1. Quadratic Equations in One Variable

Let us Work Out 1.1

1. Question

I write the quadratic polynomials from the following polynomials by understanding it.

i. $x^2 - 7x + 2$

ii. $7x^5 - x(x + 2)$

iii. $2x (x+5) + 1$

iv. $2x - 1$

Answer

(i) The given equation is $x^2 - 7x + 2$

This equation is of the form $ax^2 + bx + c = 0$ where a,b,c are real numbers as a = 1 which is not equal to 0,b = -7 and c = 2.

Hence, this equation is a quadratic equation.

(ii) The given equation is $7x^5 - x(x + 2)$

This equation is not of the form $ax^2 + bx + c = 0$ where a,b,c are real numbers as the highest degree of x in the equation is 5.

Hence, this equation is not a quadratic equation.

(iii) The given equation is $2x (x+5) + 1$

$$2x(x + 5) + 1 = 2x^2 + 10x + 1$$

Therefore, this equation is of the form $ax^2 + bx + c = 0$ where a,b,c are real numbers as a = 2 which is not equal to 0,b = 10 and c = 1.

Also the highest degree of x in the equation is 2.

Hence, this equation is a quadratic equation.

(iv) The given equation is 2x-1

This is a linear equation with highest degree of x is 1.

This is of the form $ax^2 + bx + c = 0$ where a,b,c are real numbers but here a = 0 which does not satisfy the condition of quadratic equations.

Hence, this equation is not a quadratic equation.

2. Question

Which of the following equations can be written in the form of $ax^2 + bx + c = 0$, where a, b, c are real numbers and $a \neq 0$, let us write it.

i. $x - 1 + \frac{1}{x} = 6, (x \neq 0)$

ii. $x + \frac{3}{x} = x^2, (x \neq 0)$

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

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

Answer

(i) The given equation is $x - 1 + \frac{1}{x} = 6$ where $x \neq 0$

It can be written as $x - 1 + \frac{1}{x} = 6$

$\Rightarrow x + \frac{1}{x} = 6 + 1$

$\Rightarrow \frac{x^2 + 1}{x} = 7$

$\Rightarrow x^2 + 1 = 7x$

$\Rightarrow x^2 - 7x + 1 = 0$

Therefore, this equation is of the form $ax^2 + bx + c = 0$ where a,b,c are real numbers.

Here, a = 1 which is non-zero, b = -7 and c = 1

(ii) The given equation is $x + \frac{3}{x} = x^2, (x \neq 0)$

It can be written as $x + \frac{3}{x} = x^2$

$\Rightarrow \frac{(x^2 + 3)}{x} = x^2$

$\Rightarrow x^2 + 3 = x^3$

Therefore, this equation is not of the form $ax^2 + bx + c = 0$ where a,b,c are real numbers.

Here, the highest degree of x in the equation is 3.

So, it is not a quadratic equation

(iii) The given equation is $x^2 - 6\sqrt{x} + 2 = 0$

This equation is not of the form $ax^2 + bx + c = 0$ where a,b,c are real numbers.

So, it is not a quadratic equation.

(iv) The given equation is $(x-2)^2 = x^2 - 4x + 4$

It is not a quadratic equation as both the sides are same and not forming an equation.

3. Question

Let us determine the power of the variable for which the equation $x^6 - x^3 - 2 = 0$ will become a quadratic equation?

Answer

The given expression is $x^6 - x^3 - 2 = 0$

Let $x^3 = k$

It can be written as $k^2 - k - 2 = 0$

We see that it is of the form $ax^2 + bx + c = 0$ where a,b,c are real numbers.

Therefore, the equation is quadratic for the power of variable = 3

4 A. Question

Let us determine the value of 'a' for which the equation $(a-2)x^2 + 3x + 5=0$ will not be a quadratic equation.

Answer

The given equation is $(a-2)x^2 + 3x + 5=0$

We can see that the equation is of the form $a'x^2 + bx + c = 0, a' \neq 0$ where a,b and c are real numbers.

So, for the equation not to be quadratic, a' = 0

Therefore, in the equation $(a-2)x^2 + 3x + 5 = 0$

a’ = a-2

a’ = 0

a – 2 = 0

So, a = 2.

Therefore, the above equation will not be quadratic for a = 2.

4 B. Question

If $\frac{x}{4-x}=\frac{1}{3x},(x\neq 0,x\neq 4)$ be expressed in the form of $ax^2 + bx + c = 0$ ($a \neq 0$), then let us determine the co-efficient of x.

Answer

Given equation is $\frac{x}{4-x} = \frac{1}{3x}, (x \neq 0, x \neq 4)$

It can be written as $\frac{x}{4-x} = \frac{1}{3x}$

$\Rightarrow 3x^2 = 4 - x$

$\Rightarrow 3x^2 + x - 4 = 0$

This equation is of the form $ax^2 + bx + c = 0, a \neq 0$

Therefore, a = 2, b = 1 and c = -4

So, coefficient of x = b = 1

4 C. Question

Let us express $3x^2 + 7x + 23 = (x + 4) (x + 3) = 2$ in the form of the quadratic equation $ax^2 + bx + c = 0$ ($a \neq 0$)

Answer

The given equation is $3x^2 + 7x + 23 = (x + 4)(x + 3) + 2$

$3x^2 + 7x + 23 = x^2 + 7x + 12 + 2$

$3x^2 - x^2 + 23 - 14 + 7x - 7x = 0$

$2x^2 + 9 = 0$

So, the equation is of the form $ax^2 + bx + c = 0, a \neq 0$

Here, a = 2, b = 0 and c = 9

4 D. Question

Let us express the equation $(x+2)^3 = x(x^2 - 1)$ in the form of $ax^2 + bx + c = 0$ ($a \neq 0$) and write the co-efficient of x^2, x and x°.

Answer

The given equation is $(x + 2)^3 = x(x^2 - 1)$

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

$x^3 - x^3 + 6x^2 + 12x + x + 8 = 0$

$6x^2 + 13x + 8 = 0$

So, the equation is of the form $ax^2 + bx + c = 0, a \neq 0$

Here, a = 6, b = 13 and c = 8

Coefficient of $x^2 = 6$

Coefficient of x = 13

Coefficient of $x^0 = 8$

5. Question

Let us construct the quadratic equations in one variable from the following statements.

i. Divide 42 into two parts such that one part is equal to the square of the other part.

ii. The product two consecutive positive odd numbers is 143.

iii. The sum of the squares of two consecutive numbers is 313.

Answer

(i) Let one part be x.

And the other part = x^2

Therefore, according to equation

$x^2 + x = 42$

$\Rightarrow x^2 + x - 42 = 0$

(ii) Let the positive odd number be x + 1

The other consecutive positive odd number = (x + 1) + 2 = x + 3

According to question,

(x + 1)(x + 3) = 143

$\Rightarrow x^2 + 3x + x + 3 = 143$

$\Rightarrow x^2 + 4x + 3\text{-}143 = 0$

$\Rightarrow x^2 + 4x \text{ -}140 = 0$

(iii) Let the first number be x.

