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CBSE Board Class 10 Chapter 4- Quadratic Equations
Objective Questions

Introduction to Quadratic Equations

1. What is the degree of a quadratic equation?

(A) 0
(B) 2
(C) 3
(D) 1

Answer: (B) 2
Solution: The standard form of quadratic equation is $ax^2 + bx + c = 0$, $a \neq 0$. So the degree of a quadratic equation is 2

2. Find the sum of the roots of the equation $x^2–8x+2=0$

(A) 8
(B) -8
(C) 2
(D) -6

Answer: (A) 8

Solution: For general quadratic equation $ax^2+bx+c=0$.
Sum of the roots=$−b/a$
For $x^2–8x+2=0$
Sum of the roots = $− (−8/1) =8$

Sum of the roots of the equation is 8

3. Which of the following is not quadratic equation?

(A) $x(2x + 3) = x^2+ 1$
(B) $x(x + 1) + 8 = (x + 2) (x – 2)$
(C) $(x+2)^3=x^3-4$
(D) $(x–2)^2+ 1 = 2x -3$

Answer: (B) $x(x + 1) + 8 = (x + 2) (x – 2)$

Solution: (a) $(x-2)^2 + 1 = (2x - 3)$

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

$x^2 - 4x + 4 + 1 - 2x + 3 = 0$

$x^2 - 6x + 8 = 0$

This is a quadratic equation.

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

$x^3 + 6x^2 + 12x + 8 = x^3 - 4$

$6x^2 + 12x + 12 = 0$

This is a quadratic equation.

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

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

$x^2 + 3x - 1 = 0$

This is a quadratic equation.

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

$x^2 + x + 8 = x^2 - 4$

$x + 12 = 0$

This is not a Quadratic equation.

4. If the sum of the roots of a quadratic equation is 5 and the product of the roots is also 5, then the equation is

(A) $x^2+10x+5=0$
(B) $x^2-5x+5=0$
(C) $x^2+5x-5=0$
(D) $x^2-5x+10=0$

Answer: (B) $x^2-5x+5=0$

Solution: For a quadratic equation ax2+bx+c=0,

sum of roots = −ba

product of roots = ca.

sum of roots =5 = −ba

product of roots = 5 = ca,

Thus, quadratic equation is $x^2-5x+5=0$

5. A rectangular field has an area of 3 sq. units. The length is one more than twice the breadth 'x'. Frame an equation to represent this.

(A) $x^2 - 2x+6=0$
(B) $x^2 - 2x+3=0$
(C) $2x^2+x-3=0$
(D) $2x^2+x-6=0$

Answer: (C) $2x^2+x-3=0$

Solution: Area of rectangle = length×breadth

Given, length = (2×breadth + 1)

Let the breadth of the field be x.

Length of the field = 2x+1

Area of the rectangular field = x (2x+1) =3

$2x^2+x=3$

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

Solving QE by factorisation

6. The roots of the quadratic equation $x^2+5x-14=0$ is

(A) 2, 7
(B) -2, 7
(C) -2, -7
(D) 2, -7

Answer: (D) 2, -7

Solutions: $x^2+5x-14=0$

We need to split the coefficient of x such that the sum

of the factors is 5 and their product is -14.

So we will find the coefficient as 7 and -2.

The sum of 7 and -2 is 5 and product is -14.

So now re-write the equation

$x^2+7x-2x-14=0$

Taking common terms out

$x(x+7)-2(x+7)=0$

Again taking out the common terms

$(x-2)(x+7)=0$

Now equate the factors to zero to find the roots.

So the roots of the equation are 2,-7

7. Factorize $x^2+5x+6=0$

(A) (x-1)(x-3)
(B) (x+1)(x+3)
(C) (x-2)(x-3)
(D) (x+2)(x+3)

Answer: (D) (x+2) (x+3)

Solution: Comparing $x^2 + 5x + 6 = 0$ to $ax^2 + bx + c = 0$, we have a=1, b=5 and c=6

Now, we need to find two numbers whose product is 6 and whose sum is 5

Pairs of numbers whose product is 6

1, 6

-1,-6

2, 3

-2,-3

Of these pairs, the pair that gives the sum 5 is the third pair

Identifying the pair, we rewrite the given quadratic equation as

$x^2 + 5x + 6 = x^2 + 2x + 3x + 6 = x(x+2) + 3(x+2)$

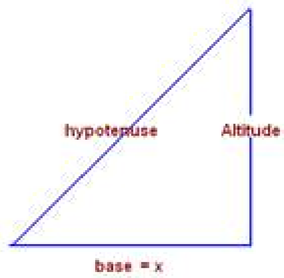
$= (x+2)(x+3)$

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

(A) 12, 5
(B) 7,2
(C) 5,3
(D) 2,5

Answer: (A) 12, 5

Solutions:



