



## MATHS

### BOOKS - ZEN MATHS (KANNADA ENGLISH)

## QUADRATIC EQUATIONS

#### Illustrative Examples

1. Two numbers differ by 2. The sum of their squares is

34. Find the smaller number.

A.

B.

C.

D.

**Answer:**  $x^2 + 2x - 15 = 0$  is in the form  $ax^2 + x + c = 0$ .

**Therefore it is a quadratic equation.**



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2. By selling an article for Rs. 18.75, a merchant loses as much per cent as it cost him in rupees.

A.

B.

C.

D.

**Answer:** This is in the form  $ax^2 + bx + c = 0 \therefore$  It is quadratic equation.



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**3.** The product of two consecutive odd numbers is 99.

A.

B.

C.

D.

**Answer:** This is in the form of  $ax^2 + bx + c = 0$ .  
Therefore it is a quadratic equation.



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**4.** Find the roots of the following equations by factorisation.

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

A.

B.

C.

D.

**Answer:**  $\therefore x = -4$  or  $x = -3$  are the roots.



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5. Find the roots of the following equations by factorisation.

(ii)  $x(x - 1) = 30$

A.

B.

C.

D.

**Answer:**  $x = 6$  or  $x = -5$  are the roots.



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6. Find the roots of the following equations by factorisation.

(iii)  $0.2t^2 + 0.39t = 0.02$

A.

B.

C.

D.

**Answer:**  $t = -2$  or  $t = 1/20$  are the roots.



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7. Find the roots of the following equations by factorisation.

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

A.

B.

C.

D.

**Answer:**  $x = \frac{\sqrt{2}}{\sqrt{3}}, x = \frac{\sqrt{2}}{\sqrt{3}}$  are the roots



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8. Find the roots of an equation by factorisation

$$(2x - 3) = \sqrt{2x^2 - 2x + 21}$$

A.

B.

C.

D.

**Answer:**  $x = 6$  or  $x = -1$  are the roots.



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9. Solve the quadratic equations by Completing the Square:

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

A.

B.

C.

D.

**Answer:**  $\therefore x = \frac{3 \pm \sqrt{3}}{2}$  and  $x = \frac{3 \pm \sqrt{3}}{2}$  are the roots.



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10. Solve the quadratic equation by Completing the

Square:  $4x^2 + 3x - 5 = 0$

A.

B.

C.

D.

**Answer:**  $\therefore x = \frac{-3 + \sqrt{89}}{8}$  and  $x = \frac{-3 - \sqrt{89}}{8}$

are the roots.



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**11. Solve the quadratic equations by Completing the Square:**

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

A.

B.

C.

D.

**Answer:**  $\therefore x = 3$  and  $x = \frac{1}{2}$  are the roots.



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**12.** Solve the quadratic equations by Completing the Square:

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

A.

B.

C.

D.

**Answer:**  $x + \frac{1}{4} = \pm \sqrt{\frac{-31}{16}}$  or  $x = \frac{\sqrt{-31}}{4}$

**This is not possible as the square root of a negative number is not real. So, root does not exist.**



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**13.** Solve the following using quadratic formula:

(i)  $2x^2 = 2x + 5$

A.

B.

C.

D.

**Answer:**  $\therefore x = \frac{1 + \sqrt{11}}{2}$  or  $x = \frac{1 - \sqrt{11}}{2}$  are the roots.



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**14.** Solve the following using quadratic formula:

(ii)  $x^2 + 7x + 12 = 0$

A.

B.

C.

D.

**Answer:**  $\therefore x = -3$  or  $x = -4$  are the roots.



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**15.** Solve the following using quadratic formula:

(iii)  $\frac{1}{2}x^2 = \sqrt{11}x - 1$

A.

B.

C.

D.

**Answer:**  $\therefore$  The roots are  $x = \sqrt{11} + 3$  or  $x = \sqrt{11} - 3$ .



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**16.** Solve the following using quadratic formula:

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

A.

B.

C.

D.

**Answer:**  $\therefore x = 1 + \sqrt{3}$  or  $x = 1 - \sqrt{3}$  are the roots.



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17. Solve the following using quadratic formula:

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

A.

B.

C.

D.

**Answer:**  $x = \frac{a}{2}$ , or  $x = -a$  are the roots



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**18.** Solve the following using quadratic formula:

(vi)  $x^2 - 8x - 7 = 0$

A.

B.

C.

D.

**Answer:**  $x = 4 + 2\sqrt{23}$  or  $x = 4 - 2\sqrt{23}$  are the roots.



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**19.** Discuss the nature of the roots of the following equations.

(i)  $2x^2 + 5x = 1$

A.

B.

C.

D.

**Answer:**  $D > 0 \therefore$  Roots are real and distinct.



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**20.** Discuss the nature of the roots of the following equations.

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

A.

B.

C.

D.

**Answer:**  $16 - 16 = 0$

**$\therefore$  Roots are real and equal.**



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**21.** Discuss the nature of the roots of the following equations.

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

A.

B.

C.

D.

**Answer:**  $D < 0 \therefore$  There are no real roots.



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**22.** Discuss the nature of the roots of the following equations.

(iv)  $2x^2 - 9x + 8 = 0$

A.

B.

C.

D.

**Answer:**  $D > 0 \therefore$  The roots are real and distinct.



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**23.** Discuss the nature of the roots of the following equations.

(v)  $x^2 + 7x + 12 = 0$

A.

