Mark scheme

Quadratic equations

Mathematics 0580 · Questions from Paper 2 and Paper 4

Total marks

47

MARKS FOR EACH QUESTION

1	2	3	4	5	6	7	8	9	10	Total
3	3	4	4	4	5	5	5	7	7	**47**

Question 1 [3]

1	$(3x + 5)(x - 4)$ [=0]	**M2**	**M1** for $(3x + b)(x + a)$ where $ab = -20$ or $3a + b = -7$
	4 and $-\frac{5}{3}$ oe	**A1**	If zero scored, **SC1** for 2 correct answers from no working or other methods

Question 2 [3]

2	0 and –3	**3**	**B2** for $x^2 + 3x$ [= 0] or better or **M1** for $10 - 6x = x^2 - 3x + 10$ oe or for correct simplification of *their* quadratic to the form $ax^2 + bx + c$ [= 0] or better or finding $y = 28$ and $y = 10$

Question 3 [4]

3	$x = 0.84$ or 7.16	4	**B1** $\frac{8 \pm k}{2}$ **B1** $\sqrt{(8^2 - 4 \times 1 \times 6)}$ or better **A1 A1**

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Question 4 **[4]**

4	–2.64, 1.14 cao with working	**4**	**B1** for $\sqrt{3^2-4(2)(-6)}$ or better seen anywhere **B1** for $p = -3$ **and** $r = 2 \times 2$ or better as long as in the form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ After **B0B0, SC1** for –2.6 or –2.637(45…) and 1.1 or 1.137(45…)

Question 5 **[4]**

5(a)	$(x-9)^2-108$	**2**	**B1** for $(x+h)^2-108$ or $(x-9)^2+h$ or $k=-9$
5(b)	19.4 or 19.39… – 1.39 or – 1.392…	**2**	**M1FT** $x - their 9 = \pm\sqrt{their 108}$ **A1** for $9 \pm \sqrt{108}$ or $9 \pm 6\sqrt{3}$

Question 6 **[5]**

6(a)	$\frac{3}{5}$ or 0.6 and –4	**4**	**M1** for $5x^2 + 17x - 12$ [= 0] **M2** for correct method to solve *their* $ax^2 + bx - c$ [= 0] e.g. factorising $(5x - 3)(x + 4)$ [= 0], completing the square or using the formula or **M1** for $(5x + a)(x + b)$ where $ab = -12$ or $5b + a = 17$ or correct partial factorisation e.g. $5x(x + 4) - 3(x + 4)$ or for $\sqrt{17^2-4(5)(-12)}$ or better or $\frac{-17+\sqrt{d}}{2(5)}$ or $\frac{-17-\sqrt{d}}{2(5)}$
6(b)	–6	**1**	

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Question 7 **[5]**

7	$4x^2+3x-85[=0]$ or $16y^2-113y+7[=0]$ oe simplified	**M2**	**M1** for $4(x^2-18)+3x=13$ or $x^2-18=\frac{13-3x}{4}$ or $y=\left(\frac{13-4y}{3}\right)^2-18$ oe or better
	correct method to solve *their* quadratic equation e.g. factors, quadratic formula, completing the square	**M1**	$\frac{-3\pm\sqrt{3^2-4\times4\times-85}}{2\times4}$ oe, $(4x-17)(x+5)$ $\frac{-(-113)\pm\sqrt{(-113)^2-4\times16\times7}}{2\times16}$ oe, $(16y-1)(y-7)$
	$x=-5$ $y=7$ $x=\frac{17}{4}$ oe $y=\frac{1}{16}$ oe	**B2**	**B1** for one correct pair or two correct x values or two correct y values If B0 scored and at least 2 method marks scored, **SC1** for correct substitution of both of their x values or their y values into $4y+3x=13$ or $y=x^2-18$

Question 8 **[5]**

8	$x=3$, $x=-3$ nfww	**5**	**M2** for $x+9+9(x+1)=(x+1)(x+9)$ oe or better or **M1** for $x+9+9(x+1)$ or $(x+1)(x+9)$ oe or better **B1** for $x^2+x+9x+9$ seen **M1 dep** for $[0=]x^2-9$ oe simplified or better

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Question 9 **[7]**

9	[0 =] $6x^2 - 19x + 3$	**B5**	**B4** for $8x - 20 + 2x + 2 = 6x^2 + 6x - 15x - 15$ or better OR **M2** for $4(2x - 5) + 2(x + 1) = 3(x + 1)(2x - 5)$ oe or **M1** for $4(2x - 5) + 2(x + 1)$ or better or common denominator $(x + 1)(2x - 5)$ or better **B1** for $2x^2 + 2x - 5x - 5$ or better seen **M1** for correctly simplifying *their* quadratic to the form [0 =] $ax^2 + bx + c$
	Correct method to solve *their* three term quadratic	**M1**	e.g. $(6x - 1)(x - 3)$ $\frac{-(-19) \pm \sqrt{(-19)^2 - 4 \times 6 \times 3}}{2 \times 6}$
	$x = 3, x = \frac{1}{6}$ oe	**B1**	

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Question 10 **[7]**

10	$x + 1 - 2x = 3x(x + 1)$	**M2**	**M1** for a common denominator of $x(x + 1)$ seen or attempt to multiply through by denominators or for $\frac{x+1-2x}{x(x+1)} = 3$
	$3x^2 + 4x - 1[= 0]$ oe nfww	**A1**	
	$[x =]\frac{-4 \pm \sqrt{4^2 - 4 \times 3 \times (-1)}}{2 \times 3}$	**B2**	**B1FT** for $\sqrt{4^2 - 4 \times 3 \times (-1)}$ or better or for $\left(x + \frac{2}{3}\right)^2$ **B1FT** for $\frac{-4+\sqrt{q}}{2 \times 3}$ or $\frac{-4-\sqrt{q}}{2 \times 3}$ or for $-\frac{2}{3} \pm \sqrt{\frac{1}{3} + \left(\frac{2}{3}\right)^2}$
	–1.55 and 0.22 final answers	**B2**	**B1** for each or **B1** for –1.548 to –1.549 **and** 0.215… or for –1.55 **and** 0.22 seen in working or for –0.22 **and** 1.55 as final answer or for –1.5 or –1.54 **and** 0.2 or 0.21 as final answer

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