Solving Equations and Inequalities

1	**14**	6	3	**M1** for one correct first step which leads towards simplifying $3y - 12 + \frac{y}{2} = 9$ or $6(y - 4) + y = 18$ or $y - 4 + \frac{y}{6} = 3$
2	**10**	3.4 or $3\frac{2}{5}$	3	**M1** $22 - 6x$ **M1** $4x + 6x = 22 + 12$
3	**12**	14.5 oe	3	**M2** for complete correct method or **M1** for one correct step
4	**5**	4.8 oe	2	**M1** for $5 + 19 = 3x + 2x$ oe or better or **B1** for $24 - 2x = 3x$ oe or $5 = 5x - 19$ oe
5	**3**	–8	2	**M1** for $2x = -16$ or $\frac{1}{2} + x = -7.5$ oe or better
6	**3**	30	2	**M1** for $n - 8 = 22$ or $\frac{n}{2} = 15$
7	**10**	3.75 oe	3	**M2** for $3 \times 5 = 7x - 3x$ oe or **M1** for $3(x + 5) = 7x$ or $x + 5 = \frac{7}{3}x$ or $1 + \frac{5}{x} = \frac{7}{3}$ or better
8	**6**	9.5 or $\frac{19}{2}$	3	**M2** for $2x = (8 \times 3) - 5$ or better oe or **M1** for $2x + 5 = 8 \times 3$ or better
9	**6**	8×10^3 or 8000 nfww	2	**M1** for $w + 4 \times 10^3 = 1.2 \times 10^4$ oe or $5w + 20 \times 10^3 = 6 \times 10^4$ oe
10	**9**	2.8 oe	3	**M2** for $12 + 2 = 8x - 3x$ or better or **M1** for $3x + 12$ or $8x - 2$
11	**1**	7, – 4	1	
12	**4**	0.5 or $\frac{1}{2}$	2	**M1** for correct first step e.g. $6y + 6 = 9$ or $y + 1 = \frac{9}{6}$
13	**3**	21	2	**M1** for $k - 8 = 13$ or $6k - 48 = 78$ or better

14	13	(a)	11	1	
		(b)	8	2FT	**FT** 30 – 2 × *their* **(a)** or **M1** for $4 \times 7 = 2(x-1) + FG$ oe or $4(x-4) = 2(x-1) + FG$ oe or $2 \times 7 + 2(x-4) = 2(x-1) + FG$ oe Allow x to be *their* **(a)** in each
15	10		120	3	**M1** $7t + 11(t+5) = 2215$ **A1** $18t + 55 = 2215$
16	10	(a)	$x + x + 4 + x + 4 = 26$ oe	1	
		(b)	6[.00] cao	2	**M1** for their linear eqn simplified to $ax = b$
17	7		5	3	**M2** for $(x-5)(x-1)$ or **M1** for evidence of a factorisation which gives the correct coefficient of x or positive prime constant term e.g. $(x-7)(x+1)$, $(x-4)(x-2)$, $(x-3)(x-1)$
18	12	(a)	$(3x-4)(x+2)$	2	**M1** for $(3x+a)(x+b)$ where $a + 3b = 2$ *or* $ab = -8$ if M0 then **SC1** for $3\left(x - \frac{4}{3}\right)(x+2)$
		(b)	$1\frac{1}{3}$, -2	1FT	**dep** on **M1**
19	14		–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…)
20	20		$x = 0.84$ or 7.16	4	**B1** $\frac{8 \pm k}{2}$ **B1** $\sqrt{(8^2 - 4 \times 1 \times 6)}$ or better **A1 A1**
21	15		–3.44, 0.44 correct working must be shown	4	**B1** for $\sqrt{(6)^2 - 4(2)(-3)}$ or better seen **B1** if in form $\frac{p + (or -) q}{r}$, for $p = -6$ **and** $r = 2 \times 2$ oe **B1, B1** (**SC1** –3.4 or –3.436… **and** 0.4 or 0.436...)

22	**15**	$\dfrac{-7 \pm \sqrt{7^2 - 4(2)(-3)}}{2 \times 2}$	**B2**	**B1** for $\sqrt{7^2 - 4(2)(-3)}$ or better seen **B1** for $p = -7$ and $r = 2 \times 2$ or better as long as in the form $\dfrac{p+\sqrt{q}}{r}$ or $\dfrac{p-\sqrt{q}}{r}$
		0.39, –3.89 cao	**B1,B1**	After **B0B0** for the two answers, **SC1** for 0.4 or 0.386[0009...] and –3.9 or –3.886[0009...] or **SC1** for –0.39 and 3.89
23	**14**	$\sqrt{1^2 - 4(2)(-2)}$	**B1**	If completing the square **B1** for $\left(x+\dfrac{1}{4}\right)^2$ oe
		If in form $\dfrac{p+\sqrt{q}}{r}$ or $\dfrac{p-\sqrt{q}}{r}$ $p = -1$, $r = 2(2)$ or 4	**B1**	**B1** for $x = -\dfrac{1}{4} + \sqrt{1+\left(\dfrac{1}{4}\right)^2}$ or $x = -\dfrac{1}{4} - \sqrt{1+\left(\dfrac{1}{4}\right)^2}$
		– 1.28 0.78	**B1** **B1**	If **0** scored for the last two **B** marks then **SC1** for – 1.3 **and** 0.8 or – 1.281 to – 1.280 **and** 0.781 or 0.7807 to 0.7808 or 1.28 **and** – 0.78 or – 1.28 **and** 0.78 seen in the working
24	**19**	$\sqrt{(-6)^2 - 4(5)(-3)}$ or better seen	**B1**	If completing the square **B1** for $\left(x-\dfrac{3}{5}\right)^2$ oe
		if $\dfrac{p+\sqrt{q}}{r}$ or $\dfrac{p-\sqrt{q}}{r}$ seen then $p = -(-6)$ and $r = 2 \times 5$	**B1**	**B1** for $\dfrac{3}{5} + \sqrt{\dfrac{3}{5}+\left(\dfrac{3}{5}\right)^2}$ or $\dfrac{3}{5} - \sqrt{\dfrac{3}{5}+\left(\dfrac{3}{5}\right)^2}$ oe
		–0.38 1.58 cao final answers	**B1** **B1**	If B0, **SC1** for – 0.4 and 1.6 or – 0.379[795..] and 1.579[795..] or – 1.58 and 0.38 as final answers or – 0.38 and 1.58 seen in working

