SETS AND VENN DIAGRAMS

Mark Scheme (2010-2014)

0606 Revision Hub

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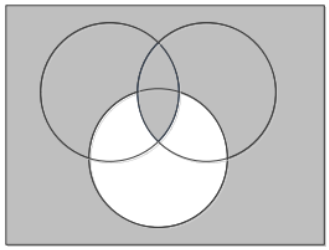
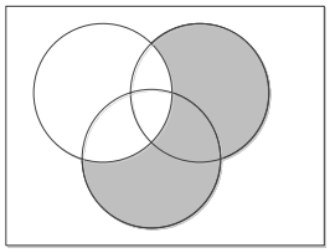
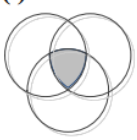
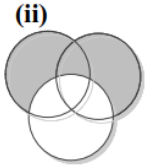
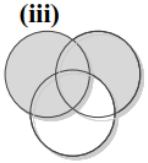
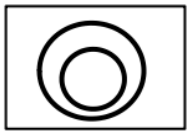
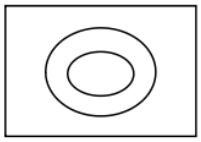
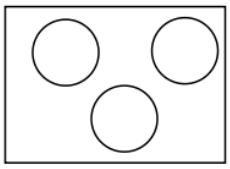
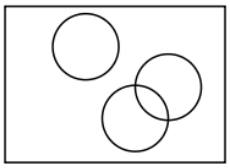
1	**(i)**	$n(A)=2$ $n(B)=3$ $n(C)=0$	**B1** **B1** **B1**	**B0** for n(2), {2},{0}, ∅ , {} etc.
	(ii)	$A\cup B=\{-1,-2,-3,3\}$	**B1**	
	(iii)	$A\cap B=\{-2\}$	**B1**	
	(iv)	ξ, 'the universal set', R, 'real numbers', $\{x:x\in\ \}$	**B1**	

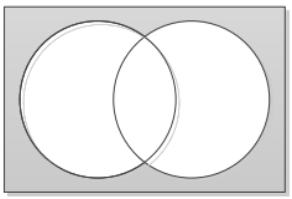
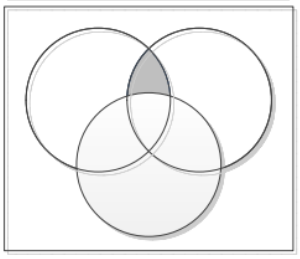
2	**(a)**		**B1**	
			**B1**	
	(b)	No.in H only $=50-x$; No in F only $=60-x$ Sum: $50-x+60-x+x+30-2x=98$ $x=14$	**B1** **M1** **A1**	Both written or on diagram Add at least 3 terms each with x involved and equate to 98 soi

3	**(a)**	**(i)**  **(ii)**  **(iii)** 	**B1** **B1** **B1**	**B1** for each
	(b) **(i)**	2	**B1**	
	(ii)	0	**B1**	

4	(a)	(i)		B1	
		(i)		B1	
	(b)	(i)	6	B1	
		(ii)	5	B1	
		(iii)	9	B1	

5	(a)	(i)		B1	
		(ii)	 or 	B1	any Venn diagram showing three circles which do not all overlap
	(b)	(i)	$50 \notin C$	B1	
		(ii)	$64 \in S \cap C$	B1ft	**ft** only on use of $\not\subset$ and $\subset$ instead of $\notin$ and $\in$
		(iii)	$n(S') = 90$	B1	

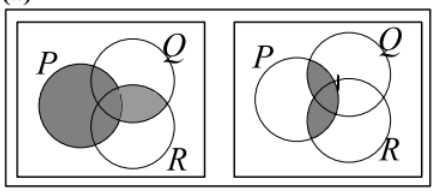
6	(i)	$n(A) = 3$	B1	[1]	If elements listed for **(i)**, then they must be correct elements to get B1 leading to $n(A) = 3$. If they are not listed and correct answer given then B1.
	(ii)	$n(B) = 4$	B1	[1]	If elements listed for **(ii)**, then they must be correct elements leading to $n(B) = 4$ to get B1. If they are not listed and correct answer given then B1.
	(iii)	$A \cup B = \{60°, 240°, 300, 420°, 600°\}$	√B1	[1]	Follow through on any sets listed in **(i)** and **(ii)**. Do not allow any repetitions.
	(iv)	$A \cap B = \{60°, 420°\}$	√B1	[1]	Follow through on any sets listed in **(i)** and **(ii)**.