B.

C.

D.

**Answer:**  $D > 0 \therefore$  The roots are real and distinct.



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**24.** Discuss the nature of the roots of the following equations.

(vi)  $4x^2 - 12x + 9 = 0$

A.

B.

C.

D.

**Answer:**  $D = 0 \therefore$  The roots are equal.



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**25.** Find the value of  $m$  or  $p$  in the following quadratic equations, which have equal roots.

(i)  $2x^2 + 3x + m = 0$

A.

B.

C.

D.

**Answer:**  $m = \frac{9}{8}$



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**26.** Find the value of  $m$  or  $p$  in the following quadratic equations, which have equal roots.

(ii)  $px^2 - 12x + 9 = 0$

A.

B.

C.

D.

**Answer:**  $p = \frac{144}{36} = 4$



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**27.** Find the value of  $m$  or  $p$  in the following quadratic equations, which have equal roots.

(iii)  $x^2 + (m + 3)x + (m + 2) = 0$

A.

B.

C.

D.

**Answer:**  $m = -1$



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**28.** Find the value of  $m$  or  $p$  in the following quadratic equations, which have equal roots.

(iv)  $px^2 + 2(p - 4)x + 2 = 0$

A.

B.

C.

D.

**Answer:**  $p = 2$



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**29.** Find the value of  $m$  or  $p$  in the following quadratic equations, which have equal roots.

$$(v) \ x^2 - (m + 1)x + m = 0$$

A.

B.

C.

D.

**Answer:**  $m = 1$



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**30.** Find the value of  $m$  or  $p$  in the following quadratic equations, which have equal roots.

(vi)  $x^2 - 2x(1 + 3m) + 7(3 + 2m) = 0$

A.

B.

C.

D.

**Answer:** The values of  $m$  are 2 and  $-\frac{10}{3}$



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## Textual Exercise 10 1

1. Check whether the following are quadratic equations :

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

A.

B.

C.

D.

**Answer:**  $x^2 + 7 = 0$ .

**Its highest degree is 2. So it is a quadratic equation.**



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2. Check whether the following are quadratic equations :

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

A.

B.

C.

D.

**Answer:**  $x^2 - 4x + 6 = 0$ .

**This is in the form  $ax^2 + bx + c = 0$ . So it is a quadratic equation.**



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3. Check whether the following are quadratic equations:

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

A.

B.

C.

D.

**Answer:**  $-3x + 1 = 0$ .

**This is not in the form  $ax^2 + bx + c = 0$ . So it is not a quadratic equation.**



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4. Check whether the following are quadratic equations :

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

A.

B.

C.

D.

**Answer:**  $x^2 - 10x - 3 = 0$ .

**This is in the form  $ax^2 + bx + c = 0$ . So it is a quadratic equation.**



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5. Check whether the following are quadratic equations :

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

A.

B.

C.

D.

**Answer:**  $x^2 - 11x - 8 = 0$

**This is in the form  $ax^2 + bx + c = 0$ . So it is a quadratic equation.**



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6. Check whether the following are quadratic equations:

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

A.

B.

C.

D.

**Answer:**  $7x - 3 = 0$

**This is not in the form  $ax^2 + bx + c = 0$ . So it is not a quadratic equation.**



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7. Check whether the following are quadratic equations :

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

A.

B.

C.

D.

**Answer:**  $-x^3 + 6x^2 + 14x + 8 = 0$ .

**This is not in the form  $ax^2 + bx + c = 0$ . So it is not a quadratic equation.**



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8. Check whether the following are quadratic equations:

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

A.

B.

C.

D.

**Answer:**  $2x^2 - 13x + 9 = 0$ .

**This is in the form  $ax^2 + bx + c = 0$ . Therefore it is a quadratic equation.**



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

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.

A.

B.

C.

D.

**Answer:**  $2x^2 + x - 528 = 0$ .

**This is the required quadratic equation.**



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

The product of two consecutive positive integers is 306. We need to find the Integers.

A.

B.

C.

D.

**Answer:**  $x^2 + x - 306 = 0$ .

**This is the required quadratic equation.**





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**11.** Represent the following situations in the form of quadratic equations :

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.

A.

B.

C.

D.

**Answer:**  $x^2 + 32x - 273 = 0$ .

**This is the quadratic equation required to find the present age of Rohan.**



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**12.** Represent the following situations in the form of quadratic equations :

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.

A.

B.

C.

D.

**Answer:**  $x^2 - 8x - 1280 = 0$

**This is the quadratic equation required to find the speed of the train.**



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## Textual Exercise 10 2

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

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

A.

B.

C.

D.

**Answer:**  $x = 5$  or  $x = -2$  are the roots.



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

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

A.

B.

C.

D.

**Answer:**  $x = -2$  or  $x = \frac{3}{2}$  are the roots.



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

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

A.

B.

C.

D.

**Answer:**  $x = -\sqrt{2}$  or  $x = \frac{-5}{\sqrt{2}}$  are the roots.



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

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

A.

B.

C.

D.

**Answer:**  $x = \frac{1}{4}$  or  $x = \frac{1}{4}$  are the roots.



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

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

A.

B.

C.

D.

**Answer:**  $x = \frac{1}{10}$  or  $x = \frac{1}{10}$  are the roots.



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**6.** Solve the problems given in Example 1.

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

A.

B.



C.

D.

