



MATHS

BOOKS - KUMAR PRAKASHAN

QUADRATIC EQUATIONS

Textual Examples

1. (A) 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.

(2) A cottage industry produces a certain number of toys in a day. The cost of production of each toy (in rupee) was found to be 55 minus the number of toys produced in a day. On a particular day, the total cost of production was Rs.750. We would like to find out the number of toys produced on that day.



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2. Check whether the following are quadratic equations :

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

$$(2) x(x + 1) = 8 = (x + 2)(x - 2)$$

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

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



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3. Find the roots of the equation

$$2x^2 - 5x + 3 = 0, \text{ by factorisation.}$$





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4. Find the roots of the quadratic equation

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



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5. Find the roots of the quadratic equation

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



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6. Find the dimensions of the prayer hall whose carpet area is 300 square metres and whose length is 1 metre more than twice its breadth.



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7. Solve the equation $2x^2 - 5x + 3 = 0$ by the method of completing the square.



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8. Find the roots of the eq $5x^2 - 6x - 2 = 0$ by the method of completing the square.



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9. Find the roots of $4x^2 + 3x + 5 = 0$ by the method of completing the square.



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10. The area of a rectangular plot is $528m^2$. The length of the plot (in metres) is one more than twice its breadth. Find the length and breadth of the plot by using the quadratic formula.



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11. The sum of the squares of two consecutive odd positive integers is 290. Find those integers.





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12. A rectangular park is to be designed whose breadth is 3m less than its length. Its area is to be 4 square metres more than the area of a park that has already been made in the shape of an isosceles triangle with its base as the breadth of the rectangular park and of altitude 12m (see the given figure). Find its length and breadth.



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13. Find the roots of the following quadratic equations, if they exist, using the quadratic formula: (1) $3x^2 - 5x + 2 = 0$



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14. Find the roots of the following equations:

(1) $x + \frac{1}{x} = 3, x \neq 0$

(2) $\frac{1}{x} - \frac{1}{x-2} = 3, x \neq 0, 2$



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15. A motorboat whose speed is 18km/h in still water takes 1 hour more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream.



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16. Find the discriminant of the quadratic equation $2x^2 - 4x + 3 = 0$, and hence find the nature of its roots.



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17. A pole has to be erected at a point on the boundary of a circular park of diameter 13 metres in such a way that the differences of its distances from two diametrically opposite fixed gates A and B on the boundary is 7 metres. Is it possible to do so ? If yes, at what distances from the two gates should the pole be erected?



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18. Find the discriminant of the equation $3x^2 - 2x + \frac{1}{3} = 0$ and hence find the nature of its roots. Find them, if they are real.



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Other Important Examples

1. Check whether the following are quadratic equations :

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

$$(2) x^2 + 7x - 3 = (x + 8)^2$$



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

(1) The sum of a non-zero integer and its reciprocal is $\frac{17}{4}$. We need to find that number.

(2) The sum of areas of two squares is 514cm^2 and their perimeters differ by 8 cm. We need to find the side of both the squares.



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3. Find the roots of the following quadratic equations by factorisation:

$$(1) 3x^2 - 13x - 30 = 0$$

$$(2) x^2 - \frac{3}{2}x + \frac{9}{16} = 0$$

$$(3) x^2 - 4\sqrt{3}x - 15 = 0$$

$$(3) \sqrt{3}x^2 - 7x - 6\sqrt{3} = 0$$



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4. Had Arya scored 10 more marks in her mathematics test out of 30 marks. 9 times these marks would have been the square of her actual marks. How many marks did she score in the test ? (No negative marking system in the test.)



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5. At t minutes past 2 pm, the time needed by the minute hand to show 3 pm was found to

be 3 minutes less than $\frac{t^2}{4}$ minutes. Find t.



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6. Solve by the method of completing the square:

$$(1) 9x^2 - 15x + 6 = 0$$

$$(2) 5x^2 - 6x - 2 = 0$$



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7. Find the roots of the following quadratic equations, if they exist, using the quadratic formula:

$$(1) \frac{1}{3}x^2 - \sqrt{11}x + 1 = 0$$

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



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8. solve for x :

$$(1) x^2 + \frac{1}{x^2} = \frac{17}{4}$$

$$(2) \frac{x+1}{x} + \frac{x}{x+1} = \frac{25}{12}$$

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



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



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10. If Zeba was younger by 5 years than what she really is, then the square of her age (in years) would have been 11 more than five times her actual age. What is her age now?



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11. Find the values of k for which the following quadratic equation has real and equal roots:

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



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12. If the roots of the equation

$$(a^2 + b^2)x^2 - 2(ac + bd)x + (c^2 + d^2) = 0$$

are equal, prove that $\frac{a}{b} = \frac{c}{d}$



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13. Is it possible that a rectangular plot of land has perimeter 360 m and area $8500m^2$. If yes, find its sides.



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Excercise 4 1

1. Check whether the following are quadratic equations :

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

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

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

$$(4) (x - 3)(2x + 1) = x(x + 5)$$

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

$$(6) x^2 + 3x + 1 = (x - 2)^2$$

$$(7) (x + 2)^3 = 2x(x^2 - 1)$$

$$(8) x^3 - 4x^2 - x + 1 = (x - 2)^3$$



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

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

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

(3) Rohan's mother is 26 years older 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.

(4) A train travels a distance of 480 km at a uniform speed. If the speed had been 8km/h less, it would have taken 3 hours more to cover the same distance. We need to find the speed of the train.



