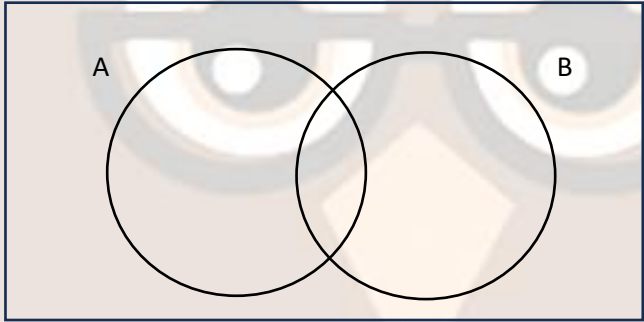
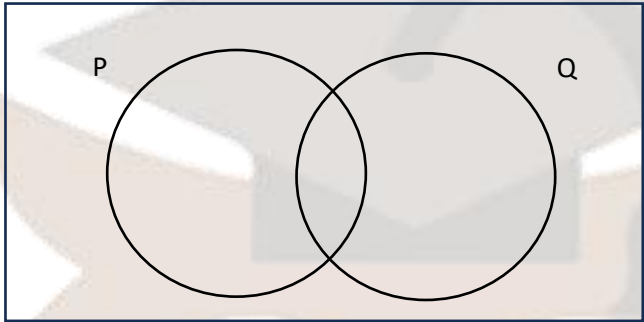
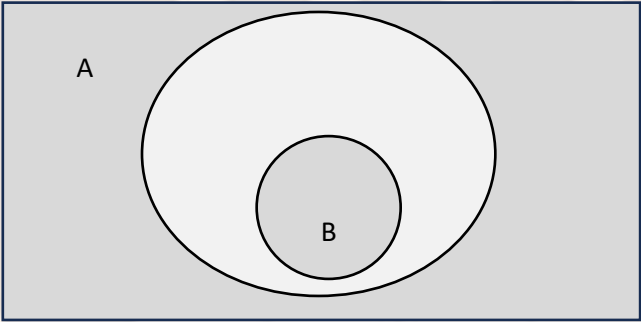
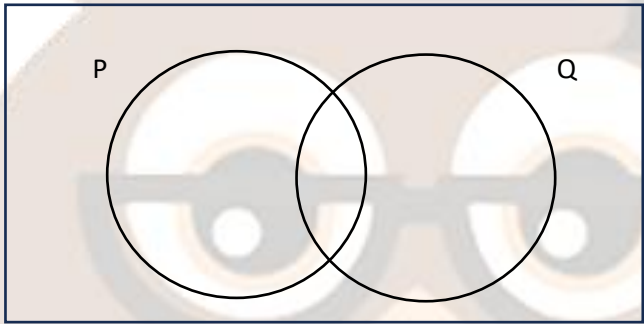
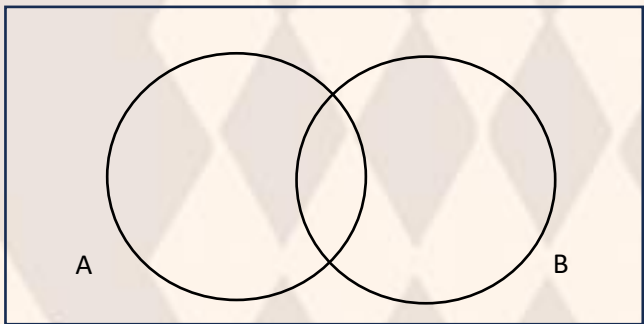


7 ESSENTIAL QUESTIONS TO MASTER

SETS

1	$\xi = \{ \text{integers } x: 0 < x \leq 10 \}$ $A = \{ \text{prime numbers} \}$ $B = \{ (x - 5)(4 - x) = 0 \}$ (i) Complete the Venn diagram to illustrate this information. Answer ξ  (ii) List the elements in $(A \cup B)'$. (iii) C is a proper subset of A. Anthony claims that $(n(C) \leq 4)$. Explain, with reasons, whether Anthony's claim is valid.	
2	$\xi = \{ \text{integers } x: 1 \leq x \leq 20 \}$ $P = \{ \text{prime numbers in } \xi \}$ $Q = \{ \text{multiples of 3 in } \xi \}$ (a) List the element(s) in $P \cap Q$. (b) Circle the correct statement from the list below. $P \subset Q$ $Q \cap P' \neq \emptyset$ $(Q \cup P)' = \{1\}$	

