

Exercise walk-through

C1.2

Sets

IGCSE Mathematics

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

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The method

Method — 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.

Exercises 2.1·2.3

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]

Exercises 2.1·2.3

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

2.1

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

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

2.2

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

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

2.3

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

Exercise 2.4

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

[2]

3 Exam-style questions

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[2]

3 Exam-style questions

2.4

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

Exercise 3.1 (a)

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]

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(a)

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

Exercise 3.1 (b)

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

(b) Find the number who cycle or walk.

[2]

Exercise 3.1 (b)

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

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

(b)

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

Exercise 3.1 (c)

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

(c) Find the number who do neither.

[2]

Exercise 3.1 (c)

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

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

(c)

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

Exercise 3.2 (a)

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]

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[3]

(a)

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

Exercise 3.2 (b)

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

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

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(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.