Planner

Linear equations

- Solving pairs of simultaneous equations by a graphical method
- Solving pairs of simultaneous equations by an algebraic method

Keywords

You should know

explanation 1a | explanation 1b | explanation 1c

1 Solve these equations.

a $7x + 5 = 40$ **b** $4z - 7 = 29$ **c** $9d + 2 = 65$ **d** $4 - 7e = 25$

e $4 + 9a = 31$ **f** $10x - 20 = 5$ **g** $4 - 3d = -23$ **h** $6x + 2 = -28$

2 Solve these equations.

a $6(2a - 3) = 30$ **b** $6(3m - 2) = 60$ **c** $6(4m - 7) = -18$

d $6(m - 2) = 12$ **e** $5(n + 3) - 2 = 23$ **f** $4(y - 7) + 2 = -14$

g $4(a + 2) = 9$ **h** $-6(p - 3) = 9$ **i** $-4(2 - x) = 12$

3 Solve these equations.

a $\frac{x}{2} = 3$ **b** $\frac{y}{4} + 7 = 11$ **c** $\frac{p}{9} + 6 = 13$ **d** $\frac{y + 7}{12} = 4$

e $7 + \frac{a}{5} = 4$ **f** $\frac{b}{3} - 4 = 1$ **g** $4 = \frac{12}{n}$ **h** $8 = \frac{56}{m}$

i $\frac{2t}{5} + \frac{t}{10} = 2.5$ **j** $\frac{3s}{7} - \frac{2s}{21} = 1$ **k** $\frac{x}{3} + \frac{x}{2} = 10$ **l** $\frac{3x}{4} - \frac{x}{3} = 3$

4 Solve these equations.

a $3n + 4 = n + 13$ **b** $7 + 5m = 8m + 1$ **c** $8y + 17 = 4y + 19$

d $8 + 3p = 9p + 4$ **e** $25 - 2y = 6y + 5$ **f** $5 - 2b = 3b + 25$

g $4(z - 6) = z - 18$ **h** $8(b + 9) = b + 93$ **i** $-2(x - 6) = x - 9$

5 Solve these equations.

a $10(4 - c) = -4 - c$ **b** $2(a + 7) = a + 7$ **c** $2(x + 1) = 3(x + 2)$

d $5(2 - 3y) = 9(2 + y)$ **e** $\frac{3x}{2} + \frac{x}{3} = x - 5$ **f** $\frac{2x}{5} + \frac{x}{2} = 5\left(\frac{x}{3} + 2\right)$

explanation 2

6 Write an equation for each problem and then solve it.

a The length of a side of an equilateral triangle is $(x - 5)$ cm. The perimeter of the triangle is 66 cm. What is x?

b Peter has x songs on his mp3 player. Gurveer has 35 more songs than Peter on his, while Hannah has half the number that Peter has on hers. Altogether they have 560 songs. How many songs does Peter have?

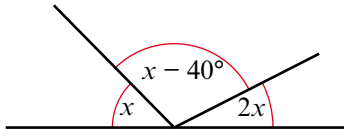
c Stephen's age is divided by 4 then 3 is added. The result is the same as subtracting 9 from his age. How old is Stephen?

d Adding 5 to a number gives the same answer as multiplying it by 3 and adding 9. What is the number?

e I am thinking of a number. When I increase it by 4 then double the answer I get 20 more than the number. What is my number?

7 In each of these problems, use angle facts to form an equation and solve it to find the unknown.

a



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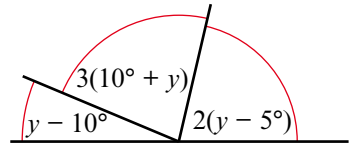

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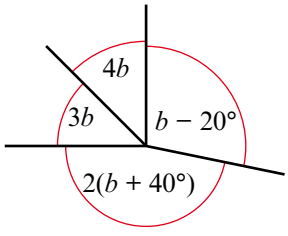

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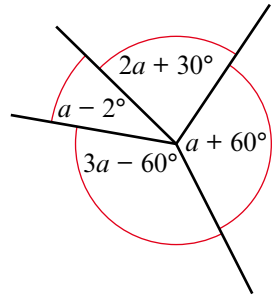


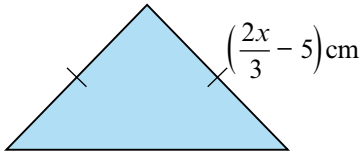
8 **a** For each diagram below, form an equation and then solve it to find the unknown.

i Perimeter = 42 cm

$(5x + 2)$ cm

$3(2x - 1)$ cm

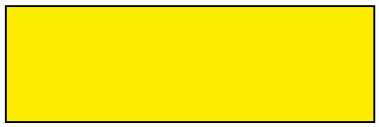
ii Perimeter = 29 cm



$\left(\frac{2x}{3} - 5\right)$ cm

$\left(\frac{x}{2} + 3\right)$ cm

b These two rectangles have equal perimeters.
Form an equation and solve it to find x.