And the other consecutive number = x + 1

According to question,

$x^2 + (x + 1)^2 = 313$

$\Rightarrow x^2 + x^2 + 1 + 2x = 313$

$\Rightarrow 2x^2 + 2x + 1 - 313 = 0$

$\Rightarrow 2x^2 + 2x - 312 = 0$

6 A. Question

Let us construct the quadratic equations in one variable from the following statements.

The length of the diagonal of a rectangular area is 15 m. and the length exceeds its breadth by 3 m.

Answer

Let the breadth of the rectangle be x m.

Therefore, the length = (x + 3) m

Given length of diagonal = 15 m

We know that the diagonal of rectangle = $\sqrt{\text{length}^2 + \text{breadth}^2}$

According to equation,

$$\sqrt{(x + 3)^2 + x^2} = 15$$

$$\Rightarrow (x + 3)^2 + x^2 = 225$$

$$\Rightarrow x^2 + 9 + 6x + x^2 = 225$$

$$\Rightarrow 2x^2 + 6x + 9 - 225 = 0$$

$$\Rightarrow 2x^2 + 6x - 216 = 0$$

Therefore, the required quadratic equation is $2x^2 + 6x - 216 = 0$

6 B. Question

Let us construct the quadratic equations in one variable from the following statements.

One person bought some kg. sugar in ₹ 80. If he would get 4 kg. more sugar with that money, then the price of kg. sugar would be less by ₹ 1.

Answer

We know that

price = quantity of sugar in kg X rate per kg

Let the quantity be x.

Price for x kg of sugar = Rs 80

therefore, $\text{rate} = \frac{\text{price}}{\text{quantity}}$.

$$\text{rate} = \frac{80}{x}$$

According to question,

For the same price, Quantity has increased by 4kgs and rate has decreased by 1 .

As, price = quantity of sugar in kg × rate per kg

So, $(x + 4)\left[\left(\frac{80}{x}\right) - 1\right] = 80$

$$\Rightarrow \frac{(x + 4)(80 - x)}{x} = 80$$

$$\Rightarrow (x + 4)(80 - x) = 80x$$

$$\Rightarrow x^2 + 4x - 320 = 0$$

Hence the required quadratic equation is $x^2 + 4x - 320 = 0$

6 C. Question

Let us construct the quadratic equations in one variable from the following statements.

The distance between two stations is 300 km. A train went to second station from first station with uniform velocity. If the velocity of the train is 5 km/hour more, then the time taken by the train to reach the second station would be lesser by 2 hours.

Answer

As we know that ,

distance = speed × time

Let speed of train be v.

Therefore,

300 = v × time

$$\Rightarrow \text{time} = \frac{300}{v}$$

According to question,

if velocity is increased by 5 then time is decreased by 2.

As, distance = speed × time

$$\text{So, } 300 = (v + 5)\left[\left(\frac{300}{v}\right) - 2\right]$$

$$\Rightarrow 300 = (v + 5)\left[\frac{300 - 2v}{v}\right]$$

$$\Rightarrow 300v = (v + 5)(300 - 2v)$$

$$\Rightarrow 300v = 300v - 2v^2 + 1500 - 10v$$

$$\Rightarrow 2v^2 + 10v - 1500 = 0$$

Hence the required quadratic equation is $2v^2 + 10v - 1500 = 0$

6 D. Question

Let us construct the quadratic equations in one variable from the following statements.

A clock seller sold a clock by purchasing it at ₹ 336. The amount of his profit percentage is as much as the amount with which he bought the clock.

Answer

Given Selling Price, SP = Rs 336

Let the Cost Price CP be x

According to question,

$$\text{profit\%} = CP$$

$$\Rightarrow \left[\frac{SP - CP}{CP}\right] \times 100 = CP$$

$$\Rightarrow \left[\frac{336 - x}{x}\right] \times 100 = x$$

$\Rightarrow x^2 + 100x - 33600 = 0$

Hence the required quadratic equation is $x^2 + 100x - 33600 = 0$

6 E. Question

Let us construct the quadratic equations in one variable from the following statements.

If the velocity of the stream is 2kms/hr, then the time taken by Ratanmajhi to cover 2 kms in downstream and upstream is 10 hours.

Answer

Let the velocity of boat be v.

Given , velocity of the stream = 2km/h

velocity in downstream = v + 2

velocity in upstream = v-2

total time = time taken during upstream + time taken during downstream

As, $\text{time} = \frac{\text{distance}}{\text{velocity}}$

According to question,

$$10 = [\frac{2}{v-2}] + [\frac{2}{v+2}]$$

$$\Rightarrow 10 = 2[\frac{v+2+v-2}{v^2-4}]$$

$$\Rightarrow 5 = \frac{2v}{v^2-4}$$

$$\Rightarrow 5v^2 - 2v - 20 = 0$$

Hence the required quadratic equation is $5v^2 - 2v - 20 = 0$

6 F. Question

Let us construct the quadratic equations in one variable from the following statements.

The time taken to clean out garden by Majid is 3 hours more than Mahim. Both of them together can complete the work in 2 hours.

Answer

Let the time taken by mahim be x hours.

So, time taken by majib = x + 3 hours

Work completed by Mahim in 1 hr $= \frac{1}{x}$

Work completed by Majid in 1 hr $= \frac{1}{x+3}$

Both complete the work in 2 hrs .

So, $2[\frac{1}{x} + \frac{1}{x+3}] = 1$

$\Rightarrow 2\left[\frac{x + 3 + x}{x(x + 3)}\right] = 1$

$\Rightarrow x^2 + 3x = 4x + 6$

$\Rightarrow x^2 - x - 6 = 0$

Hence the required equation is $x^2 - x - 6 = 0$

6 G. Question

Let us construct the quadratic equations in one variable from the following statements.

The unit digit of a two digit number exceeds it tens' digit by 6 and the product of two digits is less by 12 from the number.

Answer

Let the tens digit be x.

therefore, unit's digit = x + 6

According to question,

$x(x + 6) + 12 = 10x + x + 6$

$\Rightarrow x^2 + 6x + 12 = 11x + 6$

$\Rightarrow x^2 - 5x + 6 = 0$

Hence the required equation is $x^2 - 5x + 6 = 0$

6 H. Question

Let us construct the quadratic equations in one variable from the following statements.

There is a road of equal width around the outside of a rectangular playground having the length 45 m. and breadth 40 m. and the area of the road is 450 sqm.

Answer

Let the width of road be w m

area of road = area of rectangular paths + 4 squares at the corner.