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Excercise 4 2

1. Find the roots of the following quadratic equations by factorisation :

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

$$(2) 2x^2 + x - 6 = 0$$

$$(3) \sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$$

$$(4) 2X^2 - X + \frac{1}{8} = 0$$

$$(5) 100x^2 - 20x + 1 = 0$$



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2. (A) 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.

(2) A cottage industry produces a certain number of toys in a day. The cost of production of each toy (in rupee) was found to be 55 minus the number of toys produced in a day. On a particular day, the total cost of production was Rs.750. We would like to find out the number of toys produced on that day.



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



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4. Find two consecutive positive integers, sum of whose squares is 365.



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



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6. A cottage industry produces a certain number of pottery articles in a day. It was observed on a particular day that the cost of production of each article (in rupees) was 3 more than twice the number of articles produced on that day. If the total cost of

production on that day was Rs. 90. find the number of articles produced and the cost of each article.



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Excercise 4 3

1. Find the roots of the following equations :

$$(1) x - \frac{1}{x} = 3, x \neq 0$$

$$(2) \frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}, x \neq -4, 7$$



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



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3. In a class test, the sum of Shefali's marks in Mathematics and English is 30. Has she got 2 marks more in Mathematics and 3 marks less in English, the product of those marks would

have been 210. Find her marks in the two subjects.



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4. 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.



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5. Sum of the areas of two squares is $468m^2$. If the difference of their perimeter is $24m$, find the sides of the two squares.



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Excercise 4 4

1. Find the nature of the roots of the following quadratic equations. If the real roots exists, find them :

$$(1) 2x^2 - 3x + 5 = 0$$

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

$$(3) 2x^2 - 6x + 3 = 0$$



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2. Find the values of k for each of the following quadratic equations, so that they have two equal roots :

$$(1) 2x^2 + kx + 3 = 0$$

$$(2) kx(x - 2) + 6 = 0$$



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3. Is it possible to design a rectangular mango grove whose length is twice its breadth, and the area is $800m^2$? If so, find its length and breadth.



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4. Is it following situation possible? If so, determine their present ages.

The sum of the ages of two friends is 20 years.

Four years ago, the product of their ages in years was 48.



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5. Is it possible to design a rectangular park of perimeter 80 m and area $400m^2$? If so, find its length and breadth.



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[Test Your Skills](#)

1. Check whether the following are quadratic equations :

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

$$(2) (2x - 3)(8x + 1) = (4x + 5)(4x - 5)$$

$$(3) (5x + 3)(x - 2) = (4x + 3)(2x - 1)$$

$$(4) (2x + 5)^3 = 8(x - 1)^3$$

$$(5) x^2 + 7x - 8 = x(x + 5)$$

$$(6) x^3 + 9x^2 - 7x + 2 = (x + 3)^3$$



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2. Represent the following situations in the form of quadratic equations : (1) The length of the hypotenuse of an isosceles right angled triangle is 10 cm. We need to find the length of each of two equal sides.

(2) The sum of squares of two consecutive odd positive integers is 970. We need to find those integers.

(3) While selling an article for Rs. 96, the profit in percentage is equal to its cost price in rupees. We need to find the cost price of the article.

(4) When there is a decrease of 10 km/h in the usual speed of a train, it takes $4\frac{1}{2}$ hours more to cover 900km. We need to find the usual speed of the train.

(5) The sum of squares of two parts of 31 is 481. We need to find those two parts.



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3. The sum of the squares of two positive numbers is 233 and one number is 3 less than twice the other number. Find the numbers.



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4. Find three consecutive integers such that the square of the first increased by the product of the other two gives 154.



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5. A two digit number such that the product of the digits is 20. If 9 is subtracted from the number, the digits interchange their places. Find the number.



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6. A alone takes 6 days less than the number of days taken by B alone to finish a job. If both A and B together can finish the job in 4 days . Find the time taken by B alone to finish the job.



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



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8. Find the roots of the following quadratic equations (if they exist) by the method of completing the square: (1)

$$2x^2 + x - 4 = 0 \quad (2)6x^2 + 18x + 10 = 0$$

(3)

$$x^2 + 5x + 7 = 0$$

$$(4) x^2 + 3\sqrt{3}x - 12 = 0$$



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9. Using quadratic formula, solve the following quadratic equations :

$$(1) abx^2 + (b^2 - ac)x - bc = 0$$

$$(2) x + \frac{1}{x} = 7, x \neq 0$$

$$(3) \sqrt{3}x^2 + 10x - 8\sqrt{3} = 0$$

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



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10. Solve the following for x : $x^2 + \frac{1}{x^2} = \frac{82}{9}$

(2) $x^2 + \frac{1}{x^2} + x - \frac{1}{x} - 14 = 0$



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



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



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13. The area of an isosceles triangle is 60cm^2 and the length of each one of its equal sides is 13 cm. Find its base.



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14. Two pipes running together can fill a tank in $11\frac{1}{9}$ minutes. If one pipe takes 5 minutes more than the other to fill the tank separately, find the time in which each pipe would fill the tank separately.



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15. A shopkeeper buys a number of books for Rs. 80, If he had bought 4 more books for the same amount, each book would have cost Rs 1 less. How many books did he buy?



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16. For the equation $px^2 + 4\sqrt{3}x + 3 = 0$,

find the value of p , so that

(1) the roots are real

(2) the roots are not real

(3) the roots are equal.



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17. Determine k so that the equation $x^2 - 3kx + 64 = 0$ has no real roots.



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18. The hypotenuse of a right triangle is $3\sqrt{10}$ cm. If the smaller leg is tripled and the longer leg is doubled, new hypotenuse will be $9\sqrt{5}$ cm. Is it possible to draw such a triangle? If yes, how long are the legs of the triangle?



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19. 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.



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