MATH1040 Practice questions 4

- 1. Answer each of the following questions, showing all working.
 - (a) For the following questions let

$$A = \{x \mid x \in \mathbb{N}, 5 < x \le 11\}, B = \{5, 6, 13, 15\} \text{ and } C = \{-2, 0, 2, 4, 6, 8\}$$

- (1) Write down the elements of the set A.
- (2) Write down the elements of the set $A \cup B$.
- (3) Write down the elements of the set $B \cap C$.
- (4) Write down the elements of the set $A \setminus C$.
- (5) Write down the elements of the set $A \setminus (B \cup C)$.
- (6) Write down the elements of the set $(A \cap B) \cap C$.

(b) For the following questions let

$$A = \{-1, 2, 3\}, B = \{-5, -3, -1, 1\}$$
 and $C = \{-2, 3, 5\}.$

- (1) Write down the elements of the set $B \cup C$.
- (2) Write down the elements of the set $C \setminus \emptyset$.
- (3) Write down the elements of the set $C \setminus (B \cap A)$.
- (4) Write down the elements of the set $(C \setminus A) \setminus B$.
- (5) Write down the elements of the set $(B \cap \emptyset) \cup C$.
- (6) Write down the elements of the set $(A \cup B) \cup (B \cup C)$.
- (7) Write down the elements of the set $(\emptyset \cap C) \cap (B \cap A)$.
- (c) For the following questions let r_1 and r_2 be random natural numbers chosen independently, where r_1 is between 1 and 10 (inclusive), and r_2 is between 1 and 7 (inclusive). In each case, find the probability p that:
 - (1) r_1 is even?
 - (2) $r_1 \ge 7?$
 - (3) r_1 is even and $r_1 \ge 7$?
 - (4) r_1 is even or $r_1 \ge 7$?
 - (5) r_1 is even given that $r_1 \ge 7$?
 - (6) Both r_1 and r_2 are even?
 - (7) At least one of r_1 and r_2 is even?
 - (8) r_1 is even given that r_2 is even?
- 2. Answer each of the following questions, showing all working.
 - (a) For the following questions let

 $A = \{x \mid x \in \mathbb{N}, \; 2 \leq x \leq 7\}, \; B = \{1, 2, 10, 12\} \; \text{ and } C = \{-2, 0, 2, 4, 6, 8\}.$

- (1) Write down the elements of the set A.
- (2) Write down the elements of the set $A \cup B$.
- (3) Write down the elements of the set $B \cap C$.

- (4) Write down the elements of the set $A \setminus C$.
- (5) Write down the elements of the set $A \setminus (B \cup C)$.
- (6) Write down the elements of the set $(A \cap B) \cap C$.

(b) For the following questions let

$$A = \{-3, 1, 3, 5\}, B = \{-5, -3, -2\}$$
 and $C = \{-2, -1, 1\}.$

- (1) Write down the elements of the set $C \cap B$.
- (2) Write down the elements of the set $A \cup \emptyset$.
- (3) Write down the elements of the set $A \cup (C \cup B)$.
- (4) Write down the elements of the set $(C \cup B) \setminus A$.
- (5) Write down the elements of the set $(A \setminus B) \cap \emptyset$.
- (6) Write down the elements of the set $(C \cup B) \setminus (B \cup A)$.
- (7) Write down the elements of the set $(B \cap \emptyset) \cup (C \setminus \emptyset)$.
- (c) For the following questions let r_1 and r_2 be random natural numbers chosen independently, where r_1 is between 1 and 9 (inclusive), and r_2 is between 1 and 6 (inclusive). In each case, find the probability p that:
 - (1) r_1 is even?
 - (2) $r_1 \ge 3?$
 - (3) r_1 is even and $r_1 \ge 3$?
 - (4) r_1 is even or $r_1 \ge 3$?
 - (5) r_1 is even given that $r_1 \ge 3$?
 - (6) Both r_1 and r_2 are even?
 - (7) At least one of r_1 and r_2 is even?
 - (8) r_1 is even given that r_2 is even?
- 3. Answer each of the following questions, showing all working.
 - (a) For the following questions let

$$A = \{x \mid x \in \mathbb{N}, 5 < x \le 10\}, B = \{5, 6, 12, 14\} \text{ and } C = \{-2, 0, 2, 4, 6, 8\}$$

- (1) Write down the elements of the set A.
- (2) Write down the elements of the set $A \cup B$.
- (3) Write down the elements of the set $B \cap C$.
- (4) Write down the elements of the set $A \setminus C$.
- (5) Write down the elements of the set $A \setminus (B \cup C)$.
- (6) Write down the elements of the set $(A \cap B) \cap C$.
- (b) For the following questions let

 $A = \{-1, 1, 2, 4\}, B = \{-5, -3, 2, 4\} \text{ and } C = \{-5, -2, -1\}.$

(1) Write down the elements of the set $A \setminus B$.

