MATH1040 Basic Mathematics **Practice Problems 4**

1. Answer each of the following questions, showing all working:

(**1**) Given two sets:
B=$\{3, 9, 1\}$ and E=$\{-3, -1, 7, 2, 0, 9, -2, 1, 6\}$,
find $B \cap E$.
Illustrate your answer with Venn diagram.

(**2**) Given two sets B=$\{3, 5, 9, -2, 4, 8, 6\}$ and D=$\{-2, 6\}$,
find:

i. $B \cap D$
ii. $B \cup D$
iii. $B \backslash D$
iv. $D \backslash B$

Illustrate your answers with Venn diagrams.

(**3**) For the following questions let E=$\{-2\}$, A=$\{x \mid x \in \mathbb{N}, 2 < x \leq 8\}$, G=$\{3, -1\}$

i. Write down the elements of set G .
ii. Write down the elements of the set $G \cup A$.
iii. Write down the elements of the set $G \cap A$.
iv. Write down the elements of the set $G \backslash A$.
v. Write down the elements of the set $A \backslash (G \cup E)$. Shade the corresponding region on the Venn diagram.
vi. Write down the elements of the set $(G \cup A) \backslash E$.
vii. Write down the elements of the set $E \cup (G \cup A)$.
viii. Write down the elements of the set $E \cap \emptyset$.
ix. Write down the elements of the set $(A \cap G) \cup (A \cap E)$.

(**4**) For the following questions let s_1 and s_2 be random natural numbers chosen independently, where s_1 is between 1 and 6 (inclusive), and s_2 is between 7 and 9 (inclusive). In each case, find the probability p that:

i. s_1 is even?
ii. $s_1 = 5$?
iii. $s_1 < 2$?
iv. s_1 is even and $s_1 < 2$?
v. s_1 is even or $s_1 < 2$?
vi. s_1 is even given that $s_1 < 2$?
vii. Both s_1 and s_2 are even ?
viii. At least one of s_1 and s_2 is even ?
ix. s_1 is even given that s_2 is even ?

2. Answer each of the following questions, showing all working:

(**1**) Given two sets:
E=$\{3, -1, 0, 4, 8, 6\}$ and B=$\{1\}$,
find $E \cap B$.
Illustrate your answer with Venn diagram.

(**2**) Given two sets B=$\{-3, -1, 2, 6\}$ and C=$\{7, 2\}$,
find:

i. $B \cap C$
ii. $B \cup C$
iii. $B \backslash C$

iv. $C \backslash B$

Illustrate your answers with Venn diagrams.

(**3**) For the following questions let $H=\{3,7,9\}$, $C=\{z \mid z \in \mathbb{N}, 2 < z \leq 6\}$, $F=\{7,4,6\}$

i. Write down the elements of set C .
ii. Write down the elements of the set $C \cup F$.
iii. Write down the elements of the set $F \cap C$.
iv. Write down the elements of the set $C \backslash F$.
v. Write down the elements of the set $F \backslash (H \cup C)$. Shade the corresponding region on the Venn diagram.
vi. Write down the elements of the set $(F \cap C) \cap H$.
vii. Write down the elements of the set $C \cup (F \cap H)$.
viii. Write down the elements of the set $\emptyset \cap C$.
ix. Write down the elements of the set $(C \cup H) \setminus (F \cup \emptyset)$.

(**4**) For the following questions let t_1 and t_2 be random natural numbers chosen independently, where t_1 is between 1 and 2 (inclusive), and t_2 is between 2 and 8 (inclusive). In each case, find the probability p that:

i. t_1 is odd?
ii. $t_1 = 2$?
iii. $t_1 > 1$?
iv. t_1 is odd and $t_1 > 1$?
v. t_1 is odd or $t_1 > 1$?
vi. t_1 is odd given that $t_1 > 1$?
vii. Both t_1 and t_2 are odd ?
viii. At least one of t_1 and t_2 is odd ?
ix. t_1 is odd given that t_2 is odd ?

3. Answer each of the following questions, showing all working:

(**1**) Given two sets:
$F=\{3,7,0,9\}$ and $B=\{7\}$,
find $F \cap B$.
Illustrate your answer with Venn diagram.

(**2**) Given two sets $B=\{6\}$ and $A=\{1\}$,
find:

i. $B \cap A$
ii. $B \cup A$
iii. $B \backslash A$
iv. $A \backslash B$

Illustrate your answers with Venn diagrams.

(**3**) For the following questions let $G=\{z \mid z \in \mathbb{N}, 7 < z \leq 9\}$, $E=\{5,0,4,1\}$, $C=\{-1,0,9,1\}$

i. Write down the elements of set C .
ii. Write down the elements of the set $E \cup C$.
iii. Write down the elements of the set $C \cap E$.
iv. Write down the elements of the set $E \backslash C$.
v. Write down the elements of the set $E \backslash (C \cup G)$. Shade the corresponding region on the Venn diagram.
vi. Write down the elements of the set $(G \cup C) \cap E$.
vii. Write down the elements of the set $C \cup (E \cap G)$.
viii. Write down the elements of the set $\emptyset \backslash E$.
ix. Write down the elements of the set $(C \cup E) \setminus (C \cup G)$.

