RD SHARMA

Solutions

Class 10 Maths

Chapter 8

Ex 8.3

Question 1: Find the roots of the equation (x – 4) (x + 2) = 0

Sol:

The given equation is (x – 4) (x + 2) = 0

Either x – 4 = 0 therefore x = 4

Or, x + 2 = 0 therefore x = -2

The roots of the above mentioned quadratic equation are 4 and -2 respectively.

Question 2: Find the roots of the equation (2x + 3) (3x – 7) = 0

Sol:

The given equation is (2x + 3) (3x – 7) = 0.

Either 2x+3 =0, therefore $x = -32 x = \frac{-3}{2}$

Or, 3x-7 =0, therefore $x = 73 x = \frac{7}{3}$

The roots of the above mentioned quadratic equation are $x = -32 x = \frac{-3}{2}$ and $x = 73 x = \frac{7}{3}$ respectively.

Question 3: Find the roots of the quadratic equation $3x^2$-14x-5 = 0

Sol:

The given equation is $3x^2$-14x-5 = 0

= $3x^2$-14x-5 = 0

= $3x^2$-15x+x-5 = 0

= 3x(x-5)+1(x-5) =0

= (3x+1)(x-5) = 0

Either 3x+1 =0 therefore $x = -13 x = \frac{-1}{3}$

Or, x-5 =0 therefore x=5

The roots of the given quadratic equation are 5 and $x=-13 x=\frac{-1}{3}$ respectively.

Question 4: Find the roots of the equation $9x^2-3x-2=0$.

Sol:

The given equation is $9x^2-3x-2=0$.

$= 9x^2-3x-2=0.$

$= 9x^2 -6x+3x-2=0$

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

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

Either, $3x-2=0$ therefore $x=23 x=\frac{2}{3}$

Or, $3x+1 = 0$ therefore $x=-13 x=\frac{-1}{3}$

The roots of the above mentioned quadratic equation are $x=23 x=\frac{2}{3}$ and $x=-13 x=\frac{-1}{3}$ respectively.

Question 5: Find the roots of the quadratic equation $1x-1-1x+5=67 \frac{1}{x-1}-\frac{1}{x+5}=\frac{6}{7}$

Sol:

The given equation is $1x-1-1x+5=67 \frac{1}{x-1}-\frac{1}{x+5}=\frac{6}{7}$

$= 1x-1-1x+5=67 \frac{1}{x-1}-\frac{1}{x+5}=\frac{6}{7}$

$= x+5-x+1(x-1)(x+5)=67 \frac{x+5-x+1}{(x-1)(x+5)}=\frac{6}{7}$

$= 6x^2+4x-5=67 \frac{6}{x^2+4x-5}=\frac{6}{7}$

Cancelling out the like terms on both the sides of the numerator. We get,

$= 1x^2+4x-5=17 \frac{1}{x^2+4x-5}=\frac{1}{7}$

$= x^2+4x-5 = 7$

= x^2+4x-12 = 0

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

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

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

Either x+6 =0

Therefore x= -6

Or, x-2 =0

Therefore x=2

The roots of the above mentioned quadratic equation are 2 and -6 respectively.

Question 6: Find the roots of the equation $6x^2$+11x+3=0.

Sol:

The given equation is $6x^2$+11x+3 =0.

= $6x^2$+11x+3 =0.

= $6x^2$ +9x+2x+3 =0

= 3x(2x+3) +1(2x+3) =0

= (2x+3)(3x+1) =0

Either, 2x+3 =0 therefore $x = -\frac{3}{2}$

Or, 3x+1 =0 therefore $x = -\frac{1}{3}$

The roots of the above mentioned quadratic equation are $x = -\frac{3}{2}$ and $x = -\frac{1}{3}$ respectively .

Question 7: Find the roots of the equation $5x^2$-3x-2=0

Sol:

The given equation is $5x^2$-3x-2=0.

= $5x^2$-3x-2=0.

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

= 5x(x-1) +2(x-1) =0

= (5x+2) (x-1) =0

Either 5x+2 =0 therefore **x=** $-25 \mathrm{x} = \frac{-2}{5}$

Or, x-1 =0 therefore x= 1

The roots of the above mentioned quadratic equation are 1 and **x=** $-25 \mathrm{x} = \frac{-2}{5}$ respectively.

