1 a $3x + 7 = 15$

$$3x = 15 - 7$$
$$= 8$$
$$x = \frac{8}{3}$$

b $8 - \dfrac{x}{2} = -16$

$$-\frac{x}{2} = -16 - 8$$
$$= -24$$
$$-\frac{x}{2} \times -2 = -24 \times -2$$
$$x = 48$$

c $42 + 3x = 22$

$$3x = 22 - 42$$
$$= -20$$
$$x = -\frac{20}{3}$$

d $\dfrac{2x}{3} - 15 = 27$

$$\frac{2x}{3} = 27 + 15$$
$$= 42$$
$$\frac{2x}{3} \times \frac{3}{2} = 42 \times \frac{3}{2}$$
$$x = 63$$

e $5(2x + 4) = 13$

$$10x + 20 = 13$$
$$10x = 13 - 20$$
$$= -7$$
$$x = -\frac{7}{10} = -0.7$$

f $-3(4 - 5x) = 24$

$$-12 + 15x = 24$$
$$15x = 24 + 12$$
$$= 36$$
$$x = \frac{36}{15}$$
$$= \frac{12}{5} = 2.4$$

g $3x + 5 = 8 - 7x$

$$3x + 7x = 8 - 5$$
$$10x = 3$$
$$x = \frac{3}{10} = 0.3$$

h

$$2 + 3(x - 4) = 4(2x + 5)$$
$$2 + 3x - 12 = 8x + 20$$
$$3x - 10 = 8x + 20$$
$$3x - 8x = 20 + 10$$
$$-5x = 30$$
$$x = \frac{30}{-5} = -6$$

i

$$\frac{2x}{5} - \frac{3}{4} = 5x$$
$$\frac{2x}{5} \times 20 - \frac{3}{4} \times 20 = 5x \times 20$$
$$8x - 15 = 100x$$
$$8x - 100x = 15$$
$$-92x = 15$$
$$x = -\frac{15}{92}$$

j

$$6x + 4 = \frac{x}{3} - 3$$
$$6x \times 3 + 4 \times 3 = \frac{x}{3} \times 3 - 3 \times 3$$
$$18x + 12 = x - 9$$
$$18x - x = -9 - 12$$
$$17x = -21$$
$$x = -\frac{21}{17}$$

2 a

$$\frac{x}{2} + \frac{2x}{5} = 16$$
$$\frac{x}{2} \times 10 + \frac{2x}{5} \times 10 = 16 \times 10$$
$$5x + 4x = 160$$
$$9x = 160$$
$$x = \frac{160}{9}$$

b

$$\frac{3x}{4} - \frac{x}{3} = 8$$
$$\frac{3x}{4} \times 12 - \frac{x}{3} \times 12 = 8 \times 12$$
$$9x - 4x = 96$$
$$5x = 96$$
$$x = \frac{96}{5} = 19.2$$

c

$$\frac{3x - 2}{2} + \frac{x}{4} = -8$$
$$\frac{3x - 2}{2} \times 4 + \frac{x}{4} \times 4 = -8 \times 4$$
$$2(3x - 2) + x = -32$$
$$6x - 4 + x = -32$$
$$7x = -32 + 4$$
$$= -28$$
$$x = -4$$

d

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

$$\frac{5x}{4} \times 60 - \frac{4}{3} \times 60 = \frac{2x}{5} \times 60$$

$$75x - 80 = 24x$$

$$75x - 24x = 80$$

$$51x = 80$$

$$x = \frac{80}{51}$$

e

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

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

$$2(x-4) + (2x+5) = 24$$

$$2x - 8 + 2x + 5 = 24$$

$$4x = 24 + 8 - 5$$

$$= 27$$

$$x = \frac{27}{4} = 6.75$$

f

$$\frac{3-3x}{10} - \frac{2(x+5)}{6} = \frac{1}{20}$$

$$\frac{3-3x}{10} \times 60 - \frac{2(x+5)}{6} \times 60 = \frac{1}{20} \times 60$$

