

Solution ***Section R.2 – Linear and Rational Equations***

Exercise

Solve: $5x - 8 = 72$

Solution

$$5x - 8 + 8 = 72 + 8$$

$$5x = 80$$

$$\underline{x = 16}$$

Exercise

Solve: $14 - 5x = -41$

Solution

$$14 - 5x = -41$$

$$5x = 14 + 41$$

$$5x = 55$$

$$\underline{x = 11}$$

Exercise

Solve: $2x + 6 = 3x - 2$

Solution

$$2x + 6 - 3x - 6 = 3x - 2 - 3x - 6$$

$$-x = -8$$

$$\underline{x = 8}$$

Exercise

Solve: $11x - (6x - 5) = 40$

Solution

$$11x - 6x + 5 = 40$$

$$5x + 5 - 5 = 40 - 5$$

$$5x = 35$$

$$\underline{x = 7}$$

Exercise

Solve: $9x + 11 = 7x + 1$

Solution

$$9x + 11 - 7x - 11 = 7x + 1 - 7x - 11$$

$$2x = -10$$

$$\underline{x = -5}$$

Exercise

Solve: $2x - 7 = 6 + x$

Solution

$$2x - 7 - x + 7 = 6 + x - x + 7$$

$$\underline{x = 13}$$

Exercise

Solve: $5x - 2 = 9x + 2$

Solution

$$5x - 2 - 9x + 2 = 9x + 2 - 9x + 2$$

$$-4x = 4$$

$$\underline{x = -1}$$

Exercise

Solve: $3(x - 2) + 7 = 2(x + 5)$

Solution

$$3x - 6 + 7 = 2x + 10$$

$$3x = 9$$

$$\underline{x = 3}$$

Exercise

Solve: $3x + 5 - 5(x + 1) = 6x + 7$

Solution

$$3x + 5 - 5x - 5 = 6x + 7$$

$$-8x = 7$$

$$\underline{x = -\frac{7}{8}}$$

Exercise

Solve: $4(-2x + 1) = 6 - (2x - 4)$

Solution

$$-8x + 4 = 6 - 2x + 4$$

$$-6x = 6$$

$$\underline{x = -1}$$

Exercise

Solve: $4(x + 7) = 2(x + 12) + 2(x + 1)$

Solution

$$4x + 28 = 2x + 24 + 2x + 2$$

$$4x - 4x = 26 - 28$$

$$0 = -2 \times$$

No solution

Exercise

Solve: $6(3x - 1) = 8 - 10(10x - 14)$

Solution

$$18x - 6 = 8 - 100x + 140$$

$$118x = 154$$

$$x = \frac{154}{118}$$

$$\underline{= \frac{77}{59}}$$

Exercise

Solve: $5x - (2x - 8) = 35$

Solution

$$5x - 2x + 8 = 35$$

$$3x = 27$$

$$\underline{x = 9}$$

Exercise

Solve: $\frac{1}{14}(3x - 2) = \frac{x + 10}{10}$

Solution

$$\frac{1}{14}(3x - 2) = \frac{x + 10}{10}$$

$$(70) \frac{1}{14}(3x - 2) = (70) \frac{x + 10}{10}$$

$$5(3x - 2) = 7(x + 10)$$

$$15x - 10 = 7x + 70$$

$$15x - 7x = 10 + 70$$

$$8x = 80$$

$$\underline{x = 10}$$

Exercise

Solve: $\frac{5}{6}x - 2x + \frac{4}{3} = \frac{5}{3}$

Solution

$$6 \times \frac{5}{6}x - 2x + \frac{4}{3} = \frac{5}{3}$$

$$5x - 12x + 8 = 10$$

$$-7x = 2$$

$$\underline{x = -\frac{2}{7}}$$

Exercise

Solve: $\frac{7}{4} + \frac{1}{5}x - \frac{3}{2} = \frac{4}{5}x$

Solution

$$20 \times \frac{7}{4} + \frac{1}{5}x - \frac{3}{2} = \frac{4}{5}x$$

$$35 + 4x - 30 = 16x$$

$$5 = 12x$$

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

Exercise

Solve: $5(x + 3) + 4x - 3 = -(2x - 4) + 2$

Solution

$$5x + 15 + 4x - 3 = -2x + 4 + 2$$

$$9x + 12 = -2x + 6$$

$$9x + 12 + 2x - 12 = -2x + 6 + 2x - 12$$

$$11x = -6$$

$$\underline{x = -\frac{6}{11}}$$

Exercise

Solve: $2[x - (4 + 2x) + 3] = 2x + 3$