Question 8: Find the roots of the equation $48x^2$-13x-1=0

Sol:

The given equation is $48x^2$-13x-1=0.

= $48x^2$-13x-1=0.

= $48x^2$-16x+3x-1=0.

= 16x (3x-1) +1(3x-1) =0

= (16x+1)(3x-1) =0

Either 16x+1 =0 therefore **x=** $-116 \mathrm{x} = \frac{-1}{16}$

Or, 3x-1 =0 therefore **x=** $13 \mathrm{x} = \frac{1}{3}$

The roots of the above mentioned quadratic equation are **x=** $-116 \mathrm{x} = \frac{-1}{16}$

And **x=** $13 \mathrm{x} = \frac{1}{3}$ respectively.

Question 9: Find the roots of the equation $3x^2$=-11x-10

Sol:

The given equation is $3x^2$=-11x-10

= $3x^2$=-11x-10

$= 3x^2+11x+10 = 0$

$= 3x^2+6x+5x+10 =0$

$= 3x(x+2) +5(x+2) =0$

$= (3x+2)(x+2) =0$

Either $3x+2 =0$ therefore $x=-23x = \frac{-2}{3}$

Or, $x+2 =0$ therefore $x= -2$

The roots of the above mentioned quadratic equation are $x=-23x = \frac{-2}{3}$ and -2 respectively.

Question 10: Find the roots of the equation 25x(x+1) =-4

Sol:

The given equation is $25x(x+1) =4$

$= 25x(x+1) =-4$

$= 25x^2+25x +4 = 0$

$= 25x^2+20x+5x+4 =0$

$= 5x (5x+4)+1(5x+4)=0$

$= (5x+4)(5x+1) =0$

Either $5x+4 = 0$ therefore $x=-45x = \frac{-4}{5}$

Or, $5x+1 =0$ therefore $x=-15x = \frac{-1}{5}$

The roots of the quadratic equation are $x=-45x = \frac{-4}{5}$ and $x=-15x = \frac{-1}{5}$ respectively.

Question 12: Find the roots of the quadratic equation $1x-1x-2=3\frac{1}{x} - \frac{1}{x-2} = 3$

Sol:

The given equation is $1x-1x-2=3\frac{1}{x} - \frac{1}{x-2} = 3$

$= 1x-1x-2=3\frac{1}{x} - \frac{1}{x-2} = 3$

$= x-2-xx(x-2) = 3\frac{x-2-x}{x(x-2)} = 3$

$= 2x(x-2) = 3\frac{2}{x(x-2)} = 3$

Cross multiplying both the sides. We get,

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

$= 2 = 3x^2-6x$

$= 3x^2-6x-2 = 0$

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

$=3x^2-(3+\sqrt{3})x-(3-\sqrt{3})x+[(\sqrt{3}^2)-1^2]3x^2-(3+\sqrt{3})x-(3-\sqrt{3})x+[(\sqrt{3}^2)-1^2]$

$= 3x^2-(3+\sqrt{3})x-(3-\sqrt{3})x+[(\sqrt{3}^2)-1^2][(\sqrt{3}^2)-1^2]$
$3x^2-(3+\sqrt{3})x-(3-\sqrt{3})x+[(\sqrt{3}^2)-1^2][(\sqrt{3}^2)-1^2]$

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

$= \sqrt{3}x(\sqrt{3}+1)x-(\sqrt{3}x-(\sqrt{3}+1))(\sqrt{3}-1)\sqrt{3}x(\sqrt{3}+1)x-(\sqrt{3}x-(\sqrt{3}+1))(\sqrt{3}-1)$

$= (\sqrt{3}x-\sqrt{3}-1)(\sqrt{3}x-\sqrt{3}+1)(\sqrt{3}-1)(\sqrt{3}x-\sqrt{3}-1)(\sqrt{3}x-\sqrt{3}+1)(\sqrt{3}-1)$