$(x - 3)$ cm

$(2x + 1)$ cm

$\left(\frac{2}{3}x + 2\right)$ cm

$(x + 3)$ cm

explanation 3a | explanation 3b | online

9 For each equation copy and complete the table of values.
Then draw the graphs on the same axes.

a $y = 3x + 2$

x	0	2	4
y			

b $y = 6 - 2x$

x	0	2	4
y			

c $2y + 5x = 20$

x	0	1	
y			0

10 Find the solutions to these pairs of simultaneous equations by drawing the graphs and finding the points of intersection.

a $x + y = 8$
$y = x + 3$

b $x + 2y = 10$
$y - x = 2$

c $3x + 2y = 12$
$y = x + 1$

d $3x + 4y = 24$
$2y - x = 2$

11 **a** Use a graph to show that the simultaneous equations $y = 3x + 7$ and $2y = 6x + 11$ have no solution.

b How can you tell from the equations that there are no solutions?

12 Which of the following pairs of equations will have no solutions?

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

b $y = 2x + 1$
$2y + 4x = 12$

c $3x + 2y = 7$
$y = -1.5x + 5$

d $y = 7 - 2x$
$4y + 8x = 20$

explanation 4a | explanation 4b | explanation 4c | explanation 4d | online

13 Solve these pairs of simultaneous equations.

a $4x - y = 11$
$2x + y = 7$

b $-x + 5y = 23$
$x - 4y = -18$

c $7x - 2y = 19$
$3x + 2y = 21$

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

e $2x + 3y = 24$
$-2x - 5y = -38$

f $2x + y = 12$
$2x - y = 8$

g $x + y = -7$
$x - y = -3$

h $4x - 4y = 0$
$8x + 4y = 12$

14 Solve these pairs of simultaneous equations.

a $3x + y = 9$
$2x + y = 7$

b $5x + 3y = 26$
$2x + 3y = 14$

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

d $5x + 2y = 16$
$5x - y = 7$

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

f $3x + y = 9$
$2x + y = -1$

g $2x - 5y = 5$
$6x - 5y = 45$

h $-5x + y = 32$
$-5x + 6y = 17$

15 Solve these pairs of simultaneous equations.

a $x + 3y = 9$
$2x - y = 4$

b $4x - 3y = 7$
$2x + 2y = 7$

c $2x + 5y = 19$
$x + 2y = 8$

d $2x + y = 14$
$3x + 2y = 22$

e $5x - 3y = 22$
$2x - y = 9$

f $x + y = 0$
$4x + 8y = 6$

g $2x + 3y = 4$
$3x - 2y = -7$

h $4x + 3y = 1$
$3x + 2y = 0$

***16** Solve these pairs of simultaneous equations.

a $3x - 4y = 5$
$2x + y = -4$

b $2x + 5y = -7$
$3x + 4y = 0$

c $3x - 2y = 1$
$5x - 6y = 3$

d $x + 3y = 7$
$3x - 5y = 7$

explanation 5

17 Solve these pairs of simultaneous equations.

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

b $y = 2x - 1$
$3x - y = 6$

c $x = 1 - 2y$
$2x + 3y = 4$

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

e $y = 3 - 2x$
$3x - 3y = 0$

f $3y = 11 - x$
$3x - y = 3$

g $2x + 2y = 10$
$5y = x + 1$

h $3x - 5y = 9$
$2y + 5 = 4x$

explanation 6

18 Two numbers x and y have a difference of 12 and a sum of 24.
Write down two equations in x and y and solve them to find the numbers.

19 In a shop, potatoes are £x per kg and carrots are £y per kg.

5 kg of potatoes and 2 kg of carrots cost £3.55.

3 kg of potatoes and 3 kg of carrots cost £2.85.

a Write down two equations connecting x and y.

b Solve these simultaneous equations to find the price of potatoes and of carrots.

20 A trip to the cinema costs £31.50 for a group of 3 adults and 2 children and £52.50 for a group of 4 adults and 5 children. Use simultaneous equations to find the cost of each adult's ticket and each child's ticket.

21 At an online shop a music track costs £x to download and a movie costs £y to download.

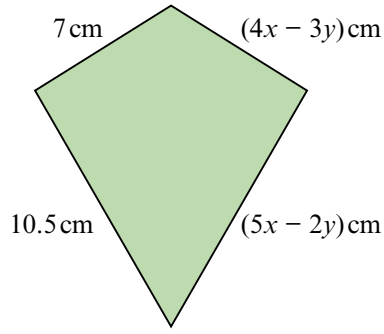
Kamal spent £24.50 to download 10 music tracks and 4 movies.
Katie spent £18.70 to download 8 music tracks and 3 movies.

Use simultaneous equations to find the cost of a music track and of a movie.

22 A straight line with equation $y = ax + b$ passes through the points $(3, -5)$ and $(-1, 11)$.

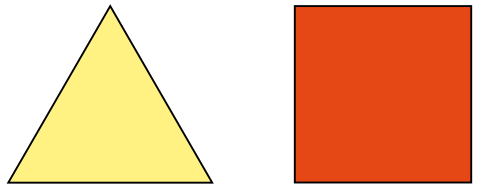
Write down two equations and solve them simultaneously to find the value of a and b.

23 This shape is a kite. Find the value of x and y.



24 The perimeters of the equilateral triangle and the square are both 84 cm.

Use simultaneous equations to find the value of a and b.



25 An employer pays some of his staff £80 per day and others £110 per day.

Altogether he has 50 staff and their daily wages come to £4570.

How many workers receive £80 per day and how many receive £110 per day?