(**4**) For the following questions let s_1 and s_2 be random natural numbers chosen independently, where s_1 is between 6 and 9 (inclusive), and s_2 is between 5 and 7 (inclusive). In each case, find the probability p that:

i. s_1 is even?
ii. $s_1 = 10$?
iii. $s_1 < 9$?
iv. s_1 is even and $s_1 < 9$?
v. s_1 is even or $s_1 < 9$?
vi. s_1 is even given that $s_1 < 9$?
vii. Both s_1 and s_2 are even ?
viii. At least one of s_1 and s_2 is even ?
ix. s_1 is even given that s_2 is odd ?

4. Answer each of the following questions, showing all working:

(**1**) Given two sets:
C=$\{5, 7, 2, -2, 8\}$ and F=$\{3, 5, 2, 0, -2, 1, 6\}$,
find $C \cap F$.
Illustrate your answer with Venn diagram.

(**2**) Given two sets E=$\{-1, 5, 2, 9, 4, 8, 6\}$ and B=$\{-1, 7, 2, 4, -2, 6, 1\}$,
find:

i. $E \cap B$
ii. $E \cup B$
iii. $E \backslash B$
iv. $B \backslash E$

Illustrate your answers with Venn diagrams.

(**3**) For the following questions let E=$\{3, 7, 2, 9, 1\}$, F=$\{5, 7, 2, 0, 9, 4, 8, 6\}$, C=$\{y \mid y \in \mathbb{N}, -4 < y < 3\}$

i. Write down the elements of set F .
ii. Write down the elements of the set $C \cup E$.
iii. Write down the elements of the set $C \cap F$.
iv. Write down the elements of the set $F \backslash E$.
v. Write down the elements of the set $C \backslash (F \cup E)$. Shade the corresponding region on the Venn diagram.
vi. Write down the elements of the set $(F \cup E) \cap C$.
vii. Write down the elements of the set $F \cup (C \cap E)$.
viii. Write down the elements of the set $\emptyset \cup C$.
ix. Write down the elements of the set $(C \cup F) \cap (F \cap E)$.

(**4**) For the following questions let r_1 and r_2 be random natural numbers chosen independently, where r_1 is between 2 and 6 (inclusive), and r_2 is between 4 and 9 (inclusive). In each case, find the probability p that:

i. r_1 is odd?
ii. $r_1 = 6$?
iii. $r_1 > 2$?
iv. r_1 is odd and $r_1 > 2$?
v. r_1 is odd or $r_1 > 2$?
vi. r_1 is odd given that $r_1 > 2$?
vii. Both r_1 and r_2 are odd ?
viii. At least one of r_1 and r_2 is odd ?
ix. r_1 is odd given that r_2 is even ?

5. Answer each of the following questions, showing all working:

(**1**) Given two sets:
$F=\{-3,-1,9,-2\}$ and $C=\{3,7,-2\}$,
find $F \cap C$.
Illustrate your answer with Venn diagram.

(**2**) Given two sets $C=\{3,9,4,8\}$ and $A=\{-3,3,5,-1,0,-2\}$,
find:

i. $C \cap A$
ii. $C \cup A$
iii. $C \backslash A$
iv. $A \backslash C$

Illustrate your answers with Venn diagrams.

(**3**) For the following questions let $G=\{x \mid x \in \mathbb{N}, 2 \leq x \leq 3\}$, $H=\{3,5,7,9,4,-2,6\}$, $A=\{-3,-1,2,0,9,-2,8,6,1\}$

i. Write down the elements of set G .
ii. Write down the elements of the set $G \cup H$.
iii. Write down the elements of the set $A \cap H$.
iv. Write down the elements of the set $A \backslash H$.
v. Write down the elements of the set $A \backslash (G \cup H)$. Shade the corresponding region on the Venn diagram.
vi. Write down the elements of the set $(A \backslash H) \backslash G$.
vii. Write down the elements of the set $G \backslash (A \backslash H)$.
viii. Write down the elements of the set $H \cup \emptyset$.
ix. Write down the elements of the set $(\emptyset \cup H) \cup (G \cup A)$.

(**4**) For the following questions let r_1 and r_2 be random natural numbers chosen independently, where r_1 is between 5 and 9 (inclusive), and r_2 is between 3 and 6 (inclusive). In each case, find the probability p that:

i. r_1 is odd?
ii. $r_1 = 9$?
iii. $r_1 \geq 6$?
iv. r_1 is odd and $r_1 \geq 6$?
v. r_1 is odd or $r_1 \geq 6$?
vi. r_1 is odd given that $r_1 \geq 6$?
vii. Both r_1 and r_2 are odd ?
viii. At least one of r_1 and r_2 is odd ?
ix. r_1 is odd given that r_2 is even ?