Either $= (\sqrt{3}x-\sqrt{3}-1)(\sqrt{3}x-\sqrt{3}-1)$

Therefore $x=\sqrt{3}+1\sqrt{3}x = \frac{\sqrt{3}+1}{\sqrt{3}}$

Or, $(\sqrt{3}x-\sqrt{3}+1)(\sqrt{3}-1)(\sqrt{3}x-\sqrt{3}+1)(\sqrt{3}-1)$

Therefore, $x=\sqrt{3}-1\sqrt{3}x = \frac{\sqrt{3}-1}{\sqrt{3}}$

The roots of the above mentioned quadratic equation are $x=\sqrt{3}-1\sqrt{3}x = \frac{\sqrt{3}-1}{\sqrt{3}}$ and $x=\sqrt{3}+1\sqrt{3}x = \frac{\sqrt{3}+1}{\sqrt{3}}$ respectively.

Question 13: Find the roots of the quadratic equation $x-1x=3x-\frac{1}{x}=3$

Sol:

The given equation is $x-1x=3x-\frac{1}{x}=3$

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

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

$=x^2-1=3x$

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

$=x^2-(32+32)x-1=0x^2-(\frac{3}{2}+\frac{3}{2})x-1=0$

$=x^2-3+\sqrt{32}x-3-\sqrt{32}x-1=0x^2-\frac{3+\sqrt{3}}{2}x-\frac{3-\sqrt{3}}{2}x-1=0$

$=x^2-3+\sqrt{32}x-3-\sqrt{32}x--44=0x^2-\frac{3+\sqrt{3}}{2}x-\frac{3-\sqrt{3}}{2}x-\frac{-4}{4}=0$

$=x^2-3+\sqrt{32}x-3-\sqrt{32}x-9-134=0x^2-\frac{3+\sqrt{3}}{2}x-\frac{3-\sqrt{3}}{2}x-\frac{9-13}{4}=0$

$=x^2-3+\sqrt{32}x-3-\sqrt{32}x-(3)^2-(\sqrt{13}^2)(2)^2=0x^2-\frac{3+\sqrt{3}}{2}x-\frac{3-\sqrt{3}}{2}x-\frac{(3)^2-(\sqrt{13}^2)}{(2)^2}=0$

$=x^2-3+\sqrt{32}x-3-\sqrt{32}x+(3+\sqrt{132})(3-\sqrt{132})=0x^2-\frac{3+\sqrt{3}}{2}x-\frac{3-\sqrt{3}}{2}x+(\frac{3+\sqrt{13}}{2})(\frac{3-\sqrt{13}}{2})=0$

$=(x-3+\sqrt{132})(x-3-\sqrt{132})=0(x-\frac{3+\sqrt{13}}{2})(x-\frac{3-\sqrt{13}}{2})=0$

Either $(x-3+\sqrt{132})=0(x-\frac{3+\sqrt{13}}{2})=0$

Therefore $3+\sqrt{132}\ \frac{3+\sqrt{13}}{2}$

Or, $(x-3-\sqrt{132})=0(x-\frac{3-\sqrt{13}}{2})=0$

Therefore $3-\sqrt{132}\ \frac{3-\sqrt{13}}{2}$

The roots of the above mentioned quadratic equation are $3+\sqrt{132}\ \frac{3+\sqrt{13}}{2}$ and $3-\sqrt{132}$ $\frac{3-\sqrt{13}}{2}$ respectively.

Question 14: Find the roots of the quadratic equation $1x+4-1x-7=1130\ \frac{1}{x+4}-\frac{1}{x-7}=\frac{11}{30}$

Sol:

The given equation is $1x+4-1x-7=1130\ \frac{1}{x+4}-\frac{1}{x-7}=\frac{11}{30}$

$= \frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$

$= \frac{x-7-x-4}{(x+4)(x-7)} = \frac{11}{30}$

$= \frac{-11}{(x+4)(x-7)} = \frac{11}{30}$

Cancelling out the like numbers on both the sides of the equation

$= \frac{-1}{(x+4)(x-7)} = \frac{1}{30}$

$= x^2-3x-28 = -30$

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

$= x^2-2x-x-2 = 0$

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

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

Either x-2 = 0

Therefore x= 2

Or, x-1 = 0

Therefore x= 1

The roots of the above mentioned quadratic equation are 1 and 2 respectively.

