2.3 Equations: linear to simultaneous

Name: _____ Class: _____ Date: _____ **Total: 29 marks**

KEY WORDS root

Equations: linear to simultaneous

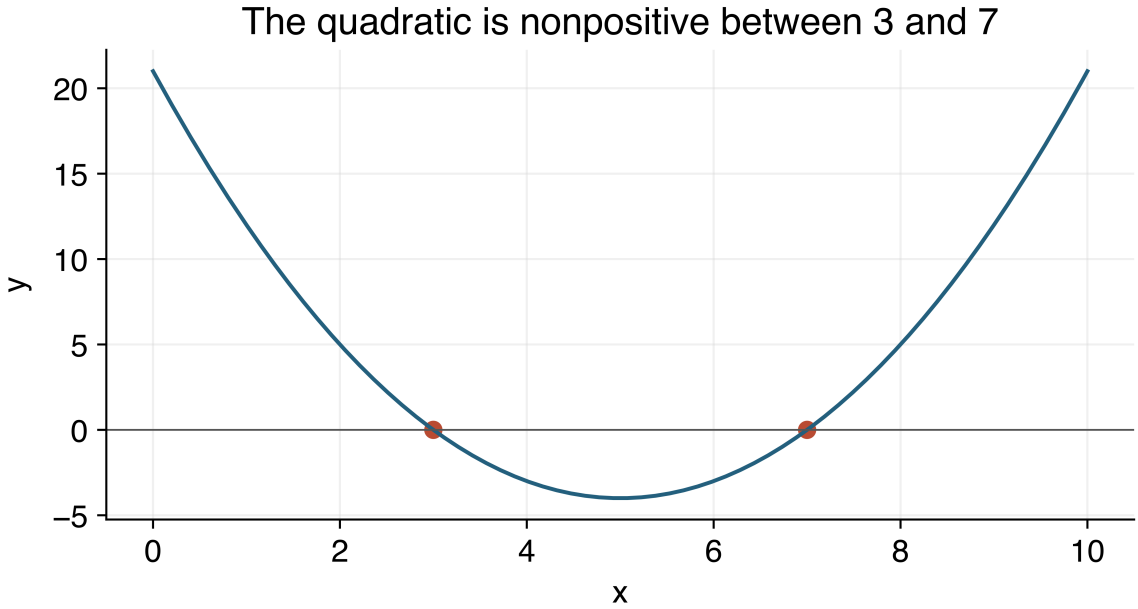
Objective

Solve linear equations with the unknown on both sides, quadratics by factorising / formula / completing the square, and simultaneous pairs including linear-quadratic (rows A17–A19 and A21).