Solution

$$2x - 2(4 + 2x) + 6 = 2x + 3$$

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

$$-2x - 2 = 2x + 3$$

$$-2x - 2 - 2x + 2 = 2x + 3 - 2x + 2$$

$$-4x = 5$$

$$\underline{x = -\frac{5}{4}}$$

Exercise

Solve: $2x - \{x - [3x - (8x + 6)]\} = 2x - 2$

Solution

$$2x - x + [3x - (8x + 6)] = 2x - 2$$

$$2x - x + 3x - (8x + 6) = 2x - 2$$

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

$$-4x - 6 = 2x - 2$$

$$-4x - 2x - 6 + 6 = 2x - 2x - 2 + 2$$

$$-6x = 4$$

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

$$\underline{= -\frac{2}{3}}$$

Distribute the minus

Distribute the plus

Distribute the minus

Divide by -6

Exercise

Solve: $4(2x + 7) = 2x + 22 + 3(2x + 3)$

Solution

$$8x + 28 = 2x + 22 + 6x + 9$$

$$8x + 28 = 8x + 31$$

$$8x + 28 - 8x = 8x + 31 - 8x$$

$$28 = 31 \quad \text{False statement}$$

No Solution

Exercise

Solve: $4[2x - (3 - x) + 5] = -7x - 2$

Solution

$$8x - 4(3 - x) + 20 = -7x - 2$$

$$8x - 12 + 4x + 20 = -7x - 2$$

$$12x - 8 = -7x - 2$$

$$12x - 8 + 7x + 8 = -7x - 2 + 7x + 8$$

$$19x = 6$$

$$\underline{x = \frac{6}{19}}$$

Exercise

Solve: $3[2x - (4 - x) + 5] = 7x - 2$

Solution

$$6x - 3(4 - x) + 15 = 7x - 2$$

$$6x - 12 + 3x + 15 = 7x - 2$$

$$9x + 3 = 7x - 2$$

$$2x = -5$$

$$\underline{x = -\frac{5}{2}}$$

Exercise

Solve: $-4(2x - 6) + 8x = 5x + 24 + x$

Solution

$$-8x + 24 + 8x = 6x + 24$$

$$6x = 0$$

$$\underline{x = 0}$$

Exercise

Solve: $-8(3x + 4) + 6x = 4(x - 8) + 4x$

Solution

$$-24x - 32 + 6x = 4x - 32 + 4x$$

$$-18x = 8x$$

$$26x = 0$$

$$\underline{x = 0}$$

Exercise

Solve: $4(x + 7) = 2(x + 12) + 2(x + 1)$

Solution

$$4x + 28 = 2x + 24 + 2x + 2$$

$$4x + 28 = 4x + 26$$

$$4x - 4x = 26 - 28$$

$$0 = -2 \quad (\text{False})$$

$$\text{Solution: } \{\emptyset\}$$

Exercise

Solve: $-6(2x + 1) - 3(x - 4) = -15x + 1$

Solution

$$-12x - 6 - 3x + 12 = -15x + 1$$

$$-15x + 6 = -15x + 1$$

$$6 = 1 \quad \text{False statement}$$

No Solution

Exercise

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

Solution

$$2x - 2 + 3 = x - 3x - 3$$

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

$$4x = -4$$

$$\underline{x = -1}$$

Exercise

$$\text{Solve: } 3(x - 4) - 4(x - 3) = x + 3 - (x - 2)$$

Solution

$$3x - 12 - 4x + 12 = x + 3 - x + 2$$

$$-x = 5$$

$$\underline{x = -5}$$

Exercise

$$\text{Solve: } 2 - (7x + 5) = 13 - 3x$$

Solution

$$2 - 7x - 5 = 13 - 3x$$

$$-7x - 3 = 13 - 3x$$

$$-4x = 16$$

$$\underline{x = -4}$$

Exercise

$$\text{Solve: } 16 = 3(x - 1) - (x - 7)$$

Solution

$$16 = 3x - 3 - x + 7$$

$$16 = 2x + 4$$

$$2x = 12$$

$$\underline{x = 6}$$

Exercise

$$\text{Solve: } 5x - 2(x + 1) = x + (3x - 5)$$

Solution

