

## §6.1 Homework Solutions

1) [BB]      4) [BB]

6) a) Let  $E = \text{English}$ ,  $M = \text{Math}$ ,  $U = \text{Universal set}$

$$|U| = 82 \quad \text{and} \quad |(E \cup M)^c| = 12 \quad \text{so} \quad |E \cup M| = 82 - 12 = 70$$

By Inclusion-Exclusion Principle,  $70 = 59 + 46 - |E \cap M| \Rightarrow |E \cap M| = \underline{35}$

b)  $|U| = 97$ . Let  $|M| = x$  and  $|E| = 2x$ .

$$|E \cup M| = 82 \quad \text{and} \quad \text{so} \quad |E \cap M| = 82 - 53 = 29$$

By Inclusion-Exclusion:  $x + 2x - 29 = 82$  so  $x = 37 \Rightarrow \underline{|M| = 37, |E| = 74}$

11) a) [BB] but note that  $\lfloor \frac{500}{3} \rfloor + \lfloor \frac{500}{5} \rfloor - \lfloor \frac{500}{15} \rfloor = 166 + 100 - 33 = 233$

b)

with  $A, B, C$  as in [BB],

$$|A \setminus (B \cup C)| = |A| - |A \cap (B \cup C)|$$

$$\text{Now } |A| = \lfloor \frac{500}{3} \rfloor = 166 \quad \text{and} \quad |A \cap (B \cup C)| =$$

=

$$= |(A \cap B) \cup (A \cap C)|$$

$$= |A \cap B| + |A \cap C| - |A \cap B \cap C| \quad (\text{By I-E})$$

$$= 33 + 83 - 16 = 100$$

$$\text{So answer is } 166 - 100 = \underline{66}$$

22) a) [BB]

b) We use result from a)

$$\text{From } \textcircled{a} \text{ on P155. } |(A \oplus B) \oplus C| = |(A \oplus B) \cup C| - |(A \oplus B) \cap C|$$

$$= |A \oplus B| + |C| - 2|(A \oplus B) \cap C| \quad \text{by the I-E Principle}$$

$$= \underline{|A| + |B| + |C| - 2|A \cap B| - 2|A \cap C| - 2|B \cap C| + 4|A \cap B \cap C|} \quad \text{from a)}$$