**Answer:**  $x = 36$  or  $x = 9$  are the roots.



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**7. Solve the problems given in Example 1.**

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

A.

B.

C.

D.

**Answer:**  $x = 30$  and  $x = 25$  are the roots.



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**8.** Find two numbers whose sum is 27 and product is 182.

A.

B.

C.

D.

**Answer:** Hence, the numbers are 13 and 14.



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

A.

B.

C.

D.

**Answer:**  $\therefore$  The two positive consecutive integers are 13 and 14.



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

A.

B.

C.

D.

**Answer:** Altitude of the triangle =  $5\text{cm}$



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11. 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 90 , find the number of articles profit and the cost of each article.

A.

B.

C.

D.

**Answer:** Hence the number of pottery articles produced is 6.

The cost of each article =  $Rs. 15$ .



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### Textual Exercise 10 3

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

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

A.

B.

C.

D.

**Answer:**  $\therefore x = \frac{3 + \sqrt{13}}{2}$  and  $x = \frac{3 - \sqrt{13}}{2}$  are the roots.



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

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

A.

B.

C.

D.

**Answer:**  $\therefore$  The roots are 2 and 1



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**3.** 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 .

A.

B.

C.

D.

**Answer:**  $\therefore$  Present age of Rehman = 7 years.





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4. 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.

A.

B.

C.

D.

**Answer:** When  $x = 12$  marks in Mathematics, marks in English  $= 30 - 12 = 18$ .

When  $x = 13$  marks in Mathematics, marks in English  $= 30 - 13 = 17$ .



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5. The diagonal of a rectangular field is 60 meters more than the shorter side. If the longer side is 30 meters more than the shorter side, find the side of the field.

A.

B.

C.

D.

**Answer:**  $\therefore$  breadth of the rectangle = 90 m.

**Length of the rectangle** =  $90 + 30 = 120$  m.



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6. The difference of squares of two number is 180. The square, of smaller number is 8 times the larger number find the two number.

A.

B.

C.

D.

**Answer:**  $\therefore$  Hence the numbers are 18 and 12  
or 18 and -12.



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7. 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.

A.

B.

C.

D.

**Answer:**  $\therefore$  The original speed of the train = 40 km/hr.



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**8.** Two water taps together can fill a tank in  $9\frac{3}{8}$  hrs.

The tap of the 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.

A.

B.

C.

D.

**Answer:**  $\therefore$  The taken by larger diameter tap to fill the tank is 15 hrs. Time taken by the smaller diameter tap is  $15 + 10 = 25$  hrs.



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**9.** 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 11km/h more than that of the passenger train , find the average speed of the two trains.

A.

B.

C.

D.

**Answer:** The average speed of passenger train = 33 km/hr.

The average speed of express train =  $33 + 11 = 44$  km/hr.



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**10.** 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.

OR

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

A.

B.

C.

D.



**Answer: Side of the first square = 18 m**

**Side of the second square =  $18 - 6 = 12$  m.**



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### Textual Exercise 10 4

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

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

A.

B.

C.

D.

**Answer:**  $D < 0 \therefore$  There are no real roots.



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

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

A.

B.

C.

D.

**Answer:**  $\therefore$  Each root is  $x = \frac{2\sqrt{3}}{3}$ .



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**3.** Find the nature of the roots of the following quadratic equations. If real roots exist, find them.

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

A.

B.

C.

D.

**Answer:**  $x = \frac{3 + \sqrt{3}}{2}$  and  $x = \frac{3 - \sqrt{3}}{2}$ .



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4. Find the value of K for each of the following quadratic equations so that they have two equal roots.

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

A.

B.

C.

D.

**Answer:** The value of  $K = \pm \sqrt{6}$ .



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5. Find the value of  $K$  for each of the following quadratic equations so that they have two equal roots.

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

A.

B.

C.

D.

**Answer:** The values of K are 0 and 6.



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6. 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.

A.

B.

C.

D.

**Answer:** Breadth =  $x = 20m$ .

$$\text{Length} = 2(x) = 2(20) = 40m.$$

$\therefore$  It is possible to design the rectangular mango grove.



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7. Is the 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.

A.

B.

C.

D.

**Answer:** This shows that there are no real roots. Therefore the given situation is not possible.



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

A.

B.

C.



D.

**Answer: breadth of the park =  $20m$**

**Length of the park =  $20\text{ m}$ .**

**$\therefore$  It is possible to design the park.**

**Since length = breadth, it will be a square park instead of rectangular.**



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**Zen Additional Questions Multiple Choice Questions  
Four Alternatives Are Suggested To Each Of The  
Following Questions Incomplete Statements Choose The  
Most Appropriate Alternative And Write The Letter Of  
The Chosen Answer In The Space Provided**

1. In the equation  $\frac{x(x-1)-(m+1)}{(x-1)(m-1)} = \frac{x}{m}$ , the roots are equal when  $m =$

A.  $\frac{1}{2}$

B.  $-\frac{1}{2}$

C. 0

D. 1

**Answer: A::B**



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2. If  $x^2 + 4ax + 3 = 0$  and  $2x^2 + 3ax - 9 = 0$  have a common root, the values of 'a' are

A.  $\pm 3$

B.  $\pm 1$

C. only 1

D.  $\pm 2$

**Answer: A::C**



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3. If  $ax^2 + bx + c = 0$  has equal roots, 'c' is equal to

A.  $\frac{-b}{2a}$

B.  $\frac{b}{2b}$

C.  $\frac{-b^2}{4a}$

D.  $\frac{b^2}{4a}$

**Answer: A::B::D**



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4. A convex polygon has 44 diagonals. Find the number of sides.