$$5x - 2x - 2 = x + 3x - 5$$

$$3x - 2 = 4x - 5$$

$$-x = -3$$

$$\underline{x = 3}$$

Exercise

Solve: $7(x+1) = 4[x - (3-x)]$

Solution

$$7x + 7 = 4x - 4(3 - x)$$

$$3x = -7 - 12 + 4x$$

$$-x = -19$$

$$\underline{x = 19}$$

Exercise

Solve: $2[3x - 2(2x - 3)] = 5(x - 6)$

Solution

$$6x - 4(2x - 3) = 5x - 30$$

$$6x - 8x + 12 = 5x - 30$$

$$-2x - 5x = -42$$

$$-7x = -42$$

$$\underline{x = 6}$$

Exercise

Solve: $.2x - .5 = .1x + 7$

Solution

$$10 \times .2x - .5 = .1x + 7$$

$$2x - 5 = x + 70$$

$$\underline{x = 75}$$

Exercise

Solve: $.01x + 3.1 = 2.03x - 2.96$

Solution

$$100 \times .01x + 3.1 = 2.03x - 2.96$$

$$x + 310 = 203x - 296$$

$$202x = 606$$

$$x = \frac{606}{202}$$

$$\underline{= 3}$$

Exercise

Solve: $.08x - .06(x + 12) = 7.72$

Solution

$$100 \times .08x - .06(x + 12) = 7.72$$

$$8x - 6(x + 12) = 772$$

$$8x - 6x - 72 = 772$$

$$2x = 700$$

$$x = 350$$

Exercise

Solve: $.04(x - 12) + .06x = 1.52$

Solution

$$100 \times .04(x - 12) + .06x = 1.52$$

$$4(x - 12) + 6x = 152$$

$$4x - 48 + 6x = 152$$

$$10x = 200$$

$$x = 20$$

Exercise

Solve: $.3(x + 2) - .5(x + 2) = -.2x - .4$

Solution

$$10 \times .3(x + 2) - .5(x + 2) = -.2x - .4$$

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

$$3x + 6 - 5x - 10 = -2x - 4$$

$$-2x - 4 = -2x - 4$$

$$0 = 0 \text{ True statement}$$

$$\text{Solution: } \mathbb{R}$$

Exercise

Solve: $.6(x - 5) + .8(x - 6) = .2x - 1.8$

Solution

$$10 \times .6(x - 5) + .8(x - 6) = .2x - 1.8$$

$$6(x-5) + 8(x-6) = 2x - 18$$

$$6x - 30 + 8x - 48 = 2x - 18$$

$$14x - 78 = 2x - 18$$

$$12x = 60$$

$$\underline{x = 5}$$

Exercise

Solve: $.5x + \frac{4}{3}x = x + 10$

Solution

$$30 \times .5x + \frac{4}{3}x = x + 10$$

$$15x + 40x = 30x + 300$$

$$55x = 30x + 300$$

$$25x = 300$$

$$x = \frac{300}{25}$$

$$\underline{x = 12}$$

Or

$$\frac{1}{2}x + \frac{4}{3}x = x + 10$$

$$6 \times \frac{1}{2}x + \frac{4}{3}x = x + 10$$

$$3x + 8x = 6x + 60$$

$$5x = 60$$

$$\underline{x = 12}$$

Exercise

Solve: $.25x + \frac{2}{3}x = x + 2$

Solution

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

$$12 \times \frac{1}{4}x + \frac{2}{3}x = 12x + 24$$

$$3x + 8x = 12x + 24$$

$$-x = 24$$

$$\underline{x = -24}$$

Exercise

Solve: $\frac{1}{4}(x-2) = \frac{1}{6}(x-5)$

Solution

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

$$6x - 12 = 4x - 20$$

$$2x = -8$$

$$\underline{x = -4}$$

Exercise

Solve: $\frac{1}{4}(3x-2) = \frac{1}{5}(x+5)$

Solution

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

$$15x - 10 = 4x + 20$$

$$11x = 30$$

$$\underline{x = \frac{30}{11}}$$

Exercise

Solve: $\frac{1}{9}(x+2) = \frac{1}{15}(2x+5)$

Solution

$$15(x+2) = 9(2x+5)$$

