

Proof Writing: Set Theory (Day 1)

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1 Sets

A set is a collection of objects known as elements. Sets can be either finite, or infinite.

1.1 Finite Sets

Examples:

$$\{1, 2, 3, 4, 5, 6\}$$

$$\{\text{all letters of the alphabet}\}$$

1.2 Infinite Sets

Examples:

$$A = \{1, 3, 5, \dots\}$$

$$B = \{\text{all real numbers}\}$$

Sets are made up of elements. The relation of "being an element of" is written via:

$$a \in A$$

Means 'a' is an element of 'A'.

2 Warm Up Exercises : Answers

1.

$$\begin{aligned} \{x \in \mathbb{Z} \text{ s.t. } |7x| < 24\} = \\ \{-3, -2, -1, 0, 1, 2, 3\} \end{aligned} \tag{1}$$

2.

$$\begin{aligned}
 &\{x \in \mathbb{R} \text{ s.t. } 7x^2 - x^3 = 12x\} \\
 &\quad 7x^2 - x^3 - 12x = 0 \\
 &\quad x(7x - x^2 - 12) = 0 \\
 &\quad -x(x^2 - 7x + 12) = 0 \\
 &\quad -x(x - 3)(x - 4) = 0 \\
 &\quad x = 0, x = 3, x = 4 \\
 &\{x \in \mathbb{R} \text{ s.t. } 7x^2 - x^3 = 12x\} = \{0, 3, 4\}
 \end{aligned}$$

3.

$$\begin{aligned}
 &\{x \in \mathbb{P}(\{1, 2, 3\}) \text{ s.t. } |x| = 2\} \\
 &\mathbb{P}(\{1, 2, 3\}) = \{\{1\}, \{2\}, \{3\}, \{1, 2\}, \{1, 3\}, \{2, 3\}, \{1, 2, 3\}\} \\
 &\{x \in \mathbb{P}(\{1, 2, 3\}) \text{ s.t. } |x| = 2\} = \{\{1, 2\}, \{1, 3\}, \{2, 3\}\}
 \end{aligned}$$