A. 10

B. 11

C. 12

D. 13

**Answer: A::B**



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5. If  $x = \sqrt{1 + \sqrt{1 + \sqrt{1 + \dots}}}$ , then

A.  $x = 1$

B.  $0 < x < 1$

C.  $x$  is infinite

D.  $1 < x < 2$

**Answer: A::B::D**



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6. A man walks 48 km in a given time. If he walks 2 km/hr faster, he finishes the journey 4 hours early. His normal rate of walking is

A. 3 km/hr

B. 4 km/hr

C. – 6 km/hr or 4 km/hr

D. 5 km/hr

**Answer: B::D**



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7. If one of the roots of the equation  $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$  is 1, the other root is

A.  $\frac{b(c - a)}{a(b - c)}$

B.  $\frac{a(b - c)}{c(a - b)}$

C.  $\frac{a(b - c)}{b(c - a)}$

D.  $\frac{c(a - b)}{a(b - c)}$

**Answer: A::B::C::D**

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8. The positive value of  $K$  for which both the equations  $x^2 + Kx + 64 = 0$  and  $x^2 - 8x + K = 0$  have real roots, is

A. 4

B. 8

C. 12

D. 16

**Answer: A::D**

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9. If the roots of the equation

$(a - b)x^2 + (b - c)x + (c - a) = 0$  are equal, then

A.  $2b = a + c$

B.  $2a = b + c$

C.  $2c = a + b$

D.  $\frac{1}{b} = \frac{1}{a} + \frac{1}{b}$

**Answer: A::B::C**



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10. If one root of  $x^2 + ax + 4 = 0$  is twice the other root, then the value of 'a' is

A.  $-3\sqrt{2}$

B.  $8\sqrt{2}$

C.  $\sqrt{2}$

D.  $-2\sqrt{2}$

**Answer: A::B::C**



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11. "The product of two consecutive positive integers is 30". This can be expressed algebraically as.

A.  $x(x + 2) = 30$

B.  $x(x - 2) = 30$

C.  $x(x - 3) = 30$

D.  $x(x + 1) = 30$

**Answer: A::C::D**



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1. If  $a = 0$  in the quadratic equation  $ax^2 + bx + 2 = 0$ , which type of equation is obtained?

A.

B.

C.

D.

**Answer:** In the quadratic equation  $ax^2 + bx + c = 0$ , if  $a = 0$  we get  $bx + c = 0$ . This is a linear equation.



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2. What is the nature of the roots of the quadratic equation if its discriminant is zero ?

A.

B.

C.

D.

**Answer:** If the value of the discriminant is 0, the roots of a quadratic equation are real and equal.



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3. Is  $(x + 1)^2 = x^2 + 4x + 4$  quadratic?

A.

B.

C.

D.

**Answer:**  $2x + 3 = 0$  is not a quadratic equation as the highest power of the variable  $x$  is not 2.



**Watch Video Solution**

**4.** Write the quadratic formula to find the roots of

$$ax^2 + bx + c = 0.$$

A.

B.

C.

D.

**Answer:**  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$



**Watch Video Solution**

5. Is  $-\sqrt{3}$  a root of the equation

$$x^2 + (\sqrt{3} + 1)x + \sqrt{3} = 0?$$

A.

B.

C.

D.

**Answer:** Since  $LHS = RHS$ ,  $-\sqrt{3}$  is a root of the given equation.



**Watch Video Solution**

**6.** Find the positive root of  $\sqrt{3x^2 + 6} = 9$ .

A.

B.

C.

D.



**Answer:**  $\therefore$  The positive root is 5.



**Watch Video Solution**

7. What are the roots of the quadratic equation

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

A.

B.

C.

D.

**Answer:**  $\therefore$  The roots are  $x = \sqrt{3}$  and  $x = \frac{-1}{\sqrt{3}}$ .



Watch Video Solution

8. If  $x = 3$  is solution of  $3x^2 + (K - 1)x + 9 = 0$ , find  $K$ .

A.

B.

C.

D.

**Answer:**  $k = -11$ .



Watch Video Solution

9. What is the value  $x + \frac{1}{x}$  for the quadratic equation  $x^2 - 2x + 1 = 0$ ?

A.

B.

C.

D.

**Answer: 2**



**Watch Video Solution**

10. Find the discriminant of the quadratic equation

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

A.

B.

C.

D.

**Answer:**  $D = 64$  is the value of the discriminant.



**Watch Video Solution**

**11.** What is the nature of the roots of the quadratic equation  $5x^2 - 2x - 3 = 0$ ?

A.

B.

C.

D.

**Answer:**  $D > 0 \therefore$  The roots are real and distinct.



**Watch Video Solution**

**12.** Which constant term is to be added to make the LHS of  $ax^2 + bx = 0$  a perfect square?

A.

B.

C.

D.

**Answer:**  $ax^2 + bx = 0$  a perfect square.



**Watch Video Solution**

**13.** If the discriminant of the equation

$6x^2 - bx + 2 = 0$  is equal to 1, find 'b'.

A.

B.

C.

D.

**Answer:**  $b = \pm 7$ .



**Watch Video Solution**

**14.** If the discriminant of  $3x^2 + 2x + a = 0$  is double the discriminant of  $x^2 - 4x + 2 = 0$ , find 'a' ?

A.

