Exercise walk-through

2.1.99

Independent transfer: Foundation then Higher

AQA · GCSE · Mathematics

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.

Sources for this lesson

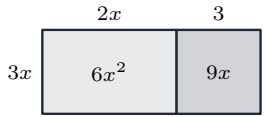
- AQA, *GCSE Mathematics (8300) specification*, subject content section 3.2 (Algebra).
- Muhammad ibn Musa al-Khwarizmi, *The Compendious Book on Calculation by Completion and Balancing* (Baghdad, about 820), the problem $x^2 + 10x = 39$.
- AQA, *GCSE Mathematics* Higher Papers 1 and 3 (June 2024), the linear-equation and **identity** questions.

Exercises 2.1·2.2

2.1 Expand and simplify $3(2x+1)-2(x-4)$. [2]

$3(2x+1)-2(x-4)$

2.2 Factorise fully $6x^2+9x$. Factorise $x^2+7x+12$. [2]



$6x^2+9x$

$x^2+7x+12$

Exercises 2.1·2.2

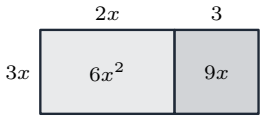
2.1 Expand and simplify $3(2x+1)-2(x-4)$. [2]

$3(2x+1)-2(x-4)$

2.1

- $6x+3-2x+8$
- $\mathbf{4x+11}$

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$6x^2+9x$

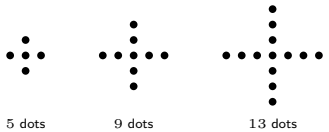
$x^2+7x+12$

2.2

- $\mathbf{3x(2x+3)}$
- $\mathbf{(x+3)(x+4)}$

Exercises 2.3·2.4

2.3 The patterns are made of dots. Find the nth term of $5, 9, 13, 17, \ldots$. Is 101 in the sequence? [2]

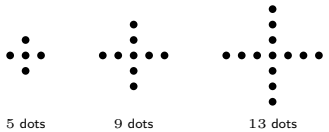


2.4 Rearrange $v = u + at$ to make t the subject. [2]

$\boxed{v = u + at}$

Exercises 2.3·2.4

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2.3

- $\mathbf{4n + 1}$
- $4n + 1 = 101$ gives $n = 25$, a whole number, so **yes**

2.4 Rearrange $v = u + at$ to make t the subject. [2]

$v = u + at$

2.4

- $v - u = at$
- $t = \dfrac{\mathbf{v - u}}{\mathbf{a}}$

Exercise 3.1

3.1 Two adult tickets and three child tickets cost £31. One adult ticket and two child tickets cost £18. Work out the cost of each ticket. [3]

2 adults + 3 children: £31

1 adult + 2 children: £18

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3.1

- $2a + 3c = 31$, $a + 2c = 18$
- doubling the second: $4c - 3c = 36 - 31$
- child £**5**, adult £**8**

Exercise 3.2 (a)

3.2 A rectangular pond is $(2x + 3)$ m long and $(x + 1)$ m wide.

(a) Write an expression for the perimeter of the pond. Simplify it. [2]

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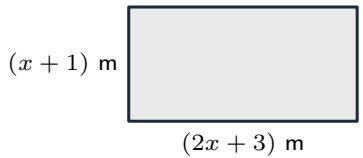
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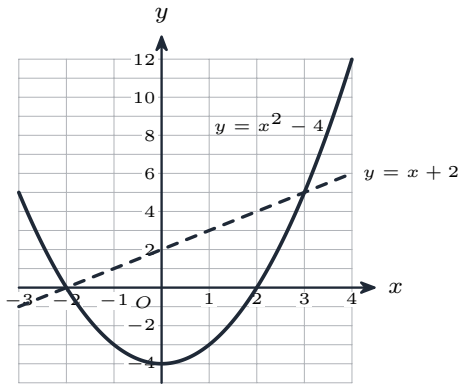
(a) $2(2x + 3) + 2(x + 1) = \mathbf{6x + 8}$

Exercise 3.2 (b)

3.2 A rectangular pond is $(2x + 3)$ m long and $(x + 1)$ m wide.

(b) The perimeter is 32 m. Find x and the length and width of the pond. [3]

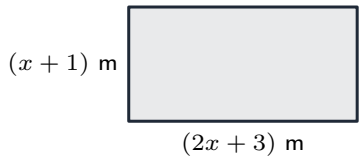


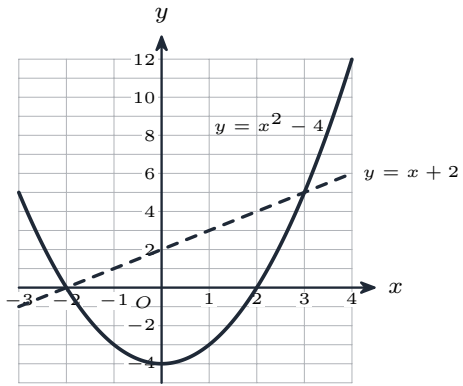


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(b) $6x + 8 = 32$; $x = 4$; **11** m by **5** m

Exercise 3.2 (c)

3.2 A rectangular pond is $(2x + 3)$ m long and $(x + 1)$ m wide.

(c) *(H)* A second pond of the same shape has an area of 30 m^2. Show that $2x^2+5x-27 = 0$. Solve it to find x to 2 decimal places. [4]

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(b) $6x + 3 = 32$; $x = \mathbf{4}$; **11** m by **3** m

(c) $(2x + 3)(x + 1) = 2x^2 + 5x + 3 = 30$, so $2x^2 + 5x - 27 = 0$; $x = \dfrac{-5 \pm \sqrt{25 + 216}}{4}$; $x = \mathbf{2.63}$; the negative answer is rejected because a length must be positive

Exercise 3.2 (d)

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(d) $x^2 - 4 = x + 2$, so $x^2 - x - 6 = 0$; $(x - 3)(x + 2) = 0$; $(\mathbf{3}, \mathbf{5})$ and $(\mathbf{-2}, \mathbf{0})$; turning point $(\mathbf{0}, \mathbf{-4})$