7	(a) (i)		B1	[1]	
	(ii)		B1	[1]	
	(b)	$S \cap T'$ or $(S' \cup T)'$ oe	B1	[1]	Others will be seen but only accept completely correct set notation

8	(i)	$n(A \cap B) = 5$	**B1**	
	(ii)	$n(A) = 16$	**B1**	
	(iii)	$n(B' \cap A)$	**B1**	

9	(i)	Attempt to solve 3 term quadratic	**M1**	
		-3 and 8	**A1**	
		$-3 < x < 8$	**A1**	Condone $-3 < x$ AND $x < 8$
	(ii)	$4 < x\ (< 12)$	**B1**	
		$S \cup T = -3 < x < 12$	**B1**	
	(iii)	$S \cap T = 4 < x < 8$ or $S' = -5 < x \leqslant -3,\ 8 \leqslant x < 12$ and $T' = -5 < x \leqslant 4$	**B1**	Penalise confusion over $<$ and $\leqslant$ (or $>$ and $\geqslant$) once only
		$-5 < x \leqslant 4$	**B1√**	*their* 4
		$8 \leqslant x < 12$	**B1√**	*their* 8 (Ignore AND/OR etc.)

10 **(a)**



B1

B1 [2]

(b) **(i)** $F \subset B$, $B \supset F$, $F \subseteq B$ and $B \supseteq F$, $F \cap B = F$ or $F \cup B = B$ B1 [1]

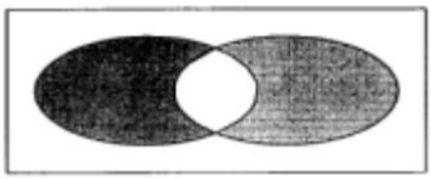
(ii) $S \cap F = \varnothing$, $S \cap F = \{\}$ or $n(S \cap F) = 0$ B1 [1]

11 **(a)** **(i)** $n(P) = 11$ B1

(ii) $18 \notin F$ or $18 \notin F'$ B1

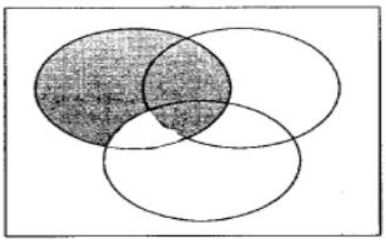
(iii) $T \subset F$ or $F \supset T$ or $F \cup T = F$ or $F \cap T = T$ o.e. B1 [3]

(b) **(i)**



B1

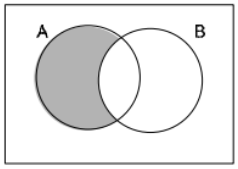
(ii)

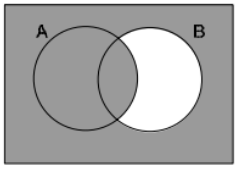


B1 [2]

12

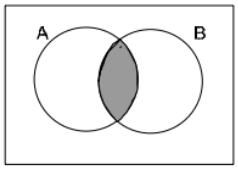
(i)

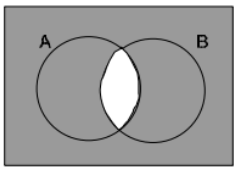




And False — **B1 + B1**

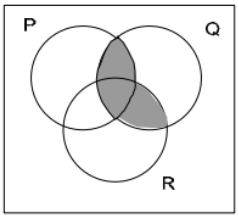
(ii)

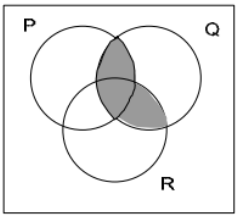




And False — **B1 + B1**

(iii)





And True — **B1 + B1**

[6]

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13 **(a)** **(i)** 7 and 0 — B2 — B1 for each.

(ii) 22 and 15 — B2 — B1 for each.

[4]

(b) 3 'sets' enclosed in a rectangle — B1 — B1 for set P and set Q separate; B1 — B1 for set R contained within set P

[2]

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14 **(a)** $11 - x + x + 13 - x = 18$
$x = 6$ — M1 — M1 for a valid method; A1

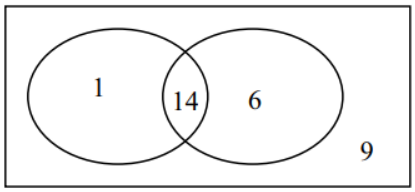
(b) **(i)** $X: \frac{7\pi}{6}, \frac{11\pi}{6}$ — B1 — B1 for both

(ii) $Y: \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$ — B1, B1 — B1 for each pair

