

Level 3 Algebra – Simultaneous Equations - Answers

June 2013 - Question 15

15	$2x - 3 = x^2 - x - 7$ $x^2 - 3x - 4 = 0$ $(x - 4)(x + 1) = 0$ $x = 4$ or $x = -1$ $y = 5$ or $y = -5$	$x = -1, y = -5$ $x = 4, y = 5$	5	M1 for eliminating one variable M1 for rearranging to get a quadratic ($= 0$) in one variable M1 for correct method to solve their quadratic equation. A1 for $x = 4$ or $x = -1$ A1 for $y = 5$ or $y = -5$ linked to corresponding x values
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Jan 2014 - Question 14

Question	Working	Answer	Mark	Notes
14	$8x^2 + (2x)^2 = 3$ $12x^2 = 3$ $x^2 = \frac{1}{4}$ $x = \pm \frac{1}{2}$ $y = \pm 1$	$x = \frac{1}{2}, y = 1$ $x = -\frac{1}{2}, y = -1$	4	M1 for eliminating one variable M1 for simplifying to get $x^2 = \frac{1}{4}$ oe or $y^2 = 1$ A2 for $x = \frac{1}{2}$ oe, $y = 1$ AND $x = -\frac{1}{2}$ oe, $y = -1$ (A1 for $x = \pm \frac{1}{2}$ oe or $y = \pm 1$ or $x = \frac{1}{2}$ oe, $y = 1$ or $x = -\frac{1}{2}$ oe, $y = -1$)

Jan 2015 - Question 20

Question	Working	Answer	Mark	Notes
20	$(x - 2)^2 + (x - 6)^2 = 8$ $x^2 - 8x + 16 = 0$ $(x - 4)^2 = 0$ $x = 4, y = 4 - 6$	$x = 4, y = -2$	4	M1 for eliminating one variable M1 for simplifying to get a quadratic $= 0$ in one variable M1 for factorising to obtain $(x - 4)^2 = 0$ or $(y + 2)^2 = 0$ A1 for $x = 4, y = -2$

June 2015 - Question 8

8	$y = 1 - 2x$ $2x^2 + 3(1 - 2x) = -1$ $2x^2 - 6x + 3 = -1$ $2x^2 - 6x + 4 = 0$ $x^2 - 3x + 2 = 0$ $(x - 1)(x - 2) = 0$	$x = 1, y = -1$ and $x = 2, y = -3$	5	M1 for correct method to eliminate one variable M1 (dep M1) for simplifying to get a quadratic ($= 0$) in one variable M1 (dep M2) for correct method to solve their quadratic A1 $x = 1, x = 2$ or $y = -1, y = -3$ A1 $x = 1, y = -1$ and $x = 2, y = -3$
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Jan 2016 - Question 15

Question	Working	Answer	Mark	Notes
15	$2x^2 + 2y^2 = 17$ $2x^2 + 2(x + 4)^2 = 17$ $4x^2 + 16x + 32 = 17$ $4x^2 + 16x + 15 = 0$ $(2x + 3)(2x + 5) = 0$ $x = -\frac{3}{2}$, or $-\frac{5}{2}$ $y = \frac{5}{2}$, $\frac{3}{2}$	$-\frac{3}{2}, \frac{5}{2}$ and $-\frac{5}{2}, \frac{3}{2}$	4	M1 for substitution of $y = x + 4$ or $x = y - 4$ into the quadratic equation M1 for $4x^2 + 16x + 15 (= 0)$ or $4y^2 - 16y + 15 (= 0)$ oe (must be in the form " $= 0$ ") A1 $x = -\frac{3}{2}, -\frac{5}{2}$ oe or $y = \frac{3}{2}, \frac{5}{2}$ oe A1 for $x = -\frac{3}{2}, y = \frac{5}{2}$ and $x = -\frac{5}{2}, y = \frac{3}{2}$

