ACTIVITY No. 1

OBJECTIVE

To find the number of subsets of a given set and verify that if a set has n number of elements, then the total number of subsets is 2^n.

MATERIAL REQUIRED

Paper, Different coloured pencils.

METHOD OF CONSTRUCTION

1. Take the empty set (say) A_0 which has no element.
2. Take a set (say) A_1 which has one element (say) a_1.
3. Take a set (say) A_2 which has two elements (say) a_1 and a_2.
4. Take a set (say) A_3 which has three elements (say) a_1, a_2 and a_3.

DEMONSTRATION

1. Represent the set A_0 as in Fig.1.
   Here, the possible subsets of A_0 is A_0 itself only, represented symbolically by $\emptyset$.
   The number of subsets of A_0 is $1 = 2^0$.

2. Represent the set A_1 as in Fig. 2.
   Here, the subsets of A_1 are $\emptyset$, $\{a_1\}$.
   The number of subsets of A_1 is $2 = 2^1$

3. Represent the set A_2 as in Fig. 3.
   Here the subsets of A_2 are $\emptyset$, $\{a_1\}$, $\{a_2\}$, $\{a_1, a_2\}$.
   The number of subsets of A_2 is $4 = 2^2$.

4. Represent the set A_3 as in Fig. 4
   Here the subsets of A_3 are $\emptyset$, $\{a_1\}$, $\{a_2\}$, $\{a_3)$, $\{a_1, a_2\}$, $\{a_2, a_3)$, $\{a_3, a_1)$ and $\{a_1, a_2, a_3\}$.
   The number of subsets of A_3 is $8 = 2^3$.

   Continuing this way, the number of subsets of set A containing n elements a_1, 2, a_3,..., a_n is 2^n.

OBSERVATION

1. The number of subsets of A_0 is $1 = 2^0$
2. The number of subsets of A_1 is $2 = 2^1$
3. The number of subsets of A_2 is $4 = 2^2$
4. The number of subsets of A_3 is $8 = 2^3$

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5. The number of subsets of A_n is $= 2^n$

APPLICATION

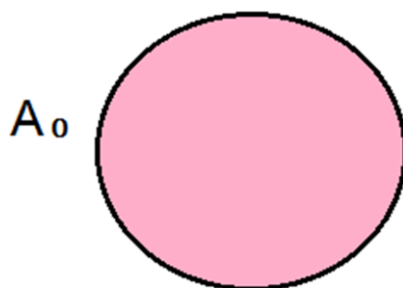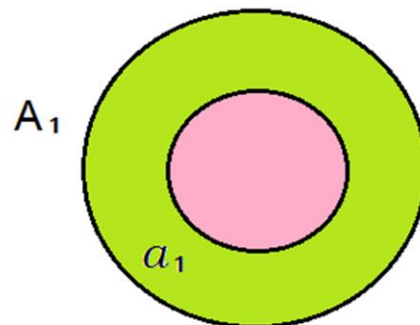The activity can be used for calculating the number of subsets of a given set.

Fig. 1

A_0
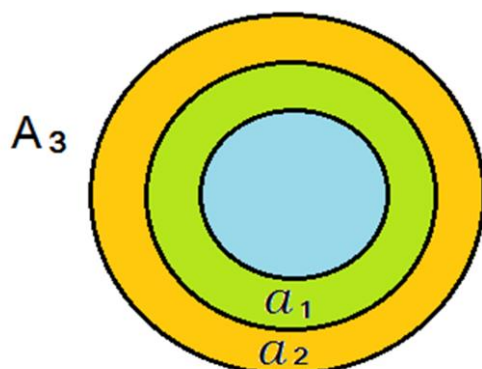
Fig. 2

A_1

a_1

Fig. 3

A_3

a_1

a_2

Fig. 4

A_4

a_1

a_2

a_3