Question 15: Find the roots of the quadratic equation $a^2x^2-3abx+2b^2=0$

Sol:

The given equation is $a^2x^2-3abx+2b^2=0$

$= a^2x^2-3abx+2b^2=0$

$= a^2x^2-abx-2abx+2b^2=0$

$= ax(ax-b)-2b(ax-b) = 0$

$= (ax-b)(ax-2b) = 0$

Either ax-b=0 therefore $x = \frac{b}{a}$

Or, ax-2b =0 therefore $x = \frac{2b}{a}$

The roots of the quadratic equation are $x=\frac{2b}{2a}$ and $x=\frac{b}{a}$ respectively.

Question 16: Find the roots of the $4x^2+4bx-(a^2-b^2)=0$

Sol:

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

$= -2(a-b) * 2(a+b)$

$=2(b-a) * 2(b+a)$

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

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

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

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

Either, $(2x+(b-a)) = 0$

Therefore $x=\frac{a-b}{2}$

Or, $(2x+b+a) =0$

Therefore $x=\frac{-a-b}{2}$

The roots of the above mentioned quadratic equation are $x=\frac{-a-b}{2}$ and $x=\frac{a-b}{2}$ respectively.

Question 17: Find the roots of the equation $ax^2+(4a^2-3b)x -12ab =0$

Sol:

The given equation is $ax^2+(4a^2-3b)x -12ab =0$

$= ax^2+(4a^2-3b)x -12ab =0$

$= ax^2+4a^2x-3bx -12ab =0$

$= ax(x-4a) – 3b(x-4a) =0$

$= (x-4a)(ax-4b) = 0$

Either x-4a =0

Therefore x= 4a

Or, ax-4b = 0

Therefore x=4bax $= \frac{4b}{a}$

The roots of the above mentioned quadratic equation are x=4bax $= \frac{4b}{a}$ and 4a respectively.

Question 18: Find the roots of x+3x+2=3x−72x−3 $\frac{x+3}{x+2} = \frac{3x-7}{2x-3}$

Sol:

The given equation is x+3x+2=3x−72x−3 $\frac{x+3}{x+2} = \frac{3x-7}{2x-3}$

= =(x+3)(2x-3)=(x+2){3x-7)

=$2x^2$-3x+6x-9=$3x^2$-x-14

=$2x^2$+3x-9=$3x^2$-x-14

=x^2-3x-x-14+9=0

= x^2-5x+x-5 = 0

=x(x-5)+1(x-5)=0

=(x-5) (x+I)-0

Either x-5-0 or x+1=0

x=5 and x=-1

The roots of the above mentioned quadratic equation are 5 and -1 respectively.

Question 19: Find the roots of the equation 2xx−4+2x−5x−3=253 $\frac{2x}{x-4} + \frac{2x-5}{x-3} = \frac{25}{3}$

Sol:

The given equation is 2xx−4+2x−5x−3=253 $\frac{2x}{x-4} + \frac{2x-5}{x-3} = \frac{25}{3}$

= 2x(x−3)+(2x−5)(x−4)(x−4)(x−3)=253 $\frac{2x(x-3)+(2x-5)(x-4)}{(x-4)(x-3)} = \frac{25}{3}$

$= 2x^2-6x+2x^2-5x-8x+20x^2-4x-3x+12 = 253\ \frac{2x^2-6x+2x^2-5x-8x+20}{x^2-4x-3x+12} = \frac{25}{3}$

$= 4x^2-19x+20x^2-7x+12 = 253\ \frac{4x^2-19x+20}{x^2-7x+12} = \frac{25}{3}$

$= 3(4x^2\text{-}19x+20) = 25(x^2\text{-}7x+12)$

$= 12x^2\text{-}57x+60 = 25x^2 - 175x+300$

$= 13x^2\text{-}78x\text{-}40x+240=0$

$= 13x^2\text{-}118x+240=0$

$= 13x^2\text{-}78x\text{-}40x+240=0$

$= 13x(x\text{-}6)\text{-}40(x\text{-}6) =0$

$= (x\text{-}6)(13x\text{-}40) =0$

Either x-6 = 0 therefore x= 6

Or , 13x-40 = 0 therefore x = $4013\ \frac{40}{13}$

The roots of the above mentioned quadratic equation are 6 and $4013\ \frac{40}{13}$ respectively.