So, $450 = 2[45w + 40w] + 4w^2$

$\Rightarrow 450 = 90w + 80w + 4w^2$

$\Rightarrow 450 = 4w^2 + 170w$

$\Rightarrow 4w^2 + 170w - 450 = 0$

Hence the required equation is $4w^2 + 170w - 450 = 0$

Let us Work Out 1.2

1 A. Question

In each of the following cases, let us justify & write whether the given values are the of the given quadratic equation:

$x^2 + x+1 = 0$,1 and -1

Answer

We know that the roots of the quadratic equation satisfies the equation.

So, if 1 and -1 are the roots of $x^2 + x + 1 = 0$

then they must satisfy the equation.

Therefore, putting 1 in the equation we have

$= 1^2 + 1 + 1 = 1 + 1 + 1 = 3$ which is not equal to 0.

So, it is not a root of the equation.

Putting -1 in the equation we have

$= (-1)^2 + (-1) + 1 = 1-1 + 1 = 1$ which is not equal to 0.

So, it is also not a root of the equation.

Hence, 1 and -1 are not the roots of the equation.

1 B. Question

In each of the following cases, let us justify & write whether the given values are the of the given quadratic equation:

$8x^2+7x=0$,0 and -2

Answer

We know that the roots of the quadratic equation satisfies the equation.

So, if 0 and -2 are the roots of $8x^2 + 7x = 0$

then they must satisfy the equation.

Therefore, putting 0 in the equation we have

$= 8 \times 0^2 + 7 \times 0 = 0 + 0 = 0$

So, it is a root of the equation.

Putting -2 in the equation we have

$= 8 \times (-2)^2 + 7 \times (-2) = 32\text{-}14 = 18$ which is not equal to 0.

So, it is also not a root of the equation.

Hence, 0 is the root of the equation.

1 C. Question

In each of the following cases, let us justify & write whether the given values are the of the given quadratic equation:

$x + \frac{1}{x} = \frac{13}{6}, \frac{5}{6}$ and 4/3

Answer

We know that the roots of the quadratic equation satisfies the equation.

So, if $\frac{5}{6}$ and $\frac{4}{3}$ are the roots of $x + \frac{1}{x} = \frac{13}{6}$

then they must satisfy the equation.

Therefore, putting $\frac{5}{6}$ in the equation we have

$= \frac{5}{6} + \frac{6}{5} = \frac{25+36}{30} = \frac{61}{30}$ which is not equal to $\frac{13}{6}$.

So, it is not a root of the equation.

Putting $\frac{4}{3}$ in the equation we have

$= \frac{4}{3} + \frac{3}{4} = \frac{(16+9)}{12} = \frac{25}{12} =$ which is not equal to $\frac{13}{6}$.

So, it is also not a root of the equation.

Hence, $\frac{5}{6}$ and $\frac{4}{3}$ are not the roots of the equation.

1 D. Question

In each of the following cases, let us justify & write whether the given values are the of the given quadratic equation:

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

Answer

We know that the roots of the quadratic equation satisfy the equation.

So, if -√3 and 2√3 are the roots of $x^2 - \sqrt{3}x - 6 = 0$

then they must satisfy the equation.

Therefore, putting -√3 in the equation we have

= -√3^2-√3 × (-√3)-6 = 3 + 3-6 = 6-6 = 0

So, it is a root of the equation.

Putting 2√3 in the equation we have

= (2√3)^2-√3 × (2√3)-6 = 12-6-6 = 12-12 = 0

So, it is also a root of the equation.

Hence, -√3 and 2√3 are the roots of the equation.

2 A. Question

Let us calculate and write the value of k for which 2/3 will be a root the quadratic equation $7x^2 + kx - 3 = 0$.

Answer

Given equation is $7x^2 + kx - 3 = 0$

It is given that $\frac{2}{3}$ is a root of the equation.

Therefore, it must satisfy the equation.

$$7 \times \left(\frac{2}{3}\right)^2 + k\left(\frac{2}{3}\right) - 3 = 0$$

$$\Rightarrow 7 \times \frac{4}{9} + \frac{2k}{3} = 3$$

$$\Rightarrow \frac{2k}{3} = 3 - \frac{28}{9}$$

$$\Rightarrow \frac{2k}{3} = \frac{27 - 28}{9}$$

$$\Rightarrow \frac{2k}{3} = -\frac{1}{9}$$

$$\Rightarrow k = -\frac{1}{9} \times \frac{3}{2}$$

$$\Rightarrow k = -\frac{1}{6}$$

Hence , the value of k is $-\frac{1}{6}$.

2 B. Question

Let us calculate and write the value of k for which –a will be a root the quadratic equation $x^2 + 3ax + k = 0$.

Answer

Given equation is $x^2 + 3ax + k = 0$

It is given that -a is a root of the equation.

Therefore, it must satisfy the equation.

$$(-a)^2 + 3a(-a) + k = 0$$

$$\Rightarrow a^2 - 3a^2 + k = 0$$

$$\Rightarrow -2a^2 + k = 0$$

$$\Rightarrow k = 2a^2$$

Hence, the value of k is $2a^2$.

3. Question

If 2/3 and -3 are the two roots of the quadratic equation $ax^2 + 7x + b = 0$, then let me calculate the values of a and b.

Answer

Given equation is $ax^2 + 7x + b = 0$

It is given that -3 and $\frac{2}{3}$ are the roots of the equation.

Therefore, they must satisfy the equation.

$$a(-3)^2 + 7 \times (-3) + b = 0$$

$$\Rightarrow 9a - 21 + b = 0$$

$$\Rightarrow 9a + b = 21$$

$$\Rightarrow b = 21 - 9a \text{.....eq (1)}$$

And

$$a\left(\frac{2}{3}\right)^2 + 7 \times \left(\frac{2}{3}\right) + b = 0$$

$$\Rightarrow \frac{4a}{9} + \frac{14}{3} + b = 0$$

$$\Rightarrow 4a + 42 + 3b = 0$$

$$\Rightarrow 4a + 3b = -42 \text{.....eq(2)}$$

Now, putting the value of b in eq(2)

$$4a + 3b = -42$$

$$\Rightarrow 4a + 3(21 - 9a) = -42$$

$$\Rightarrow 4a + 63 - 27a = -42$$

$$\Rightarrow -23a = -42 - 63$$

$$\Rightarrow -23a = -105$$

$$\Rightarrow a = \frac{105}{23}$$

Therefore putting the value of a in eq(1).

$$b = 21 - 9a$$

$$\Rightarrow b = 21 - 9 \times \frac{105}{23}$$

$$\Rightarrow b = 21 - \frac{945}{23}$$

$$\Rightarrow b = \frac{483 - 945}{23}$$

$$\Rightarrow b = -\frac{462}{23}$$

Therefore, putting the value of a and b in the equation

$$ax^2 + 7x + b = 0$$

$$\Rightarrow \frac{105}{23}x^2 + 7x - \frac{462}{23} = 0$$

$$\Rightarrow \frac{105x^2 + 161x - 461}{23} = 0$$

$$\Rightarrow 105x^2 + 161x - 461 = 0$$

Hence , the required equation is $105x^2 + 161x - 461 = 0$

4 A. Question

Let us solve :

