Q1. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

x = ... or x = ...

(Total 3 marks)

Q2. (a) Solve $x^2 - 2x - 1 = 0$.

Give your solutions correct to 2 decimal places.

....

(3)

(b) Write down the solutions, correct to 2 decimal places, of $3x^2 - 6x - 3 = 0$.

....

(1)
(Total 4 marks)

Q3. Solve $x^2 - 4x - 45 = 0$.

....

(Total 3 marks)

Q4. Solve $3x^2 + 2x - 4 = 0$

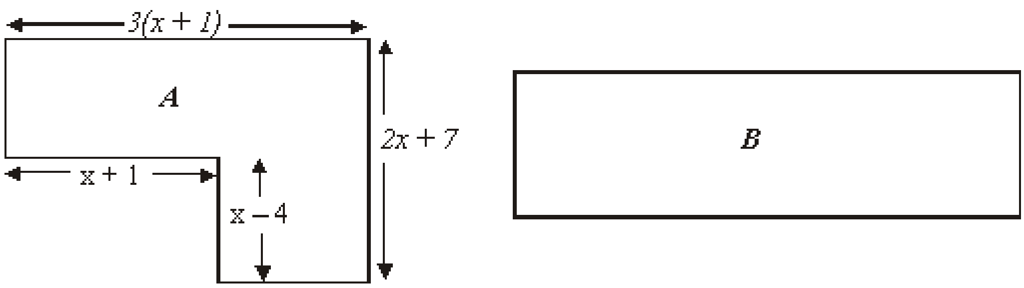
Give your answer correct to three significant figures.

....

(Total 3 marks)

Q5.

Diagram **NOT** accurately drawn



The diagram shows two shapes.
In shape *A*, all of the angles are right angles.
Shape *B* is a rectangle.
All the measurements are in centimetres.

The area of shape *A* is equal to the area of shape *B*.

Find an expression, in terms of x, for the length and an expression, in terms of x, for the width of shape *B*.

....

(Total 6 marks)

Q6. (a) Simplify fully $(x^3)^{\frac{1}{2}} \times (x^2)^{\frac{1}{4}}$

....

(3)

(b) Solve $(x - 1)(x + 2) = 18$

....

(4)

(c) Solve the simultaneous equations

$y = x^2 - 1$

$y = 5 - x$

....

....

(5)
(Total 12 marks)

M1.

Working	Answer	Mark	Additional Guidance
$x = \frac{-6 \pm \sqrt{6^2 - 4 \times 2 \times (-95)}}{4}$ $x = \frac{-6 \pm \sqrt{796}}{4}$ **OR** $x^2 + 3x - 47.5 = 0$ $(x + 1.5)^2 - 1.5^2 - 47.5 = 0$ $x = -1.5 \pm \sqrt{49.75}$	5.55, –8.55	3	**M1** for correct substitution in formula of 2, 6 and ± 95 **M1** for reduction to $\frac{-6 \pm \sqrt{796}}{4}$ **A1** 5.55 to 5.555 **and** –8.55 to –8.555 **OR** **M1** $(x + 1.5)^2 - 1.5^2 - 47.5 = 0$ **M1** $x = -1.5 \pm \sqrt{49.75}$ **A1** 5.55 to 5.555 and –8.55 to –8.555 SC: **B1** for one answer correct with or without working
			Total for Question: 3 marks

M2.

	Working	Answer	Mark	Additional Guidance
(a)	$x = \frac{--2 \pm \sqrt{(-2)^2 - 4 \times 1 \times (-1)}}{2}$ $= \frac{2 \pm \sqrt{8}}{2}$ $= \frac{2 \pm 2.82843}{2}$ $x = -0.4142$ or $x = 2.4142$	–0.41, 2.41	3	**M1** for substitution into formula (condone incorrect signs) **M1** for $\frac{2 \pm \sqrt{8}}{2}$ **A1** for –0.41 to –0.415 and 2.41 to 2.415 **OR** **M1** for $(x - 1)^2 - 1^2 - 1$ seen **M1** for $(x - 1) = \pm\sqrt{2}$

				A1 for –0.41 to –0.415 and 2.41 to 2.415 T&I **B3** both solutions, **B1** 1 solution
(b)		–0.41, 2.41	1	**B1** ft from (a)
				Total for Question: 4 marks

M3.

Working	Answer	Mark	Additional Guidance
$(x + 5)(x - 9)$	9, –5	3	**M2** for $(x - 9)(x + 5)$ (**M1** for $(x \pm 9)(x \pm 5)$ **A1** cao 9 and –5 **OR** **M1** for substitution into formula (condone incorrect signs) **M1** for $\frac{4 \pm \sqrt{196}}{2}$ **A1** cao **OR** **M1** for $(x - 2)^2 - 2^2 - 45$ (= 0) **M1** for $x = 2 \pm \sqrt{4 + 45}$ **A1** cao **OR** T&I **B3** Both solutions correct (**B1** One solution correct)
			Total for Question: 3 marks

M4.

