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Sets

Solutions & Answer Key

Full worked solutions, marking scheme & answer key

IGCSE Mathematics

The Panda Math Tutor

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Companion to the *Student Worksheet*

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Note

About this booklet. These are the complete solutions to every question in the *Sets — Student Worksheet*. Question numbers match exactly: set notation E1–E6, types of sets T1–T7, Venn diagrams V1–V6, set operations O1–O8, combined expressions and shading C1–C6, the number of elements formula F1–F6, three-set problems H1–H5, set-builder notation B1–B6, the Mixed Review MR1–MR10, and the examination questions Q1–Q8 of Part III.
Completed Venn diagrams are drawn out in full, and every counting answer is checked by confirming that all the regions add up to $n(U)$. Part V collects the common mistakes to watch for, and Part VI is a quick answer key for fast marking.

4 Part IV — Complete Solutions

Note

Each solution names the definition or rule being applied. For Venn diagram questions the completed diagram is shown, since in the examination the diagram itself carries most of the marks.

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4.1 Solutions — Sets and Set Notation

Solution E1

(a) $\boxed{\text{True}}$ — 9 is listed in A.
(b) $\boxed{\text{False}}$ — 12 is not in A, so we should write $12 \notin A$.
(c) $\boxed{\text{False}}$ — 24 *is* in A, so the correct statement is $24 \in A$.
(d) $\boxed{\text{True}}$ — there are five elements: $4, 9, 14, 19, 24$.

Solution E2

(a) The letters are G, E, O, M, E, T, R, Y. The second E is a repeat, and repeats are listed only once:

$$\boxed{\{\text{G}, \text{E}, \text{O}, \text{M}, \text{T}, \text{R}, \text{Y}\}} \qquad (7 \text{ elements})$$

(b) "Between 3 and 17" means strictly between, so start at 4 and stop at 16:

$$\boxed{\{4, 6, 8, 10, 12, 14, 16\}}$$

Solution E3

(a) EDUCATION contains E, U, A, I, O — all five vowels:

$$\boxed{\{\mathrm{A},\mathrm{E},\mathrm{I},\mathrm{O},\mathrm{U}\}}, \qquad n = 5.$$

(b) Check each number from 21 to 39 for factors:

$$\boxed{\{23, 29, 31, 37\}}, \qquad n = 4.$$

(c) Work in factor pairs: 1×24, 2×12, 3×8, 4×6:

$$\boxed{\{1, 2, 3, 4, 6, 8, 12, 24\}}, \qquad n = 8.$$

Solution E4

The error: elements of a set are *distinct* — each one is listed only once, however many times it appears in the word. The student has repeated A three times and N twice.

$$\boxed{\{\mathrm{B},\mathrm{A},\mathrm{N}\}}, \qquad n = 3.$$

Order does not matter either, so $\{\mathrm{B},\mathrm{A},\mathrm{N}\} = \{\mathrm{N},\mathrm{A},\mathrm{B}\}$.

Solution E5

List the multiples of 6 up to 40:

$$6,\ 12,\ 18,\ 24,\ 30,\ 36 \qquad (42 \text{ is too big})$$

$$\boxed{A = \{6, 12, 18, 24, 30, 36\}}, \qquad \boxed{n(A) = 6}.$$

Solution E6

List the distinct letters of each word:

$$P = \{\mathrm{L},\mathrm{I},\mathrm{S},\mathrm{T},\mathrm{E},\mathrm{N}\}, \qquad Q = \{\mathrm{S},\mathrm{I},\mathrm{L},\mathrm{E},\mathrm{N},\mathrm{T}\}.$$

Two sets are equal when they contain *exactly the same elements* — that is, $P \subseteq Q$ and $Q \subseteq P$. Every letter of P appears in Q, and every letter of Q appears in P, so

$$\boxed{P = Q}.$$

The words are anagrams, so the order of listing differs, but order does not affect a set.

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