$$15x + 30 = 18x + 45$$

$$3x = -15$$

$$\underline{x = -5}$$

Exercise

Solve: $\frac{1}{2}(4x+8) - 16 = -\frac{2}{3}(9x-12)$

Solution

$$6 \times \frac{1}{2}(4x+8) - 16 = -\frac{2}{3}(9x-12)$$

$$3(4x+8) - 16 = -4(9x-12)$$

$$12x + 24 - 16 = -36x + 48$$

$$12x + 36x = 48 + 72$$

$$48x = 120$$

$$x = \frac{120}{48}$$

$$= \frac{5}{2}$$

Exercise

$$\text{Solve: } \frac{3}{4}(24 - 8x) - 16 = -\frac{2}{3}(6x - 9)$$

Solution

$$12 \times \frac{3}{4}(24 - 8x) - 16 = -\frac{2}{3}(6x - 9)$$

$$9(24 - 8x) - 192 = -8(6x - 9)$$

$$216 - 72x - 192 = -48x + 72$$

$$24x = 24 - 72$$

$$24x = -48$$

$$x = -2$$

Exercise

$$\text{Solve: } \frac{x-3}{4} = \frac{5}{14} - \frac{x+5}{7}$$

Solution

$$(28) \frac{x-3}{4} = (28) \frac{5}{14} - (28) \frac{x+5}{7}$$

$$LCD : 4 \quad 14 \quad 7 \rightarrow 28$$

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

$$7x - 21 = 10 - 4x - 20$$

$$7x + 4x = 21 - 10$$

$$11x = 11$$

$$x = 1$$

Exercise

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

Solution

$$12 \frac{x+1}{4} = 12 \frac{1}{6} + 12 \frac{2-x}{3}$$

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

$$3x + 3 = 2 + 8 - 4x$$

$$3x + 4x = 2 + 8 - 3$$

$$7x = 7$$

$$\underline{x = 1}$$

Exercise

Solve $\frac{x-8}{3} + \frac{x-3}{2} = 0$

Solution

$$(6)\frac{x-8}{3} + (6)\frac{x-3}{2} = 0(6)$$

LCD: 2, 3: 6

$$2(x-8) + 3(x-3) = 0$$

$$2x - 16 + 3x - 9 = 0$$

$$5x - 25 = 0$$

$$5x = 25$$

$$\underline{x = 5}$$

Exercise

Solve: $\frac{5}{2x} - \frac{8}{9} = \frac{1}{18} - \frac{1}{3x}$

Solution

Restriction: $x \neq 0$

$$18x \frac{5}{2x} - 18x \frac{8}{9} = 18x \frac{1}{18} - 18x \frac{1}{3x}$$

$$2x \cdot 9 - 18 \cdot 3x \rightarrow 18x$$

$$9(5) - 2x(8) = x - 6$$

$$45 - 16x = x - 6$$

$$45 + 6 = x + 16x$$

$$51 = 17x$$

$$x = \frac{51}{17}$$

$$\underline{= 3}$$

Exercise

Solve: $\frac{1}{x+4} + \frac{1}{x-4} = \frac{22}{x^2-16}$

Solution

Restrictions: $x \neq \pm 4$

$$(x+4)(x-4)\frac{1}{x+4} + (x+4)(x-4)\frac{1}{x-4} = (x+4)(x-4)\frac{22}{x^2-16}$$

$$x-4 + x+4 = 22$$

$$2x = 22$$

$$\underline{x = 11}$$

Exercise

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

Solution

Condition (Restriction): $x-1 \neq 0 \Rightarrow x \neq 1$

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

$$3x^2 - x - 3x + 1 - 6x = 3x^2 - 3x$$

$$3x^2 - x - 3x + 1 - 6x - 3x^2 + 3x = 0$$

$$-7x + 1 = 0$$

$$-7x = -1$$

$$\underline{x = \frac{1}{7}}$$

Exercise

Solve: $\frac{x}{x-2} = \frac{2}{x-2} + 2$

Solution

Restriction: $x-2 \neq 0 \Rightarrow x \neq 2$

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

$$x = 2 + 2x - 4$$

$$-x = -2$$

$$x = 2$$

\Rightarrow No *Solution* or $\{\emptyset\}$ because of the restriction.