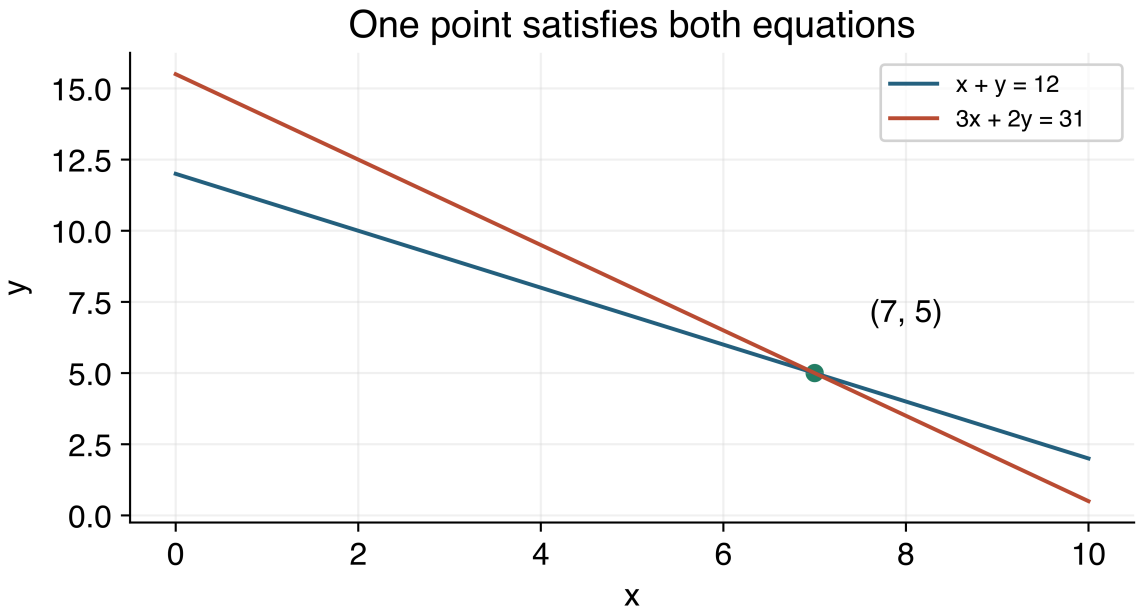
1 Key knowledge and worked examples

Linear. Expand, collect, divide – brackets included: $7x - 22 = 4x + 29$ gives $3x = 51$ and $x = 17$ (the 1H June 2024 anchor).

Quadratics and pairs. Factorise first ($x^2 + x - 30 = (x + 6)(x - 5)$); formula or completing the square at Higher ($x^2+6x+2 = 0$ gives $x = -3 \pm \sqrt{7}$). Linear-quadratic pairs: substitute the line into the curve and KEEP BOTH roots.



Original native-lesson illustration; labels belong to its worked example.



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 Solve $5x - 3 = 2x + 9$ [2]

2.2 Solve $3(x-2) = 2(x+5)$ [2]

2.3 Solve $x^2 - 3x - 10 = 0$ [2]

2.4 Solve $x^2 + 6x + 2 = 0$, giving exact roots [3]

2.5 Solve the pair $y = 2x + 1$, $y = x^2 - 2$ [4]

2.6 A rectangle's length exceeds its width by 5 m and its area is 84 m^2. Form and solve a quadratic for the dimensions. [4]

3 Exam-style questions

3.1 *(Edexcel-style, 1H June 2024 Q8 adapted.)* Solve $7x - 22 = 4x + 29$. [3]

3.2 *(Original.)* The line $y = 2x + 5$ meets the curve $y = x^2$. (a) Show the x-coordinates satisfy $x^2 - 2x - 5 = 0$. (b) Find both intersection points, exact where irrational. [5]

3.3 *(Original.)* 120 tickets were sold for £340. Adult tickets cost £5 and child tickets £2.50. Form a pair of simultaneous equations and find each count. [4]

Solutions

2.1 $3x = 12$, so $x = 4$.

2.2 $3x - 6 = 2x + 10$, so $x = 16$.

2.3 $(x - 5)(x + 2) = 0$: $x = 5$ or -2.

2.4 $(x + 3)^2 = 7$, so $x = -3 \pm \sqrt{7}$.

2.5 $x^2 - 2 = 2x + 1$, so $x^2 - 2x - 3 = 0 = (x - 3)(x + 1)$: points $(3, 7)$ and $(-1, -1)$.

2.6 $w(w + 5) = 84$ gives $w^2 + 5w - 84 = 0 = (w + 12)(w - 7)$: width 7 m, length 12 m.

3.1 $3x = 51$, so $x = 17$.

3.2 (a) $x^2 = 2x + 5$, so $x^2 - 2x - 5 = 0$. (b) $x = 1 \pm \sqrt{6}$; the points are $(1 + \sqrt{6}, 7 + 2\sqrt{6})$ and $(1 - \sqrt{6}, 7 - 2\sqrt{6})$.

3.3 $a + c = 120$ and $5a + 2.5c = 340$: from the first $a = 120 - c$; $5(120 - c) + 2.5c = 340$ gives $600 - 2.5c = 340$, so $c = 104$ and $a = 16$.

Local review guidance: substitution shown before expansion; BOTH solutions with both coordinates; context rejections justified. This is authored classroom guidance.