Question 20: Find the roots of the quadratic equation $x+3x-2-1-xx=174\ \frac{x+3}{x-2} - \frac{1-x}{x} = \frac{17}{4}$

Sol:

The given equation is $x+3x-2-1-xx=174\ \frac{x+3}{x-2} - \frac{1-x}{x} = \frac{17}{4}$

$= x(x+3)-(x-2)(1-x)x(x-2) = 174\ \frac{x(x+3)-(x-2)(1-x)}{x(x-2)} = \frac{17}{4}$

$= x^2+3x-x+x^2+2-2xx^2-2x = 174\ \frac{x^2+3x-x+x^2+2-2x}{x^2-2x} = \frac{17}{4}$

$= 2x^2+2x^2-2x = 174\ \frac{2x^2+2}{x^2-2x} = \frac{17}{4}$

$= 4(2x^2+2) = 17(x^2\text{-}2x)$

$= 8x^2+8 = 17x^2\text{-}34x$

$= 9x^2\text{-}34x\text{-}8 = 0$

$= 9x^2\text{-}36x+2x\text{-}8 = 0$

= 9x(x-4)+2(x-4) =0

= (9x+2)(x-4) =0

Either 9x+2 = 0 therefore $x = -29x = \frac{-2}{9}$

Or, x-4 = 0 therefore x= 4

The roots of the above mentioned quadratic equation are $x = -29x = \frac{-2}{9}$ and 4 respectively.

Question 21: Find the roots of the quadratic equation $1x-2+2x-1=6x \frac{1}{x-2} + \frac{2}{x-1} = \frac{6}{x}$

Sol:

The equation is $1x-2+2x-1=6x \frac{1}{x-2} + \frac{2}{x-1} = \frac{6}{x}$

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

$= (x-1)+2x-4(x^2-2x-x+2)=6x \frac{(x-1)+2x-4}{(x^2-2x-x+2)} = \frac{6}{x}$

$= 3x-5(x^2-3x+2)=6x \frac{3x-5}{(x^2-3x+2)} = \frac{6}{x}$

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

= 3x^2-5x= 6x^2-18x+12

= 3x^2-13x+12 =0

= 3x^2-9x-4x+12 =0

= 3x(x-3)-4(x-3) =0

= (x-3)(3x-4) = 0

Either x-3 = 0 therefore x= 3

Or, 3x-4 = 0 therefore $43\frac{4}{3}$

The roots of the above mentioned quadratic equation are 3 and $43\frac{4}{3}$ respectively.

Question 22: Find the roots of the quadratic equation $x+1x-1-x-1x+1=56 \frac{x+1}{x-1} - \frac{x-1}{x+1} = \frac{5}{6}$

Sol:

The equation is $\frac{x+1}{x-1} - \frac{x-1}{x+1} = \frac{5}{6}$

$= \frac{(x+1)^2-(x-1)^2}{x^2-1} = \frac{5}{6}$

$= \frac{4x}{x^2-1} = \frac{5}{6}$

$= 6(4x) = 5(x^2-1)$

$= 24x = 5x^2-5$

$= 5x^2-24x-5 = 0$

$= 5x^2-25x+x-5 = 0$

$= 5x(x-5)+1(x-5) = 0$

$= (5x+1)(x-5) = 0$

Either $x-5 = 0$

Therefore $x = 5$

Or, $5x+1 = 0$

Therefore $x = -15 x = \frac{-1}{5}$

The roots of the above mentioned quadratic equation are $x = -15 x = \frac{-1}{5}$ and 5 respectively.