Exercise

Solve the equation $\frac{x}{x-7} = \frac{7}{x-7} + 8$

Solution

Restriction: $x - 7 \neq 0 \Rightarrow \boxed{x \neq 7}$

$$(x-7)\frac{x}{x-7} = (x-7)\frac{7}{x-7} + 8(x-7)$$

$$x = 7 + 8x - 56$$

$$x - 8x = -49$$

$$-7x = -49$$

$$x = \frac{-49}{-7} = 7$$

But $x \neq 7$ (restriction), therefore there is **no solution**

Exercise

Solve: $\frac{3x}{5} - x = \frac{x}{10} - \frac{5}{2}$

Solution

$$10 \times \frac{3x}{5} - x = \frac{x}{10} - \frac{5}{2}$$

$$6x - 10x = x - 25$$

$$-4x = x - 25$$

$$-5x = -25$$

$$\underline{x = 5}$$

Exercise

Solve: $2x - \frac{2x}{7} = \frac{x}{2} + \frac{17}{2}$

Solution

$$\frac{14x - 2x}{7} = \frac{x + 17}{2}$$

$$\frac{12x}{7} = \frac{x + 17}{2}$$

$$24x = 7x + 119$$

$$17x = 119$$

$$\underline{x = 7}$$

Exercise

Solve: $\frac{x+3}{6} = \frac{2}{3} + \frac{x-5}{4}$

Solution

$$12 \times \frac{x+3}{6} = \frac{2}{3} + \frac{x-5}{4}$$

$$2x + 6 = 8 + 3x - 15$$

$$2x - 3x = 8 - 15 - 6$$

$$-x = -13$$

$$\underline{x = 13}$$

Exercise

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

Solution

$$12 \times \frac{x+1}{4} = \frac{1}{6} + \frac{2-x}{3}$$

$$3x + 3 = 2 + 8 - 4x$$

$$7x = 7$$

$$\underline{x = 1}$$

Exercise

Solve: $\frac{x}{4} = 2 + \frac{x-3}{3}$

Solution

$$12 \times \frac{x}{4} = 2 + \frac{x-3}{3}$$

$$3x = 24 - 4x - 12$$

$$7x = 12$$

$$\underline{x = \frac{12}{7}}$$

Exercise

Solve: $5 + \frac{x-2}{3} = \frac{x+3}{8}$

Solution

$$24 \times 5 + \frac{x-2}{3} = \frac{x+3}{8}$$

$$120 + 8x - 16 = 3x + 9$$

$$5x = 9 - 104$$

$$5x = -95$$

$$x = -19$$

Exercise

Solve: $\frac{x+1}{3} = 5 - \frac{x+2}{7}$

Solution

$$21 \times \frac{x+1}{3} = 5 - \frac{x+2}{7}$$

$$7x + 7 = 105 - 3x - 6$$

$$10x = 92$$

$$x = \frac{46}{5}$$

Exercise

Solve: $\frac{3x}{5} - \frac{x-3}{2} = \frac{x+2}{3}$

Solution

$$30 \times \frac{3x}{5} - \frac{x-3}{2} = \frac{x+2}{3}$$

$$18x - 15x + 45 = 10x + 20$$

$$3x - 10x = 20 - 45$$

$$-7x = -25$$

$$x = \frac{25}{7}$$

Exercise

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

Solution

$$\text{Restriction: } \begin{cases} x - 2 \neq 0 \Rightarrow x \neq 2 \\ x \neq 0 \end{cases}$$