Let the base = x cm

Given that the altitude of a right triangle is 7 cm less than its base

Altitude is = x - 7 cm

Given that hypotenuse = 13cm

Applying Pythagoras theorem,

$base^2 + altitude^2 = hypotenuse^2$

Substituting the values, we get

$\Rightarrow x^2 + (x-7)^2 = 13^2$

$\Rightarrow x^2 + x^2 + 49 - 14x = 169$

$\Rightarrow 2x^2 - 14x + 49 - 169 = 0$

$\Rightarrow 2x^2 - 14x - 120 = 0$

Dividing with 2 on both sides the above equation simplifies to

$\Rightarrow x^2 - 7x - 60 = 0$

$\Rightarrow x^2 - 12x + 5x - 60 = 0$

$\Rightarrow x(x - 12) + 5(x - 12) = 0$

$\Rightarrow (x - 12)(x + 5) = 0$

$\Rightarrow x - 12 = 0$ or $x + 5 = 0$

$\Rightarrow x = 12$ or $x = -5$

Length cannot be negative so x cannot be equal to – 5

base x = 12cm; altitude = 12 – 7 = 5cm

9. If a train travelled 5 km/hr faster, it would take one hour less to travel 210 km. The speed of the train is :

(A) 60 km/hr
(B) 70 km/hr
(C) 35 km/hr
(D) 30 km/hr

Answer: (D) 30 km/hr

Solution: Let the speed of the train be x km/hr.
Distance travelled = 210 km

Time taken to travel 210 km = 210/x hours

When the speed is increased by 5 km/h, the new speed is (x+5)

Time taken to travel 210 km with the new speed is 210 / (x+5) hours

According to the question,
$210/x-210/(x+5)=1$
$\Rightarrow 210(x+5)-210x=x(x+5)$
$\Rightarrow 210x+1050-210x=x^2+5x$
$\Rightarrow x^2+5x-1050=0$
$\Rightarrow (x+35)(x-30)=0$
$\Rightarrow x= -35, 30$

The speed cannot be negative. Thus, the speed of the train is 30 km/hr

10. If the solutions of the equation $x^2+3x-18=0$ are -6, 3 then the roots of the equation $2(x^2+3x-18)=0$ are

(A) 3, 3
(B) -6, 3
(C) -12, 6
(D) -6, 6

Answer: (B) -6, 3

Solution: The roots of a quadratic equation do not change when it is multiplied by a constant non-zero real number. So when the equation $x^2+3x-18=0$ is multiplied by 2, the roots still remain the same i.e. -6, 3.

Solving QE by completing square

11. The square of (5x + 1) is equal to 16. What isx?

(A) x = 4, ¼
(B) x =- 1,3/5
(C) x = 1,3/2
(D) x= -1, 4/5

Answer: (B) x =- 1, 3/5

Solution: Converting statement into an equation-

$\Rightarrow (5x+1)^2 = 16$ (Applying $(a+b)^2$ formula)

$\Rightarrow 5x + 1 = \pm 4$ (Taking square root on both sides)

$\Rightarrow 5x = -5, 3$

$\Rightarrow x = -1, 3/5$

12. Using the method of completion of squares find one of the roots of the equation $2x^2-7x+3=0$. Also, find the equation obtained after completion of the square.

(A) 6, $(x-7/4)^2-25/16=0$
(B) 3, $(x-7/4)^2-25/16=0$
(C) 3, $(x-7/2)^2-25/16=0$
(D) 13, $(x-7/2)^2-25/16=0$

Answer: (B) 3, $(x-7/4)^2-25/16=0$

Solution: $2x^2-7x+3=0$

Dividing by the coefficient of x^2, we get

$x^2-7/2x+3/2=0$; a=1, b=7/2, c=3/2

Adding and subtracting the square of $b/2=7/4$, (half of coefficient of x)

We get, $[x^2-2\,(7/4)\,x+(7/4)^2]-(7/4)^2+3/2=0$

The equation after completing the square is:
$(x-7/4)^2-25/16=0$

Taking square root, $(x-7/4) = (\pm 5/4)$
Taking positive sign $5/4$, $x=3$
Taking negative sign $-5/4$, $x=1/2$

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

(A) $x=3$
(B) $x=(5\pm \sqrt{19})/3$
(C) $x= (3\pm \sqrt{19})/ 5$
(D) $x=5$

Answer: (C) $x= (3\pm \sqrt{19})/ 5$

Solution: Multiplying the equation throughout by 5, we get $25x^2-30x-10=0$
This is the same as:
$(5x)^2-[2\times (5x)\times 3]+3^2-3^2-10=0$
$\Rightarrow (5x-3)^2-9-10=0$
$\Rightarrow (5x-3)^2-19=0$
$\Rightarrow (5x-3)^2=19$
$\Rightarrow 5x-3=\pm \sqrt{19}$