B.

C.

D.

**Answer:** The value of  $a = -1$



**Watch Video Solution**

**15.** Find  $K$  for which equation  $4x^2 + 4\sqrt{3}x + K = 0$  has equal roots.

A.

B.

C.

D.

**Answer:**  $K = 3$



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16. If the quadratic equation  $mx^2 + 2x + m = 0$  has two equal roots, find  $m$ ?

A.

B.

C.

D.

**Answer:**  $\pm 1$

[Watch Video Solution](#)

17. If the product of two consecutive integers is 306, write its quadratic representation.

A.

B.

C.

D.

**Answer:**  $x^2 + x - 306 = 0$  is the required quadratic equation.



**Watch Video Solution**

**18.** Write the quadratic equation which has 5 as the product of its two roots.

A.

B.

C.

D.

**Answer:**  $x^2 - 6x + 5 = 0$ .



**Watch Video Solution**

**19.** Find the value of the discriminant of the quadratic equation  $2x^2 - 4x + 3 = 0$

A.

B.

C.

D.

**Answer:**  $-8$



**Watch Video Solution**

20. Write,  $(x+1)/2 = (1/x)$  in the standard form of a quadratic equation.

A.

B.

C.

D.

**Answer: 0**



**Watch Video Solution**

1. Solve the following quadratic equation by factorisation.  $12abx^2 - (9a^2 - 8b^2)x - 6ab = 0$ .

A.

B.

C.

D.

**Answer:**  $\therefore x = \frac{3a}{4b}$  or  $x = \frac{-2b}{3a}$ .



**Watch Video Solution**

2. Solve the equation  $10ax^2 + 15ax - 6x - 9 = 0$ ,

where  $a \neq 0$ .

A.

B.

C.

D.

**Answer:**  $x = \frac{-3}{2}$  or  $x = \frac{3}{5a}$



**Watch Video Solution**

3. Solve the following quadratic for x:

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

A.

B.

C.

D.

**Answer:**  $x = \frac{a^2 - b^2}{2}$  or  $x = \frac{a^2 + b^2}{2}$



**Watch Video Solution**

4. Solve for 'x':  $\sqrt{6x + 7} - (2x - 7) = 0$ .



A.

B.

C.

D.

**Answer:**  $x = 7$  or  $x = 3/2$ .



**Watch Video Solution**

5. Solve for  $x$ :  $\frac{14}{x+3} - 1 = \frac{5}{x+1}, x \neq 3, x \neq -1$

A.

B.

C.

D.

**Answer:**  $x = \frac{5 \pm \sqrt{-47}}{2}$



**View Text Solution**

**6. Solve by using the formula method:**

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

(ii)  $\frac{x-1}{x-2} + \frac{x-3}{x-4} = 3\frac{1}{3}, x \neq 2 \quad x \neq 4$

A.

B.

C.

D.

Answer:  $\frac{-b}{a}$



Watch Video Solution

7. Solve by using the formula method:

(ii)  $\frac{x-1}{x-2} + \frac{x-3}{x-4} = 3\frac{1}{3}, x \neq 2 \quad x \neq 4$

A.

B.

C.

D.

Answer:  $\frac{5}{2}$



Watch Video Solution

8. Solve the following by the quadratic formula:

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

A.

B.

C.

D.

**Answer:**  $x = (a - b)^2$  or  $(a - b)^2$ .



**Watch Video Solution**

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

A.

B.

C.

D.

**Answer:**  $x = \frac{2}{\sqrt{3}}$  or  $x = -4\sqrt{3}$ .



**Watch Video Solution**

**10.** What constant should be added and subtracted to solve the quadratic equation  $9x^2 + \frac{3}{2}x - \sqrt{2} = 0$  using the method of completing the square?

A.

B.

C.

D.

**Answer:**  $\frac{1}{50}$  is to be added on both sides.



**Watch Video Solution**

11. Find the nature of the roots of the quadratic equation  $\sqrt{2}x^2 - \frac{3}{\sqrt{2}}x + \frac{1}{\sqrt{2}} = 0$ .

A.

B.

C.

D.

**Answer:**  $\frac{1}{2} > 0$

$\therefore$  The roots are real and distinct.



**Watch Video Solution**

12. Write the condition to be satisfied for the equation  $ax^2 + 2bx + c = 0$  and  $bx^2 - 2\sqrt{ac}x + b = 0$  to have equal roots.

A.

B.

C.

D.

**Answer:**  $\therefore$  Condition is  $b^2 = ac$ .



**Watch Video Solution**



13. If the equation  $ax^2 + bx + c = 0$  has equal roots, find  $c$  in terms of 'a' and 'b'.

A.

B.

C.

D.

Answer:  $\frac{b^2}{4a}$ .



Watch Video Solution

14. For what value of  $K$  does  $4x^2 - 2(K + 1)x + (K + 1) = 0$  have real and equal roots ?

A.

B.

C.

D.

**Answer:**  $\therefore$  The value of  $K = 3$  or  $K = -1$ .



**Watch Video Solution**

15. If 2 is the root of the quadratic equation  $3x^2 + px - 8 = 0$  and  $4x^2 - 2px + K = 0$  has equal roots, find the value of K.

A.

B.

C.

D.

**Answer: 25**



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

A.

B.

C.

D.