25	**21**	$\sqrt{(4)^2-4(3)(-5)}$ or better seen if $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ seen then $p = -4$ and $r = 2(3)$ -2.12 0.79 final answers	**B1** **B1** **B1** **B1**	If completing the square **B1** for $\left(x+\frac{2}{3}\right)^2$ oe **B1** for $-\frac{2}{3}+\sqrt{\frac{5}{3}+\frac{2^2}{3^2}}$ or $-\frac{2}{3}-\sqrt{\frac{5}{3}+\frac{2^2}{3^2}}$ If B0, **SC1** for 0.786[299] **and** −2.119[632] -2.1 **and** 0.8 or -2.120 or -2.119 **and** 0.786 or 2.12 and –0.79 final answers –2.12 **and** 0.79 seen not as final answers
26	**17**	$\frac{-(-11)\pm\sqrt{(-11)^2-4(3)(4)}}{2\times 3}$ 0.41 and 3.26 final ans cao	**2** **B1B1**	**B1** for $\sqrt{(-11)^2-4(3)(4)}$ or better and, if in form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$, **B1** for $p=-(-11)$ and $r=2(3)$ **SC1** for 0.4 and 3.3 or 0.409... and 3.257... or -0.41 and -3.26 or 0.41 and 3.26 seen in working
27	**23**	$\sqrt{(3)^2-4(2)(-3)}$ oe or better $\frac{-3+\sqrt{k}}{2(2)}$ or $\frac{-3-\sqrt{k}}{2(2)}$ oe –2.19, 0.69	**B1** **B1** **B1B1**	If completing the square, **B1** for $\left(x+\frac{3}{4}\right)^2$ oe **B1** for $-\frac{3}{4}+\sqrt{\frac{3}{2}+\left(\frac{3}{4}\right)^2}$ or $-\frac{3}{4}-\sqrt{\frac{3}{2}+\left(\frac{3}{4}\right)^2}$ oe **SC1** for –2.2 or –2.186… **and** 0.7 or 0.686.. or –2.19 **and** 0.69 seen but not final answer or 2.19 **and** –0.69 **Maximum score without working is 2**
28	**13**	$x < -3$	3	**M1** correct move **M1** correct move **M1** correct move
29	**6**	1, 2, 3, 4	**3**	**M1** $10x < 45$ **A1** $x < 4.5$
30	**4**	$y \varnothing -1.25$	**2**	**M1** inequality with y's and constants correctly collected

31	9	$x \leqslant 39$ **www**	3	**M1** correct first move **M1** correct 2nd move **M1** correct move to answer line
32	16	$x < 6.8$	4	**B3** for 6.8 with wrong inequality or equal as answer. Or **M1** for first move completed correctly and **M1** for second move completed correctly and **M1** for third move completed correctly
33	8	$x \geq -\frac{3}{8}$ oe	2	**M1** for $-3 \leq 8x$ oe If 0 then **SC1** for $-\frac{3}{8}$ with incorrect inequality.
34	18	$-1 \quad -2 \quad -3 \quad -4$	4	**B3** for $x < {}^{-3}/_{5}$ and $x > -4.5$ oe or **B2** for $x < {}^{-3}/_{5}$ or $x > -4.5$ oe or **B1** for $5x < -3$ or $-9 < 2x$ oe Or mark on answer line -1 oe
35	14 (a)	$n < 9$	2	**M1** for $2n < 18$ or $2n - 18 < 0$ oe If 0 scored **SC1** for 9 with incorrect inequality.
	(b)	$(b + d)(a + c)$	2	**B1** for $b(a + c) + d(a + c)$ or $a(b + d) + c(b + d)$
36	15	[0], 1, 2, 3	4	**M1** for moving the 5 correctly **M1** for collecting *their* terms **A1** for a correct inequality for x as $[0 \leq] x < 4$
37	9	$t < -\frac{6}{7}$	2	**M1** for $5t + 2t < 17 - 23$ If zero scored **SC1** for $-\frac{6}{7}$ with incorrect inequality sign or equals sign
38	4	$n < 1.5$ oe final answer	2	**B1** for 1.5 oe in answer or **M1** for $3 > 8n - 6n$ oe
39	8	$x > -9$	2	**M1** for $\frac{x}{3} > 2 - 5$ oe or $\left(\frac{x}{3} + 5\right) \times 3 > 2 \times 3$ oe
40	7	1, 2, 3	3	**B2** for $t < 4$ or **M1** for $2 + 6 > 3t - t$ oe or better If zero scored, **SC1** for answer 0, 1, 2, 3 or 1, 2, 3, 4
41	12	$n < -4.4$ or $n < -4\frac{2}{5}$ final answer	2	**M1** for $8n - 3n < -5 - 17$ or better or $3n - 8n > 17 + 5$ or better