Question 23: Find the roots of the quadratic equation $\frac{x-1}{2x+1} + \frac{2x+1}{x-1} = \frac{5}{2}$

Sol:

The equation is $\frac{x-1}{2x+1} + \frac{2x+1}{x-1} = \frac{5}{2}$

$= \frac{(x-1)^2+(2x+1)^2}{2x^2-2x+x-1} = \frac{5}{2}$

$= \frac{x^2-2x+1+4x^2+4x+1}{2x^2-x-1} = \frac{5}{2}$

$= \frac{5x^2+2x+2}{2x^2-x-1} = \frac{5}{2}$

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

= $10x^2+4x+4 = 10x^2-5x-5$

Cancelling out the equal terms on both sides of the equation. We get,

= 4x+5x+4+5=0

= 9x+9=0

= 9x = -9

X = -1

X = -1 is the only root of the given equation.

Question 24: Find the roots of the quadratic equation $\frac{m}{n}x^2+\frac{n}{m}=1-2x$

The given equation is $\frac{m}{n}x^2+\frac{n}{m}=1-2x$

= $\frac{m}{n}x^2+\frac{n}{m}=1-2x$

= $\frac{m^2x^2+n^2}{mn}=1-2x$

= $m^2x^2+2mnx+(n^2-mn) = 0$

Now we solve the above quadratic equation using factorization method

Therefore

= $(m^2x^2+mnx+m\sqrt{mnx})+(mnx-m\sqrt{mnx}(n+\sqrt{mn})(n-\sqrt{mn}))=0$
$(m^2x^2 + mnx + m\sqrt{mnx}) + (mnx - m\sqrt{mnx}(n + \sqrt{mn})(n - \sqrt{mn})) = 0$

= $(m^2x^2+mnx+m\sqrt{mnx})+(mx(n-\sqrt{mn})+(n+\sqrt{mn})(n-\sqrt{mn}))=0$
$(m^2x^2 + mnx + m\sqrt{mnx}) + (mx(n - \sqrt{mn}) + (n + \sqrt{mn})(n - \sqrt{mn})) = 0$

= $mx(mx+n+\sqrt{mn})+(n-\sqrt{mn})(mx+n+\sqrt{mn})=0$
$mx(mx + n + \sqrt{mn}) + (n - \sqrt{mn})(mx + n + \sqrt{mn}) = 0$

= $(mx+n+\sqrt{mn})(mx+n-\sqrt{mn})=0(mx + n + \sqrt{mn})(mx + n - \sqrt{mn}) = 0$

Now, one of the products must be equal to zero for the whole product to be zero for the whole product to be zero. Hence, we equate both the products to zero in order to find the value of x .

Therefore,

$(mx+n+\sqrt{mn})=0(mx + n + \sqrt{mn}) = 0$ $mx=-n-\sqrt{mn}mx = -n - \sqrt{mn}$ $x=\frac{-n-\sqrt{mn}}{m}$
$x = \frac{-n-\sqrt{mn}}{m}$

Or

$(mx+n-\sqrt{mn})=0(mx+n-\sqrt{mn})=0$ $x=-n+\sqrt{mnm}\,x=\frac{-n+\sqrt{mn}}{m}$ $x=-n+\sqrt{mnm}\,x=\frac{-n+\sqrt{mn}}{m}$

The roots of the above mentioned quadratic equation are $x=-n+\sqrt{mnm}\,x=\frac{-n+\sqrt{mn}}{m}$ and $x=-n-\sqrt{mnm}\,x=\frac{-n-\sqrt{mn}}{m}$ respectively.

Question 25: Find the roots of the quadratic equation $x-ax-b+x-bx-a=ab+ba$

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

Sol:

The given equation is $x-ax-b+x-bx-a=ab+ba\,\frac{x-a}{x-b}+\frac{x-b}{x-a}=\frac{a}{b}+\frac{b}{a}$

$= x-ax-b+x-bx-a=ab+ba\,\frac{x-a}{x-b}+\frac{x-b}{x-a}=\frac{a}{b}+\frac{b}{a}$

$= (x-a)^2+(x-b)^2(x-a)(x-b)=ab+ba\,\frac{(x-a)^2+(x-b)^2}{(x-a)(x-b)}=\frac{a}{b}+\frac{b}{a}$

$= x^2-2ax+a^2+x^2-2bx+b^2x^2+ab-bx-ax=a^2+b^2ab\,\frac{x^2-2ax+a^2+x^2-2bx+b^2}{x^2+ab-bx-ax}=\frac{a^2+b^2}{ab}$

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

$= (2abx^2-2abx(a+b)+ab(a^2+b^2)) = (a^2+b^2)(x^2-(a^2+b^2)(a+b)x+(a^2+b^2)(ab)$

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

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

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

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

Either x= 0

Or, (x-(a+b))=0

Therefore x= a+b

The roots of the above mentioned quadratic equation are 0 and a+b respectively.

