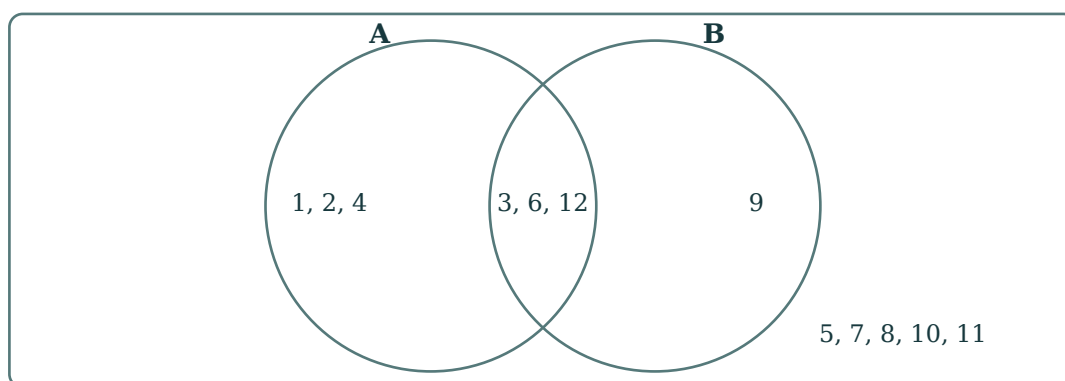


Venn Diagrams

Foundation / Higher tier | Written solutions

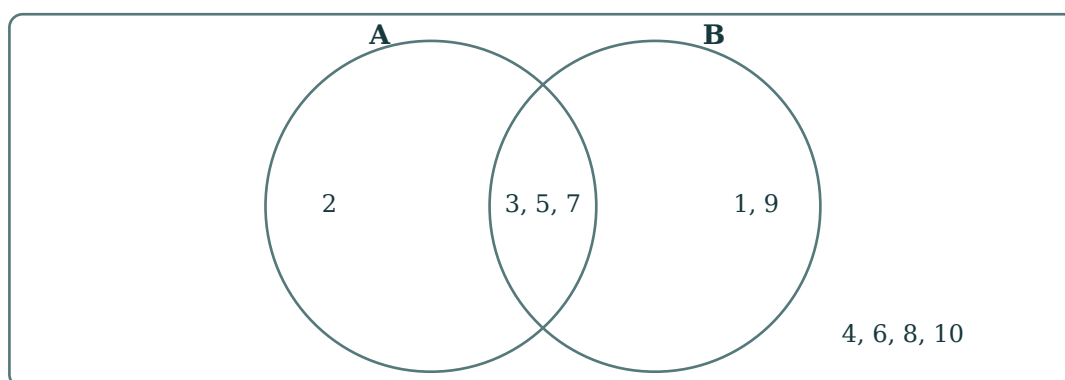
TWO SETS

Question 1



- a) $A = \{1, 2, 3, 4, 6, 12\}$; $B = \{3, 6, 9, 12\}$. Place common values 3, 6, 12 first, then the remaining values.
- b) $A \cap B$ contains 3 of the 12 outcomes, so $P(A \cap B) = 3/12 = 1/4$.

Question 2



- a) Prime numbers are $\{2, 3, 5, 7\}$; odd numbers are $\{1, 3, 5, 7, 9\}$. One is odd but not prime.
- b) Six of 10 numbers are outside A, so $P(A') = 6/10 = 3/5$.
- c) $A \cup B$ includes 2, 3, 5, 7, 1 and 9: $P(A \cup B) = 6/10 = 3/5$.

Question 3

The regions contain football only 8, both 5, basketball only 7 and neither 10.

- a) Football = $8 + 5 = 13$. b) Total = $8 + 5 + 7 + 10 = 30$.
c) Basketball but not football = 7. d) $P(\text{both}) = 5/30 = 1/6$.

Question 4

Read the numbers by region: A only {2, 4, 8, 10}; overlap {6}; B only {3, 9}; outside both {1, 5, 7}.