$3y^2 - 20 = 160 - 2y^2$

Answer

$3y^2 - 20 = 160 - 2y^2$

$\Rightarrow 3y^2 + 2y^2 = 160 + 20$

$\Rightarrow 5y^2 = 180$

$\Rightarrow y^2 = \frac{180}{5} = 36$

$\Rightarrow y = \sqrt{36} = 6, -6$

Hence , y = 6 or y = -6

4 B. Question

Let us solve :

$(2x+1)^2 + (x+1)^2 = 6x + 47$

Answer

$(2x + 1)^2 + (x + 1)^2 = 6x + 47$

$\Rightarrow 4x^2 + 1 + 4x + x^2 + 1 + 2x = 6x + 47$

$\Rightarrow 5x^2 + 6x + 2 - 6x = 47$

$\Rightarrow 5x^2 = 47 - 2$

$\Rightarrow 5x^2 = 45$

$\Rightarrow x^2 = \frac{45}{5} = 9$

$\Rightarrow x = \sqrt{9} = 3, -3$

Hence , x = 3 or x = -3

4 C. Question

Let us solve :

(x-7)(x-9) = 195

Answer

$(x-7)(x-9) = 195$

$\Rightarrow x^2 - 9x - 7x + 63 = 195$

$\Rightarrow x^2 - 16x + 63 - 195 = 0$

$\Rightarrow x^2 - 16x - 132 = 0$

$\Rightarrow x^2 - 22x + 6x - 132 = 0$

$\Rightarrow x(x-22) + 6(x-22) = 0$

$\Rightarrow (x-22)(x+6) = 0$

$\Rightarrow x = 22, -6$

Hence, x = 22 or x = -6

4 D. Question

Let us solve :

$$3x - \frac{24}{x} = \frac{x}{3}, x \neq 0$$

Answer

$3x - \frac{24}{x} = \frac{x}{3}$

$\Rightarrow \frac{3x^2 - 24}{x} = \frac{x}{3}$

$\Rightarrow 3(3x^2 - 24) = x^2$

$\Rightarrow 9x^2 - 72 = x^2$

$\Rightarrow 9x^2 - x^2 = 72$

$\Rightarrow 8x^2 = 72$

$\Rightarrow x^2 = \frac{72}{8} = 9$

$\Rightarrow x = \sqrt{9}$

$\Rightarrow x = 3, -3$

Hence, x = 3 or x = -3

4 E. Question

Let us solve :

$$\frac{x}{3}+\frac{3}{x}=\frac{15}{x}, x \neq 0$$

Answer

$\frac{x}{3} + \frac{3}{x} = \frac{15}{x}$

$\Rightarrow \frac{x^2 + 9}{3x} = \frac{15}{x}$

$\Rightarrow (x^2 + 9) = 45$

$\Rightarrow x^2 + 9 - 45 = 0$

$\Rightarrow x^2 - 36 = 0$

$\Rightarrow x^2 = 36$

$\Rightarrow x = \sqrt{36}$

$\Rightarrow x = 6, -6$

Hence, x = 6 or x = -6

4 F. Question

Let us solve :

$$10x-\frac{1}{x}=3, x \neq 0$$

Answer

$10x - \frac{1}{x} = 3$

$\Rightarrow \frac{10x^2 - 1}{x} = 3$

$\Rightarrow 10x^2 - 1 = 3x$

$\Rightarrow 10x^2 - 3x - 1 = 0$

$\Rightarrow 10x^2 - 5x + 2x - 1 = 0$

$\Rightarrow 5x(2x - 1) + 1(2x - 1) = 0$

$\Rightarrow (5x + 1)(2x - 1) = 0$

$$\Rightarrow x = \frac{1}{2}, -\frac{1}{5}$$

Hence, x = $\frac{1}{2}$ or x = -$\frac{1}{5}$

4 G. Question

Let us solve :

$$\frac{2}{x^2} - \frac{5}{x} + 2 = 0, x \neq 0$$

Answer

$$\frac{2}{x^2} - \frac{5}{x} + 2 = 0$$

$$\Rightarrow \frac{2 - 5x + 2x^2}{x^2} = 0$$

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

$$\Rightarrow 2x^2 - 4x - x + 2 = 0$$

$$\Rightarrow 2x(x-2) - 1(x-2) = 0$$

$$\Rightarrow (x-2)(2x-1) = 0$$

$$\Rightarrow x = \frac{1}{2}, 2$$

Hence, x = $\frac{1}{2}$ or x = 2

4 H. Question

Let us solve :

$$\frac{(x-2)}{(x+2)} + 6\left(\frac{x+2}{x-6}\right) = 1, x \neq -2, 6$$

Answer

$$\frac{(x-2)}{(x+2)} + 6\frac{(x-2)}{(x-6)} = 1$$

$$\Rightarrow \frac{(x-2)(x-6) + 6(x-2)(x+2)}{(x+2)(x-6)} = 1$$

$$\Rightarrow x^2 - 6x - 2x + 12 + 6(x^2 - 4) = 1 \times (x+2)(x-6)$$

$$\Rightarrow x^2 - 8x + 12 + 6x^2 - 24 = x^2 - 6x + 2x - 12$$

$$\Rightarrow x^2 - 8x + 12 + 6x^2 - 24 - x^2 + 6x - 2x + 12 = 0$$

$$\Rightarrow 6x^2 - 4x = 0$$

$$\Rightarrow 2x(3x - 2) = 0$$

$$\Rightarrow x = \frac{3}{2}, 0$$

4 I. Question

Let us solve :

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

Answer

$$\frac{1}{(x-3)} - \frac{1}{(x+5)} = \frac{1}{6}$$

$$\Rightarrow \frac{x + 5 - x + 3}{(x-3)(x+5)} = \frac{1}{6}$$

$$\Rightarrow \frac{8}{(x-3)(x+5)} = \frac{1}{6}$$

$$\Rightarrow 48 = (x-3)(x+5)$$

$$\Rightarrow (x-3)(x+5) - 48 = 0$$

$$\Rightarrow x^2 + 5x - 3x - 15 - 48 = 0$$

$$\Rightarrow x^2 + 2x - 63 = 0$$

$$\Rightarrow x^2 + 9x - 7x - 63 = 0$$

$$\Rightarrow x(x+9) - 7(x+9) = 0$$

$$\Rightarrow (x-7)(x+9) = 0$$

$$\Rightarrow x = 7, -9$$

4 J. Question

Let us solve :

$$\frac{x}{x+1} + \frac{x+1}{x} = 2\frac{1}{12}, x \neq 0, -1$$

Answer

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

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

$$\Rightarrow \frac{x^2 + x^2 + 1 + 2x}{x^2 + x} = \frac{25}{12}$$

$$\Rightarrow \frac{2x^2 + 1 + 2x}{x^2 + x} = \frac{25}{12}$$

$$\Rightarrow 12(2x^2 + 1 + 2x) = 25(x^2 + x)$$

$$\Rightarrow 24x^2 + 12 + 24x = 25x^2 + 25x$$

$$\Rightarrow 24x^2 + 12 + 24x - 25x^2 - 25x = 0$$

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

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

$$\Rightarrow x^2 + 4x - 3x - 12 = 0$$

$$\Rightarrow x(x+4) - 3(x+4) = 0$$

$$\Rightarrow (x-3)(x+4) = 0$$

$$\Rightarrow x = 3, -4$$

4 K. Question

Let us solve :

$$\frac{ax+b}{a+bx} = \frac{cx+d}{c+dx}\left[a \neq b, c \neq d\right], x \neq -\frac{a}{b}, \frac{-c}{d}$$