Question 26: Find the roots of the quadratic equation $1(x-1)(x-2)+1(x-2)(x-3)+1(x-3)(x-4)=16$

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

Sol:

The given equation is $1(x-1)(x-2)+1(x-2)(x-3)+1(x-3)(x-4)=16$

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

$$= 1(x-1)(x-2)+1(x-2)(x-3)+1(x-3)(x-4)=16\ \frac{1}{(x-1)(x-2)}+\frac{1}{(x-2)(x-3)}+\frac{1}{(x-3)(x-4)}=\frac{1}{6}$$

$$= (x-3)(x-4)+(x-1)(x-4)+(x-1)(x-2)(x-1)(x-2)(x-3)(x-3)(x-4)=16\ \frac{(x-3)(x-4)+(x-1)(x-4)+(x-1)(x-2)}{(x-1)(x-2)(x-3)(x-3)(x-4)}=\frac{1}{6}$$

$$= (x-3)(x-4)+(x-1)[(x-4)+(x-2)](x-1)(x-2)(x-3)(x-3)(x-4)=16\ \frac{(x-3)(x-4)+(x-1)[(x-4)+(x-2)]}{(x-1)(x-2)(x-3)(x-3)(x-4)}=\frac{1}{6}$$

$$= (x-3)(x-4)+(x-1)(2x-6)(x-1)(x-2)(x-3)(x-3)(x-4)=16\ \frac{(x-3)(x-4)+(x-1)(2x-6)}{(x-1)(x-2)(x-3)(x-3)(x-4)}=\frac{1}{6}$$

$$= (x-3)(x-4)+(x-1)2(x-3)(x-1)(x-2)(x-3)(x-3)(x-4)=16\ \frac{(x-3)(x-4)+(x-1)2(x-3)}{(x-1)(x-2)(x-3)(x-3)(x-4)}=\frac{1}{6}$$

$$= (x-3)[(x-4)+(2x-2)](x-1)(x-2)(x-3)(x-3)(x-4)=16\ \frac{(x-3)[(x-4)+(2x-2)]}{(x-1)(x-2)(x-3)(x-3)(x-4)}=\frac{1}{6}$$

$$= (x-3)(3x-6)(x-1)(x-2)(x-3)(x-3)(x-4)=16\ \frac{(x-3)(3x-6)}{(x-1)(x-2)(x-3)(x-3)(x-4)}=\frac{1}{6}$$

$$= 3(x-3)(x-2)(x-1)(x-2)(x-3)(x-3)(x-4)=16\ \frac{3(x-3)(x-2)}{(x-1)(x-2)(x-3)(x-3)(x-4)}=\frac{1}{6}$$

Cancelling out the like terms on both the sides of numerator and denominator. We get,

$$= 3(x-1)(x-2)(x-4)=16\ \frac{3}{(x-1)(x-2)(x-4)}=\frac{1}{6}$$

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

$= x^2-4x-x+4 = 18$

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

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

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

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

Either $x-7 = 0$

Therefore $x=7$

Or, $x+2 =0$

Therefore $x= -2$

The roots of the above mentioned quadratic equation are 7 and -2 respectively.

Question 27: Find the roots of the quadratic equation $\frac{a}{x-a}+\frac{b}{x-b}=\frac{2c}{x-c}$

Sol:

The given equation is $\frac{a}{x-a}+\frac{b}{x-b}=\frac{2c}{x-c}$

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

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

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

$= (x-c)(ax-2ab+bx) = 2c(x^2-bx-ax+ab)$

$= (a+b)x^2-2abx-(a+b)cx+2abc= 2cx^2-2c(a+b)x+2abc$

Question 28: Find the roots of the Question $x^2+2ab=(2a+b)x$

Sol:

The given equation is $x^2+2ab=(2a+b)x$

$= x^2+2ab = (2a+b)x$

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

$= x^2-2ax-bx+2ab = 0$

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

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

Either $x-2a = 0$

Therefore $x= 2a$

Or, $x-b =0$

Therefore $x= b$

The roots of the above mentioned quadratic equation are 2a and b respectively.

