Exercise walk-through

2.3 Sequences, including nth term (A24–A25)

AQA · GCSE · Mathematics

Straight-line graphs

- Every straight line, except a vertical one, has an equation $y = mx + c$.
- The number m is the **gradient**, the steepness: how far y goes up when x increases by 1.
- The number c is the y-intercept, where the line crosses the y-axis.
- Between two points,

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Solving equations

- **Linear equations.** Collect the letters on one side and the numbers on the other. **Worked example 8.** $7x - 22 = 4x + 29$.
- Subtract $4x$: $3x - 22 = 29$.
- Add 22: $3x = 51$, so $x = 17$.
- **Quadratic equations by factorising.** Make one side zero and factorise.

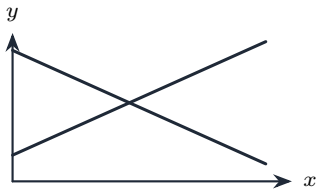
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Sequences

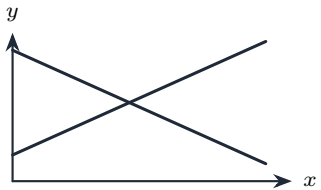
- A sequence is a list of numbers that follows a rule.
- A term-to-term rule says how to get the next term; a position-to-term rule, the **nth term** , gives any term from its position n.
- You should know the square numbers (1, 4, 9, 16, ...), cube numbers (1, 8, 27, ...), triangular numbers (1, 3, 6, 10, ...) and Fibonacci-type sequences, where each term is the sum of the two before.
- **Arithmetic sequences.** An **arithmetic progression** adds the same number each time.

Exercises 2.1·2.2

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

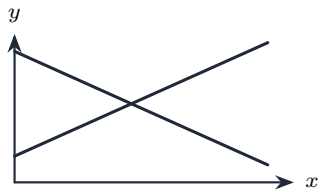


2.2 Solve $3(x - 2) = 2(x + 5)$ [2]



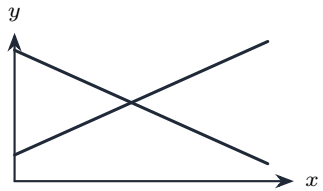
Exercises 2.1·2.2

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



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

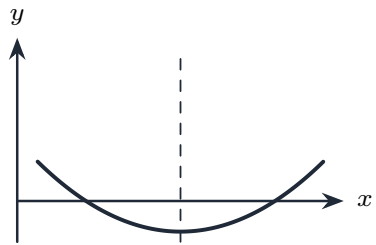
2.2 Solve $3(x - 2) = 2(x + 5)$ [2]



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

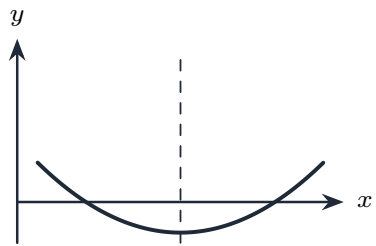
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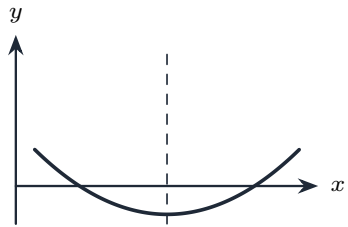
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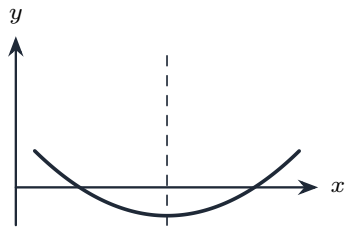
2.3 $(x - 5)(x + 2) = 0$: $x = 5$ or -2.

Setup for exercise 2.4

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

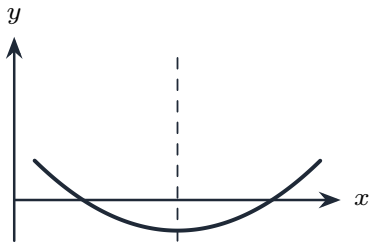


2.5 Solve the pair $y = 2x + 1$, $y = x^2 - 2$ [4]



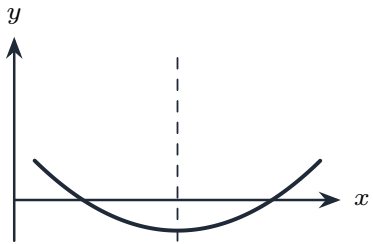
Exercise 2.4

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]



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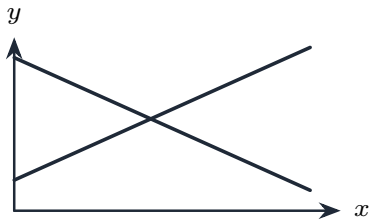
2.4 $(x+3)^2 = 7$, so $x = -3 \pm \sqrt{7}$.

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.

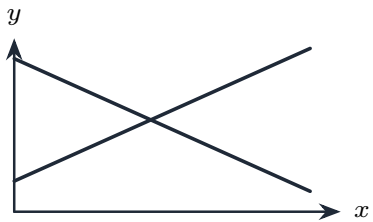
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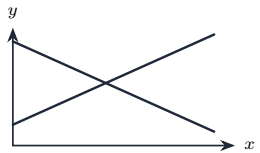
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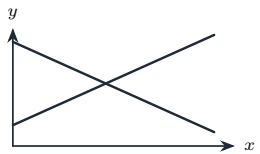
3.1 $3x = 51$, so $x = 17$.

Exercise 3.2

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]

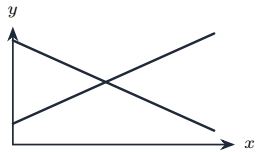


3.3 *(Original.)* 120 tickets were sold for £340. Adult tickets cost £5 and child tickets £2.50. Form a pair of simultaneous equations and find each count. [4]

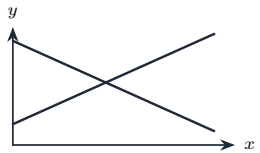


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3.3 $a + c = 120$ and $5a + 2.5c = 340$: from the first $a = 120 - c$; $5(120 - c) + 2.5c = 340$

Full solution on next slide

Full solution 3.2

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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.