x+3)}=0$

36. $x=\frac{1}{2-\frac{1}{2-\frac{1}{2-x}}},x\neq2$

37. $4x^2-2(a^2+b^2)x+a^2b^2=0$

38. $9x^2-9(a+b)x+(2a^2+5ab+2b^2)=0$

39. $4x^2-4a^2x+(a^4-b^4)=0$

40. $x^2+\left(\frac{a+b}{a}+\frac{a}{a+b}\right)x+1=0$

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

42. $x^2+3x-(a^2+a-2)=0$

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

44. $x+\frac{1}{x}=25\frac{1}{25}$

45. $(x-3)(x-4)=\frac{34}{(33)^2}$

46. $x^2+\left(a+\frac{1}{a}\right)x+1=0$

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

48. $7x+\frac{3}{x}=35\frac{3}{5}$

49. $\frac{x-a}{x-b}+\frac{x-b}{x-a}=\frac{a}{b}+\frac{b}{a}$

50. $(x-5)(x-6)=\frac{25}{(24)^2}$

PRACTICE QUESTIONS
QUADRATIC EQUATIONS
METHOD OF COMPLETING THE SQUARE

Solve the following quadratic equation (if they exist) by the method of completing the square:

1. $8x^2 - 22x - 21 = 0$
2. $2x^2 - x + \frac{1}{8} = 0$
3. $4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$
4. $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$
5. $9x^2 - 15x + 6 = 0$
6. $2x^2 - 5x + 3 = 0$
7. $4x^2 + 3x + 5 = 0$
8. $5x^2 - 6x - 2 = 0$
9. $4x^2 + 4bx - (a^2 - b^2) = 0$
10. $a^2x^2 - 3abx + 2b^2 = 0$
11. $x^2 - (\sqrt{3} + 1)x + \sqrt{3} = 0$
12. $x^2 - 4ax + 4a^2 - b^2 = 0$
13. $x^2 - (\sqrt{2} + 1)x + \sqrt{2} = 0$
14. $\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$
15. $\sqrt{2}x^2 - 3x - 2\sqrt{2} = 0$
16. $4x^2 + 4\sqrt{3}x + 3 = 0$
17. $2x^2 + x + 4 = 0$
18. $2x^2 + x - 4 = 0$
19. $3x^2 + 11x + 10 = 0$
20. $2x^2 - 7x + 3 = 0$
21. $5x^2 - 19x + 17 = 0$
22. $2x^2 + x - 6 = 0$
23. $2x^2 - 9x + 7 = 0$
24. $6x^2 + 7x - 10 = 0$
25. $x^2 - 4\sqrt{2}x + 6 = 0$

PRACTICE QUESTIONS
QUADRATIC EQUATIONS
METHOD OF QUADRATIC FORMULA

Show that each of the following equations has real roots, and solve each by using the quadratic formula:

