

# 1.5 Sets and Venn diagrams

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_ Total: 20 marks

KEY WORDS set • complement

## Sets and Venn diagrams

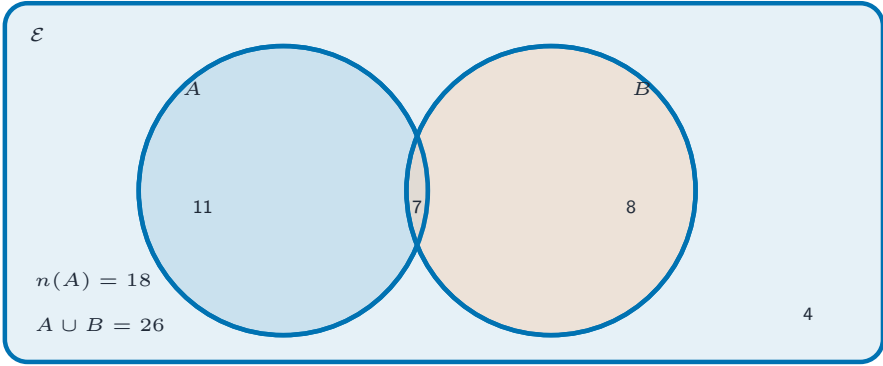
### Objective

Use set notation and Venn diagrams: union, intersection, membership, universal and empty sets, complements; at Higher, subsets, element counts and practical sets (objectives Foundation 1.5 A–E and Higher 1.5 A–D).

### 1 Key knowledge and worked examples

**Notation.**  $A = \{2, 4, 6, 8\}$  is a set;  $\cup$  union (either),  $\cap$  intersection (both),  $\in / \notin$  membership;  $\mathcal{E}$  the universal set,  $\emptyset$  the empty set,  $A'$  the complement. A Venn diagram draws the regions.

**Counting.**  $n(A)$  counts elements. 30 students: 18 cricket, 15 tennis, 7 both – regions 11, 7, 8, 4 with  $n(A) = 18$ ,  $A \cup B$  covering 26 and 4 in  $B'$  and  $A'$ . Subset:  $B \subset A$  when every element of  $B$  is in  $A$ .



HCF reads the overlap's product; LCM everything's product (prime-factor Venns)

### 2 Practice

2.1 For  $A = \{1, 2, 3, 4, 5\}$  and  $B = \{4, 5, 6, 7\}$ , find  $A \cap B$  [1]

2.2 Find  $A \cup B$  [2]

2.3 Write whether  $3 \in B$  is true or false [1]

2.4  $\mathcal{E} = \{1, \dots, 10\}$ ,  $A = \{2, 4, 6, 8\}$ : list  $A'$  [2]

### 3 Exam-style questions

**3.1** (*Original.*) 30 students: 18 play cricket ( $C$ ), 15 tennis ( $T$ ), 7 both. (a) Fill a Venn diagram. (b) Find  $n(C \cup T)$  and the number in neither region. (c) A student who plays cricket is chosen at random: find the probability they also play tennis. [5]

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**3.2** (*Original.*)  $P$  = multiples of 3 between 1 and 20;  $Q = \{x: x \text{ is odd}\}$ . (a) List  $P$  and  $P \cap Q$ . (b) Is  $P \subset Q$ ? Justify. [4]

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**3.3** (*Edexcel 4MA1 1HR June 2024 Q11 family, adapted.*) The prime factors of  $A$  fill a two-set Venn with those of  $B$ ; the overlap holds  $2^2$  and 3, the rest of  $A$  holds  $2^2$  and 5, and the rest of  $B$  holds 7. (a) Find  $A$  and  $B$ . (b) Write down the HCF. [5]

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