# Simultaneous Equations - Worksheet

## Skill

### Group A - Matching coefficients

Solve each pair of simultaneous equations:

**1)** $a + 3b = 11$
$a + 2b = 9$

**2)** $c + d = 15$
$c - d = 9$

**3)** $e + 6f = 18$
$e + 4f = 14$

**4)** $2g + h = 36$
$g - h = 9$

**5)** $6i - 3j = 12$
$4i - 3j = 2$

**6)** $k + 2l = 18$
$k + 6l = 30$

**7)** $m + 6n = 30$
$m + 2n = -18$

**8)** $2m + 4p = -18$
$2m - 4p = -30$

**9)** $\frac{1}{3}q + 2r = -18$
$\frac{1}{3}q + 6r = 30$

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### Group B - Different coefficients

Solve each pair of simultaneous equations:

**1)** $3a + 2b = 23$
$2a - b = 6$

**2)** $3c - 3d = 9$
$2c + d = 12$

**3)** $4e + 2f = 34$
$3e + f = 21$

**4)** $9g - 4h = 59$
$2g - h = 12$

**5)** $3i + 2j = 33$
$5i - 4j = 44$

**6)** $6k + 4l = 66$
$10k - 8l = 88$

**7)** $3m + 2n = 14$
$4m + 5n = 14$

**8)** $-3m - 2n = -14$
$-4m - 5n = 14$

**9)** $-2q - 5r = 15$
$4q - r = -30$

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### Group C - Rearranging equations

After rearranging each pair of simultaneous equations to the general form $ax + by = c$ where $a$, $b$ and $c$ are constants, solve each pair of simultaneous equations:

**1)** $3x = 7 - 2y$
$4x - 3y = 15$

**2)** $2x + 3y = 7$
$4y = 3x + 15$

**3)** $-2x - 3y = 7$
$3y = 77 + 4x$

**4)** $7x - 15y = \frac{5}{2}$
$3x - 2y = \frac{11}{2}$

**5)** $14x = 30y + 5$
$6x = 4y + 11$

**6)** $\frac{7}{2}x - \frac{15}{2}y = \frac{5}{4}$
$\frac{3}{2}x - y = \frac{11}{4}$

**7)** $3x = 5(y - 2)$
$4x + 3y = 52$

**8)** $3x = 2(19 - y)$
$x = 5(6 - y)$

**9)** $4(13 - x) - 3y = 0$
$2(y + 11) - 3x = 0$

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# Simultaneous Equations - Worksheet

## Applied

**1)** Daniel and Ayushi go to the shop. Daniel spends £6.50 and buys 2 apples and 5 oranges. Ayushi buys 4 apples and 6 oranges for £8.60.

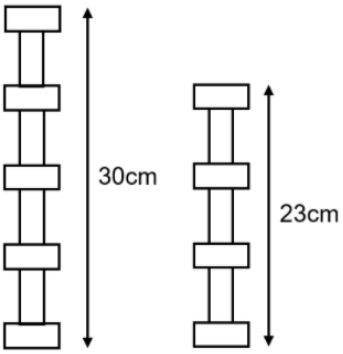
What is the cost of each item?

**2)** Q is the point of intersection of the lines with equations $5x + 3y = 9$ and $2y = 7x - 25$.

Find the coordinates of point $Q$.

**3)** All the rectangles in the diagrams are identical.

What is the length and width of each rectangle?

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# Simultaneous Equations - Exam Questions

**1)** Solve the simultaneous equations:

$$3a + b = -4$$
$$3a - 4b = 6$$

.....

**(4 marks)**

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**2)** Solve the simultaneous equations:

$$x + 3y = 12$$
$$5x - y = 4$$

.....

**(4 marks)**

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**3)** **(a)** Solve the simultaneous equations:

$$4x + y = 25$$
$$x - 3y = 16$$

.....

**(4)**

**(b)** Hence, or otherwise, find the coordinate of the intersections between the following lines:

$$4x + y = 25$$
$$x - 3y = 16$$

.....

**(1)**

**(5 marks)**

# Simultaneous Equations - Exam Questions

**4)** Find the point of intersections between the following lines:

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

.....

**(4 marks)**

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**5)** Solve the following simultaneous equations

$$4x + 3y - 5 = 0$$
$$2x - 5y - 3 = 6$$

.....

**(4 marks)**

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**6)** The cost of a plumber consists of two parts: the fixed costs and the hourly rate.
One piece of work takes the plumber 5 hours and costs £155.
Another piece of work takes the plumber 8 hours and costs £230.

**(a)** i) What is the hourly rate of the plumber?

ii) What is the fixed cost for the plumber?

.....

**(4)**

**(b)** How much would the plumber charge for 2 hours of work?

.....