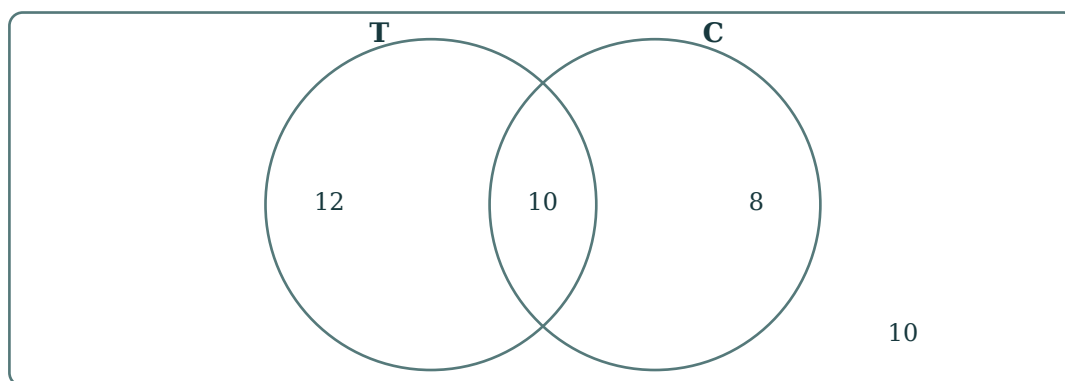
- a) $A = \{2, 4, 6, 8, 10\}$. b) $B' = \{1, 2, 4, 5, 7, 8, 10\}$.
c) $A \cup B = \{2, 3, 4, 6, 8, 9, 10\}$. d) $A \cap B = \{6\}$.

Question 5

Total = $9 + 6 + 5 + 10 = 30$. The regions are maths only 9, both 6, science only 5, neither 10.

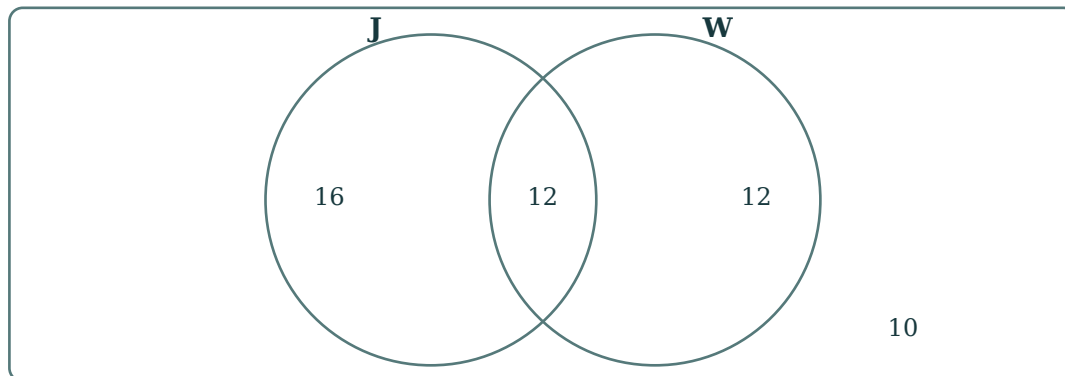
- a) $P(M \cap S) = 6/30 = 1/5$. b) $P(M \cup S) = (9 + 6 + 5)/30 = 2/3$.
c) $P(M') = (5 + 10)/30 = 1/2$. d) $P(M \cap S') = 9/30 = 3/10$.

Question 6



- a) Tea only = $22 - 10 = 12$. Coffee only = $18 - 10 = 8$. The union has $12 + 10 + 8 = 30$, leaving $40 - 30 = 10$ outside.
b) Neither = 10 people. c) $P(\text{tea but not coffee}) = 12/40 = 3/10$.