June 2016 - Question 8

8	$y = x - 3$ $x^2 - 2x - 3 = 0$ $(x - 3)(x + 1) = 0$ $x = 3$ or -1 $y = 0$ or -4 OR $x = y + 3$ $y = (y + 3)^2 - (y + 3) - 6$ $y^2 + 4y = 0$ $y = 0$ or -4 $x = 3$ or -1	$x = 3, y = 0$ and $x = -1, y = -4$	5	M1 for method to eliminate one variable M1(dep M1) for simplifying to get a quadratic ($= 0$) in one variable M1(dep M2) for correct method to solve their quadratic A1 $x = 3, x = -1$ or $y = 0, y = -4$ A1 $x = 3, y = 0$ and $x = -1, y = -4$
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Jan 2017 - Question 19

19	$4x^2 - (-3 - x)^2 = 36$ $4x^2 - (9 + 6x + x^2) = 36$ $3x^2 - 6x - 45 = 0$ $x^2 - 2x - 15 = 0$ $(x + 3)(x - 5) = 0$ $x = -3, 5$ $y = 0, -8$	-3, 0 and 5, -8	5	M1 for substitution of $y = -3 - x$ into the quadratic equation M1 (dep on M1) for correct expansion of brackets within the equation M1 (dep on M2) for equation of the form $ax^2 + bx + c = 0$ A1 $x = -3, 5$ oe or $y = 0, -8$ oe A1 for $x = -3, y = 0$ and $x = 5, y = -8$
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June 2017 - Question 8

8	$(2x - 1)(x + 3) = 0$ $x = \frac{1}{2}$ or $x = -3$ Or use of formula $\frac{-5 \pm \sqrt{5^2 - 4 \times 2 \times (-3)}}{2 \times 2}$	$x = \frac{1}{2}, y = -7\frac{1}{4}$ $x = -3, y = 1\frac{1}{2}$	5	M1 for correct method to eliminate one variable M1 (dep M1) for simplifying to get a quadratic (= 0) in one variable M1 (dep M2) for correct method to solve their quadratic A1 $x = \frac{1}{2}, x = -3$ or $y = -7\frac{1}{4}, y = 1\frac{1}{2}$ oe A1 $x = \frac{1}{2}, y = -7\frac{1}{4}$ and $x = -3, y = 1\frac{1}{2}$ oe
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Jan 2018 - Question 17

17	$32x^2 - 9(\frac{4}{3}x)^2 = 1$ $32x^2 - 16x^2 = 1$ $16x^2 = 1$ OR $32\left(\frac{3y}{4}\right)^2 - 9y^2 = 1$ $18y^2 - 9y^2 = 1$ $9y^2 = 1$	$\frac{1}{4}, \frac{1}{3}$ and $-\frac{1}{4}, -\frac{1}{3}$	4	M1 for substitution of $y = \frac{4}{3}x$ or $x = \frac{3}{4}y$ or $9y^2 = (4x)^2$ into the quadratic equation oe to obtain equation in one variable M1 for method to simplify to $32x^2 - 16x^2 = 1$ or $18y^2 - 9y^2 = 1$ A1 $x = \pm\frac{1}{4}$ oe or $y = \pm\frac{1}{3}$ oe or $x = \frac{1}{4}, y = \frac{1}{3}$ or $x = -\frac{1}{4}, y = -\frac{1}{3}$ A1 for $x = \frac{1}{4}, y = \frac{1}{3}$ and $x = -\frac{1}{4}, y = -\frac{1}{3}$
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June 2018 - Question 11

11		$x = -1, y = \frac{5}{2}$ $x = 2, y = -\frac{1}{2}$	5	M1 for correct method to eliminate one variable M1 (dep M1) for quadratic (= 0) in one variable M1 (dep M2) for correct method to solve their quadratic, eg correct factorisation or substitution into the formula A1 $x = -1, x = 2$ or $y = \frac{5}{2}, y = -\frac{1}{2}$ A1 $x = -1, y = \frac{5}{2}$ and $x = 2, y = -\frac{1}{2}$ (accept coordinate pairs)
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Jan 2019 - Question 14

Question	Working	Answer	Mark	Notes
14	$x^2 + 3x + 2 = x + 2$ $x^2 + 2x = 0$ $x(x + 2) = 0$ $x = 0, x = -2$ $y = 2, y = 0$	0, 2 and -2, 0	4	M1 for substitution of $y = x + 2$ into the quadratic equation oe to obtain equation in one variable M1 for $x^2 + 2x (= 0)$ oe A1 $x = 0, -2$ or $y = 2, 0$ A1 for $x = 0, y = 2$ and $x = -2, y = 0$

