

C2.1 Introduction to algebra

Name: _____ Class: _____ Date: _____

Total: 20 marks

KEY WORDS substitute 代入 • expression 表达式 • algebra 代数 • brackets 括号
 • distance 距离

Objective

Use introduction to algebra to solve Core IGCSE Mathematics problems.

You must be able to:

- Translate a situation into an expression or formula
- Substitute signed and fractional values carefully
- Explain the difference between fixed and variable costs

1 Key knowledge and worked examples

■ Key knowledge: Introduction to algebra

Letters stand for numbers. $3x$ means $3 \times x$, while x^2 means $x \times x$. Substitute each value in brackets, especially a negative value, then follow the order of operations. Distinguish an expression, which has no equals sign, from an equation. Build an expression by translating the operations in the stated order.

■ Worked example: Introduction to algebra

fixed: 40

hourly: 12h

total: C

Find $3a^2 - 2b$ when $a = -2$ and $b = 5$.

- Substitute with brackets: $Q = 3(-2)^2 - 2(5)$.
- Powers first: $Q = 3(4) - 10 = 2$.
- A taxi costs 6 yuan plus 3 yuan per km: for distance d km, $C = 6 + 3d$ yuan.

■ Method check

Keep unlike terms separate: a fixed cost is paid once, while a cost per item is multiplied by the item count.

2 Practice

2.1 Find $4x + 7$ when $x = 3$. [2]

2.2 Find $p^2 + q$ when $p = -5$ and $q = 6$. [2]

2.3 Find $(a + b)/c$ when $a = 8, b = -2, c = 3$. [2]

2.4 Write an expression for five less than twice n . [2]

3 Exam-style questions

3.1 Apply the introduction to algebra methods below. Show working and include units where appropriate.

(a) A hall charges 40 yuan plus 12 yuan per hour. Write a formula for the cost C for h hours. [2]

(b) Find the cost for 3.5 hours. [2]

(c) A student writes $C = 52h$. Explain the mistake, using the cost for one hour and for two hours. [2]

3.2 A delivery company charges 25 yuan per order and 4 yuan for each parcel. There are n parcels in one order.

(a) Write a formula for the total cost C and find the cost of an order with 7 parcels. [3]

(b) Two orders contain 3 and 4 parcels respectively. Find their combined cost and explain why it differs from the single 7-parcel order. [3]

Solutions

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

2.1

- $Q = 4(3) + 7 = \mathbf{19}$.

2.2

- $Q = (-5)^2 + 6 = 25 + 6 = \mathbf{31}$.

2.3

- $Q = (8 - 2)/3 = 6/3 = \mathbf{2}$.

2.4

- Double first then subtract 5: $2n - 5$.

3.1

(a)

- Fixed cost plus hourly cost: $C = 40 + 12h$.

(b)

- $C = 40 + 12(3.5) = \mathbf{82}$ yuan.

(c)

- The fixed 40 yuan is charged once. One hour costs 52 yuan, but two cost $C = 40 + 24 = 64$, **not 104 yuan**.

3.2

(a)

- Fixed plus variable cost gives $C = \mathbf{25} + \mathbf{4n}$.
- At $n = 7$, $C = 25 + 4(7)$, so $C = \mathbf{53}$ yuan.

(b)

- Two orders: $T = (25 + 4(3)) + (25 + 4(4))$, giving $T = \mathbf{78}$ yuan.
- The extra **25 yuan** is a second fixed charge, not an extra parcel charge.