$\Rightarrow x= (3\pm \sqrt{19})/ 5$

14. There is a natural number x. Write down the expression for the product of x and its next natural number.

(A) $2x^2+1$
(B) $x^2- x$
(C) $x^2+ x$
(D) $(x + 1)(x+2)$

Answer: (C) $x^2 + x$

Solution: If a natural number is x, the next natural number is greater than x by 1 and hence x+1. For eg. For 3, next natural number is 4. The product of the 2 numbers is $x(x+1) = x^2 + x$

15. What number should be added to x^2+6x to make it a perfect square?

(A) 36
(B) 18
(C) 9
(D) 72

Answer: (C) 9

Solution: The identity $(a+b)^2 = (a^2+2ab+b^2)$ represents a perfect square.
If we observe carefully we can see that x^2+6x can be written in the form of $(a^2+2ab+b^2)$ by adding a constant.
$x^2+2(x)(3)$ +constant.
To make x^2+6x a perfect square, divide the co efficient of x by 2 and then add the square of the result to make this a perfect square.
Hence, $6/2=3$ and $3^2 = 9$

We should add 9 to make x^2+6x a perfect square.

Solving QE using quadratic formula

16. The equation $x^2+4x+c=0$ has real roots, then

(A) $C \geq 6$
(B) $C \leq 8$
(C) $C \leq 4$
(D) $C \geq 4$

Answer: (C) $C \leq 4$

Solution: **Step 1:-** For, $x^2+4x+c=0$, value of discriminant $D=4^2-4c=16-4c$

Step 2:- The roots of quadratic equation are real only when $D \geq 0$

$16-4c \geq 0$

Step 3:- $c \leq 4$

17. Find the discriminant of the quadratic equation $3x^2–5x+2=0$ and hence, find the nature of the roots.

(A) –1, no real roots
(B) 1, two equal roots
(C) –1, two distinct real roots
(D) 1, two distinct real roots

Answer: (D) 1, two distinct real roots

Solution: $D = b^2–4ac= (–5)^2–4×3×2=1>0$

$D = 1>0 \Rightarrow$ Two distinct real roots.

18. Taylor purchased a rectangular plot of area 634 m^2. The length of the plot is 2 m more than thrice its breadth. Find the length and breadth (approximate values).

(A) 34.6 m & 11.20 m
(B) 44.6 m & 14.20 m
(C) 32 m & 16 m
(D) 88 m & 24 m

Answer: (B) 44.6 m & 14.20 m

Solution: Let x and y be the length and breadth of the rectangle respectively.
Given, $x=2+3y$
Area of the rectangle=length × breadth

$=xy$
$\Rightarrow 634= (2+3y) y$
$\Rightarrow 634=2y+3y^2$
So, $3y^2+2y−634=0$

The roots of the above quadratic equation will be

$$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$y = \frac{-2 \pm \sqrt{2^2 - 4(3)(-634)}}{2(3)}$$

⇒

$$y = \frac{-2 \pm \sqrt{4 + 7608}}{6}$$

⇒

$$y = \frac{-2 \pm \sqrt{7612}}{6}$$

⇒

$$y = \frac{-2 \pm 87.246}{6}$$

⇒

$$y = \frac{-2 + 87.246}{6}$$

⇒ OR

$$y = \frac{-2 - 87.246}{6}$$

⇒

⇒ y=14.20 or

y= -14.87

Considering positive value for breadth, we have y=14.20.

Using x=2+3y, we have

x=2+3(14.20) =44.6

Now, we have

x=44.6 and y=14.20 (approximately).

19. If the equation $x^2+2(k+2)x+9k=0$ has equal roots, then values of k are ___________.

(A) 1,4
(B) -1,5
(C) -1,-4
(D) 1,-5

Answer: (A) 1, 4

Solution: Step 1:- For, $x^2+2(k+2)x+9k=0$, value of discriminant D= $[2(k+2)]^2-4(9k)$ $=4(K^2+4-5k)$

Step 2:- The roots of quadratic equation are real and equal only when D=0
$k^2+4-5k=0$
$\Rightarrow k^2-5k+4=0$
$\Rightarrow k^2-k-4k+4=0$
$\Rightarrow k(k-1)-4(k-1)=0$
$\Rightarrow (k-1)(k-4)=0$

Step 3:- k=4 or 1

20. Find the roots of the $3x^2 - 5x + 2 = 0$ quadratic equation, using the quadratic formula.

(A) (7±1)/6
(B) (4±1)/ 6
(C) (5±2)/ 6
(D) (5±1)/ 6

Answer: (D) (5±1)/ 6

Solution: Quadratic equation of the form $ax^2 + bx + c = 0$

The roots of the above quadratic equation will be

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

a=3, b= -5 and c=2

$$x = \frac{-(5) \pm \sqrt{(-5)^2 - 4 \times 3 \times 2}}{2 \times 3}$$

$$x = \frac{(5) \pm \sqrt{25 - 24}}{6} \qquad = \frac{5 \pm 1}{6}$$

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