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

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

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

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

$$3x = 0 \quad x+1 = 0$$

$$x = 0 \quad x = -1$$

$x = -1$ is the only solution

Exercise

Solve: $\frac{-4x}{x-1} + \frac{4}{x+1} = \frac{-8}{x^2-1}$

Solution

Restriction: $x \neq \pm 1$

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

$$-4x(x+1) + 4(x-1) = -8$$

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

$$-4x^2 = -4$$

$$x^2 = 1$$

$x = \pm 1$ The solution is $\{\emptyset\}$

Exercise

Solve: $\frac{4x+3}{x+1} + \frac{2}{x} = \frac{1}{x^2+x}$

Solution

Restriction: $x+1 \neq 0 \rightarrow x \neq -1, 0$

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

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

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

$$4x^2 + 5x + 2 - 1 = 1 - 1$$

$$4x^2 + 5x + 1 = 0$$

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

$$4x+1=0 \quad x+1=0$$

$$\underline{x = -\frac{1}{4}} \quad \cancel{x = -1}$$

Exercise

Solve: $\frac{6}{x+3} - \frac{5}{x-2} = \frac{-20}{x^2+x-6}$

Solution

$$\frac{6}{x+3} - \frac{5}{x-2} = \frac{-20}{x^2+x-6}$$

Restriction: $x \neq -3, 2$

$$(x+3)(x-2)\frac{6}{x+3} - (x+3)(x-2)\frac{5}{x-2} = (x+3)(x-2)\frac{-20}{x^2+x-6}$$