Question 29: Find the roots of the quadratic equation $(a+b)^2x^2-4abx-(a-b)^2=0$

Sol:

The given equation is $(a+b)^2x^2-4abx-(a-b)^2=0$

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

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

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

$= (a+b)^2x(x-1)(a+b)^2(x-1)=0$

$= (x-1)(a+b)^2x+(a+b)^2)=0$

Either $x-1=0$

Therefore $x=1$

Or, $(a+b)^2x+(a+b)^2)=0$

Therefore $-(\frac{a-b}{a+b})^2-(\frac{a-b}{a+b})^2$

The roots of the above mentioned quadratic equation are $-(\frac{a-b}{a+b})^2-(\frac{a-b}{a+b})^2$ and 1 respectively .

Question 30: Find the roots of the quadratic equation $a(x^2+1)-x(a^2+1)=0$

Sol:

The given equation is $a(x^2+1)-x(a^2+1)=0$

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

$= ax^2+a-a^2x-x=0$

$= ax(x-a)-1(x-a)=0$

$= (x-a)(ax-1)=0$

Either $x-a=0$

Therefore $x=a$

Or, $ax-1=0$

Therefore x=1a$x = \frac{1}{a}$

The roots of the above mentioned quadratic equation are (a) and x=1a$x = \frac{1}{a}$ respectively.

Question 31: Find the roots of the quadratic equation $x^2+(a+\frac{1}{a})x+1=0$
$x^2 + (a + \frac{1}{a})x + 1 = 0$.

Sol:

The given equation is $x^2+(a+\frac{1}{a})x+1=0$$x^2 + (a + \frac{1}{a})x + 1 = 0$

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

= $x^2+ax+\frac{x}{a}+(a\times\frac{1}{a})=0$$x^2 + ax + \frac{x}{a} + (a \times \frac{1}{a}) = 0$

= $x(x+a)+\frac{1}{a}(x+a)=0$$x(x + a) + \frac{1}{a}(x + a) = 0$

= $(x+a)(x+\frac{1}{a})=0$$(x + a)(x + \frac{1}{a}) = 0$

Either x+a = 0

Therefore x= -a

Or , $(x+\frac{1}{a})=0$$(x + \frac{1}{a}) = 0$

Therefore x=1a$x = \frac{1}{a}$

The roots of the above mentioned quadratic equation are x=1a$x = \frac{1}{a}$ and –a respectively.

Question 32: Find the roots of the quadratic equation $abx^2+(b^2-ac)x-bc=0$

Sol:

The given equation is $abx^2+(b^2-ac)x-bc=0$

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

= $abx^2+b^2x-acx-bc=0$

= bx (ax+b)-c (ax+b)=0

= (ax+b)(bx-c) = 0

Either, ax+b = 0

Therefore x=−bax = $\frac{-b}{a}$

Or, bx-c = 0

Therefore x=cbx = $\frac{c}{b}$

The roots of the above mentioned quadratic equation are x=cbx = $\frac{c}{b}$ and x=−bax = $\frac{-b}{a}$ respectively.

Question 33: Find the roots of the quadratic equation $a^2b^2x^2+b^2x-a^2x-1=0$

Sol:

The given equation is $a^2b^2x^2+b^2x-a^2x-1=0$

= $a^2b^2x^2+b^2x-a^2x-1=0$

= $b^2x(a^2x+1)-1(a^2x+1)$

= $(a^2x+1)(b^2x-1) =0$

Either $(a^2x+1) =0$

Therefore x=−1a2x = $\frac{-1}{a^2}$

Or, $(b^2x-1) =0$

Therefore x=1b2x = $\frac{1}{b^2}$

The roots of the above mentioned quadratic equation are x=1b2x = $\frac{1}{b^2}$ and x=−1a2x = $\frac{-1}{a^2}$ respectively.