



# MATHS

## NCERT - NCERT

### MATHEMATICS(ENGLISH)

#### QUADRATIC EQUATIONS

#### Exercise 4 3

1. Find the roots of the following quadratic equations, if they exist, by the method of

completing the square:

$$(i) 2x^2 - 7x + 3 = 0$$

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

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

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



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2. Find the roots of the quadratic equations by applying the quadratic formula.

$$(i) 2x^2 - 7x + 3 = 0$$

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

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

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



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**3.** Find the roots of the following equations :

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

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



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

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



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



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7. 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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8. A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.





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9. Two water taps together can fill a tank in  $9\frac{3}{8}$  hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.



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10. Sum of the areas of two squares is  $468\text{ m}^2$ .

If the difference of their perimeters is 24 m,

find the sides of the two squares.



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**11.** An express train takes 1 hour less than a passenger train to travel 132 km between Mysore and Bangalore (without taking into consideration the time they stop at intermediate stations). If the average speed of the express train is 11 km/h more than that of the passenger train, find the average speed of the two trains.





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## Exercise 4 4

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

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

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

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



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



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3. 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)

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





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4. Is it possible to design a rectangular park of perimeter 80 m and area 400 m<sup>2</sup>? If so, find its length and breadth.



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5. 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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## Exercise 4 1

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

(i) The area of a rectangular plot is  $528 \text{ m}^2$ .

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.

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

(iii) 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.

(iv) A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, then 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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2. 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)  $(2x - 1)(x - 3) = (x + 5)(x - 1)$

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

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

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



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## Solved Examples

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



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



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3. Find the roots of the quadratic equation

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



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4. Find the roots of the quadratic equation

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

A.  $-1/2, 3/2$

B.  $-1/2, 2/3$

C.  $-1/2, -2/3$



D. None of these

**Answer: B**



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5. Solve the equation given in Example 3 by the method of completing the square.



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6. Find the dimensions of the prayer hall discussed in Section 4.1.

For instance, suppose a charity trust decides to build a prayer hall having a carpet area of 300 square meters with its length one meter more than twice its breadth. What should be the length and breadth of the hall?



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7. 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.(ii) 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 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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8. Find the roots of the equation

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



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9. Check whether the following are quadratic equations :

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

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

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

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



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**10.** A rectangular park is to be designed whose breadth is 3 m 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 its altitude 12 m. Find length and breath of the rectangular park .



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

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

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

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



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**12.** Solve Question 2(i) of Exercise 1 by using the quadratic formula.

(i) The area of a rectangular plot is  $528m^2$  .

The length of the plot (in meters) is one more than twice its breadth. We need to find the length and breadth of the plot.



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**13.** Find two consecutive odd positive integers, sum of whose squares is 290.

A. 11, 13

B. 12, 14

C. 15, 18

D. None of these

**Answer:**



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



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**15.** 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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**16.** Find the roots of the following equations :

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

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



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**17.** A motor boat whose speed is 18 km/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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**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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## Exercise 4 2

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



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

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



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



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6. Find two consecutive positive integers, sum of whose squares are 365.

A. 13,14

B. 12,13

C. 14,15



D. none of these

**Answer: A**



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