$$6(x-2) - 5(x+3) = -20$$

$$6x - 12 - 5x - 15 = -20$$

$$x = -20 + 12 + 15$$

$$\underline{x = 7}$$

Exercise

Solve: $\frac{6}{x+1} - \frac{5}{x+2} = \frac{10}{x^2+3x+2}$

Solution

Restriction: $x \neq -1, -2$

$$6(x+2) - 5(x+1) = 10$$

$$6x + 12 - 5x - 5 = 10$$

$$\underline{x = 3}$$

Exercise

Solve: $3(x-4) - 5(x+2) = 3[2 - (x+24)] - 2(x-2)$

Solution

$$3x - 12 - 5x - 10 = 6 - 3(x+24) - 2x + 4$$

$$-2x - 22 = -3x - 72 - 2x + 10$$

$$3x = -62 + 22$$

$$3x = -42$$

$$\underline{x = -14}$$

Exercise

Solve: $(2x+3)(6x-1) - 9 = 15x^2 - (3x-2)(x-2)$

Solution

$$12x^2 + 16x - 3 - 9 = 15x^2 - (3x^2 - 8x + 4)$$

$$12x^2 + 16x - 12 = 15x^2 - 3x^2 + 8x - 4$$

$$12x^2 + 16x - 8x = 12x^2 - 4 + 12$$

$$8x = 8$$

$$\underline{x = 1}$$

Exercise

Solve: $(3x - 1)^2 - 2x(x - 1) = 7x^2 - 5x + 2$

Solution

$$9x^2 - 6x + 1 - 2x^2 + 2x = 7x^2 - 5x + 2$$

$$7x^2 - 4x + 1 = 7x^2 - 5x + 2$$

$$\underline{x = 1}$$

Exercise

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

Solution

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

$$3x^2 - 2x - 7 = 3x^2$$

$$2x = 7$$

$$\underline{x = \frac{7}{2}}$$

Exercise

Solve: $4x + 13 - \{2x - [4(x - 3) - 5]\} = 2(x - 6)$

Solution

$$4x + 13 - 2x + 4(x - 3) - 5 = 2x - 12$$

$$2x + 8 + 4x - 12 = 2x - 12$$

$$4x = -8$$

$$\underline{x = -2}$$

Exercise

Solve: $-2\{7 - [4 - 2(1 - x) + 3]\} = 10 - [4x - 2(x - 3)]$

Solution

$$-14 + 2[7 - 2 + 2x] = 10 - 4x + 2x - 6$$

$$-14 + 2(5 + 2x) = 2 - 2x$$

$$-14 + 10 + 4x = 2 - 2x$$

$$6x = 6$$

$$\underline{x = 1}$$

Exercise

Solve: $2(y + 2) + (y + 3)^2 = y(y + 5) + 2\left(\frac{17}{2} + y\right)$

Solution

$$2y + 4 + y^2 + 6y + 9 = y^2 + 5y + 17 + 2y$$

$$8y + 13 = 7y + 17$$

$$\underline{y = 4}$$

Exercise

Solve: $(y + 1)(y - 1) = (y + 2)(y - 3) + 4$

Solution

$$y^2 - 1 = y^2 - y - 6 + 4$$

$$-1 = -y - 2$$

$$\underline{y = -1}$$

Exercise

Solve: $45 - [4 - 2y - 4(y + 7)] = -4(1 + 3y) - [4 - 3(y + 2) - 2(2y - 5)]$

Solution

$$45 - [4 - 2y - 4y - 28] = -4 - 12y - [4 - 3y - 6 - 4y + 10]$$

$$45 - 4 + 2y + 4y + 28 = -4 - 12y - 4 + 3y + 6 + 4y - 10$$

$$69 + 6y = -12 - 5y$$

$$6y + 5y = -12 - 69$$

$$11y = -81$$

$$\underline{y = -\frac{81}{11}}$$

Exercise

Solve: $35 - [2 - 3y - 4(y + 7)] = -3(1 + 3y) + 4 - 3(y + 2) - 2(2y - 5)$

Solution

$$35 - 2 + 3y + 4(y + 7) = -33 - 9y + 4 - 3y - 6 - 4y + 10$$

$$33 + 3y + 4y + 28 = -25 - 16y$$

$$61 + 7y = -25 - 16y$$

$$23y = -86$$

$$\underline{y = -\frac{86}{23}}$$

Exercise

Solve: $25 - [2 + 5y - 3(y + 2)] = -3(2y - 5) - [5(y - 1) - 3y + 3]$

Solution

$$25 - [2 + 5y - 3y - 6] = -6y + 15 - [5y - 5 - 3y + 3]$$

$$25 - (2y - 4) = -6y + 15 - (2y - 2)$$

$$25 - 2y + 4 = -6y + 15 - 2y + 2$$

$$-2y + 29 = -8y + 17$$

$$6y = -12$$

$$\underline{y = -2}$$

Exercise

Solve: $V = lwh$, for h

Solution

$$\underline{h = \frac{V}{lw}}$$

Exercise

Solve: $A = \frac{1}{2}h(B + b)$ for B

Solution

$$2A = h(B + b) \quad \text{Multiply both sides by 2}$$

$$\frac{2A}{h} = B + b \quad \text{Divide both sides by } h$$

$$\underline{B = \frac{2A}{h} - b}$$

Exercise

Solve: $A = \frac{1}{2}h(a + b)$ for a

Solution

$$2A = 2 \cdot \frac{1}{2}h(a + b)$$

$$2A = h(a + b)$$

$$\frac{2A}{h} = \frac{h}{h}(a + b)$$

$$\frac{2A}{h} = a + b$$

$$\frac{2A}{h} - b = a$$

$$\underline{a = \frac{2A}{h} - b} \quad \text{or} \quad a = \frac{2A - bh}{h}$$

Exercise

Solve: $S = 2\pi rh + 2\pi r^2$ for h

Solution

$$2\pi rh = S - 2\pi r^2$$

$$\underline{h = \frac{S - 2\pi r^2}{2\pi r}}$$

Exercise

Solve: $A = \frac{1}{2}h(b_1 + b_2)$, for h

Solution

$$2A = h(b_1 + b_2)$$

$$\underline{h = \frac{2A}{b_1 + b_2}}$$

Exercise

Solve: $A = \frac{1}{2}h(b_1 + b_2)$, for b_2

Solution

$$2A = h(b_1 + b_2)$$

$$\frac{2A}{h} = b_1 + b_2$$

$$b_2 = \frac{2A}{h} - b_1$$

Exercise

Solve: $A = \frac{1}{2}h(b_1 + b_2)$, for b_1

Solution

$$\frac{2A}{h} = b_1 + b_2$$

$$b_1 = \frac{2A}{h} - b_2$$

Exercise

Solve: $S = P + Prt$ for t .

