# Exercise 9.3

Solve the following equations and verify your answer

**Q.1** $\frac{2x-3}{3x+2} = -\frac{2}{3}$

**Sol:** $\frac{2x-3}{3x+2} = \frac{2}{3}$

By Cross Multiplying

$\Rightarrow$

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

$\Rightarrow 6x-9 = -6x-4$

$\Rightarrow 12x = -4+9$

$\Rightarrow 12x = 5$

$\Rightarrow x = \frac{5}{12}$

**Q.2** $\frac{2-y}{y+7} = \frac{3}{5}$

**Solution:** $\frac{2-y}{y+7} = \frac{3}{5}$

By Cross Multiplying

$\Rightarrow 5(2-y) = 3(y+7)$

$\Rightarrow 10-5y = 3y+21$

$\Rightarrow -5y-3y = 21-10$

$\Rightarrow -8y = 11 \quad \Rightarrow y = \frac{-11}{8}$

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(3) $\frac{5x-7}{3x} = 2$

Sol: By Cross Multiplying

$\Rightarrow 5x-7 = 6x$

$\Rightarrow 5x-6x = 7$

$\Rightarrow -x = 7$

$\Rightarrow x = -7$

(4) $\frac{3x+5}{2x+7} = 4$

Sol: By Cross Multiplying

$\Rightarrow 3x+5 = 4(2x+7)$

$\Rightarrow 3x+5 = 8x+28$

$\Rightarrow 3x-8x = 28-5$

$\Rightarrow -5x = 23$

$\Rightarrow x = -\frac{23}{5}$

(5) $\frac{2y+5}{y+4} = 1$

Sol: By Cross Multiplication.

$2y+5 = y+4$

$\Rightarrow 2y-y = 4-5$

$\Rightarrow y = -1$

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(6) $\frac{2x+1}{3x-2} = \frac{5}{9}$

Sol: $\because \frac{2x+1}{3x-2} = \frac{5}{9}$

By cross Multiplying

$\Rightarrow 9(2x+1) = 5(3x-2)$

$\Rightarrow 18x+9 = 15x-10$

$\Rightarrow 18x - 15x = -10-9$

$\Rightarrow 3x = -19$

$\Rightarrow x = -\frac{19}{3}$

(7) $\frac{1-9y}{19-3y} = \frac{5}{8}$

Sol: $\because \frac{1-9y}{19-3y} = \frac{5}{8}$

By Cross multiplication

$\Rightarrow 8(1-9y) = 5(19-3y)$

$\Rightarrow 8-72y = 95-15y$

$\Rightarrow -72y+15y = 95-8$

$\Rightarrow -57y = 87$

$\Rightarrow y = \frac{-87}{57} = -\frac{29}{19}$

$\Rightarrow y = -\frac{29}{19}$

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

Sol: By cross multiplying

Sol: $2x = -3(3x+1)$

$\Rightarrow 2x = -9x-3$

$\Rightarrow 2x+9x = -3$

$\Rightarrow 11x = -3 \Rightarrow x = \frac{-3}{11}$

(9) $\frac{y-(7-8y)}{9y-(3+4y)} = \frac{2}{3}$

Sol: $\frac{y-(7-8y)}{9y-(3+4y)} = \frac{2}{3}$

$= \frac{y-7+8y}{9y-3-4y} = \frac{2}{3}$

$= \frac{9y-7}{5y-3} = \frac{2}{3}$

By cross multiplying

$\Rightarrow 3(9y-7) = 2(5y-3)$

$\Rightarrow 27y-21 = 10y-6$

$\Rightarrow 27y-10y = -6+21$

$\Rightarrow 17y = 15$

$y = \frac{15}{17}$

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

Solution: $\frac{6}{2x-(3-4x)} = \frac{2}{3}$

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

$\Rightarrow \frac{6}{6x-3} = \frac{2}{3}$

By Cross Multiplication.

