1. For each of the following sets, write out the set using the listing method. Also write down the cardinality of each set.

   (a) $\{s : s \text{ is an negative integer } -10 \leq s \leq 0\}$

   (b) $\{t : t \text{ is an even number } 1 \leq t \leq 20\}$

   (c) $\{u : u \text{ is a prime number } 1 \leq u \leq 20\}$

   (d) $\{v : v \text{ is a multiple of 3 } 1 \leq v \leq 20\}$

2. Consider the set Z:

$$Z = \{a, b, c\}$$

   (i) How many sets are in the power set of Z?

   (ii) Write out the power set of Z.

   (iii) How many elements are in each element set?

3. Describe the following set by the listing method

$$\{2r + 1 : r \in \mathbb{Z}^+ \text{ and } r \leq 5\}$$

4. Describe the following set by the listing method

   (a) $\{s : \text{s is an odd integer and} 2 \leq s \leq 10\}$

   (b) $\{2m : m \in Z \text{ and } 5 \leq m \leq 10\}$

   (c) $\{2^t : t \in Z \text{ and } 0 \leq t \leq 5\}$

5. Describe the following set by the builder method

   (a) {12,13,14,15,16,17}

   (b) {0,5,-5,10,-10,15,-15,.....}

   (c) {6,8,10,12,14,16,18}

6. Consider the universal set U such that

$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

   and the sets

$$A = \{2, 5, 7, 9\}$$
$$B = \{2, 4, 6, 8, 9\}$$

   (a) $A - B$

   (b) $A \otimes B$

   (c) $A \cap B$

   (d) $A \cup B$

   (e) $A' \cap B'$

   (f) $A' \cup B'$

7. Given S is the set of all 5 digit binary strings, E is the set of a 5 digit binary strings beginning with a 1 and F is the set of all 5 digit binary strings ending with two zeroes.

(a) Find the cardinality of S, E and F.

(b) Draw a Venn diagram to show the relationship between the sets S, E and F. Show the relevant number of elements in each region of your diagram.

8. Suppose we have the sets A and B defined as follows:

$$A = \{\sqrt{2}, \frac{3}{2}, 2\}$$

$$B = \{x \in R : XnotinQ\}$$

(i) $A \cap Q$

(ii) $A \cap B$

(iii) $B \cup Q$

9. Shade in the following areas on Venn diagrams.

(a) $A' \cup B$

(b) $A \cap B'$

(c) $(A \cap B)'$

(d) $A' \cup B'$

(e) $(A \cup B)'$

(f) $A' \cap B'$

10. Draw a Venn Diagram to represent the universal set $\mathcal{U} = \{0, 1, 2, 3, 4, 5, 6\}$ with subsets:

$$A = \{2, 4, 5\}$$
$$B = \{1, 4, 5, 6\}$$

Find each of the following

(a) $A \cup B$

(b) $A \cap B$

(c) $A - B$

(d) $B - A$

(e) $A \otimes B$

11. Given S is the set of all 5 digit binary strings, E is the set of a 5 digit binary strings beginning with a 1 and F is the set of all 5 digit binary strings ending with two zeroes.

(a) Find the cardinality of S, E and F.

(b) Draw a Venn diagram to show the relationship between the sets S, E and F. Show the relevant number of elements in each region of your diagram.

12. Using membership tables

A	B	C	x	y	z
0	0	0	1	1	1
0	0	1	0	0	1
0	1	0	0	0	1
0	1	1	0	0	1
1	0	0	1	0	1
1	0	1	1	0	1
1	1	0	0	0	1
1	1	1	1	0	1

(i) Draw a venn diagram to show three subsets A,B and C of a universal set U intersecting in the most general way?

(ii) How are sets X and Z related?

(iii) Can you describe each of the subsets X,Y and Z in terms of the sets A,B,C using the operations union intersection and set complement.

13. Describe the following set by the listing method

$$\{2r + 1 : r \in Z^{+} and r \leq 5\}$$

14. Let n be an element of the set $\{10, 11, 12, 13, 14, 15, 16, 17, 18, 19\}$, and p and q be the propositions: p : n is even, $q : n > 15$. Draw up truth tables for the following statements and find the values of n for which they are true:

(a) $p \vee \neg q$

(b) $\neg p \wedge q$