**(2)**

**(6 marks)**

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# Simultaneous Equations - Answers

| | Question | Answer |
|---|---|---|
| | Skill Questions | |
| Group A | Solve each pair of simultaneous equations:<br>**1)** $a + 3b = 11$<br>$a + 2b = 9$<br>**2)** $c + d = 15$<br>$c - d = 9$<br>**3)** $e + 6f = 18$<br>$e + 4f = 14$<br>**4)** $2g + h = 36$<br>$g - h = 9$<br>**5)** $6i - 3j = 12$<br>$4i - 3j = 2$<br>**6)** $k + 2l = 18$<br>$k + 6l = 30$<br>**7)** $m + 6n = 30$<br>$m + 2n = -18$<br>**8)** $2m + 4p = -18$<br>$2m - 4p = -30$<br>**9)** $\frac{1}{3}q + 2r = -18$<br>$\frac{1}{3}q + 6r = 30$ | **1)** $a = 5, b = 2$<br>**2)** $c = 12, d = 3$<br>**3)** $e = 6, f = 2$<br>**4)** $g = 15, h = 6$<br>**5)** $i = 5, j = 6$<br>**6)** $k = 12, l = 3$<br>**7)** $m = -42, n = 12$<br>**8)** $m = -12, p = 1.5$<br>**9)** $q = -126, r = 12$ |

# Simultaneous Equations - Answers

| | Question | Answer |
|---|---|---|
| | Skill Questions | |
| Group B | Solve each pair of simultaneous equations:<br><br>**1)** $3a + 2b = 23$<br>$2a - b = 6$<br><br>**2)** $3c - 3d = 9$<br>$2c + d = 12$<br><br>**3)** $4e + 2f = 34$<br>$3e + f = 21$<br><br>**4)** $9g - 4h = 59$<br>$2g - h = 12$<br><br>**5)** $3i + 2j = 33$<br>$5i - 4j = 44$<br><br>**6)** $6k + 4l = 66$<br>$10k - 8l = 88$<br><br>**7)** $3m + 2n = 14$<br>$4m + 5n = 14$<br><br>**8)** $-3m - 2n = -14$<br>$-4m - 5n = 14$<br><br>**9)** $-2q - 5r = 15$<br>$4q - r = -30$ | <br><br>**1)** $a = 5, b = 4$<br><br>**2)** $c = 5, d = 2$<br><br>**3)** $e = 4, f = 9$<br><br>**4)** $g = 11, h = 10$<br><br>**5)** $i = 10, j = 1.5$<br><br>**6)** $k = 10, l = 1.5$<br><br>**7)** $m = 6, n = -2$<br><br>**8)** $m = 14, n = -14$<br><br>**9)** $q = -7.5, r = 0$ |

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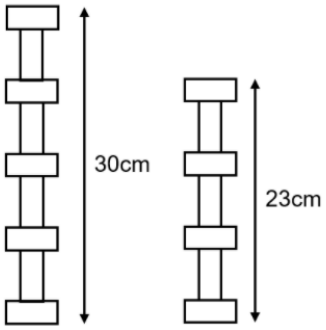
# Simultaneous Equations - Answers

| | Question | Answer |
|---|---|---|
| | Skill Questions | |
| Group C | After rearranging each pair of simultaneous equations to the general form $ax + by = c$ where $a$, $b$ and $c$ are constants, solve each pair of simultaneous equations: | |
| | **1)** $3x = 7 - 2y$<br>$4x - 3y = 15$ | **1)** $x = 3,\ y = -1$ |
| | **2)** $2x + 3y = 7$<br>$4y = 3x + 15$ | **2)** $x = -1, y = 3$ |
| | **3)** $-2x - 3y = 7$<br>$3y = 77 + 4x$ | **3)** $x = -14,\ y = 7$ |
| | **4)** $7x - 15y = \frac{5}{2}$<br>$3x - 2y = \frac{11}{2}$ | **4)** $x = \frac{5}{2},\ y = 1$ |
| | **5)** $14x = 30y + 5$<br>$6x = 4y + 11$ | **5)** $x = \frac{5}{2},\ y = 1$ |
| | **6)** $\frac{7}{2}x - \frac{15}{2}y = \frac{5}{4}$<br>$\frac{3}{2}x - y = \frac{11}{4}$ | **6)** $x = \frac{5}{2},\ y = 1$ |
| | **7)** $3x = 5(y + 2)$<br>$4x + 3y = 52$ | **7)** $x = 10,\ y = 4$ |
| | **8)** $3x = 2(19 - y)$<br>$x = 5(6 - y)$ | **8)** $x = 10,\ y = 4$ |
| | **9)** $4(13 - x) - 3y = 0$<br>$2(y + 11) - 3x = 0$ | **9)** $x = 10,\ y = 4$ |

