

C1.2 Sets

Name: _____ Class: _____ Date: _____ **Total: 20 marks**

KEY WORDS venn diagram 维恩图 • element 元素 • universal set 全集 • intersection 交集
• union 并集

Objective

Use sets to solve Core IGCSE Mathematics problems.

You must be able to:

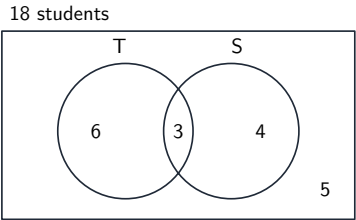
- Use set membership, union, intersection and complement
- Complete two-set regions without double counting
- Interpret a region in its original context

1 Key knowledge and worked examples

■ **Key knowledge: Sets**

A set is a collection of elements. The universal set contains every element under discussion. $n(A)$ counts elements; A' contains elements outside A . $A \cap B$ means in both; $A \cup B$ means in either or both. In a two-set Venn diagram, count the overlap once. Fill the intersection first, then the two outer regions.

■ **Worked example: Sets**



Of 18 students, 9 play tennis, 7 swim and 3 do both.

- Tennis only: $n(T \text{ only}) = 9 - 3 = 6$; swimming only: $n(S \text{ only}) = 7 - 3 = 4$.
- Union: $n(T \cup S) = 6 + 3 + 4 = 13$.
- Neither: $n((T \cup S)') = 18 - 13 = 5$.

■ **Method check**

The intersection belongs to both sets. Subtract it before finding an only-one region; count it just once in the union.

2 Practice

2.1 $A = \{2, 4, 6, 8\}$ and $B = \{1, 2, 3, 4\}$. List $A \cap B$. [2]

2.2 For the same sets, list $A \cup B$. [2]

2.3 The universal set is $\{1, 2, 3, 4, 5, 6, 7, 8\}$. List A' . [2]

2.4 Write $\{x : x \text{ is an integer, } -2 \leq x < 2\}$ as a list. [2]

3 Exam-style questions

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

(a) In a class of 28, 16 cycle, 12 walk and 5 do both on different days. Find the number who only cycle. [2]

(b) Find the number who cycle or walk. [2]

(c) Find the number who do neither. [2]

3.2 Of 40 pupils, 24 swim, 18 run and 10 do both.

(a) Find the numbers who only swim, only run and do neither. [3]

(b) A pupil says that 42 pupils do at least one activity because $24 + 18 = 42$. Correct the statement and explain the error. [3]

Solutions

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

2.1

- Keep elements in both lists: $\{2, 4\}$.

2.2

- Combine without repeats: $\{1, 2, 3, 4, 6, 8\}$.

2.3

- Remove 2, 4, 6 and 8 from the universal set: $\{1, 3, 5, 7\}$.

2.4

- Include the lower boundary but exclude 2: $\{-2, -1, 0, 1\}$.

3.1

(a)

- $n(\text{cycle only}) = 16 - 5 = \mathbf{11}$.

(b)

- $n(\text{union}) = 16 + 12 - 5 = \mathbf{23}$; subtract the overlap once.

(c)

- $n(\text{neither}) = 28 - 23 = \mathbf{5}$.

3.2

(a)

- Only swim: $s = 24 - 10 = \mathbf{14}$.
- Only run: $r = 18 - 10 = \mathbf{8}$.
- Union $u = 24 + 18 - 10 = 32$, so neither $n = 40 - 32 = \mathbf{8}$.

(b)

- The ten in both activities are counted twice.
- Use $n(S \cup R) = n(S) + n(R) - n(S \cap R)$.
- $u = 24 + 18 - 10 = \mathbf{32}$ pupils.