



KS3.M-P6 Venn Diagrams and Set Notation

AQA KS3.M-P6 · Calculators not allowed · about 60 minutes

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

1 Write down the meaning of each set notation.

(a) $A \cap B$ (1)

(b) $A \cup B$ (1)

(c) A' (the complement of A, within the universal set U) (1)

2 In a group of 50 pupils, 30 study French and 22 study German. If 10 study both French and German, how many pupils study at least one of French or German?

(2)

3 Complete the two-set Venn diagram. There are 40 people. 18 are in A, 15 are in B and 7 are in neither. Fill the three regions: A only, B only, and $A \cap B$.

(a) $A \cap B$ (both) (1)

(b) A only (1)

(c) B only (1)

- 4** Use inclusion-exclusion. In a class of 28, 12 read book A and 9 read book B. Work out how many read neither if 4 read both.

(2)

- 5** If U is the universal set and A is a subset of U , what is $A \cup A'$? State the result.

(1)

- 6** In a club of 80 members, 50 like tea, 30 like coffee and 10 like both. What is the probability that a randomly chosen member likes tea or coffee or both? Give your answer as a fraction in simplest form.

(2)

7

Three-set Venn. In a group of 60, 30 are in A, 25 in B, 20 in C. Exactly 5 are in all three sets. There are 10 in both A and B, 8 in both A and C and 6 in both B and C (these pairwise numbers include the 5 who are in all three). Fill in the number of elements in each of the seven non-overlapping regions: (A only), (B only), (C only), (A and B only), (A and C only), (B and C only), (A and B and C).

(a) A and B and C (all three) (1)

(b) A and B only (in A and B but not C) (1)

(c) A and C only (in A and C but not B) (1)

(d) B and C only (in B and C but not A) (1)

(e) A only (1)

(f) B only (1)

(g) C only (1)

Mark scheme · KS3.M-P6 Venn Diagrams and Set Notation

Question 1

- (a) **B1** elements that are in both A and B (intersection) cao
- (a) Answer: **elements in both A and B**
- (b) **B1** elements that are in A or in B or in both (union) cao
- (b) Answer: **elements in A or B or both**
- (c) **B1** elements in the universal set U that are not in A (complement) cao
- (c) Answer: **elements not in A (within the universal set)**

Question 2

- **M1** use inclusion-exclusion: $30 + 22 - 10$ oe
- **A1** 42 cao
- Answer: **42 pupils**

Question 3

- (a) **B1** $A \cap B = A + B -$ (in at least one) cao
- (a) Answer: **0**
- (b) **B1** A only = A total minus overlap cao
- (b) Answer: **18**
- (c) **B1** B only = B total minus overlap cao
- (c) Answer: **15**

Question 4

- **M1** in at least one = $12 + 9 - 4$ oe
- **A1** 11 cao
- Answer: **11 pupils**

Question 5

- **B1** A union A' is the universal set U cao
- Answer: **U (the universal set)**

Question 6

- **M1** use inclusion-exclusion: $50 + 30 - 10 = 70$ oe
- **A1** $70/80 = 7/8$ simplified cao
- Answer: **7/8**

Question 7

- (a) **B1** value given in question cao
- (a) Answer: **5**
- (b) **B1** pairwise minus triple: $10 - 5$ cao
- (b) Answer: **5**
- (c) **B1** pairwise minus triple: $8 - 5$ cao
- (c) Answer: **3**
- (d) **B1** pairwise minus triple: $6 - 5$ cao
- (d) Answer: **1**
- (e) **B1** A only = A total minus parts in overlaps cao
- (e) Answer: **17**
- (f) **B1** B only = B total minus parts in overlaps cao
- (f) Answer: **14**
- (g) **B1** C only = C total minus parts in overlaps cao
- (g) Answer: **11**