$\Rightarrow$

$12x-6 = 18$

$\Rightarrow 12x = 18+6$

$\Rightarrow x = \frac{24}{12}$

$\Rightarrow x = 2$

(11) $\frac{2}{3x} - \frac{3}{2x} = \frac{1}{12}$

Sol: $\frac{2}{3x} - \frac{3}{2x} = \frac{1}{12}$

$= \frac{4-9}{6x} = \frac{1}{12}$

$\Rightarrow \frac{-5}{6x} = \frac{1}{12}$

By Cross Multiplying

$\Rightarrow$

$6x = -60$

$\Rightarrow x = \frac{-60}{6} = -10$

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Q.12 $\frac{3x+5}{4x+2} = \frac{3x+4}{4x+7}$

Solution: $(3x+5)(4x+7) = (3x+4)(4x+2)$ (By Cross Multiplication)

$\Rightarrow 3x(4x+7)+5(4x+7) = 3x(4x+2)+4(4x+2)$

$\Rightarrow 12x^2+21x+20x+35 = 12x^2+6x+16x+8$

$\Rightarrow 41x+35 = 22x+8$

$\Rightarrow 41x-22x = 8-35$

$\Rightarrow 19x = -27$

$x = -\frac{27}{19}$

Q.13 $\frac{7x-2}{5x-1} = \frac{7x+3}{5x+4}$

Sol: (By cross Multiplying)

$= (7x-2)(5x+4) = (7x+3)(5x-1)$

$= 7x(5x+4)-2(5x+4) = 7x(5x-1)+3(5x-1)$

$= 35x^2+28x-10x-8 = 35x^2-7x+15x-3$

$\Rightarrow 18x-8 = 8x-3$

$\Rightarrow 18x-8x = -3+8$

$\Rightarrow 10x = 5$

$\Rightarrow x = \frac{5}{10} = \frac{1}{2}$

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(4) $\left(\frac{x+1}{x+2}\right)^2 = \frac{x+2}{x+4}$

Sol: $\because \frac{(x+1)^2}{(x+2)^2} = \frac{x+2}{x+4}$

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

(By Cross Multiplying)

$\Rightarrow (x^2+2x+1)(x+4) = (x^2+4x+4)(x+2)$

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

$\Rightarrow x^3+4x^2+2x^2+8x+x+4 = x^3+2x^2+4x^2+8x+4x+8$

$= 6x^2+9x+4 = 6x^2+12x+8$

$\Rightarrow 9x-12x = 8-4$

$\Rightarrow -3x = 4$

$\Rightarrow x = -\frac{4}{3}$

Q.15 $\left(\frac{x+1}{x-4}\right)^2 = \frac{x+8}{x-2}$

Sol: $\frac{(x+1)^2}{(x-4)^2} = \frac{x+8}{x-2}$

$\Rightarrow \frac{x^2+2x+1}{x^2-8x+16} = \frac{x+8}{x-2}$

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$\Rightarrow (x-2)(x^2+2x+1)$ (By Cross Multiplication)

$= (x+8)(x^2-8x+16)$

$\Rightarrow x(x^2+2x+1) - 2(x^2+2x+1) = x(x^2-8x+16) + 8(x^2-8x+16$

$\Rightarrow x^3+2x^2+x-2x^2-4x-2 = x^3-8x^2+16x+8x^2-64x+128$

$= x^3-3x-2 = x^3-48x+128.$

$= -3x+48x = 128+2$

$\Rightarrow 45x = 130$

$\Rightarrow x = \frac{130}{45} = \frac{26}{9}$

$\therefore x = \frac{26}{9}$

Q.16 $\frac{9x-7}{3x+5} = \frac{3x-4}{x+6}$

Solution: By Cross Multiplying

$\Rightarrow (9x-7)(x+6) = (3x-4)(3x+5)$

$= 9x(x+6) - 7(x+6) = 3x(3x+5) - 4(3x+5)$

$= 9x^2+54x-7x-42 = 9x^2+15x-12x-20$

$= 47x-42 = 3x-20$

$\Rightarrow 47x-3x = -20+42$

$\Rightarrow 44x = 22 \Rightarrow x = \frac{22}{44} =$

$= \frac{1}{2}$

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17 $\frac{x+2}{x+5} = \frac{x}{x+6}$

Sol: By cross multiplication.