Answer

$$\frac{ax+b}{a+bx} = \frac{cx+d}{c+dx}$$

$$\Rightarrow (ax+b)(c+dx) = (cx+d)(a+bx)$$

$$\Rightarrow acx + adx^2 + bc + bdx = acx + bcx^2 + ad + bdx$$

$$\Rightarrow acx + adx^2 + bc + bdx - acx - bcx^2 - ad - bdx = 0$$

$$\Rightarrow (ad-bc)x^2 + bc - ad = 0$$

$$\Rightarrow (ad-bc)x^2 = -(bc-ad)$$

$$\Rightarrow (ad-bc)x^2 = ad - bc$$

$$\Rightarrow x^2 = \frac{ad - bc}{ad - bc} = 1$$

$$\Rightarrow x^2 - 1 = 0$$

$$\Rightarrow (x + 1)(x - 1) = 0$$

$$\Rightarrow x = 1, -1$$

4 L. Question

Let us solve :

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

Answer

Let 2x + 1 = y

$$y + \frac{3}{y} = 4$$

$$\Rightarrow y^2 + 3 = 4y$$

$$\Rightarrow y^2 - 4y + 3 = 0$$

$$\Rightarrow y^2 - 3y - y + 3 = 0$$

$$\Rightarrow y(y - 3) - 1(y - 3) = 0$$

$$\Rightarrow (y - 3)(y - 1) = 0$$

$$\Rightarrow y = 3, 1$$

For y = 3,

2x + 1 = 3

$\Rightarrow$ 2x = 3-1

$\Rightarrow$ 2x = 2

$\Rightarrow x = \frac{2}{2} = 1$

For y = 1,

2x + 1 = 1

$\Rightarrow$ 2x = 1-1

$\Rightarrow$ 2x = 0

⇒ x = 0

So, x = 1 or x = 0

4 M. Question

Let us solve :

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

Answer

Let x + 1 = k

$$\therefore \frac{k}{2}+\frac{2}{k}=\frac{k}{3}+\frac{3}{k}-\frac{5}{6}$$

$$\Rightarrow \frac{k^2+4}{2k}=\frac{2k^2+18-5k}{6k}$$

$$\Rightarrow \frac{k^2+4}{1}=\frac{2k^2+18-5k}{3}$$

$$\Rightarrow 3(k^2+4)=(2k^2+18-5k)$$

$$\Rightarrow 3k^2-2k^2+12-18+5k=0$$

$$\Rightarrow k^2+5k-6=0$$

$$\Rightarrow k^2+6k-k-6=0$$

$$\Rightarrow k(k+6)-1(k+6)=0$$

$$\Rightarrow (k-1)(k+6)=0$$

$$\Rightarrow k=1,-6$$

For, k = 1

x + 1 = 1

⇒ x = 1-1 = 0

For, k = -6

x + 1 = -6

⇒ x = -6-1 = -7

So, x = 1 or x = -7

4 N. Question

Let us solve :

$$\frac{12x+17}{3x+1}-\frac{2x+15}{x+7}=3\frac{1}{5}, x \neq -\frac{1}{3}, -7$$

Answer

$\frac{12x+17}{3x+1}-\frac{2x+15}{x+7}=\frac{16}{5}$

$\Rightarrow \frac{(12x+17)(x+7)-(2x+15)(3x+1)}{(3x+1)(x+7)}=\frac{16}{5}$

$\Rightarrow \frac{12x^2+101x+119-6x^2-47x-15}{3x^2+22x+7}=\frac{16}{5}$

$\Rightarrow \frac{6x^2+54x+104}{3x^2+22x+7}=\frac{16}{5}$

$\Rightarrow 30x^2 + 270x + 520 = 48x^2 + 352x + 112$

$\Rightarrow 18x^2 + 82x - 408 = 0$

$\Rightarrow 9x^2 + 41x - 204 = 0$

$\Rightarrow 9x^2 + 68x - 27x - 204 = 0$

$\Rightarrow x(9x + 68) - 3(9x + 68) = 0$

$\Rightarrow (x - 3)(9x + 68) = 0$

$\Rightarrow x = 3$ and $x = -68/3$

4 O. Question

Let us solve :

$$\frac{x+3}{x-3}+6\left(\frac{x-3}{x+3}\right)=5, x \neq 3, -3$$

Answer

$\frac{(x+3)}{(x-3)} + 6\frac{(x-3)}{(x+3)} = 5$

$\Rightarrow \frac{(x+3)(x+3) + 6(x-3)(x-3)}{(x-3)(x+3)} = 5$

$\Rightarrow x^2 + 6x + 9 + 6(x^2 - 6x + 9) = 5 \times (x-3)(x+3)$

$\Rightarrow x^2 - 6x + 9 + 6x^2 - 36x + 54 = 5(x^2 - 9)$

$\Rightarrow x^2 - 6x + 9 + 6x^2 - 36x + 54 - 5x^2 + 45 = 0$

$\Rightarrow 2x^2 - 42x + 108 = 0$

$\Rightarrow x^2 - 21x + 54 = 0$

$\Rightarrow x = \frac{3}{2}, 0$

4 P. Question

Let us solve :

$$\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}, x \neq 0, -(a+b)$$

Answer

$\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$

$\Rightarrow \frac{1}{a + b + x} = \frac{bx + ax + ab}{abx}$

$\Rightarrow abx = (a + b + x)(bx + ax + ab)$

$\Rightarrow abx = abx + a^2x + a^2b + b^2x + abx + ab^2 + bx^2 + ax^2 + abx$

$\Rightarrow (a + b)x^2 + (a^2 + b^2 + 2ab)x + a^2b + ab^2 = 0$

$\Rightarrow (a + b)x^2 + (a + b)^2x + ab(a + b) = 0$

$\Rightarrow (a + b)(x^2 + (a + b)x + ab) = 0$

$\Rightarrow x^2 + (a + b)x + ab = 0$

$\Rightarrow x^2 + ax + bx + ab = 0$

$\Rightarrow x(x + a) + b(x + a) = 0$

$\Rightarrow (x + a)(x + b) = 0$

$\Rightarrow x = -a, -b$

4 Q. Question

Let us solve :

