



Sets Ex 1.4 Q13

We have $A \subseteq B$, $B \subseteq C$ and $C \subseteq A$, so $A \subseteq B \subseteq C \subseteq A$
Now, A is a subset of B and B is a subset of C , so

A is a subset of C , i.e., $A \subseteq C$

Also, $C \subseteq A$

Hence, $A = C$

Sets Ex 1.4 Q14

\therefore an empty set has zero element.

\therefore power set of \emptyset has $2^0 = 1$ element.

Sets Ex 1.4 Q15

(i)

The set of right triangles is a subset of the set of all triangles in the plane. So, the set of all triangles in the plane forms a universal set for the set of right triangles.

(ii)

The set of isosceles triangles forms a subset of the set of all triangles in the plane.

Hence the set of all triangles in the plane forms a universal set for the set of isosceles triangles.

Sets Ex 1.4 Q16

$$X = \{8^n - 7n - 1 : n \in \mathbb{N}\}$$

$$Y = \{4n(n-1) : n \in \mathbb{N}\}$$

In order to show that $X \subseteq Y$ we show that every element of X is an element of Y .

So let $x \in X \Rightarrow x = 8^m - 7m - 1$ for some $m \in \mathbb{N}$

$$\begin{aligned} \Rightarrow x &= (1+7)^m - 7m - 1 \\ &= \left({}^mC_0 1^m + {}^mC_1 1^{m-1} 7 + \dots + {}^mC_{m-1} 1^1 7^{m-1} + {}^mC_m 7^m \right) - 7m - 1 \\ &\quad \text{[using binomial expansion]} \\ &= 1 + 7m + {}^mC_2 7^2 + {}^mC_3 7^3 + \dots + {}^mC_m 7^m - 7m - 1 \\ &= {}^mC_2 7^2 + {}^mC_3 7^3 + \dots + {}^mC_m 7^m \\ &= 49 \left({}^mC_2 + {}^mC_3 7 + \dots + {}^mC_m 7^{m-2} \right), \quad m \geq 2 \\ &= 49 t_m, \quad m \geq 2, \quad \text{where } t_m = {}^mC_2 + {}^mC_3 7 + \dots + {}^mC_m 7^{m-2} \end{aligned}$$

Is some positive integer depending on $m \geq 2$

For $m = 1$

$$\begin{aligned} x &= 8^1 - 7 \times 1 - 1 \\ &= 8 - 8 \\ &= 0 \end{aligned}$$

Hence, X contains all positive integral multiples of 49.

Also, Y consists of all positive integral multiples of 49, including 0, for $n = 1$.

Thus, we conclude that $X \subseteq Y$.

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