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

$\Rightarrow x^2+6x+2x+12 = x^2+5x$

$\Rightarrow 8x+12 = 5x$

$\Rightarrow 8x-5x = 12$

$\Rightarrow 3x = 12$

$\Rightarrow x = \frac{12}{3} = 4$

18 $\frac{2x-(7-5x)}{9x-(3+4x)} = \frac{7}{6}$

Sol: $\frac{2x-7+5x}{9x-3-4x} = \frac{7}{6}$

$\Rightarrow \frac{7x-7}{5x-3} = \frac{7}{6}$

$\Rightarrow 6(7x-7) = 7(5x-3)$

$\Rightarrow 42x-42 = 35x-21$

$\Rightarrow 42x-35x = -21+42$

$\Rightarrow 7x = 21$

$\Rightarrow x = \frac{21}{7} = 3$

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19 $$\frac{15(2-x)-5(x+6)}{1-3x}=10$$

Sol: $$\frac{15(2-x)-5(x+6)}{1-3x}=10$$

$$\Rightarrow \frac{30-15x-5x-30}{1-3x}=10$$

$$\Rightarrow \frac{-20x}{1-3x}=\frac{10}{1}$$

$$\Rightarrow -20x=10-30x$$

$$\Rightarrow -20x+30x=10$$

$$\Rightarrow 10x=10$$

$$\Rightarrow x=1$$

20 $$\frac{x+3}{x-3}+\frac{x+2}{x-2}=2$$

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

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

$$=\frac{2x^2-12}{x^2-5x+6}=2$$

$$\Rightarrow 2x^2-12=2(x^2-5x+6)$$

$$=2x^2-12=2x^2-10x+12$$

$$=-12-12=-10x \Rightarrow -24=-10x$$

$$\Rightarrow x=\frac{24}{10}=\frac{12}{5} \Rightarrow x=\frac{12}{5}$$

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

Solution: $\dfrac{x(2x-3)+2(2x-3)-2x^2+6}{x-5}=2$

$\Rightarrow \dfrac{2x^2-3x+4x-6-2x^2+6}{x-5}=2$

$\Rightarrow \dfrac{x}{x-5}=2$

$\Rightarrow x=2x-10$

$\Rightarrow 10=2x-x$

$\Rightarrow x=10$

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

Sol: $\dfrac{x^2-\{x^2+3x+2\}}{5x+1}=6$

$\Rightarrow \dfrac{x^2-x^2-3x-2}{5x+1}=6$

$\Rightarrow \dfrac{-3x-2}{5x+1}=6$

Cross Multiplying

$\Rightarrow -3x-2=6(5x+1)$

$\Rightarrow -3x-2=30x+6$

$\Rightarrow -33x=8 \Rightarrow x=\dfrac{-8}{33}$

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(23) $\frac{(2x+3)-(5x-7)}{6x+11} = \frac{-8}{3}$

Sol: $\frac{2x+3-5x+7}{6x+11} = \frac{-8}{3}$

$\Rightarrow \frac{-3x+10}{6x+11} = \frac{-8}{3}$

By Cross Multiplying

$\Rightarrow 3(-3x+10) = -8(6x+11)$

$\Rightarrow -9x+30 = -48x-88$

$\Rightarrow -9x+48x = -88-30$

$\Rightarrow 39x = -118$

$\Rightarrow x = \frac{-118}{39}$

Q.24 Find a positive value of $x$ for which the given equation is satisfied.

(i) $\frac{x^2-9}{5+x^2} = \frac{-5}{9}$ (ii) $\frac{y^2+4}{3y^2+7} = \frac{1}{2}$

Sol: (i) $\frac{x^2-9}{5+x^2} = \frac{-5}{9}$

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

$= 9x^2-81 = -25-5x^2$

$\Rightarrow 9x^2+5x^2 = -25+81$ $\Rightarrow 14x^2 = 56$

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

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(ii) $\dfrac{y^2+4}{3y^2+7} = \dfrac{1}{2}$

<u>Solution</u>: $2(y^2+4) = 3y^2+7$

(By Cross multiplying)

$\Rightarrow 2y^2+8 = 3y^2+7$

$\Rightarrow 8-7 = 3y^2 - 2y^2$

$\Rightarrow 1 = y^2$

$\Rightarrow y = \pm 1$

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