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

$$18 - 18x - 20x - 100 = 3$$

$$-38x = 3 - 18 + 100$$

$$= 85$$

$$x = -\frac{85}{38}$$

g

$$\frac{3-x}{4} - \frac{2(x+1)}{5} = -24$$

$$\frac{3-x}{4} \times 20 - \frac{2(x+1)}{5} \times 20 = -24 \times 20$$

$$5(3-x) - 8(x+1) = -480$$

$$15 - 5x - 8x - 8 = -480$$

$$-13x = -480 - 15 + 8$$

$$= -487$$

$$x = \frac{487}{13}$$

h

$$\frac{-2(5-x)}{8} + \frac{6}{7} = \frac{4(x-2)}{3}$$

$$\frac{-2(5-x)}{8} \times 168 + \frac{6}{7} \times 168 = \frac{4(x-2)}{3} \times 168$$

$$-42(5-x) + 144 = 224(x-2)$$

$$-210 + 42x + 144 = 224x - 448$$

$$42x - 224x = -448 + 210 - 144$$

$$-182x = -382$$

$$x = \frac{382}{182} = \frac{191}{91}$$

3 a $3x + 2y = 2; 2x - 3y = 6$

Use elimination. Multiply the first equation by 3 and the second equation by 2.

$9x + 6y = 6$ ①

$4x - 6y = 12$ ②

① + ②:

$$13x = 18$$
$$x = \frac{18}{13}$$

Substitute into the first equation:

$$3 \times \frac{18}{13} + 2y = 2$$
$$\frac{54}{13} + 2y = 2$$
$$2y = 2 - \frac{54}{13}$$
$$= -\frac{28}{13}$$
$$y = -\frac{14}{13}$$

b $5x + 2y = 4; 3x - y = 6$

Use elimination. Multiply the second equation by 2.

$5x + 2y = 4$ ①

$6x - 2y = 12$ ②

① + ②:

$$11x = 16$$
$$x = \frac{16}{11}$$

Substitute into the second, simpler equation:

$$3 \times \frac{16}{11} - y = 6$$
$$\frac{48}{11} - y = 6$$
$$-y = 6 - \frac{48}{11}$$
$$y = -\frac{18}{11}$$

c $2x - y = 7; 3x - 2y = 2$

Use substitution. Make y the subject of the first equation.

$$y = 2x - 7$$

Substitute into the second equation:

$$3x - 2(2x - 7) = 2$$
$$3x - 4x + 14 = 2$$
$$-x = 2 - 14$$
$$x = 12$$

Substitute into the equation in which y is the subject:

$$y = 2 \times 12 - 7$$
$$= 17$$

d $x + 2y = 12; x - 3y = 2$

Use substitution. Make x the subject of the first equation.

$$x = 12 - 2y$$

Substitute into the second equation:

$$12 - 2y - 3y = 2$$
$$-5y = 2 - 12$$
$$= -10$$
$$y = 2$$

Substitute into the first equation:

$$x + 2 \times 2 = 12$$
$$x + 4 = 12$$
$$x = 8$$

e $7x - 3y = -6; x + 5y = 10$

Use substitution. Make x the subject of the second equation.

$$x = 10 - 5y$$

Substitute into the first equation:

$$7(10 - 5y) - 3y = -6$$
$$70 - 35y - 3y = -6$$
$$-38y = -6 - 70$$
$$= -76$$
$$y = \frac{-76}{-38} = 2$$

Substitute into the second equation:

$$x + 5 \times 2 = 10$$
$$x + 10 = 10$$
$$x = 0$$

f $15x + 2y = 27; 3x + 7y = 45$

Use elimination. Multiply the second equation by 5.

$$15x + 2y = 27 \qquad ①$$
$$15x + 35y = 225 \qquad ②$$
$$① - ②:$$
$$-33y = -198$$
$$y = \frac{-198}{-33} = 6$$

Substitute into the second equation:

$$3x + 7 \times 6 = 45$$
$$3x + 42 = 45$$
$$3x = 45 - 42$$
$$= 3$$
$$x = 1$$