June 2019 - Question 15

15	$49 - 28x + 4x^2$ $147 - 84x + 12x^2$ $+ 4x^2$ $= 43$ $104 - 84x + 16x^2$ $= 0$ $4x^2 - 21x + 26 = 0$ $(4x - 13)(x - 2)$ $= 0$ <p>Or</p> $49 - 14y + y^2$ $49 - 14y + y^2$ $+ 3y^2$ $= 43$ $2y^2 - 7y + 3 = 0$ $(2y - 1)(y - 3)$ $= 0$	$x = 2, y = 3$ and $x = 3.25, y = 0.5$	5	<p>M1 for substitution of $y = 7 - 2x$ or $2x = 7 - y$ oe into the quadratic equation to eliminate one variable</p> <p>M1 (dep on M1) for expansion of brackets within the quadratic</p> <p>M1 (dep on M2) for equation of the form $ax^2 + bx + c (= 0)$</p> <p>A1 $x = 2, 3.25$ oe or $y = 3, 0.5$ oe</p> <p>A1 for $x = 2, y = 3$ and $x = 3.25, y = 0.5$</p>
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Jan 2020 - Question 17

17		$x = 5, y = \frac{5}{2}$ $x = -\frac{5}{2}, y = -5$	5	<p>M1 for substitution of $2y = 2x - 5$ or $y = x - \frac{5}{2}$ into</p> <p>$4x^2 + 4y^2 = 125$ oe to obtain equation in one variable</p> <p>M1 for writing equation in the form $ax^2 + bx + c (= 0)$</p> <p>eg $8x^2 - 20x - 100 (= 0)$ oe</p> <p>M1 for method to solve the equation,</p> <p>eg $(2x + 5)(x - 5) (= 0)$</p> <p>A1 $x = \frac{5}{2}, x = 5$ OR $y = \frac{5}{2}, y = -5$ OR $x = -\frac{5}{2}, y = -5$ OR</p> <p>$x = 5, y = \frac{5}{2}$</p> <p>A1 for $x = 5, y = \frac{5}{2}$ and $x = -\frac{5}{2}, y = -5$</p>
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Jan 2021 - Question 13

13	$2x^2 - 6 = 3(2x - 2)$ $2x^2 - 6 = 6x - 6$ $2x^2 = 6x$	$x = 0, y = -2$ $x = 3, y = 4$	4	<p>M1 for substitution to obtain equation in one variable,</p> <p>M1 for method to simplify to a quadratic in the form $ax^2 + bx + c = 0$ eg $2x^2 - 6x (= 0)$</p> <p>A1 $x = 0, 3$ or $y = -2, 4$</p> <p>A1 for $x = 0, y = -2$ and $x = 3, y = 4$</p>
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Jan 2022 - Question 16

16		$x = \frac{3}{\sqrt{8}}, y = \frac{1}{\sqrt{8}}$ $x = -\frac{3}{\sqrt{8}}, y = -\frac{1}{\sqrt{8}}$	4	<p>M1 for substitution of $x = 3y$ or $y = \frac{1}{3}x$ into</p> <p>$x^2 - y^2 = 1$ oe to obtain equation in one variable</p> <p>M1 for simplifying, eg $8y^2 = 1$</p> <p>A1 for solutions for one variable, eg $y = \pm \frac{1}{\sqrt{8}}$</p> <p>or one correct pairing</p> <p>A1 for complete solution, $x = \frac{3}{\sqrt{8}}, y = \frac{1}{\sqrt{8}}$ and</p> <p>$x = -\frac{3}{\sqrt{8}}, y = -\frac{1}{\sqrt{8}}$</p>
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June 2022 - Question 16

16	$x + 1 = 3x^2 + 6x - 1$ $3x^2 + 5x - 2 = 0$ $(3x - 1)(x + 2) = 0$ OR $x^2 = (y - 1)^2$ $y = 3(y^2 - 2y + 1)$ $+ 6(y - 1)$ $- 1$ $3y^2 - y - 4 = 0$ $(3y - 4)(y + 1) = 0$	$x = \frac{1}{3}, y = \frac{4}{3}$ $x = -2, y = -1$	4	<p>M1 for method to eliminate one variable to form one quadratic equation, eg substitute $y = x + 1$ or $x = y - 1$</p> <p>M1 for writing equation in the form $ax^2 + bx + c = 0$ or $ay^2 + by + c = 0$, eg $3x^2 + 5x - 2 (= 0)$ or $3y^2 - y - 4 (= 0)$</p> <p>A1 $x = \frac{1}{3}, -2$ or $y = \frac{4}{3}, -1$</p> <p>A1 for $x = \frac{1}{3}, y = \frac{4}{3}$ and $x = -2, y = -1$</p>
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Jan 2023 - Question 10