**Answer:**  $\therefore$  when  $a \neq b, D < 0 \rightarrow$  it has no real roots.



**Watch Video Solution**

17. Determine the condition for the roots of the equation  $ax^2 + bx + c = 0$  to differ by 2.

A.

B.

C.

D.

**Answer:**  $4a^2$



**Watch Video Solution**

18. If  $\frac{1}{2}$  is a root of the equation  $x^2 + Kx - \frac{5}{4} = 0$ , find the value of K.

A.

B.

C.

D.

**Answer: 2**



**Watch Video Solution**

**19.** Find two consecutive odd numbers whose product is 99.

A.

B.

C.

D.

**Answer: 11**



**Watch Video Solution**

**20.** The difference of two natural numbers is 3 and the difference of their reciprocals is  $\frac{3}{28}$ . Find the numbers.

A.

B.

C.

D.

**Answer:** The number are 7 and 4



**Watch Video Solution**

**21.** Sum of a number and its reciprocal is  $5\frac{1}{5}$ . Find the number.

A.

B.

C.



D.

**Answer:**  $x = 5$  or  $x = \frac{1}{5}$



**Watch Video Solution**

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

A.

B.

C.

D.

**Answer:**  $\therefore$  The number is 12



**Watch Video Solution**

**23.** A two-digit number is 4 times sum of its digits. It is also equal to 3 times the product of its digits. Find the number.

A.

B.

C.

D.

**Answer: 24**



**Watch Video Solution**

**24.** One day I asked the son of my close friend about his age. The child replied in a different way. He said: "One year ago my dad was 8 times as old as me, and now his age (in years) is equal to the square of my age." Represent the above situation by a quadratic equation.

A.

B.

C.

D.

**Answer:**  $x^2 - 8x + 7 = 0$ , which is the required quadratic equation.



**Watch Video Solution**

**25.** Solve  $2x^2 - 5x + 3 = 0$  by using formula.

A.

B.

C.

D.

**Answer:**  $x = \frac{3}{2}x = 1$



**Watch Video Solution**

**26.** Solve the equation  $x^2 - 3x - 10 = 0$  by using formula.

A.

B.

C.

D.

**Answer:**  $x = 5 \quad x = -2$



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27. The length of a rectangular field is 3 times its breadth. If the area of the field is 147 sq.m, find its length and breadth.

A.

B.

C.

D.

**Answer: 21cm**

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**28.** Find the discriminant of the equation  $2x^2 - 5x + 3 = 0$  and hence write the nature of the roots.

A.

B.

C.

D.

**Answer:**  $D > 0$ , roots are real and distinct.



**Watch Video Solution**

## Zen Additional Questions Short Answer Sa Type 2 Questions

1. Solve for 'x' :

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

A.

B.

C.

D.

**Answer:**  $-a$



**Watch Video Solution**



2. If  $(x^2 + y^2)(a^2 + b^2) = (ax + by)^2$ , prove that

$$\frac{x}{a} = \frac{y}{b}.$$

A.

B.

C.

D.

**Answer:**  $\frac{x}{a}$



**Watch Video Solution**

3. If 1 is the root of the quadratic equation  $3x^2 + ax - 2 = 0$  and the quadratic equation  $a(x^2 + 6x) - b = 0$  has equal roots, find 'b'.

A.

B.

C.

D.

**Answer: 9**



**Watch Video Solution**

4. Divide 67 into two parts whose product is 1102.

A.

B.

C.

D.

**Answer:** Therefore, the two parts of 67 are 38 and 29.



**Watch Video Solution**

5. Three consecutive natural numbers are such that the square of the middle number exceeds the

difference of the squares of the other two by 60. Find the numbers.

A.

B.

C.

D.

**Answer:**  $\therefore$  the numbers are 9, 10 and 11.



**Watch Video Solution**

**6.** A two-digit number is such that product of its digits is 18. When 63 is subtracted from the number, the

digits get interchanged. Find the number.

A.

B.

C.

D.

**Answer:**  $\therefore$  the number is 92



**Watch Video Solution**

7. The perimeter of right-angled triangle is 30 cm and its hypotenuse is 13 cm. Find the other two sides.

A.

B.

C.

D.

**Answer:**  $\therefore$  The sides are 5 cm, 12 cm, and 13 cm.



**Watch Video Solution**

**8.** The area of a right-angled triangle is  $165m^2$ .

Determine its base and altitude if the latter exceeds the former by 7.

A.

B.

C.

D.

**Answer: 22cm**



**Watch Video Solution**

9. The speed of a boat in still water is 11 km/hr. It can go 12 km upstream and return downstream to the original point in 2 hours 45 minutes. Find the speed of the stream.

A.

B.

C.

D.

**Answer: 5 km/h**



**Watch Video Solution**

**10.** A two digit number is such that the product of its digits is 18. when 63 is subtracted from the number, the digits interchange their places. Find the number.

OR

A plane left 30 minutes later than the scheduled time and in order to reach its destination 1500 km away in



time it has to increase its speed by 250 km/hr from its usual speed. Find its usual speed.

A.

B.

C.

D.

**Answer:**  $x = 750 \text{ km/h}$ .



**Watch Video Solution**

**11.** A fast train takes 3 hours less than a slow train for a journey of 600 km . If the speed of the slow train is

10 km/hr less than the fast train, find their speeds.

A.

B.

C.

D.

**Answer: 40 km/h.**



**Watch Video Solution**

**12.** 300 apples are distributed equally among a certain number of students. Had there been 10 more

students, each would have received one apple less.

