

C2.5 Equations

Name: _____ Class: _____ Date: _____

Total: 20 marks

KEY WORDS simultaneous equations 联立方程 • range 值域 • change the subject 公式变形
 • linear 一次 • unknown 未知数

Objective

Use equations to solve Core IGCSE Mathematics problems.

You must be able to:

- Construct and solve linear and simultaneous equations
- Check solutions in the original situation
- Rearrange a simple formula with the subject appearing once

1 Key knowledge and worked examples

■ Key knowledge: Equations

Write an equation by making two equal quantities equal. Solve a linear equation by doing the same operation to both sides; expand brackets first if needed. For simultaneous equations, eliminate one unknown, solve the other, then substitute back. To change the subject of a simple formula, undo operations in reverse order. Check solutions in the original equations.

■ Worked example: Equations

2 adults + 1 child	1 adult + 2 children	two equal totals
-----------------------	-------------------------	---------------------

Solve $3x + 2 = 17$: subtract 2 to get $3x = 15$, then divide by 3 to get $x = 5$.

- Simultaneous: $x + y = 9$, $x - y = 3$. Add to get $2x = 12$, so $x = 6$; then $y = 9 - 6 = 3$.
- Rearrange $v = u + at$ for t : subtract u to get $v - u = at$, then divide to get $t = (v - u)/a$, $a \neq 0$.

■ Method check

Choose variables and state what they represent before forming equations. A solved pair must satisfy both original totals.

2 Practice

2.1 Solve $4x - 7 = 13$. [2]

2.2 Solve $3(x + 2) = 21$. [2]

2.3 Make x the subject of $y = 5x - 4$. [2]

2.4 Solve $a + b = 11$ and $a - b = 5$. [2]

3 Exam-style questions

3.1 Apply the equations methods below. Show working and include units where appropriate.

(a) Two adult tickets and one child ticket cost 31 yuan. One adult ticket and two child tickets cost 26 yuan. Write equations for adult price a and child price c . [2]

(b) Find the adult ticket price. [2]

(c) Find the child ticket price and check both totals. [2]

3.2 A notebook and two pens cost 19 yuan. Two notebooks and one pen cost 26 yuan. Let notebook price be n and pen price be p .

(a) Form two equations and find both prices. [3]

(b) The charge for delivery is $C = 8 + 3d$, where d is distance in km. Rearrange for d and find the distance when $C = 29$ yuan. [3]

Solutions

Award method and answer marks as indicated; accept equivalent correct methods.

2.1

- Add 7: $4x = 20$; divide by 4: $x = 5$.

2.2

- Divide by 3: $x + 2 = 7$; subtract 2: $x = 5$.

2.3

- Add 4, then divide by 5: $x = (y + 4)/5$.

2.4

- Add: $2a = 16$, so $a = 8$. Substitute: $b = 3$.

3.1

(a)

- $2a + c = 31$ **and** $a + 2c = 26$.

(b)

- Double the second: $2a + 4c = 52$. Subtract the first: $3c = 21$, so $c = 7$. Then $2a = 24$ and $a = 12$ **yuan**.

(c)

- $c = 7$ **yuan**. Checks: $2(12) + 7 = 31$ and $12 + 2(7) = 26$.

3.2

(a)

- $n + 2p = 19$ and $2n + p = 26$.
- Eliminate to obtain $3p = 12$, so $p = 4$, $n = 11$ yuan.
- Check: $11 + 8 = 19$ and $22 + 4 = 26$.

(b)

- Subtract the fixed charge: $3d = C - 8$.
- Thus $d = (\mathbf{C} - \mathbf{8})/\mathbf{3}$.
- At $C = 29$, $d = (29 - 8)/3 = \mathbf{7}$ km.