(iii) $X \subset Y$, $X \cap Y = X$ or $X \cup Y = Y$ — B1

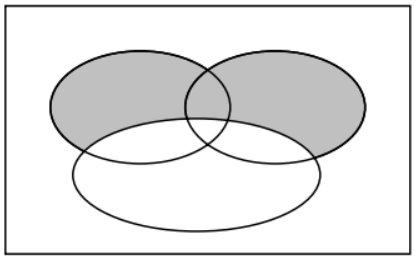
[6]

15 **(a)**



6 correctly positioned	B1
14 correctly positioned	B1
1 correctly positioned	B1
9 correctly positioned	B1√

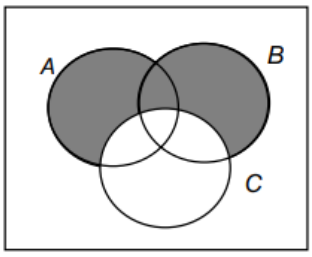
(b)



B1

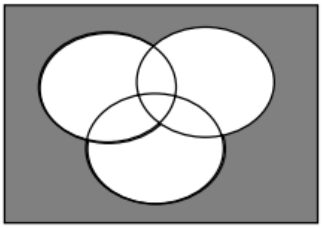
[5]

16 **(a)** **(i)**



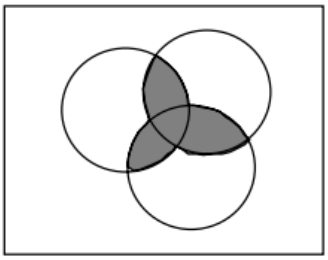
B1 for each region shaded correctly

(ii)



B1

(iii)



B1

(b) n(P) = 3

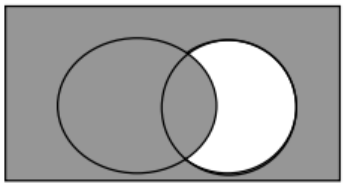
B1

[4]

17 **(a)** **(i)** $n(E) = 72$ or $n(W \cup B \cup R) = 72$ — B1

(ii) $R \subset W$ or $R \cap W = R$ or $R \cup W = W$ or $R \cap W' = \varnothing$ — B1

(b) **(i)**



— B1

(ii) $(X' \cap Y)'$ or $(X \cap Y) \cup Y'$ or $(X \cup Y)' \cup X$ or $(X' \cap Y') \cup X$ — B1 [4]

18 **(a)** **(i)** $x = 30°, 150°$ — B1, B1 [2] — B1 for each

(ii) $x - 30° = 120°, 240°$
$x = 150°, 270°$
$A \cup B = \{30°, 150°, 270°\}$

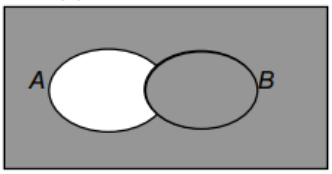
B1 — B1 for $x = 150°, 270°$ only
√B1 — Follow through on their A and B
[2]

(b) $\cos 3x = \pm 1$ or $\tan 3x = 0$
$3x = 0°, 180°, 360°, 540°$
$x = 0°, 60°, 120°, 180°$
$n(C) = 4$

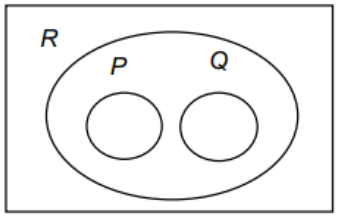
M1 — M1 for dealing with sec and $3x$

A1 — A1 for all solutions correct
√B1 — Follow through on their number of solutions
[3]

19 **(a)**



(b)



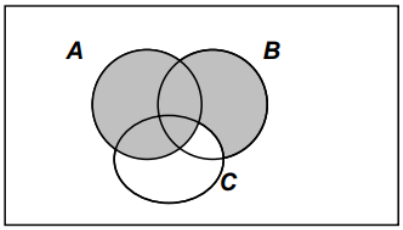
B1+B1

(c) $24 - x + x + 18 - x + 3x = 50$ or $24 + 18 - x + 3x = 50$ B1
Solve for x (4) M1
12 A1
[6]

20 **(i), (ii)** and **(iii)** B1 B1 B1 [3] B1 for each correct Venn diagram

(b) **(i)** {9,10,11,12,13,14} B1 Or equivalent
(ii) {5,6,7,8,9,10,11,12,13,14,15,16,17,18,19, 20} B1 Or equivalent
(iii) ∅ or { } B1
[3]

21 **(a)**



B1

(b) $X' \cup Y$, $(X \cap Y')'$, $X' \cup (X \cap Y)$,
$Y \cup (X \cup Y)'$, or $Y \cup (X' \cap Y')$ oe B1

(c) $18 + 16 + 2 = 30 + x$ M1
6 A1 [4]