2. Determine whether the following statements are true or false and circle the appropriate answer.

(4 marks)

(a) The set $\{1,1,\{1\}\}$ has two elements. True False

(b) $\{1\} \in \{1,2,3\}$. True False

(c) $\{1\} \subseteq \{1,2,3\}$. True False

(d) $\{4\} \in \{\{4,5\},\{3,4,5\},\{3\}\}$. True False

(e) $\{4,5\} \subseteq \{\{4,5\},\{3,4,5\},\{3\}\}$. True False

(f) $\emptyset \subseteq \{1,2,3,4\}$. True False

(g) $\emptyset \in \mathcal{P}(\{1,2,3,4\})$. True False

(h) $\{1,2\}$, $\{3,4\}$ is a partition of the set $\{1,2,3,4,5\}$. True False

3. Let A be the set of integers that are divisible by 2; that is,

$$A = \{n \in \mathbb{Z} \mid n = 2k \text{ for some integer } k\}.$$

Let B be the set of integers that are divisible by 6; that is,

$$B = \{n \in \mathbb{Z} \mid n = 6h \text{ for some integer } h\}.$$

Prove that $B \subseteq A$. **(4 marks)**

Suppose that $b \in B$.

Then $b = 6h$ for some integer h.

Hence $b = 6h$

$= 2(3h)$

$3h$ is an integer so $b = 2k$ for some integer k.

Therefore $b \in A$.

Since every element in B is in A, $B \subseteq A$.

4. Let $U = \{a,b,c,d,e,f,g,h\}$ be a universal set with subsets

$$A = \{a,b,c,f,g,h\} \text{ and } B = \{b,c,d,f\}.$$

Write down the following sets. **(3 marks)**

$A \cap B = \{b,c,f\}$

$A \cup B = \{a,b,c,d,f,g,h\}$

$A - B = \{a,g,h\}$

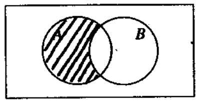
$A^c = \{d,e\}$

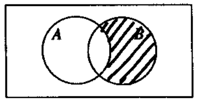
$\mathcal{P}(A^c) = \{\emptyset, \{d\}, \{e\}, \{d,e\}\}$

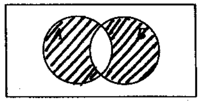
5. Illustrate the following set property by shading the indicated regions of the Venn diagrams.

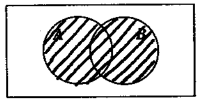
For all sets A and B, $(A-B)\cup(B-A) = (A\cup B) - (A\cap B)$.

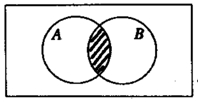
(3 marks)

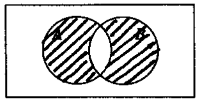

$A-B$


$B-A$


$(A-B)\cup(B-A)$


$A\cup B$


$A\cap B$


$(A\cup B)-(A\cap B)$

these are equal