# Simultaneous Equations - Answers

| | Question | Answer |
|---|---|---|
| | Applied Questions | |
| 1) | Daniel and Ayushi go to the shop. Daniel spends £6.50 and buys 2 apples and 5 oranges. Ayushi buys 4 apples and 6 oranges for £8.60.<br>What is the cost of each item? | One apple costs £0.50 (or $50p$)<br><br>One orange costs £1.10 (or $110p$) |
| 2) | Q is the point of intersection of the lines with equations $5x + 3y = 9$ and $2y = 7x - 25$.<br>Find the coordinates of point $Q$ | $Q = (3, -2)$ |
| 3) | All the rectangles in the diagrams are identical.<br>What is the length and width of each rectangle?<br><br>  | Length = $5cm$<br><br>Width = $2cm$ |

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# Simultaneous Equations - Mark Scheme

| | Question | Answer | |
|---|---|---|---|
| | Exam Questions | | |
| **1)** | Solve the simultaneous equations<br>$3a + b = -4$<br>$3a - 4b = 6$ | $5b = -10$<br>$b = -2$<br>One unknown substituted back into either equation<br>$a = -\frac{2}{3}$ | **(1)**<br>**(1)**<br>**(1)**<br>**(1)** |
| **2)** | Solve the simultaneous equations<br>$x + 3y = 12$<br>$5x - y = 4$ | Correct attempt to multiply either equation to equate coefficients<br>E.g $5x + 15y = 60$ or $x + 3y = 12$<br>$5x - y = 4$ $\quad 15x - 3y = 12$<br><br>Correct attempt to find $y$ or $x$<br>($16y = 56$ or $16x = 24$ seen)<br>One unknown substituted back into either equation<br>$y = \frac{7}{2}$ oe<br><br>$x = \frac{3}{2}$ oe | **(1)**<br>**(1)**<br><br><br><br><br>**(1)**<br><br>**(1)** |
| **3) (a)** | Solve the simultaneous equations<br>$4x + y = 25$<br>$x - 3y = 16$ | Correct attempt to multiply either equation to equate coefficients<br>E.g $12x + 3y = 75$ or $4x + y = 25$<br>$x - 3y = 16$ $\quad 4x - 12y = 64$<br><br>Correct attempt to find $y$ or $x$<br>($13x = 91$ or $13y = -39$ seen)<br><br>One unknown substituted back into either equation<br>$x = 7$<br>$y = -3$ | **(1)**<br>**(1)**<br><br><br><br><br>**(1)**<br>**(1)** |

# Simultaneous Equations - Mark Scheme

| | | | |
|---|---|---|---|
| **(b)** | Hence, or otherwise, find the coordinate of intersections between the following lines:<br>$4x + y = 25$<br>$x - 3y = 16$ | $(7, -3)$ must be written as a coordinate | **(1)** |
| **4)** | Find the point of intersections between the following lines:<br>$3y - 2x = -3$<br>$2y + x = 12$ | Correct attempt to multiply either equation to equate coefficients<br><br>E.g $3y - 2x = -3$ or $6y - 4x = -6$<br>$4y + 2x = 24$ $6y + 3x = 36$<br><br>Correct attempt to find $y$ or $x$ e.g. $7y = 21$ seen.<br><br>One unknown substituted back into either equation<br>$x = 6$<br>$y = 3$<br>$(6, 3)$ as coordinate | **(1)**<br>**(1)**<br><br>**(1)**<br><br>**(1)** |
| **5)** | Solve the following simultaneous equations<br>$4x + 3y - 5 = 0$<br>$2x - 5y - 3 = 6$ | Attempt to rearrange the equations or correct attempt to multiply either equation to equate coefficients<br><br>Finding value of either unknown correctly<br><br>One unknown substituted back into either equation<br>ft<br>$x = 2$<br>$y = -1$ | **(1)**<br><br>**(1)**<br><br><br><br>**(1)**<br>**(1)** |

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# Simultaneous Equations - Mark Scheme

| | | | |
|---|---|---|---|
| **6** **(a)** | The cost of a plumber consists of two parts: the fixed costs and the hourly rate.<br><br>One piece of work takes the plumber 5 hours and costs £155.<br><br>Another piece of work takes the plumber 8 hours and costs £230.<br><br>i) What is the hourly rate of the plumber?<br><br>ii) What is the fixed cost for the plumber? | Construction of equations e.g any of the below seen<br>$5h + f = 155$<br>$8h + f = 230$<br><br>Correct method to find either variable<br><br>i) Hour rate = £25<br><br>ii) Fixed cost = £30 | **(1)**<br>**(1)**<br><br><br>**(1)**<br><br>**(1)** |
| **(b)** | How much would the plumber charge for<br><br>2 hours of work? | $2 \times$ "25" + "30"<br><br>£80 | **(1)**<br><br>**(1)** |

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