

## Problem

If  $C$  is a set with  $c$  elements, how many elements are in the power set of  $C$ ? Explain your answer.

## Step-by-step solution

### Step 1 of 1

Consider the data, Number of elements in set  $C = c$

#### Formula:

When the number of elements in the set  $S$  is  $n$ , then its power set consists of  $2^n$  elements.

The Power set is the set of all subsets of the set  $S$ .

The set  $C$  contains  $c$  elements such as  $\{c_1, c_2, c_3, \dots, c_c\}$ . Substituting, ' $c$ ' instead of ' $n$ '. The number of elements in the power set of  $C$  is ' $2^c$ ' elements.

#### Example:

Assume  $C = \{1, 2, 3, 4\}$ . So, the number of elements in set  $C$  is 4.

The total subsets of the set  $C$  are:

$\{\}, \{1\}, \{2\}, \{3\}, \{4\}, \{1, 2\}, \{1, 3\}, \{1, 4\}, \{2, 3\}, \{2, 4\},$   
 $\{3, 4\}, \{1, 2, 3\}, \{1, 2, 4\}, \{1, 3, 4\}, \{2, 3, 4\}, \{1, 2, 3, 4\}.$

The set of all subsets is called a Power set. Thus, the power set is as follows:

$$P(C) = \left\{ \{\}, \{1\}, \{2\}, \{3\}, \{4\}, \{1, 2\}, \{1, 3\}, \{1, 4\}, \{2, 3\}, \{2, 4\}, \{3, 4\}, \{1, 2, 3\}, \{1, 2, 4\}, \{1, 3, 4\}, \{2, 3, 4\}, \{1, 2, 3, 4\} \right\}$$

The number of elements in the power set is 16 ( $2^4$ ).

Thus, when the number of elements in a set  $C$  is  $c$ , then the number of elements in its power set consists of  $2^c$  elements.

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