Working	Answer	Mark	Additional Guidance

$\frac{-2\pm\sqrt{2^2-4\times3\times-4}}{2\times3}$ $=\frac{-2\pm\sqrt{52}}{6}$ **OR** $3(x+\frac{1}{3})^2-\frac{13}{3}=0$ $(x+\frac{1}{3})^2=\frac{13}{9}$	0.869 –1.54	3	

Total for Question: 3 marks

M5.

Working	Answer	Mark	Additional Guidance
$A = 3(x + 1)(2x + 7) - (x - 4)(x + 1)$ $= 3(2x^2 + 9x + 7) - (x^2 - 3x - 4)$ $= 5x^2 + 30x + 25$ Factorising gives $5(x + 1)(x + 5)$ **OR** Splitting shape A into rectangles, area to be added: e.g. $3(x + 1)(x + 11) + (x - 4)(2x + 2)$ $= 3(x^2 + 12x + 11) + (2x^2 - 6x - 8)$ $= 5x^2 + 30x + 25$ Factorising gives $5(x + 1)(x + 5)$	$5x + 5$ by $x + 5$ or $5x + 25$ by $x + 1$	6	**M1** for attempting to subtract the area of small rectangle from area of large rectangle in A **M1** for $3(x + 1)(2x + 7) - (x - 4)(x + 1)$ **A1** for $3(2x^2 + 9x + 7)$ and $(x^2 - 3x - 4)$ **A1** for $5x^2 + 30x + 25$ **M1** for attempting to factorise "$5x^2 + 30x + 25$" to get dimensions of B **A1** for $5x + 5$ by $x + 5$ or $5x + 25$ by $x + 1$ **OR** **M1** for attempting to add the area of two (or more) rectangles that make up the shape A **M1** for $3(x + 1)(x + 11) + (x - 4)(2x + 2)$ oe equivalent **A1** for $3(x^2 + 12x + 11)$ and $(2x^2 - 6x - 8)$ **A1** for $5x^2 + 30x + 25$ **M1** for attempting to factorise "$5x^2 + 30x + 25$" to get dimensions of B **A1** for $5x + 5$ by $x + 5$ or $5x + 25$ by $x + 1$
			Total for Question: 6 marks

M6.

	Working	Answer	Mark	Additional Guidance
(a)	$x^{3/2} \times x^{1/2}$	x^2	3	**B1** $x^{3/2}$ seen **B1** $x^{1/2}$ oe seen **A1** cao
(b)	$x^2 - 1x + 2x - 2 = 18$ $x^2 + x - 20 = 0$ $(x + 5)(x - 4)$	4, –5	4	**M1** Correct expantion **B1** $x^2 + x - 20 = 0$ **B1** $(x + 5)(x - 4)$ **A1** cao
(c)	$x^2 + x - 6 = 0$ $(x + 3)(x - 2)$ $x = -3$, $x = 2$	$x = -3$, $y = 8$ $x = 2$, $y = 3$	5	**M1** Sets equations equal and rearranges **B1** $x^2 + x - 6 = 0$ **B1** $(x - 3)(x + 2)$ **A2** Two correct pair of sollutions **A1** correct set of x values
				Total for Question: 12 marks

E1. The question asked for solutions to be given correct to 3 significant figures and this should have alerted candidates to the fact that they needed to use the quadratic formula. Relatively few, however, used the formula. Many used trial and improvement and some of these candidates were able to find one solution to a sufficient degree of accuracy to gain one mark. Attempts at factorising were common as were attempts to rearrange the equation. Many of those who did use the formula were unable to gain all 3 marks. The formula was usually written down correctly but even if the substitution was correct an inability to deal with negative numbers meant that the discriminant was often evaluated incorrectly. Another common error was to divide only the discriminant by 4.

E2. Part (a) was a standard quadratic equation. Many candidates tried factorisation despite the hint that the answers should be correct to 2 decimal places. Others did not use the formula with sufficient care or precision so often the 'b' term was detached from its denominator.

Candidates who used completing the square were often successful.

Part (b) was intended to tease out whether candidates understood that multiplying through any equation by a constant leaves the solutions unchanged. Many candidates took the opportunity offered by the working space to use whatever method they had used (often unsuccessfully) in part (a). Few saw the connection despite the instruction in the question that is was a 'write down'.

E3. Apart from some cases of trial and improvement where the $x = 9$ was found, this proved to be inaccessible for many candidates. As calculators were not available, most successful candidates tried to factorise the left hand side. Those that did try the quadratic formula generally could not handle the number work, even if they had substituted in correctly.

Common errors which scored marks were based on incorrect factorisations of the quadratic expression to, for example, $(x - 9)(x - 5)$ or $(x + 9)(x - 5)$. A very common and disappointing error was to write the factorised form as the answer on the answer line – so the candidates were presumably unaware of the requirement from the key word 'solve'