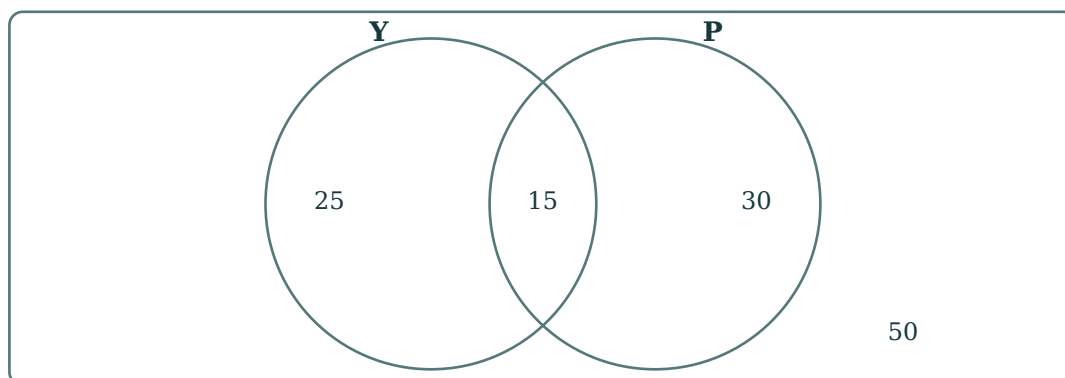
Question 7



a) Juice only = $28 - 12 = 16$. Water only = $24 - 12 = 12$. Neither = $50 - (16 + 12 + 12) = 10$.

b) Juice only = 16 people. c) Given that they like water, use the 24 water-likers as the denominator: $12/24 = 1/2$.

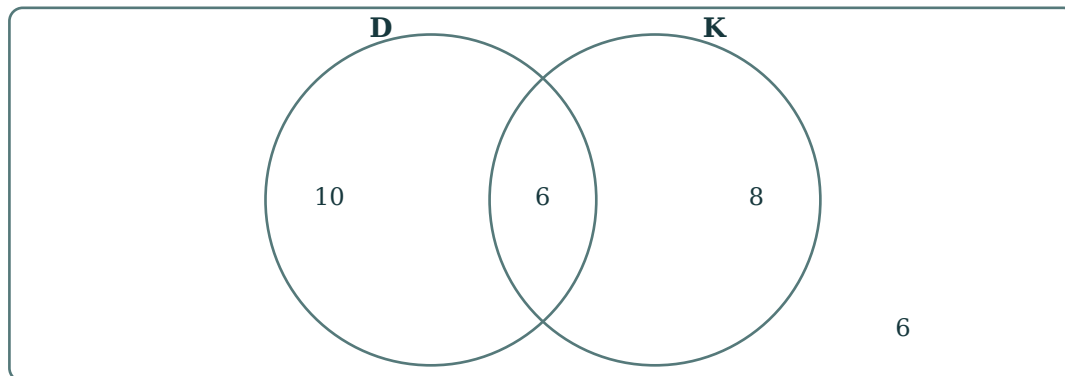
Question 8



a) Yoga only = $40 - 15 = 25$. The union has $120 - 50 = 70$ people. Pilates only = $70 - 25 - 15 = 30$.

b) Pilates total = $30 + 15 = 45$ people. c) Exactly one class = $25 + 30 = 55$ people.

