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Quadratic Simultaneous Equations - Worksheet

Skill

Group A - Using linear terms

Solve each pair of equations simultaneously:

1) $ab = 12$
$b = a + 1$

2) $cd = 12$
$d = c - 1$

3) $ef = 12$
$f = e - 4$

4) $gh = 12$
$h = g + 4$

5) $i + j = 7$
$ij = 10$

6) $2k + 2l = 30$
$2kl = 72$

7) $4qr = 12$
$r = q + 2$

8) $mp = -2$
$p = 2m - 5$

9) $mn = 12$
$2n = m - 5$

Group B - One of the equations contains a quadratic term

Solve each pair of equations simultaneously:

1) $y = x + 3$
$y = x^2 + 5x - 2$

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

3) $y = x + 18$
$y = x^2 - 2x - 10$

4) $y = x^2 - 3x - 2$
$y = 2x - 8$

5) $y = x^2 - 3$
$y = x - 3$

6) $y = x + 3$
$y = x^2 - 3$

7) $y = 2x - 1$
$y = x^2 - 2x + 2$

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

9) $y = 3x + 9$
$y = 2x^2 + 9x + 1$

Group C - With more than one quadratic term

Solve each pair of equations simultaneously:

1) $x^2 + y^2 = 9$
$y = x + 3$

2) $y = x - 3$
$x^2 + y^2 = 9$

3) $x^2 + y^2 = 25$
$y = x + 5$

4) $y = x - 4$
$x^2 + y^2 = 16$

5) $y - x + 7 = 0$
$x^2 + y^2 - 49 = 0$

6) $x - 4y + 1 = 0$
$x^2 - 4xy + y^2 = 13$

7) $y = -x^2 + 5x + 2$
$y = 3x^2 - x - 2$

8) $y + x^2 = 5x$
$y + x + 2 = 3x^2 - 2$

9) $2x + y = 7$
$x^2 - y^2 = 8$

Quadratic Simultaneous Equations - Worksheet

Applied

1)   Line A and Line B intersect at coordinates C and D.
Find C and D if the equations of the lines are as follows:

$Line\ A$: $x + y + 1 = 4$
$Line\ B$: $x^2 + 3y - 27 = 0$

2)   Solve the simultaneous equations:
$y = 5x - 1$
$y = (x + 1)^2$

3)   The line 'L' and the curve 'C' intersect at the points A and B
L: $y - x = 4$
C: $y - x^2 - 4 = 3x$

Find the distance between the points A and B

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Quadratic Simultaneous Equations - Exam Questions

1) Solve the simultaneous equations:

$xy = 12$
$y - 3x + 9 = 0$

....
(5 marks)

2) Solve the simultaneous equations:

$a^2 + b^2 = 20$
$b + 10 = 2a$

....
(5 marks)

3) Solve the simultaneous equations:

$x^2 - 4y^2 = 9$
$3x + 4y = 7$

....
(5 marks)

4) Find the distance between the two points of intersection of the two lines:

$y = 2x^2 - 3x - 10$
$2x - y + 2 = 0$

....
(6 marks)

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Quadratic Simultaneous Equations - Answers

	Question	Answer
	Skill Questions	
Group A	Solve each pair of equations simultaneously: **1)** $ab = 12$ $\quad b = a + 1$ **2)** $cd = 12$ $\quad d = c - 1$ **3)** $ef = 12$ $\quad f = e - 4$ **4)** $gh = 12$ $\quad h = g + 4$ **5)** $i + j = 7$ $\quad ij = 10$ **6)** $2k + 2l = 30$ $\quad 2kl = 72$ **7)** $4qr = 12$ $\quad r = q + 2$ **8)** $mp = -2$ $\quad p = 2m - 5$ **9)** $mn = 12$ $\quad 2n = m - 5$	**1)** $a = -4,\ b = -3$ $a = 3,\ b = 4$ **2)** $c = -3,\ d = -4$ $c = 4,\ d = 3$ **3)** $e = 6,\ f = 2$ $e = -2,\ f = -6$ **4)** $g = -6,\ h = -2$ $g = 2,\ h = 6$ **5)** $i = 2,\ j = 5$ $i = 5,\ j = 2$ **6)** $k = 12,\ l = 3$ $k = 3,\ l = 12$ **7)** $q = -3,\ r = -1$ $q = 1,\ r = 3$ **8)** $m = 0.5,\ p = -4$ $m = 2,\ p = -1$ **9)** $m = 8,\ n = \frac{3}{2}$ $m = -3,\ n = -4$
Group B	Solve each pair of equations simultaneously: **1)** $y = x + 3$ $\quad y = x^2 + 5x - 2$ **2)** $y = x + 3$ $\quad y = x^2 - 3x - 2$ **3)** $y = x + 18$ $\quad y = x^2 - 2x - 10$	**1)** $x = -5,\ y = -2$ $x = 1,\ y = 4$ **2)** $x = 5,\ y = 8$ $x = -1,\ y = 2$ **3)** $x = 7,\ y = 25$ $x = -4,\ y = 14$

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Quadratic Simultaneous Equations - Answers