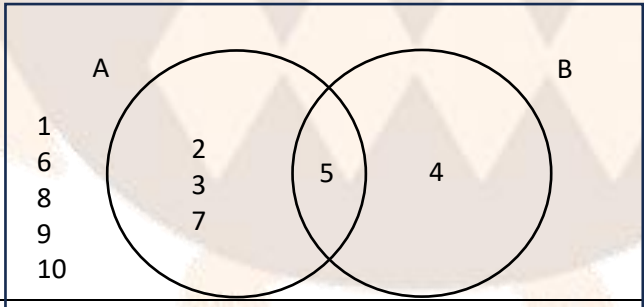
	(c) On the Venn diagram, shade the region that represents $P \cup Q'$ ξ 	
3	(a) $\xi = \{ \text{integers} : 2 \leq x \leq 18 \}$ $M = \{ \text{prime numbers} \}$ $N = \{ \text{factors of 28} \}$ Draw a Venn diagram to illustrate this information. (b) Use set notation to describe the shaded region. ξ  (c) The sets ξ, P and Q satisfy the conditions $n(\xi) = 18,$ $n(P) = 9,$ $n(Q) = 15.$	

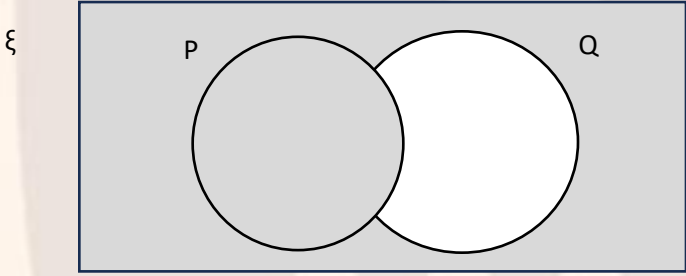
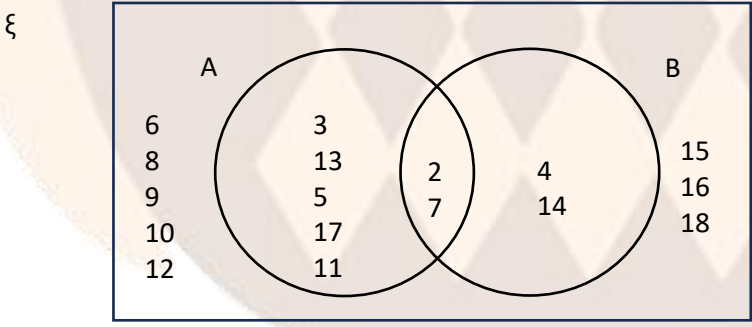
	Find the largest possible value of $n(P \cup Q)'$.	
4	$\xi = \{ \text{integers } x : 1 \leq x \leq 12 \}$ $P = \{ \text{prime numbers} \}$ $Q = \{ \text{multiples of 3} \}$ (i) Represent the above information on the Venn diagram shown in the answer space below. ξ  ii) List the elements in $(P' \cap Q') \cup (P \cap Q)$. iii) $R = \{x : x \text{ is a multiple of 6}\}$. Use set notation to describe the relationship between Q and R. b) On the Venn diagram, shade the region which represents $A \cap B'$ below. ξ 	

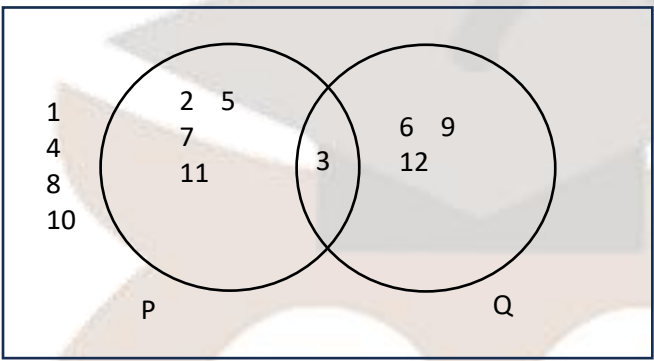
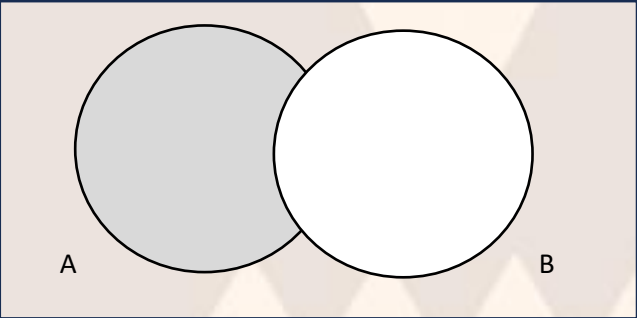
5	(a) $\xi = \{\text{students in a school}\}$ Let $H = \{\text{students with heights greater than 170 cm}\}$ $B = \{\text{students who enjoy playing basketball}\}$ $S = \{\text{students who do not wear spectacles}\}$ (i) Express in words the meaning of $H' \cap B \neq \emptyset$. (ii) Express in set-notation the statement "All students who enjoy playing basketball do not wear spectacles." (b) $\xi = \{x : x \text{ is an integer and } 41 \leq x \leq 54\}$ $P = \{x : x \text{ is divisible by 3}\}$ $Q = \{x : x \text{ is divisible by 6}\}$ (i) Find the value of $n(P)$ (ii) List the elements in the set $P \cap Q$ (iii) Draw a Venn diagram to represent ξ, P and Q.	
6	(a) It is given that $\xi = \{x : x \text{ is an integer such that } 1 < x \leq 15\}$, $A = \{x : x \text{ is an odd number}\}$, $B = \{x : x \text{ is a multiple of 3}\}$.	