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

Answer

Let $\frac{x+a}{x-a} = k$

$k^2 - 5k + 6 = 0$

$\Rightarrow k^2 - 3k - 2k + 6 = 0$

$\Rightarrow k(k-3) - 2(k-3) = 0$

$\Rightarrow (k-3)(k-2) = 0$

$\Rightarrow k = 3,2$

For k = 3,

$\frac{x+a}{x-a} = 3$

$\Rightarrow x + a = 3(x-a)$

$\Rightarrow x + a = 3x - 3a$

$\Rightarrow x - 3x + a + 3a = 0$

$\Rightarrow -2x + 4a = 0$

$\Rightarrow -2x = -4a$

$\Rightarrow x = 4 = -\frac{4a}{-2} = 2a$

Therefore, x = 2a

For k = 2,

$\frac{x+a}{x-a} = 2$

$\Rightarrow x + a = 2(x-a)$

$\Rightarrow x + a = 2x - 2a$

$\Rightarrow x - 2x + a + 2a = 0$

$\Rightarrow -x + 3a = 0$

$\Rightarrow -x = -3a$

$\Rightarrow x = 3a$

Therefore, x = 3a

So, x = 2a or x = 3a

4 R. Question

Let us solve :

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

Answer

$$\frac{1}{x}-\frac{1}{x+b}=\frac{1}{a}-\frac{1}{a+b}$$

$$\Rightarrow \frac{x+b-x}{x(x+b)}=\frac{a+b-a}{a(a+b)}$$

$$\Rightarrow \frac{b}{x(x+b)}=\frac{b}{a(a+b)}$$

$$\Rightarrow \frac{1}{x(x+b)}=\frac{1}{a(a+b)}$$

$$\Rightarrow a(a+b)=x(x+b)$$

$$\Rightarrow a^2+ab=x^2+bx$$

$$\Rightarrow x^2-a^2+bx-ab=0$$

$$\Rightarrow (x+a)(x-a)+b(x-a)=0$$

$$\Rightarrow (x-a)(x+a+b)=0$$

$$\Rightarrow x=a,-(a+b)$$

4 S. Question

Let us solve :

$$\frac{1}{(x-1)(x-2)}+\frac{1}{(x-2)(x-3)}+\frac{1}{(x-3)(x-4)}=\frac{1}{6}, x \neq 1,2,3,4$$

Answer

We can write this equation as

$$\frac{1}{x-2}-\frac{1}{x-1}+\frac{1}{x-3}-\frac{1}{x-2}+\frac{1}{x-4}-\frac{1}{x-3}=\frac{1}{6}$$

$$\Rightarrow \frac{1}{x-4}-\frac{1}{x-1}=\frac{1}{6}$$

$$\Rightarrow \frac{x-1-x+4}{(x-4)(x-1)}=\frac{1}{6}$$

$$\Rightarrow \frac{3}{(x-4)(x-1)} = \frac{1}{6}$$

$$\Rightarrow (x-4)(x-1) = 18$$

$$\Rightarrow x^2 - x - 4x + 4 - 18 = 0$$

$$\Rightarrow x^2 - 5x - 14 = 0$$

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

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

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

$$\Rightarrow x = 7, -2$$

4 T. Question

Let us solve :

$$\frac{a}{x-a} + \frac{b}{x-b} = \frac{2c}{x-c}, x \neq a, b, c$$

Answer

$$\frac{a}{x-a} + \frac{b}{x-b} = \frac{2c}{x-c}$$

$$\Rightarrow \frac{ax - ab + bx - ab}{(x-a)(x-b)} = \frac{2c}{x-c}$$

$$\Rightarrow \frac{(a+b)x - 2ab}{(x-a)(x-b)} = \frac{2c}{x-c}$$

$$\Rightarrow (a+b)x - 2ab \times (x-c) = 2c \times (x^2 - bx - ax + ab)$$

$$\Rightarrow ax^2 - acx + bx^2 - bcx - 2abx + 2abc = 2cx^2 - 2bcx - 2acx + 2abc$$

$$\Rightarrow ax^2 + bx^2 - 2cx^2 - acx - bcx - 2abx + 2bcx + 2acx + 2abc - 2abc = 0$$

$$\Rightarrow (a+b-2c)x^2 + (ac + bc - 2ab)x = 0$$

$$\Rightarrow x\{(a+b-2c)x + (ac + bc - 2ab)\} = 0$$

$$\Rightarrow x = 0, -\frac{ac + bc - 2ab}{a + b - 2c}$$

4 U. Question

Let us solve :

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

Answer

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

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

$$\Rightarrow x(x - \sqrt{3}) - 2(x - \sqrt{3}) = 0$$

$$\Rightarrow (x - 2)(x - \sqrt{3}) = 0$$

$$\Rightarrow x = 2, \sqrt{3}$$

Let us Work Out 1.3

1. Question

The difference of two positive whole numbers is 3 and the sum of their squares is 117; by calculating, let us write the two numbers.

Answer

Let one of the whole numbers be x.

Therefore, the other whole number is x + 3.

According to question,

$$x^2 + (x + 3)^2 = 117$$

$$\Rightarrow x^2 + x^2 + 6x + 9 = 117$$

$$\Rightarrow 2x^2 + 6x - 108 = 0$$

$$\Rightarrow x^2 + 3x - 54 = 0$$

$$\Rightarrow x^2 + 9x - 6x - 54 = 0$$

$$\Rightarrow x(x + 9) - 6(x + 9) = 0$$

$$\Rightarrow (x + 9)(x - 6) = 0$$

$$\Rightarrow x = -9 \text{ or } x = 6$$

As given the numbers are positive, so, the numbers are x = 6 and x + 3 = 6 + 3 = 9.

2. Question

The base of a triangle is 18m. more than two times of its heights, if the area of the triangle is 360 sq.m., then let us determine the height of it.

Answer

Let the height of the triangle be h.

Therefore, the base of triangle = 2h + 18.

According to question,

Area of triangle = 360

$\frac{1}{2} \times \text{base} \times \text{height} = 360$

$\Rightarrow \frac{1}{2} \times (2h + 18) \times h = 360$

$\Rightarrow \frac{2}{2}(h^2 + 9h) = 360$

$\Rightarrow h^2 + 9h - 360 = 0$

$\Rightarrow h^2 + 24h - 15h - 360 = 0$

$\Rightarrow h(h + 24) - 15(h + 24) = 0$

$\Rightarrow (h + 24)(h - 15) = 0$

$\Rightarrow h = -24 \text{ or } h = 15$

So, the height of triangle is 15m.

