



eClassroom

GCSE Mathematics

Venn Diagrams & Set Notation

Questions

Pearson Edexcel GCSE & iGCSE Mathematics



Section A — Foundation

Worked Examples

[Fluency]

$\varepsilon = \{1,2,3,4,5,6,7,8\}$. $A = \{2,4,6,8\}$. $B = \{1,2,3,4\}$. Find $A \cap B$, $A \cup B$ and A' .

$$A \cap B = \{2,4\} \quad A \cup B = \{1,2,3,4,6,8\} \quad A' = \{1,3,5,7\}$$

[Reasoning]

30 students: 18 like football, 12 like tennis, 7 like both. Draw a Venn diagram and find P(likes exactly one sport).

Only football=11, Only tennis=5, Both=7, Neither=7

$$P(\text{exactly one}) = \frac{16}{30} = \frac{8}{15}$$

[Problem Solving]

From the Venn diagram above, find P(likes tennis | likes football).

$$P(T|F) = \frac{P(T \cap F)}{P(F)} = \frac{7/30}{18/30} = \frac{7}{18}$$

[Fluency]

1. $\varepsilon = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. $A = \{2, 4, 6, 8, 10\}$. $B = \{1, 2, 3, 4, 5, 6\}$.

List the elements of:

(a) $A \cap B$ (b) $A \cup B$ (c) A' (complement in ε)

(3 marks)

[Fluency]

2. 30 students were asked if they like football (F) or tennis (T).

18 like football, 12 like tennis and 7 like both.

- (a) Draw a Venn diagram. (2)
 (b) Find P(likes football). (1)
 (c) Find P(likes both). (1)
 (d) Find P(likes at least one). (1)

(5 marks)

[Fluency]

3. Using the Venn diagram from Question 2, find P(neither football nor tennis).

(1 mark)



**[Reasoning]**

4. $A = \{\text{multiples of 3 up to 20}\}$. $B = \{\text{multiples of 4 up to 20}\}$. $\varepsilon = \{1, 2, \dots, 20\}$.

- (a) List the elements of A and B. (2)
(b) Draw a Venn diagram. (2)
(c) A number is chosen at random from ε . Find $P(A \cap B)$. (1)

(5 marks)

[Reasoning]

5. Using the Venn diagram from Question 2:

- (a) Find $P(\text{likes tennis} \mid \text{likes football})$. (2)
(b) Find $P(\text{likes only football})$. (1)

(3 marks)

[Reasoning]

6. 100 people were asked about coffee (C) and tea (T).

55 drink coffee, 40 drink tea, 15 drink both.

- (a) Complete a Venn diagram. (2)
(b) Find $P(C \cup T)$. (1)
(c) Find $P(C' \cap T)$. (1)

(4 marks)

[Problem Solving]

7. $P(A) = 0.4$, $P(B) = 0.3$, $P(A \cup B) = 0.6$.

- (a) Find $P(A \cap B)$. (2)
(b) Find $P(A' \cap B')$. (1)

(3 marks)

[Problem Solving]

8. 40 students were asked about their three favourite subjects: Maths (M), English (E) and Science (S).

$n(M) = 20$, $n(E) = 18$, $n(S) = 15$, $n(M \cap E) = 8$, $n(M \cap S) = 5$, $n(E \cap S) = 6$, $n(M \cap E \cap S) = 3$.

- (a) Complete a Venn diagram. (3)
(b) Find the number in none of the sets. (1)
(c) Find $P(\text{exactly one subject})$. (2)

(6 marks)



Section B — Higher

Worked Examples

[Fluency]

$\varepsilon = \{1, \dots, 20\}$. $P = \{\text{primes}\}$. $E = \{\text{even numbers}\}$. Find $P(P \cup E)$ and verify using a Venn diagram.

Primes in 1–20: $\{2, 3, 5, 7, 11, 13, 17, 19\}$. Even: $\{2, 4, 6, \dots, 20\} = 10$.

$P \cap E = \{2\}$. $P(P \cup E) = 8/20 + 10/20 - 1/20 = 17/20$

[Reasoning]

Shade $A \cap B'$ on a Venn diagram. Describe in words.

$A \cap B'$ = elements in A but not in B = **A only**

[Problem Solving]

$n(\varepsilon) = 50$, $n(A) = 30$, $n(B) = 20$, $n(A' \cap B') = 8$. Find $n(A \cap B)$.

$n(A \cup B) = 50 - 8 = 42$

$n(A \cap B) = n(A) + n(B) - n(A \cup B) = 30 + 20 - 42 = 8$

[Fluency]

1. $\varepsilon = \{1, 2, \dots, 20\}$. $A = \{\text{multiples of 3}\}$. $B = \{\text{multiples of 5}\}$.

(a) Draw a Venn diagram showing A, B and ε . (3)

(b) Find $P(A \cap B)$. (1)

(c) Find $P(A' \cap B')$. (2)

(6 marks)

[Fluency]

2. $n(\varepsilon) = 50$. $n(A) = 28$. $n(B) = 19$. $n(A \cap B) = 8$.

(a) Find $n(A \cup B)$. (2)

(b) Find $P(A')$. (1)

(c) Find $P(A|B)$. (2)

(5 marks)

[Reasoning]

3. On a Venn diagram with sets A, B and universal set ε , shade each region:

(a) $A \cap B'$ (b) $A \cup B'$ (c) $(A \cup B)'$

(3 marks)



**[Reasoning]**

4. $P(A) = 0.5$, $P(B) = 0.4$, $P(A \cup B) = 0.7$.

(a) Find $P(A \cap B)$. (2)

(b) Are A and B independent? Show your working. (2)

(4 marks)

[Problem Solving]

5. $n(\xi) = 40$. Three sets A, B and C with:

$n(A) = 20$, $n(B) = 18$, $n(C) = 15$

$n(A \cap B) = 8$, $n(A \cap C) = 5$, $n(B \cap C) = 6$, $n(A \cap B \cap C) = 3$

(a) Find the number in none of the sets. (3)

(b) Find $P(A \cap B \cap C)$. (1)

(c) Find $P(\text{exactly one set})$. (2)

(6 marks)

[Problem Solving]

6. $P(A) = 0.6$, $P(B) = 0.5$, $P(A \cap B) = 0.3$.

(a) Find $P(A \cup B)$. (1)

(b) Show that A and B are independent. (2)

(c) Find $P(A' \cup B')$. (2)

(5 marks)