- (2) Write down the elements of the set $C \cap \emptyset$.
- (3) Write down the elements of the set $B \cap (C \cup A)$.
- (4) Write down the elements of the set $(C \setminus B) \cup A$.
- (5) Write down the elements of the set $(\emptyset \cap C) \cup A$.
- (6) Write down the elements of the set $(A \setminus C) \cap (B \cap C)$.
- (7) Write down the elements of the set $(\emptyset \setminus B) \cup (A \cap \emptyset)$.
- (c) For the following questions let r_1 and r_2 be random natural numbers chosen independently, where r_1 is between 1 and 8 (inclusive), and r_2 is between 1 and 10 (inclusive). In each case, find the probability p that:
 - (1) r_1 is even?
 - (2) $r_1 \ge 5?$
 - (3) r_1 is even and $r_1 \ge 5$?
 - (4) r_1 is even or $r_1 \ge 5$?
 - (5) r_1 is even given that $r_1 \ge 5$?
 - (6) Both r_1 and r_2 are even?
 - (7) At least one of r_1 and r_2 is even?
 - (8) r_1 is even given that r_2 is even?
- 4. Answer each of the following questions, showing all working.
 - (a) For the following questions let

$$A = \{x \mid x \in \mathbb{N}, \ 4 < x \le 8\}, \ B = \{4, 5, 7, 9\} \text{ and } C = \{-2, 0, 2, 4, 6, 8\}$$

- (1) Write down the elements of the set A.
- (2) Write down the elements of the set $A \cup B$.
- (3) Write down the elements of the set $B \cap C$.
- (4) Write down the elements of the set $A \setminus C$.
- (5) Write down the elements of the set $A \setminus (B \cup C)$.
- (6) Write down the elements of the set $(A \cap B) \cap C$.
- (b) For the following questions let

$$A = \{-5, -2, 5\}, B = \{-5, -1, 1, 4\} \text{ and } C = \{-4, 0, 2, 4\}.$$

- (1) Write down the elements of the set $C \setminus A$.
- (2) Write down the elements of the set $A \cup \emptyset$.
- (3) Write down the elements of the set $C \cup (A \cap B)$.
- (4) Write down the elements of the set $(A \cap B) \cap C$.
- (5) Write down the elements of the set $(\emptyset \cap A) \cup B$.
- (6) Write down the elements of the set $(A \cap C) \setminus (C \cap A)$.
- (7) Write down the elements of the set $(C \cap B) \cap (B \setminus \emptyset)$.

- (c) For the following questions let r_1 and r_2 be random natural numbers chosen independently, where r_1 is between 1 and 8 (inclusive), and r_2 is between 1 and 9 (inclusive). In each case, find the probability p that:
 - (1) r_1 is even?
 - (2) $r_1 \ge 3?$
 - (3) r_1 is even and $r_1 \ge 3$?
 - (4) r_1 is even or $r_1 \ge 3$?
 - (5) r_1 is even given that $r_1 \ge 3$?
 - (6) Both r_1 and r_2 are even?
 - (7) At least one of r_1 and r_2 is even?
 - (8) r_1 is even given that r_2 is even?
- 5. Answer each of the following questions, showing all working.
 - (a) For the following questions let

$$A = \{x \mid x \in \mathbb{N}, \ 4 < x \le 10\}, \ B = \{4, 5, 11, 13\} \ \text{and} \ C = \{-2, 0, 2, 4, 6, 8\}$$

- (1) Write down the elements of the set A.
- (2) Write down the elements of the set $A \cup B$.
- (3) Write down the elements of the set $B \cap C$.
- (4) Write down the elements of the set $A \setminus C$.
- (5) Write down the elements of the set $A \setminus (B \cup C)$.
- (6) Write down the elements of the set $(A \cap B) \cap C$.
- (b) For the following questions let

 $A = \{-4, 0, 5\}, B = \{-2, 0, 1, 3\}$ and $C = \{-5, -3, 0\}.$

- (1) Write down the elements of the set $A \setminus B$.
- (2) Write down the elements of the set $\emptyset \cup A$.
- (3) Write down the elements of the set $A \setminus (C \cap B)$.
- (4) Write down the elements of the set $(B \cup C) \setminus A$.
- (5) Write down the elements of the set $(C \cap \emptyset) \cap B$.
- (6) Write down the elements of the set $(A \setminus C) \setminus (A \setminus C)$.
- (7) Write down the elements of the set $(A \setminus B) \cup (\emptyset \cap C)$.
- (c) For the following questions let r_1 and r_2 be random natural numbers chosen independently, where r_1 is between 1 and 6 (inclusive), and r_2 is between 1 and 10 (inclusive). In each case, find the probability p that:
 - (1) r_1 is even?
 - (2) $r_1 \ge 2?$
 - (3) r_1 is even and $r_1 \ge 2$?
 - (4) r_1 is even or $r_1 \ge 2$?
 - (5) r_1 is even given that $r_1 \ge 2$?

- (6) Both r_1 and r_2 are even?
- (7) At least one of r_1 and r_2 is even?
- (8) r_1 is even given that r_2 is even?