3. Question

If 5 times of a positive whole number is less by 3 than twice of its square, then let us determine the number.

Answer

Let the positive number be x.

According to question,

$5x + 3 = 2x^2$

$\Rightarrow 2x^2 - 5x - 3 = 0$

$\Rightarrow 2x^2 + x - 6x - 3 = 0$

$\Rightarrow x(2x + 1) - 3(2x + 1) = 0$

$\Rightarrow (2x + 1)(x - 3) = 0$

$\Rightarrow x = -1/2 \text{ or } x = 3$

As the number is positive, so, x = 3.

4. Question

The distance between two places is 200 km.; the time taken by motor car from one place to another is less by 2 hrs than the time taken by a zeep car. If the speed of the motor car is 5 km/hr. more than the speed of the zeep car, then by calculating let us write the speed of the motor car.

Answer

Let time taken by motor car be t.

As, distance = speed × time

200 = speed of motor car × t

speed of motor car = $\frac{200}{t}$

Given, time taken by zeep = t + 2

Again, speed of zeep = $\frac{200}{t+2}$

According to question,

Speed of the motor car is 5 km/hr more than the speed of the zeep car.

So, $\frac{200}{t} - 5 = \frac{200}{t+2}$

$$\Rightarrow \frac{200}{t} - \frac{200}{t+2} = 5$$

$$\Rightarrow \frac{200t + 400 - 200t}{t(t+2)} = 5$$

$$\Rightarrow \frac{400}{t(t+2)} = 5$$

$$\Rightarrow \frac{80}{t(t+2)} = 1$$

$$\Rightarrow t^2 + 2t - 80 = 0$$

$$\Rightarrow (t-8)(t+10) = 0$$

$$\Rightarrow t = 8 \text{ or } t = -10$$

So, speed of the motor car is $\frac{200}{8}$ = 25km/hr.

5. Question

The area of the Amita's rectangular land is 2000 sq.m. and perimeter of it is 180 m. By calculating, let us write the length and breadth of the Amita's land.

Answer

Let the length of rectangular land be l.

As, length × breadth = Area

breadth = $\frac{2000}{l}$.

Also given, perimeter = 180

According to question,

$$2(\text{length} + \text{breadth}) = 180$$

$$\Rightarrow 2(l + \frac{2000}{l}) = 180$$

$$\Rightarrow l + \frac{2000}{l} = \frac{180}{2} = 90$$

$$\Rightarrow \frac{l^2 + 2000}{l} = 90$$

$$\Rightarrow l^2 - 90l + 2000 = 0$$

$$\Rightarrow l^2 - 40l - 50l + 2000 = 0$$

$$\Rightarrow l(l - 40) - 50(l - 40) = 0$$

$$\Rightarrow (l - 40)(l - 50) = 0$$

$$\Rightarrow l = 40 \text{ or } l = 50$$

$$\Rightarrow b = 50 \text{ or } b = 40$$

Hence, if the length = 40m then breadth = 50m

Or

If length = 50m then length = 40m

6. Question

The tens digit of a two digit number is less by 3 than the unit digit. If the product of the two digits is subtracted from the number, the result is 15. Let us write the unit digit of the number by calculation.

Answer

Let the unit digit be x

therefore, tens digit be x-3.

According to question,

$10(x-3) + x - x(x-3) = 15$

$\Rightarrow 10x - 30 + x - x^2 + 3 = 15$

$\Rightarrow x^2 - 14x + 45 = 0$

$\Rightarrow x^2 - 9x - 5x + 45 = 0$

$\Rightarrow x(x-9) - 5(x-9) = 0$

$\Rightarrow (x-5)(x-9) = 0$

$\Rightarrow x = 5 \text{ or } x = 9$

Hence, the unit digit is 5 or 9.

7. Question

There are two pipes in a water reservoir of our school. Two pipes together take $11\frac{1}{9}$ minutes to fill the reservoir. If the two pipes are opened separately, then one pipe would take 5 minutes more time than the other pipe. Let us write by calculating the time taken to fill the reservoir separately by each of the pipes.

Answer

Let time taken by one pipe to separately fill the reservoir be x.

therefore, time taken by another pipe be x + 5.

As, portion filled by one pipe in one min = $\frac{1}{x}$

portion filled by another pipe in one min = $\frac{1}{x+5}$

According to question,

$$\frac{1}{x} + \frac{1}{x+5} = \frac{9}{100}$$

$$\Rightarrow \frac{x+5+x}{x(x+5)} = \frac{9}{100}$$

$\Rightarrow 100(2x + 5) = 9(x^2 + 5x)$

$\Rightarrow 200x + 500 = 9x^2 + 45x$

$\Rightarrow 9x^2 + 45x - 200x - 500 = 0$

$\Rightarrow 9x^2 - 155x - 500 = 0$

$\Rightarrow 9x^2 - 180x + 25x - 500 = 0$

$$\Rightarrow 9x(x-20) + 25(x-20) = 0$$

$$\Rightarrow (x-20)(9x + 25) = 0$$

$$\Rightarrow x = -\frac{25}{9} \text{ or } x = 20$$

So the time taken to fill the reservoir by first pipe is 20 hrs and second pipe is 25 hrs.

8. Question

Porna and Pijush together complete a work in 4 days. If they work separately, then the time taken by Porna would be 6 days more than the time taken by Pijaush. Let us write, by calculating, the time taken by Porna alone to complete the work.

Answer

Let time taken by pijush be x days.

Therefore, time taken by porna be x + 6 days.

According to question,

$$\frac{1}{x} + \frac{1}{x + 6} = \frac{1}{4}$$

$$\Rightarrow \frac{x + 6 + x}{x(x + 6)} = \frac{1}{4}$$

$$\Rightarrow 4(2x + 6) = x^2 + 6x$$

$$\Rightarrow 8x + 24 = x^2 + 6x$$

$$\Rightarrow x^2 + 6x - 8x - 24 = 0$$

$$\Rightarrow x^2 - 2x - 24 = 0$$

$$\Rightarrow (x-6)(x + 4) = 0$$

$$\Rightarrow x = 6 \text{ or } x = -4$$

So, time taken by pijush to complete the work alone is 6 days , and by porna is 12 days.

9. Question

If the price of 1 dozen pen is reduced by ₹ 6, then 3 more pens will be got in ₹ 30. Before the reduction of price, let us calculate the price of 1 donzen pen.

Answer

Let the price of a dozen pen before reduction be r

As, price = pens × rate per dozen

30 = pens × r

So, number of pens before reduction is $\frac{30}{r}$.

