Exercise walk-through

2.1.2
Algebra Language

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.

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

Inequalities

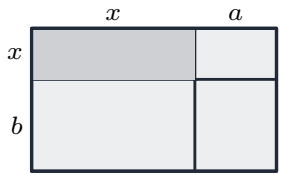
- Solve a linear inequality like an equation, but if you multiply or divide by a negative number, turn the sign round: from $-2x < 6$ you get $x > -3$.
- On a number line, an open circle means the end value is not included ($<$ or $>$) and a filled circle means it is ($\leq$ or $\geq$).
- **Worked example 15.** Find the integers n with $-3 < 2n + 1 \leq 9$.
- Subtract 1: $-4 < 2n \leq 8$.

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.

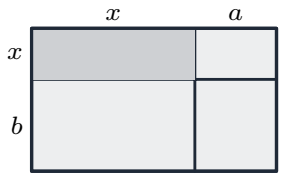
Exercise 2.1

2.1 Simplify (a) $a \times a \times a$ (b) $3 \times p \times q \times 2$ (c) $m \div 5$ [3]



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2.1

(a) $\boldsymbol{a^3}$

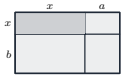
(b) numbers first, letters in order: $\boldsymbol{6pq}$

(c) $\dfrac{\boldsymbol{m}}{\boldsymbol{5}}$

Exercise 2.2

2.2 Here are four statements. Write expression, equation, formula or identity for each one. [2]

$5x - 2$ $\quad v = u + at$ $\quad 3(y + 1) \equiv 3y + 3$ $\quad 2n + 7 = 15$



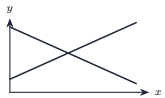
2.3 Work out the value of $4 + 3d$ when $d = 5$. [1]



2.4 Work out the value of a^2b when $a = -2$ and $b = 3$. [2]



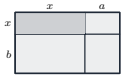
2.5 Pens cost p pence each and pencils cost 15 pence each. Write an expression for the cost, in pence, of 4 pens and 6 pencils. [2]



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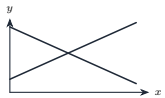
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2.2

- $5x - 2$: **expression**; $v = u + at$: **formula**; $3(y + 1) \equiv 3y + 3$: **identity**; $2n + 7 = 15$: **equation**

2.3

Full solution on next slide

Full solution 2.2

2.2

- $5x - 2$: **expression**; $v = u + at$: **formula**; $3(y + 1) \equiv 3y + 3$: **identity**; $2n + 7 = 15$: **equation**

2.3

- $4 + 3 \times 5 = 4 + 15 = \mathbf{19}$

2.4

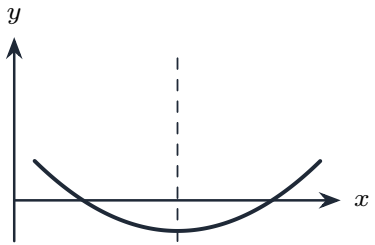
- $a^2b = (-2)^2 \times 3 = 4 \times 3 = \mathbf{12}$

2.5

- 4 pens cost $4p$ and 6 pencils cost $6 \times 15 = 90$ pence
- $\mathbf{4p + 90}$ pence

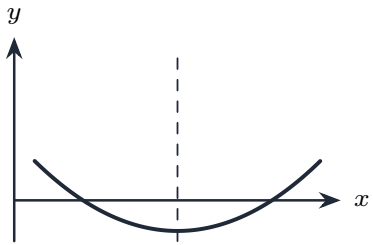
Exercise 3.1

3.1 Lena says, “In the expression $3x^2$, the coefficient of x^2 is 2.” Is she correct? Give a reason. [1]



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3.1

- **No**: $3x^2$ means $3 \times x^2$, so the coefficient is **3**; the 2 is the power

Setup for exercise 3.2

3.2 Use $v = u + at$ to work out v when $u = 12$, $a = -3$ and $t = 5$. [2]



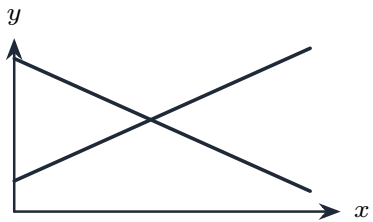
3.3 The kinetic energy of an object is $E = \frac{1}{2}mv^2$. Work out E when $m = 6$ and $v = -4$. [2]



3.4 A gym charges a joining fee of ¥50 and then ¥12 for each visit.

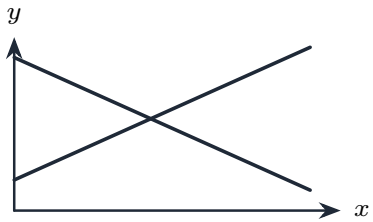
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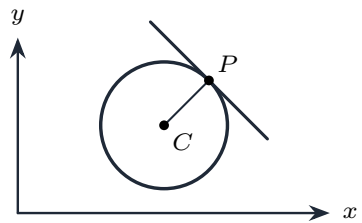
(a)

- fixed fee plus a charge per visit: $\boldsymbol{T = 50 + 12n}$

Exercise 3.2 (b)

(b) Use your formula to work out the number of visits when $T = 230$. [2]

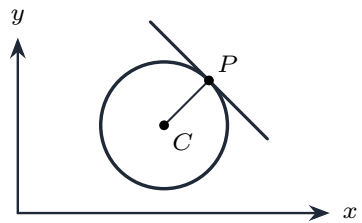
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Full solution on next slide

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Full solution 3.2 (b)

(b)

- $230 = 50 + 12n$, so $12n = 180$
- $n = \mathbf{15}$ visits

3.5

- numerator: $x^2 + y^2 = (-3)^2 + 4^2 = 9 + 16 = 25$
- denominator: $y - x = 4 - (-3) = 7$
- so $\dfrac{x^2 + y^2}{y - x} = \dfrac{25}{7}$