10	$2(2y-3)^2 + 4y^2 = 18$ $6y^2 - 12y (= 0)$ $y(6y - 12)$	$x = -3, y = 0$ $x = 1, y = 2$	5	<p>M1 for eliminating one variable eg substitution of $4y^2 = (x+3)^2$ into the quadratic equation oe to obtain equation in one variable</p> <p>M1 for a quadratic in one variable and in the form $ax^2 + bx + c (= 0)$ eg $3x^2 + 6x - 9 (= 0)$ oe</p> <p>M1 for factorising the quadratic eg $3(x+3)(x-1)$ oe or using the formula to the point of $\frac{-6 \pm \sqrt{144}}{6}$</p> <p>A1 $x = -3, 1$ or $y = 0, 2$</p> <p>A1 for $x = -3, y = 0$ and $x = 1, y = 2$</p>
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June 2023 - Question 18

18		$x = \frac{10\sqrt{2}}{3}, y = -\frac{8\sqrt{2}}{3}$ $x = -\frac{10\sqrt{2}}{3}, y = \frac{8\sqrt{2}}{3}$	5	<p>M1 for substitution of $y = -\frac{4}{5}x$ or $x = -\frac{5}{4}y$ into $x^2 - y^2 = 8$ to obtain equation in one variable eg, $x^2 - \left(-\frac{4}{5}x\right)^2 = 8$ or $\left(-\frac{5}{4}y\right)^2 - y^2 = 8$</p> <p>M1 for simplifying and collecting terms, eg $\frac{9}{25}x^2 - 8 = 0$ oe or $\frac{9}{16}y^2 - 8 = 0$ oe</p> <p>M1 for method to find the value(s) for x or the value(s) for y, eg $x = (\pm)\sqrt{\frac{200}{9}}$ oe or $y = (\pm)\sqrt{\frac{128}{9}}$ oe</p> <p>A1 $x = \pm\frac{10\sqrt{2}}{3}$ or $y = \pm\frac{8\sqrt{2}}{3}$ or $x = \frac{10\sqrt{2}}{3}, y = -\frac{8\sqrt{2}}{3}$ or $x = -\frac{10\sqrt{2}}{3}, y = \frac{8\sqrt{2}}{3}$ oe</p> <p>A1 for $x = \frac{10\sqrt{2}}{3}, y = -\frac{8\sqrt{2}}{3}$ and $x = -\frac{10\sqrt{2}}{3}, y = \frac{8\sqrt{2}}{3}$ oe, must be paired</p>
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Jan 2024 - Question 16

16	$2x = 5x^2 - 22x - 5$ $5x^2 - 24x - 5 = 0$ $(5x + 1)(x - 5) = 0$ OR $x = \frac{y}{2}$ $y = 5\left(\frac{y}{2}\right)^2 - 22\left(\frac{y}{2}\right) - 5$ $5y^2 - 48y - 20 = 0$ $(5y + 2)(y - 10) = 0$	$x = -\frac{1}{5}, y = -\frac{2}{5}$ $x = 5, y = 10$	4	<p>M1 for substitution of $y = 2x$ into the quadratic equation to obtain equation in one variable, x or using $x = \frac{y}{2}$ into the quadratic equation to obtain equation in one variable, y.</p> <p>M1 for writing equation in the form $ax^2 + bx + c = 0$ or $ay^2 + by + c = 0$, eg $5x^2 - 24x - 5 (= 0)$ or $5y^2 - 48y - 20 (= 0)$</p> <p>A1 $x = -\frac{1}{5}, 5$, or $y = -\frac{2}{5}, 10$</p> <p>A1 for $x = -\frac{1}{5}, y = -\frac{2}{5}$ and $x = 5, y = 10$</p>
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