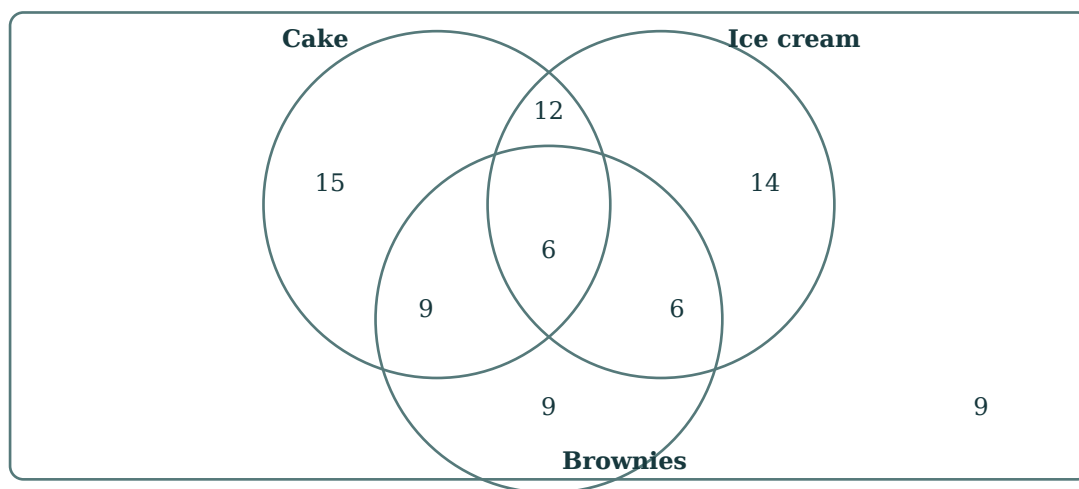
Question 9



- a) At least one instrument = $30 - 6 = 24$. Intersection = $16 + 14 - 24 = 6$. Drums only = 10; keyboard only = 8.
b) Both = 6 students. c) Only one instrument = $10 + 8 = 18$ students.

THREE SETS

Question 10



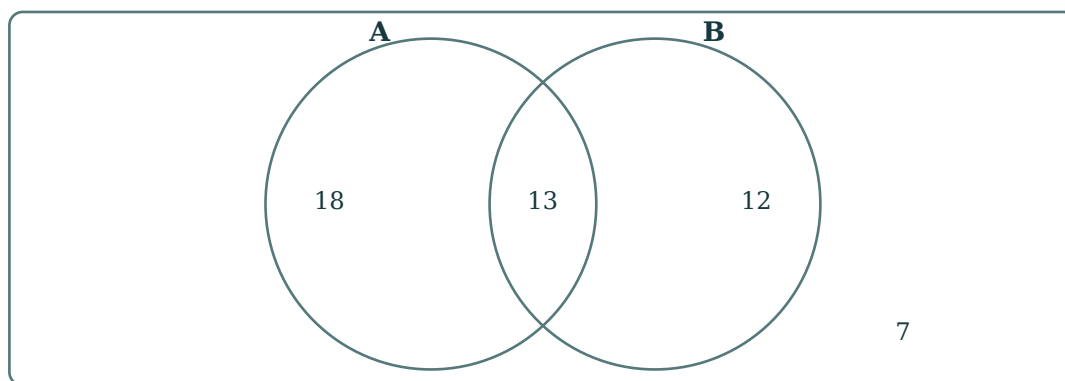
- a) Put 6 in the triple overlap. Exactly cake and ice cream = $18 - 6 = 12$; exactly cake and brownies = $15 - 6 = 9$; exactly ice cream and brownies = $12 - 6 = 6$.
Cake only = $42 - 12 - 9 - 6 = 15$; ice cream only = $38 - 12 - 6 - 6 = 14$; brownies only = $30 - 9 - 6 - 6 = 9$. The union is 71, so neither = $80 - 71 = 9$.
b) Exactly two desserts = $12 + 9 + 6 = 27$ people.

Question 11

The “both” totals include those who like all three. Exactly popcorn and nachos = $18 - 5 = 13$.

Exactly popcorn and sweets = $15 - 5 = 10$; exactly nachos and sweets = $12 - 5 = 7$.

Exactly two snacks = $13 + 10 + 7 = 30$ people.

Question 12


The four regions add to 50: $2x + (x + 4) + (x + 3) + 7 = 50$. Thus $4x + 14 = 50$ and $x = 9$.

Apples and bananas = $x + 4 = 13$. Banana-likers = $(x + 4) + (x + 3) = 13 + 12 = 25$.

$P(\text{apples} \mid \text{bananas}) = 13/25$.