1. $9x^2+7x-2=0$

2. $x^2+6x+6=0$

3. $2x^2+5\sqrt{3}x+6=0$

4. $36x^2-12ax+(a^2-b^2)=0$

5. $a^2b^2x^2-(4b^4-3a^4)x-12a^2b^2=0$

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

7. $4x^2-2(a^2+b^2)x+a^2b^2=0$

8. $9x^2-9(a+b)x+(2a^2+5ab+2b^2)=0$

9. $4x^2-4a^2x+(a^4-b^4)=0$

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

11. $4\sqrt{3}x^2+5x-2\sqrt{3}=0$

12. $3\sqrt{7}x^2+4x-\sqrt{7}=0$

13. $\sqrt{7}x^2-6x-13\sqrt{7}=0$

14. $4\sqrt{6}x^2-13x-2\sqrt{6}=0$

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

16. $2x^2+5\sqrt{3}x+6=0$

17. $x^2-2x+1=0$

18. $3x^2+2\sqrt{5}x-5=0$

19. $3a^2x^2+8abx+4b^2=0, a\neq 0$

20. $2x^2-2\sqrt{6}x+3=0$

21. $3x^2-2x+2=0$

22. $\sqrt{3}x^2+10x-8\sqrt{3}=0$

23. $x^2+x+2=0$

24. $16x^2=24x+1$

25. $25x^2+20x+7=0$

26. $6x^2+x-2=0$

27. $x^2+5x+5=0$

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

29. $abx^2+(b^2-ac)x-bc=0$

30. $x^2-2ax+(a^2-b^2)=0$

31. $12abx^2-(9a^2-8b^2)x-6ab=0$

32. $24x^2 - 41x + 12 = 0$

33. $2x^2 - 7x - 15 = 0$

34. $6x^2 + 11x - 10 = 0$

35. $10x^2 - 9x - 7 = 0$

36. $x^2 - x - 156 = 0$

37. $z^2 - 32z - 105 = 0$

38. $40 + 3x - x^2 = 0$

39. $6 - x - x^2 = 0$

40. $7x^2 + 49x + 84 = 0$

PRACTICE QUESTIONS
QUADRATIC EQUATIONS
NATURE OF ROOTS

1. Find the value of k for which the quadratic equation $2x^2 + kx + 3 = 0$ has two real equal roots.

2. Find the value of k for which the quadratic equation $kx(x - 3) + 9 = 0$ has two real equal roots.

3. Find the value of k for which the quadratic equation $4x^2 - 3kx + 1 = 0$ has two real equal roots..

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

5. If -5 is a root of the equation $2x^2 + px - 15 = 0$ and the equation $p(x^2 + x) + k = 0$ has equal roots, find the value of k.

6. Find the value of k for which the quadratic equation $(k - 12)x^2 + 2(k - 12)x + 2 = 0$ has two real equal roots..

7. Find the value of k for which the quadratic equation $k^2x^2 - 2(k - 1)x + 4 = 0$ has two real equal roots..

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

9. Prove that both the roots of the equation $(x - a)(x - b) + (x - b)(x - c) + (x - c)(x - a) = 0$ are real but they are equal only when $a = b = c$.

10. Find the positive value of k for which the equation $x^2 + kx + 64 = 0$ and $x^2 - 8x + k = 0$ will have real roots.

11. Find the value of k for which the quadratic equation $kx^2 - 6x - 2 = 0$ has two real roots.

12. Find the value of k for which the quadratic equation $3x^2 + 2x + k = 0$ has two real roots.

13. Find the value of k for which the quadratic equation $2x^2 + kx + 2 = 0$ has two real roots.

14. Show that the equation $3x^2 + 7x + 8 = 0$ is not true for any real value of x.

15. Show that the equation $2(a^2 + b^2)x^2 + 2(a + b)x + 1 = 0$ has no real roots, when $a \neq b$.

16. Find the value of k for which the quadratic equation $kx^2 + 2x + 1 = 0$ has two real and distinct roots.

17. Find the value of p for which the quadratic equation $2x^2 + px + 8 = 0$ has two real and distinct roots.

18. If the equation $(1 + m^2)x^2 + 2mcx + (c^2 - a^2) = 0$ has equal roots, prove that $c^2 = a^2(1 + m^2)$.

19. If the roots of the equation $(c^2 - ab)x^2 - 2(a^2 - bc)x + (b^2 - ac) = 0$ are real and equal, show that either $a = 0$ or $(a^3 + b^3 + c^3) = 3abc$.

20. Find the value of k for which the quadratic equation $9x^2 + 8kx + 16 = 0$ has two real equal roots.

21. Find the value of k for which the quadratic equation $(k + 4)x^2 + (k+1)x + 1 = 0$ has two real equal roots.

22. Prove that the equation $x^2(a^2 + b^2) + 2x(ac + bd) + (c^2 + d^2) = 0$ has no real root, if $ad \neq bc$.

23. If the roots of the equation $x^2 + 2cx + ab = 0$ are real unequal, prove that the equation $x^2 - 2(a + b) + a^2 + b^2 + 2c^2 = 0$ has no real roots.

24. Find 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.

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

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

27. Find the value of k for which the quadratic equation $k^2x^2 - 2(2k - 1)x + 4 = 0$ has real and equal roots.

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

29. Find the value of k for which the quadratic equation $(4 - k)x^2 + (2k + 4)x + (8k + 1) = 0$ has real and equal roots.

30. Find the value of k for which the quadratic equation $(2k + 1)x^2 + 2(k + 3)x + (k + 5) = 0$ has real and equal roots.