Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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The quadratic formula

Time allowed: 55 minutes

Subject code **0580**

Mathematics

Questions from Paper 2 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
You may use a calculator.

Total marks

/ 45

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.
- Unless a question says otherwise, give answers that are not exact to 3 significant figures, and angles in degrees to 1 decimal place.

Information

- This paper has 10 questions worth 45 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 Solve the equation.

$$x^2 - 8x + 6 = 0$$

Show all your working and give your answers correct to 2 decimal places.

Answer $x =$ ..... or $x =$ ..... [4]

The quadratic formula Click for more variations

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

2 Solve the equation $x^2 + 5x - 7 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

The quadratic formula Click for more variations

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2	$\frac{-5 \pm \sqrt{5^2 - 4\times1\times-7}}{2\times1}$	**B2**	**B1** for $\sqrt{5^2 - 4\times1\times-7}$ and if in form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ **B1** for $p = -5$ and $r = 2\times1$
	−6.14 and 1.14 cao	**B2**	**B1** for 1 correct answer for −6.1 and 1.1 or −6.140... and 1.140... or 6.14 and −1.14 or correct answers seen in working

3 Solve the equation $2x^2 + 3x - 6 = 0$.
Show all your working and give your answers correct to 2 decimal places.

Answer $x =$ ..... or $x =$ ..... [4]

The quadratic formula Click for more variations

3	–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…)

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4 Solve the equation.

$$2x^2 + x - 2 = 0$$

Show your working and give your answers correct to 2 decimal places.

Answer $x =$ ..... or $x =$ ..... [4]

The quadratic formula Click for more variations

4	$\sqrt{1^2 - 4(2)(-2)}$	**B1**	If completing the square **B1** for $\left(x + \frac{1}{4}\right)^2$ oe
	If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ $p = -1,\ r = 2(2)$ or 4	**B1**	**B1** for $x = -\frac{1}{4} + \sqrt{1 + \left(\frac{1}{4}\right)^2}$ or $x = -\frac{1}{4} - \sqrt{1 + \left(\frac{1}{4}\right)^2}$
	– 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

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5 Solve the equation $3x^2 - 11x + 4 = 0$.
Show all your working and give your answers correct to 2 decimal places.

x = ... or x = ...[4]

The quadratic formula Click for more variations

5	$\frac{-(-11) \pm \sqrt{(-11)^2 - 4(3)(4)}}{2 \times 3}$	**2**	**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 $r = 2(3)$
	0.41 and 3.26 final ans cao	**B1B1**	**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

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6 Solve the equation $5x^2 + 10x + 2 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

The quadratic formula Click for more variations

6	$\sqrt{10^2 - 4\times5\times2}$ oe or better	**B1**	If completing the square: **B1** for $(x+1)^2$ oe **B1** for $-1+\sqrt{1-\frac{2}{5}}$ or $-1-\sqrt{1-\frac{2}{5}}$ oe
	$\frac{-10+\sqrt{q}}{2(5)}$ or $\frac{-10-\sqrt{q}}{2(5)}$ oe	**B1**	
	– 0.23, –1.77 final ans cao	**B1B1**	**SC1** for – 0.2 or – 0.225... **and** –1.8 or –1.774... or –1.775 or 0.23 and 1.77 as answer or – 0.23 and –1.77 seen in working Maximum score without working is 2

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7 Use the quadratic formula to solve the equation $3x^2 + 7x - 11 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

The quadratic formula Click for more variations

7	$\frac{-7 \pm \sqrt{(7)^2 - 4(3)(-11)}}{2 \times 3}$	**B2**	**B1** for $\sqrt{(7)^2 - 4(3(-11))}$ or better and **B1** for $\frac{-7+\sqrt{q}}{2(3)}$ or $\frac{-7-\sqrt{q}}{2(3)}$
	–3.41 and 1.08 cao	**B2**	**B1** for each If **B0**, **SC1** for –3.4 and 1.1 or –3.409 and 1.076 or –3.4089... and 1.0756.... or 3.41 and –1.08 or –3.41 and 1.08 seen in working

8 Solve the equation $3x^2 - 2x - 2 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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$x =$ ..... or $x =$ ..... [4]

The quadratic formula Click for more variations

8	$\frac{-(-2)\pm\sqrt{(-2)^2-4(3)(-2)}}{2(3)}$ oe	**B2**	**B1** for $\sqrt{(-2)^2-4(3)(-2)}$ or better or **B1** for $\frac{-(-2)+\sqrt{q}}{2(3)}$ or $\frac{-(-2)-\sqrt{q}}{2(3)}$
	–0.55, 1.22	**B2**	**B1** for each If zero scored, **SC1** for – 0.6 and 1.2 or –0.549 or –0.548… and 1.215… or 0.55 and −1.22 or –0.55 and 1.22 seen in working

9 The line $y = 4x + 12$ intersects the curve $y = 2x^2 - x - 3$ at point P and point Q.

Find the coordinates of P and Q.
You must show all your working and give your answers correct to 2 decimal places.

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(....., ...)

(....., ...)

[6]

Simultaneous equations Click for more variations

9	$2x^2 - 5x - 15$ [= 0] or $y^2 - 34y + 144$ [= 0] oe	**M2**	**M1** for $4x + 12 = 2x^2 - x - 3$ or better or $y = 2\left(\frac{y-12}{4}\right)^2 - \left(\frac{y-12}{4}\right) - 3$ or better
	$\frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-15)}}{2(2)}$ oe or for $\frac{5}{4} \pm \sqrt{\frac{15}{2} + \left(\frac{5}{4}\right)^2}$ oe	**M2**	**FT** *their* 3-term quadratic in x or y or **M1** for $\sqrt{(-5)^2 - 4(2)(-15)}$ or better or for $\frac{-(-5) + \sqrt{q}}{2 \times 2}$ oe or $\frac{-(-5) - \sqrt{q}}{2 \times 2}$ oe or for $\left(x - \frac{5}{4}\right)^2$
	(4.26, 29.04) and (– 1.76, 4.96)	**B2**	**B1** for one correct pair or both x-values correct or both y – values correct

10 Solve.

$$\frac{1}{x} - \frac{2}{x+1} = 3$$

Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [7]

Solving equations with algebraic fractions Click for more variations

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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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