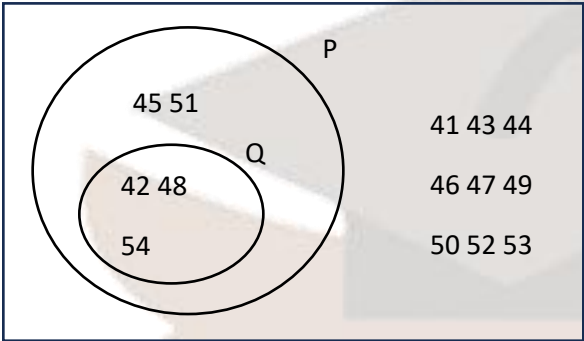
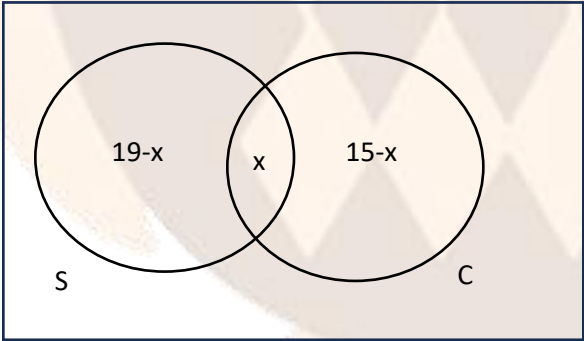
	(i) Write down (a) $A \cap B$ (b) $A' \cap B$ (ii) A number a is chosen at random from ξ. Find the probability that $a \in (A \cup B)$. (b) There are 27 children in a class. Out of these children, 19 own a smartphone, 15 own a computer, and 3 own neither a smartphone nor a computer. Using a Venn diagram, or otherwise, find the number of children who own a smartphone but not a computer.	
7	$\xi = \{\text{integers } x: 2 \leq x < 16\}$ $A = \{\text{multiples of 3}\}$ $B = \{\text{factors of 20}\}$ (a) (i) List all the elements in A'. (ii) List all the elements in $A \cap B$. (iii) Find the value of $n(A \cup B)'$. (b) On the Venn diagram, shade the region which represents $(P' \cup Q) \cap Q'$.	

Answer Key:

1	(i) ξ 	
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	(ii) 1, 6, 8, 9, 10 (iii) $n(A) = 4$. If C is a proper subset of A, the number of elements in C must be less than 4. Hence Anthony's claim is not valid.
2	(a) $P = \{2, 3, 5, 7, 11, 13, 17, 19\}$ $Q = \{3, 6, 9, 12, 15, 18\}$ (b) Circle the correct statement from the list below. $P \subset Q$ $Q \cap P' \neq \emptyset$ $(Q \cup P)' = \{1\}$ (c) On the Venn diagram, shade the region that represents $P \cup Q'$ 
3	(a)  (b) $B \cup A'$

	(c) 3
4	i)  ii) {1, 3, 4, 8, 10} iii) RCQ b) 
5	There are students whose heights are not greater than 170 cm (or 170 cm or less) and who enjoy playing basketball. Part A $(B \subseteq S)$ $(P = \{42, 45, 48, 51, 54\})$ $(n(P) = 5)$ Part B $Q = \{42, 48, 54\}$ $P \cap Q = \{42, 48, 54\}$

	ξ 
6	Here is the text of the solution you provided: (a) $\xi = \{2, 3, 4, \dots, 14, 15\}$, $A = \{3, 5, 7, 9, 11, 13, 15\}$ $B = \{3, 6, 9, 12, 15\}$. (i) (a) $A \cap B = \{3, 9, 15\}$ (b) $A' = \{2, 4, 6, 8, 10, 12, 14\}$ $A \cap B = \{6, 12\}$ (ii) $A \cup B = \{3, 5, 6, 7, 9, 11, 12, 13, 15\}$, Probability that a $\in (A \cup B) = \frac{9}{14}$ (b) Let x be the number of children who own both a smartphone and a computer. ξ 

	$19 + 15 - x + 3 = 27$ $37 - x = 27$ $x = 10$. Therefore, the number who own a smartphone but not a computer is $19 - x = 19 - 10 = 9$.
7	(a)(i) $A' = \{2, 4, 5, 7, 8, 10, 11, 13, 14\}$ (ii) $A = \{3, 6, 9, 12, 15\}$ $B = \{2, 4, 5, 10\}$ $A \cap B = \emptyset$ or $\{\}$ (iii) $A = \{3, 6, 9, 12, 15\}$ $B = \{2, 4, 5, 10\}$ $A \cup B = \{2, 3, 4, 5, 6, 9, 10, 12, 15\}$ $(A \cup B)' = \{7, 8, 11, 13, 14\}$ $n((A \cup B)') = 5$ (b) ξ 