Group B continued	**4)** $y = x^2 - 3x - 2$ $y = 2x - 8$	**4)** $x = 2, y = -4$ $x = 3, y = -2$
	5) $y = x^2 - 3$ $y = x - 3$	**5)** $x = 0, y = -3$ $x = 1, y = -2$
	6) $y = x + 3$ $y = x^2 - 3$	**6)** $x = -2, y = 1$ $x = 3, y = 6$
	7) $y = 2x - 1$ $y = x^2 - 2x + 2$	**7)** $x = 1, y = 1$ $x = 3, y = 5$
	8) $y - 2x = 4$ $y = x^2 + x - 2$	**8)** $x = -2, y = 0$ $x = 3, y = 10$
	9) $y = 3x + 9$ $y = 2x^2 + 9x + 1$	**9)** $x = -4, y = -3$ $x = 1, y = 12$
Group C	Solve each pair of equations simultaneously: **1)** $x^2 + y^2 = 9$ $y = x + 3$	 **1)** $x = 0, y = 3$ $x = -3, y = 0$
	2) $y = x - 3$ $x^2 + y^2 = 9$	**2)** $x = 3, y = 0$ $x = 0, y = -3$
	3) $x^2 + y^2 = 25$ $y = x + 5$	**3)** $x = 0, y = 5$ $x = -5, y = 0$
	4) $y = x - 4$ $x^2 + y^2 = 16$	**4)** $x = 4, y = 0$ $x = 0, y = -4$
	5) $y - x + 7 = 0$ $x^2 + y^2 - 49 = 0$	**5)** $x = 7, y = 0$ $x = 0, y = -7$
	6) $x - 4y + 1 = 0$ $x^2 - 4xy + y^2 = 13$	**6)** $x = -9, y = -2$ $x = 23, y = 6$
	7) $y = -x^2 + 5x + 2$ $y = 3x^2 - x - 2$	**7)** $x = -\frac{1}{2}, y = -\frac{3}{4}$ $x = 2, y = 8$

Quadratic Simultaneous Equations - Answers

Group C continued	**8)** $y + x^2 = 5x$ $\quad y + x + 2 = 3x^2 - 2$ **9)** $2x + y = 7$ $\quad x^2 - y^2 = 8$	**8)** $x = -\frac{1}{2},\ y = -\frac{11}{4}$ $\quad x = 2,\ y = 6$ **9)** $x = 3,\ y = 1$ $\quad x = \frac{19}{3},\ y = -\frac{17}{3}$

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Quadratic Simultaneous Equations - Answers

	Question	Answer
	Applied Questions	
1)	Line A and Line B intersect at coordinates C and D. Find C and D if the equations of the lines are as follows: *Line A*: $x + y + 1 = 4$ *Line B*: $x^2 + 3y - 27 = 0$	$(-3, 6)$ and $(6, -3)$
2)	Solve the simultaneous equations: $y = 5x - 1$ $y = (x + 1)^2$	$x = 1, \ y = 4$ $x = 2, \ y = 9$
3)	The line 'L' and the curve 'C' intersect at the points A and B L: $y - x = 4$ C: $y - x^2 - 4 = 3x$ Find the distance between the points A and B	Intersection points at $(-2, 2)$ and $(0, 4)$ $AB = \sqrt{8}$ or $2\sqrt{2}$ or $2.83 \ (3sf)$

Quadratic Simultaneous Equations - Mark Scheme

	Question	Answer	
	Exam Questions		
1)	Solve the simultaneous equations $xy = 12$ $y - 3x + 9 = 0$	Rearranging second equation to $y = 3x - 9$ Substitution of $(3x - 9)$ into equation one	**(1)**
		Correct expansion of bracket, e.g. $3x^2 - 9x = 12$ $3x^2 - 9x - 12 = 0$	**(1)**
		Solving for x correctly $(4 \text{ and} - 1)$ Correct substitution of x back into either equations	**(1)** **(1)**
		Correct final answer: $x = 4$, $y = 3$ $x = -1$, $y = -12$	**(1)**
2)	Solve the simultaneous equations $a^2 + b^2 = 20$ $b + 10 = 2a$	Clear attempt for substitution of $2a - 10$ into first equation	**(1)**
		Correct expansion of at least 3 terms of $(2a - 10)^2$ $4a^2 - 20a - 20a + 100$	**(1)**
		Simplifying to : $5a^2 - 40a + 80 = 0$ or $a^2 - 8a + 16 = 0$	**(1)**
		Correct substitution of a back into either equations for b	**(1)**
		Correct final answer: $a = 4$, $b = -2$	**(1)**

Quadratic Simultaneous Equations - Mark Scheme

3)	Solve the simultaneous equations $$x^2 - 4y^2 = 9$$ $$3x + 4y = 7$$	Method to find an expression for y to substitute into first equations E.g $y = \frac{7-3x}{4}$	**(1)**
		Correct substitution and expansion E.g. $x^2 - 4(\frac{49-42x+9x^2}{16}) = 9$ Or $4x^2 - 49 + 42x - 9x^2 = 36$	**(1)**
		Correct attempt to form a quadratic equation E.g. $5x^2 - 42x + 85 = 0$	**(1)**
		Correct method for solving quadratic equations	**(1)**
		Correct final answer: $x = 3.4, y = -0.8$ $x = 5, y = -2$	**(1)**
4)	Find the distance between the intersection of the two lines $$y = 2x^2 - 3x - 10$$ $$2x - y + 2 = 0$$	Eliminating one unknown E.g $2x + 2 = 2x^2 - 3x - 10$	**(1)**
		Correctly rearranging equation to form a quadratic $2x^2 - 5x - 12 = 0$	**(1)**
		Correct use of method to solve quadratic for one unknown E.g. completing the square, quadratic formula, or factorisation	**(1)**
		Use of substitution to find other variable	**(1)**
		Correct points of intersection seen $(-1.5, -1)$ and $(4, 10)$ or $x = -\frac{3}{2}, y = -1$ $x = 4, y = 10$	**(1)**
		Method for distance between two points E.g. Pythagorean Theorem Correct final answer: 12.3 (to 3 sf)	**(1)**

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