Find the number of students.

A.

B.

C.

D.

**Answer:**  $\therefore$  There were 50 students.



**Watch Video Solution**

**13.** 7 years ago Alka's age was 5 times the square of Swati's age. Three years hence Swati's age will be  $\frac{2}{5}$

th of Alka's age. Find their present ages.

A.

B.

C.

D.

**Answer: 27 years.**



**Watch Video Solution**

**14.** A' takes 6 days less than 'B' to complete a piece of work. If both work together they can complete the

same work in 4 days. In how many days will 'B' alone complete the work?

A.

B.

C.

D.

**Answer:**  $x = 12$



**Watch Video Solution**

**15.** A peacock is sitting on the top of a pillar 9m high.  
From a point 27 m away from the bottom of the pillar,

a snake is coming to its hole at the base of the pillar. Seeing this, the peacock pounces on the snake. If their speeds are equal, at what distance from hole is the snake caught?

A.

B.

C.

D.

**Answer: Snake is caught at 12 m from the hole.**



**Watch Video Solution**

**16.** One-fourth of a herd of camels was seen in a desert. Twice the square root of the herd had gone to mountains and the remaining 15 camels were seen on a river bank. Find the total numbers of camels.

A.

B.

C.

D.

**Answer:**  $\therefore$  the total number of camels is 36.



**Watch Video Solution**

17. If the list price of a toy is reduced by Rs 2, a person can buy 2 more toys for Rs. 360. Find the original price of the toy.

A.

B.

C.

D.

**Answer:** The original price of the toy is Rs. 20.



**Watch Video Solution**



**18.** To save fuel , to avoid air pollution and for good health two persons A and B ride bicycle for a distance of 12 Km to reach their office. As the cycling speed of B is 2 km/h more than that of A, B takes 30 min less than that of A to reach the office. Find the time taken by A and B to reach the office.

A.

B.

C.

D.

**Answer: 15 hours**



## Zen Additional Questions Long Answer La Type Questions

1. Derive the quadratic formula from the standard form  $(ax^2 + bx + c = 0)$  of a quadratic equation.

A.

B.

C.

D.

**Answer:**  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

This is the required quadratic formula.



Watch Video Solution

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

A.

B.

C.

D.

Answer:  $\frac{7}{4}$

3. If the roots of a quadratic equation  $x^2 + 2px + mn = 0$  are real and equal, show that the roots of the quadratic equation  $x^2 - 2(m + n)x + (m^2 + n^2 + 2p^2) = 0$  are also equal.

A.

B.

C.

D.

**Answer:**



**Watch Video Solution**

**4. Solve the quadratic equation by factorisation:**

$$3\left(\frac{7x+1}{5x-3}\right) - 4\left(\frac{5x-3}{7x+1}\right) = 11x \neq 3/5, x \neq 1/7$$

A.

B.

C.

D.

**Answer:**  $x = 0$  or  $x = 1$



**Watch Video Solution**

5. The numerator of a fraction is 3 less than its denominator. If 2 is added to the both numerator and denominator, the sum of the new fraction and the original fraction is  $\frac{29}{20}$ . Find the original fraction.

A.

B.

C.

D.

**Answer:**  $x = \frac{-12}{11}$  or  $x = 10$ .



6. The hypotenuse of a right-angled triangle is  $3\sqrt{5}$  cm. If the smallest side is tripled and the larger side is doubled, the new hypotenuse becomes 15 cm. Find the length of each side.

A.

B.

C.

D.

**Answer:**  $\therefore$  Smallest side is 3 cm and larger side is 6 cm.





7. Some students planned a picnic. The total budget for food was Rs. 2000. But 5 students failed to attend the picnic and thus the cost of food for each member increased by Rs. 20. How many students attended the picnic and how much did each student pay for food?

A.

B.

C.

D.

**Answer:** The number of students who attended the



picnic is 25.



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8. A trader bought articles for Rs. 900. Five articles were found to be damaged. He sold each of the remaining articles at rupees two more than what he had paid for it. He got a profit of Rs. 80 on the whole transaction. Find the number of articles he bought.

A.

B.

C.

D.

**Answer: He brought 75 articles.**



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**9.** A man bought a certain number of glass vessels for Rs. 600. He broke two of them. Then he sold each of the rest for Rs. 10 more than he had paid for it, thereby gaining Rs. 50 on the whole. How many glass vessels did he buy?

A.

B.

C.

D.

**Answer:**  $\therefore$  Number of glass vessels is 6



**Watch Video Solution**

**10.** The total cost of a certain length of a piece of cloth is Rs. 200. If the piece was 5 m longer, each metre of cloth would cost Rs. 2 less and the cost of the piece would have remained unchanged. How long is the piece and what is its original rate per metre ?

A.

B.

C.

D.

**Answer: Rs. 10**



**Watch Video Solution**

**11.** A truck covers a distance of 150 km at a certain average speed and then covers another 200 km at an average speed and then covers another 200 Km at an average speed which is 20 km per hour more than the first speed. If the truck covers the total distance in 5 hours, find the first speed of the truck.

A.

B.

C.

D.

**Answer:** Hence, the first speed of the truck is 60 km/h.



**Watch Video Solution**

**12.** A motorboat, whose speed is 24 km/h in still water, takes 1 hour more to go 32 km upstream than to return downstream to the same spot. Find the speed of the stream.

A.

B.