Solution

$$S - P = Prt$$

$$\frac{S - P}{Pr} = \frac{Pr}{Pr}t$$

$$t = \frac{S - P}{Pr}$$

Exercise

Solve: $S = 2lw + 2wh + 2hl$ for h

Solution

$$S = 2lw + (2w + 2l)h$$

$$(2w + 2l)h = S - 2lw$$

$$h = \frac{S - 2lw}{2w + 2l}$$

Exercise

Solve: $S = 2lw + 2wh + 2hl$ for w

Solution

$$S = (2l + 2h)w + 2hl$$

$$(2l + 2h)w = S - 2hl$$

$$w = \frac{S - 2hl}{2l + 2h}$$

Exercise

Solve: $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$ for R_1

Solution

1st Method

$$RR_1R_2 \frac{1}{R} = RR_1R_2 \frac{1}{R_1} + RR_1R_2 \frac{1}{R_2}$$

$$R_1R_2 = RR_2 + RR_1$$

$$R_1R_2 - RR_1 = RR_2$$

$$R_1(R_2 - R) = RR_2$$

$$R_1 = \frac{RR_2}{R_2 - R}$$

2nd Method

$$\frac{1}{R} - \frac{1}{R_2} = \frac{1}{R_1}$$

$$\frac{R_2 - R}{RR_2} = \frac{1}{R_1}$$

$$R_1R_2 - RR_1 = RR_2$$

$$R_1(R_2 - R) = RR_2$$

$$R_1 = \frac{RR_2}{R_2 - R}$$

3rd Method

$$\frac{1}{R} - \frac{1}{R_2} = \frac{1}{R_1}$$

$$\frac{R_2 - R}{RR_2} = \frac{1}{R_1}$$

Multiply by the common denominator RR_1R_2

Simplify

Move R_1 to one side

Factor R_1

Divide by $R_2 - R$

Common denominator on one side of the equality

Cross multiplication

Factor R_1

Divide by $R_2 - R$

Cross multiplication

$$\underline{R_1 = \frac{RR_2}{R_2 - R}}$$

Flip

Exercise

Solve: $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$ for R

Solution

$$\frac{1}{R} = \frac{R_1 + R_2}{R_1 R_2}$$

$$\underline{R = \frac{R_1 R_2}{R_1 + R_2}}$$

Exercise

Solve: $V = \frac{d_1 - d_2}{t}$ for d_1

Solution

$$d_1 - d_2 = Vt$$

$$\underline{d_1 = Vt + d_2}$$

Exercise

Solve: $V = \frac{d_1 - d_2}{t}$ for d_2

Solution

$$d_1 - d_2 = Vt$$

$$\underline{d_2 = d_1 - Vt}$$

Exercise

Solve: $z = \frac{x - \mu}{s}$ for x

Solution

$$x - \mu = sz$$

$$\underline{x = sz + \mu}$$

Exercise

Solve: $z = \frac{x - \mu}{s}$ for μ

Solution

$$x - \mu = sz$$

$$\mu = x - sz$$

Exercise

Solve: $s = \frac{1}{2}at^2 + vt$ for v

Solution

$$vt = s - \frac{1}{2}at^2$$

$$v = \frac{s}{t} - \frac{1}{2}at$$

Exercise

Solve: $s = \frac{1}{2}at^2 + vt$ for a

Solution

$$\frac{1}{2}at^2 = s - vt$$

$$at^2 = 2s - 2vt$$

$$a = \frac{2s - 2vt}{t^2}$$

Exercise

Solve: $L = a + (n - 1)d$ for n

Solution

$$(n - 1)d = L - a$$

$$n - 1 = \frac{L - a}{d}$$

$$n = \frac{L - a}{d} + 1$$

Exercise

Solve: $L = a + (n-1)d$ for d

Solution

$$(n-1)d = L - a$$

$$\underline{d = \frac{L - a}{n - 1}}$$

Exercise

Solve: $A = \frac{x_1 + x_2 + x_3}{n}$ for x_2

Solution

$$x_1 + x_2 + x_3 = nA$$

$$\underline{x_2 = nA - x_1 - x_3}$$

Exercise

Solve: $A = \frac{x_1 + x_2 + x_3}{n}$ for n

Solution

$$\underline{n = \frac{x_1 + x_2 + x_3}{A}}$$