After reduction:

Again price = pens × rate per dozen

$$30 = \left[3 + \frac{30}{r}\right] \times (r - 6)$$

$$\Rightarrow 30 = \left[\frac{3(r + 10)}{r}\right] \times (r - 6)$$

$$\Rightarrow 10r = (r + 10) \times (r - 6)$$

$$\Rightarrow 10r = r^2 - 6r + 10r - 60$$

$$\Rightarrow 0 = r^2 - 6r + 10r - 10r - 60$$

$$\Rightarrow r^2 - 6r - 60 = 0$$

$$\Rightarrow r = -5.3 \text{ or } r = 11.3$$

As rate can never be negative so, price of a dozen pen is

Rs. 11.30.

10 A1. Question

The number of roots of a quadratic equation is

A. one

B. two

C. three

D. none of them

Answer

As we know that the highest degree of variable in quadratic equation is two so the number of roots is two.

10 A2. Question

If in a $ax^2 + bx + c$ quadratic equation, then

A. $b \neq 0$

B. $C \neq 0$

C. $a \neq 0$

D. none of these

Answer

In a quadratic equation the coefficient of x^2 is non-zero.

10 A3. Question

The highest power of the variable in a quadratic equation is

A. 1

B. 2

C. 3

D. none of these

Answer

As we know that the highest power of variable in quadratic equation is two.

10 A4. Question

The equation $4(5x^2 - 7x + 2)=5 (4x^2 – 6x + 3)$ is

A. linear

B. quadratic

C. 3rd degree

D. none of these

Answer

$$4(5x^2 - 7x + 2) = 5(4x^2 - 6x + 3)$$

$$\Rightarrow 20x^2 - 28x + 8 = 20x^2 - 30x + 15$$

$$\Rightarrow 20x^2 - 20x^2 - 28x + 30x + 8 - 15 = 0$$

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

10 A5. Question

The root/two roots of the equation $\frac{x^2}{x} = 6$.

A. 0

B. 6

C. 0 & 6

D. -6

Answer

$\frac{x^2}{x} = 6$

$\Rightarrow x^2 = 6x$

$\Rightarrow x^2 - 6x = 0$

$\Rightarrow x(x-6) = 0$

$\Rightarrow x = 0, x = 6$

10 B. Question

Let us write the following statements whether they are true or false :

i. $(x-3)^2 = x^2 - 6x + 9$ is a quadratic equation

ii. 5 is the only one root of the equation $x^2 = 25$

Answer

(i) False

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

$\Rightarrow x^2 + 9 - 6x = x^2 - 6x + 9$

As both sides are same, so it is not a quadratic equation.

(ii) False

$x^2 - 25 = 0$

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

$\Rightarrow x = 0, 5$

10 C. Question

Let us fill in the blank :

i. If a = 0 and b ≠ 0 in the equation $ax^2 + bx + c = 0$, then the equation is a …….. equation.

ii. The two roots of the equation $x^2 = 6x$ are …….. & …….. .

Answer

(i) linear

if a = 0, the equation is bx + c = 0 which is linear.

(ii) 6 and 0

$x^2 - 6x = 0$

$\Rightarrow x^2 - 6x = 0$

$\Rightarrow x(x-6) = 0$

$\Rightarrow x = 0,6$

11 A. Question

Let us find the value of a, if one root of the equation x^2+ax+3=0 is 1

Answer

The given equation is $x^2 + ax + 3 = 0$

Given one of the roots is 1.

So, 1 must satisfy the equation.

$\therefore (1)^2 + a \times 1 + 3 = 0$

$\Rightarrow 1 + a + 3 = 0$

$\Rightarrow a + 4 = 0$

$\Rightarrow a = -4$

Therefore, the value of a is -4.

11 B. Question

Let us write the value of the other root if one root of the equation x^2 - (2 + b) x + 6 = 0 is 2.

Answer

The given equation is $x^2 - (2 + b)x + 6 = 0$

Given one of the roots is 2.

So, 2 must satisfy the equation.

$\therefore (2)^2$-(2 + b) × 2 + 6 = 0

$\Rightarrow$ 4-4-2b + 6 = 0

$\Rightarrow$ -2b = -6

$\Rightarrow b = \frac{-6}{-2}$

$\Rightarrow b = 3$

Therefore, the value of b is 3.

$\therefore$ the equation is $x^2 - (2 + 3)x + 6 = 0$

$\Rightarrow x^2 - 5x + 6 = 0$

$\Rightarrow x^2 - 3x - 2x + 6 = 0$

$\Rightarrow x(x-3) - 2(x-3) = 0$

$\Rightarrow (x-3)(x-2) = 0$

$\Rightarrow x = 3,2$

Therefore the other root is 3.

11 C. Question

Let us write the value of the other root if one root of the equation $2x^2 + kx + 4 = 0$ is 2.

Answer

The given equation is $2x^2 + kx + 4 = 0$

Given one of the roots is 2.

So, 2 must satisfy the equation.

$\therefore 2 \times (2)^2 + k \times 2 + 4 = 0$

$\Rightarrow 8 + 2k + 4 = 0$

$\Rightarrow 2k + 12 = 0$

$\Rightarrow k = -\frac{12}{2} = -6$

Therefore, the value of k is -6.

$\therefore$ the equation is $2x^2 + (-6)x + 4 = 0$

$\Rightarrow 2x^2 - 6x + 4 = 0$

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

$\Rightarrow x^2 - x - 2x + 2 = 0$

$\Rightarrow x(x-1) - 2(x-1) = 0$

$\Rightarrow (x-1)(x-2) = 0$

$\Rightarrow x = 1,2$

Therefore the other root is 1.

11 D. Question

Let us write the equation; if the difference of a proper fraction and its reciprocal is 9/20.

Answer

Let the proper fraction be x.

Its reciprocal is $\frac{1}{x}$

According to question ,

$$x - \frac{1}{x} = \frac{9}{20}$$

$$\Rightarrow \frac{(x^2-1)}{x} = \frac{9}{20}$$

$\Rightarrow 20x^2 - 20 = 9x$

$\Rightarrow 20x^2 - 9x - 20 = 0$

11 E. Question

Let us write the values of a and b, if the two roots of the equation $ax^2 + bx + 35 = 0$ are -5 and -7

Answer

The given equation is $ax^2 + bx + 35 = 0$

Given the roots are -5 and -7.

So, -5 and -7 must satisfy the equation.

$\therefore 2 \times (2)^2 + k \times 2 + 4 = 0$

$\Rightarrow 8 + 2k + 4 = 0$

$\Rightarrow 2k + 12 = 0$

$$\Rightarrow k = -\frac{12}{2} = -6$$

Therefore, the value of k is -6.

$\therefore$ the equation is $2x^2 - (-6)x + 4 = 0$

$\Rightarrow 2x^2 + 6x + 4 = 0$

$\Rightarrow x^2 + 3x + 2 = 0$

$\Rightarrow x^2 + x + 2x + 2 = 0$

$\Rightarrow x(x + 1) + 2(x + 1) = 0$

$\Rightarrow (x + 1)(x + 2) = 0$

$\Rightarrow x = -1, -2$

Therefore, the other root is -1.