C.

D.

**Answer:** Hence, the speed of the stream is 8 km/h.



**Watch Video Solution**

**13.** A motor boat takes 6 hours to cover 100 km downstream and 30 km upstream. If the boat goes 75 km downstream and returns back to the starting

point in 8 hours, find the speed of the boat in still water and the speed of the stream.

A.

B.

C.

D.

**Answer:**  $\therefore$  Speed of the boat in still water is 20 km/hr and speed.



**Watch Video Solution**

**14.** The present age of Varun is 10 more than square of Swati's age. Five years hence Swati's age will be one-fourth of Varun's age. Find their present ages.

A.

B.

C.

D.

**Answer:**  $\therefore$  present age of Varun is 35 and Swati is 5.



**Watch Video Solution**



15. At  $t$  minutes past 2 p.m. the time needed by the minute hand of a clock to show 3 p.m. was found to be 3 minutes less than  $\frac{t^2}{4}$  minutes. Find  $t$ .

A.

B.

C.

D.

**Answer:**  $t = 14$  is the correct answer.



**Watch Video Solution**

**16.** A pole has to be erected at a point on the boundary of a circular park of diameter 17 m 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. Find the distances from the gates where the pole is to be erected.

A.

B.

C.

D.

**Answer:**            **Hence,**             $AP = x = 15m$             **and**  
 $PB = x - 7 = 15 - 7 = 8m.$



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17. The ages of two students A and B are 19 years and 15 years respectively. Find how many years it will take so that the product of their ages becomes equal to 480.

A.

B.

C.

D.

**Answer:**  $\therefore$  After 5 years the product of their age is = 480



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## Zen Additional Questions Hots Higher Order Thinking Skills Questions

1. Solve the equation

$$16 \times 4^{x+2} - 16 \times 2^{x+1} + 1 = 0.$$

A.

B.

C.

D.

**Answer:**  $x = -4$



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2. If  $a$ ,  $b$  and  $c$  are distinct real numbers, prove that

the equation

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

has real and distinct roots.

A.

B.

C.

D.

**Answer:**  $D > 0$

$\therefore$  hence it has real and distinct roots.



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

A.

B.

C.

D.

**Answer:**  $\therefore D$  is less than 0.

$\therefore$  the given equation will not have any real roots.



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

A.

B.

C.

D.

**Answer:** The actual marks is 15.



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5. Had Ajita scored 10 more marks in her mathematics test out of 30 marks, 9 times that number would have been the square of her actual marks. How many marks did she get in the test?

A.

B.

C.

D.

**Answer:**



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6. In a group of children each child gives a gift to every other child. If the number of gifts is 132, find the number of children.

A.

B.

C.

D.

**Answer:**  $\therefore$  There are 12 children.



**Watch Video Solution**

7. There is a square field whose side is 44 m. A square flower bed is prepared in its centre leaving gravel path all round the flower bed. The total cost of laying the flower bed and gravelling the path of Rs. 2.75 and Rs. 1.50 per metre square respectively is Rs. 4904 . Find the width of the gravel path.

A.

B.

C.

D.

**Answer:**  $\therefore$  width of gravel path is 2 m



8. From a station two trains start at the same time. One train moves west and the other moves north. First train moves 5 km/hr faster than the second train. If, after 2 hours, the distance between the two trains is 50 km, find the average speed of each train.

A.

B.

C.

D.

**Answer:**  $\therefore$  The speed of the train moving north is 15

km/hr and speed of the train that is moving towards west is  $15 + 5 = 20$  km/hr.



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9. At present, Asha's age (in years) is 2 more than the square of her daughter Nisha's age. When Nisha grows to her mother's present age, Asha's age would be one year less than 10 times the present age of Nisha. Find the present age of both Asha and Nisha.

A.

B.

C.

D.

**Answer:**  $\therefore$  , Asha's age is 27 years and Nisha's age is 5 years.



**Watch Video Solution**

**10.** Find the quadratic equation if

$x = \sqrt{5 + \sqrt{5 + \sqrt{5 + \dots}}}$  up to  $\infty$  and  $x$  is a natural number.

A.

B.

C.

D.

**Answer:**  $= \frac{-1 \pm \sqrt{21}}{2}.$



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## Zen Additional Questions lit Foundation

1. Evaluate:  $20 + \frac{1}{20 + \frac{1}{20 + \frac{1}{20 + \dots}}}$

A.

B.

C.

D.

**Answer:**  $10 \pm \sqrt{101}$



**Watch Video Solution**

2. Find the condition that quadratic equations  $x^2 + ax + b = 0$  and  $x^2 + bx + a = 0$  may have a common root.

A.

B.

C.

D.

**Answer:**  $a + b = 1$



**Watch Video Solution**

**3.** Using quadratic formula solve the equation.

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

A.

B.

C.

D.

**Answer:**  $x = \frac{a + 2b}{3}$

**are required solutions.**





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4. Find the solution of  $\sqrt{x-2} + \sqrt{4-x} = \sqrt{6-x}$ .

A.

B.

C.

D.

**Answer:**  $\therefore x = 3$  or  $x = -5$



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5. Solve:  $6\left(x^2 + \frac{1}{x^2}\right) - 25\left(x - \frac{1}{x}\right) + 12 = 0.$

A.

B.

C.

D.

**Answer: Hence,  $x = 3, \frac{-1}{3}, 2$  and  $\frac{-1}{2}.$**



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