

EXERCISE No. 3.1

Q. 1 Write the following sets in builder notation:

(i) $\{1,4,9,16,25,36, \dots, 484\}$

Solution:

$\{1,4,9,16,25,36, \dots, 484\}$

Set builder notation:

$\{x \mid x = n^2, n \in \mathbb{N} \wedge 1 \leq n \leq 22\}$

(ii) $\{2,4,8,16,32, \dots, 1024\}$

Solution

let $B = \{2,4,8,16,32, \dots, 1024\}$

Set builder notation:

$\{x \mid x = 2^n, n \in \mathbb{N} \wedge 1 \leq n \leq 10\}$

(iii) $\{0, \pm 1, \pm 2, \dots, \pm 1000\}$

Solution:

$\{0, \pm 1, \pm 2, \dots, \pm 1000\}$

Set builder notation:

$\{x \mid x \in \mathbb{Z} \wedge -1000 \leq x \leq 1000\}$

(iv) $\{6,12,18, \dots, 120\}$

Solution:

$\{6,12,18, \dots, 120\}$

Set builder notation.

$\{x \mid x = 6n, n \in \mathbb{N} \wedge 1 \leq n \leq 20\}$

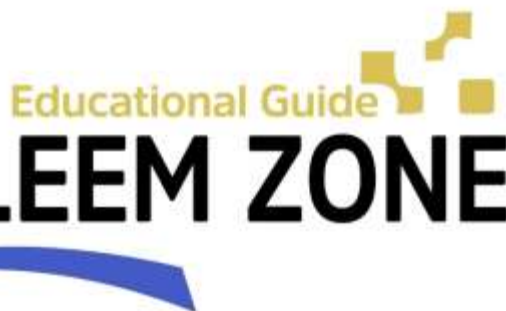
(v) $\{100,102,104, \dots, 400\}$

Solution:

$= \{100,102,104, \dots, 400\}$

Set builder notation:

$= \{x \mid x = 2n, n \in \mathbb{N} \wedge 50 \leq n \leq 200\}$



(vi) $\{1, 3, 9, 27, 81, \dots\}$

Solution:

$\{1, 3, 9, 27, 81, \dots\}$

Set builder notation:

$\{x \mid x = 3^n, n \in W\}$

(vii) $\{1, 2, 4, 5, 10, 20, 25, 50, 100\}$

Solution:

$\{1, 2, 4, 5, 10, 20, 25, 50, 100\}$

Set builder notation:

$\{x \mid x \text{ is a divisor of } 100\}$

(viii) $\{5, 10, 15, \dots, 100\}$

solution:

$\{5, 10, 15, \dots, 100\}$

Set builder notation:

$\{x \mid x = 5n, n \in N \wedge 1 \leq n \leq 20\}$

(ix) The set of all integers between - 1000 and 1000

$\{x \mid x \in Z \wedge -1000 \leq x \leq 1000\}$



Q. 2 Write each of the following sets in tabular forms:

(i) $\{x \mid x \text{ is a multiple of } 3 \wedge x \leq 36\}$

Solution: (Expected correction)

$\{x \mid x \text{ is a multiple of } 3 \wedge x \leq 36\}$

$\{3, 6, 9, \dots, 36\}$

(ii) $\{x \mid x \in \mathbb{R} \wedge 2x + 1 = 0\}$

Solution:

$\{x \mid x \in \mathbb{R} \wedge 2x + 1 = 0\}$

Tabular form:

We know that

$$2x + 1 = 0$$

$$2x = -1$$

$$x = -\frac{1}{2}$$

$$\left\{-\frac{1}{2}\right\}$$

(iii) $\{x \in P \wedge x < 12\}$

Solution:

$$\{x \mid x \in P \wedge x < 12\}$$

Tabular form

$$\{2, 3, 5, 7, 11\}$$

(iv) $\{x \mid x \text{ is a divisor of } 128\}$

Solution:

$$\{x \mid x \text{ is a divisor of } 128\}$$

Tabular form:

$$\{1, 2, 4, 8, 16, 32, 64, 128\}$$

(v) $\{x \mid x = 2^n, n \in N \wedge n < 8\}$

Solution:

$$\{x \mid x = 2^n, n \in N \wedge n < 8\}$$

Tabular form:

$$\{2, 4, 8, 16, 32, 64, 128\}$$

(vi) $\{x \mid x \in N \wedge x + 4 = 0\}$

Solution:

$$\{x \mid x \in N \wedge x + 4 = 0\}$$

Tabular form:

$$x + 4 = 0 \Rightarrow x = -4$$

$$-4 \notin N$$

(viii) $\{x \mid x \in \mathbb{N} \wedge x = x\}$

Solution:



$$\{x \mid x \in N \wedge x = x\}$$

Tabular form:

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

(viii) $\{x \mid x \in \mathbb{Z} \wedge 3x + 1 = 0\}$

Solution:

$$\{x \mid x \in \mathbb{Z} \wedge 3x + 1 = 0\}$$

Tabular form:

$$\because 3x + 1 = 0 \Rightarrow x = -\frac{1}{3}$$

$$\left. \vphantom{\frac{1}{3}} \right\} \because -\frac{1}{3} \notin \mathbb{Z}$$

Q. 3 Write two proper subsets of each of the following sets:

(i) $\{a, b, c\}$

Solution:

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

Two proper subsets are $\{a\}, \{b\}$

(ii) $\{0, 1\}$

Solution:

$$\{0, 1\}$$

Two proper subsets are $\{0\}$ and $\{1\}$

(iii) $\mathbb{N}$

Solution:

$$\mathbb{N} = \{1, 2, 3, 4, 5, \dots\}$$

Two proper subsets:

$$\{1, 3, 5, 7, \dots\} \text{ and } \{2, 4, 6, 8, \dots\}$$

(iv) $\mathbb{Z}$

Solution:

$$\mathbb{Z} = \{0, \pm 1, \pm 2, \pm 3, \pm 4, \dots\}$$

Two proper subsets:

$$\{1, 2, 3, 4, \dots\} \text{ and } \{-1, -2, -3, -4, \dots\}$$

(v) $\mathbb{Q}$



Solution:

Two subsets: N and W

(vi) R

Solution:

Since, $R = Q \cup Q'$

Two proper subsets: Q and Q'

(vii) $\{x \mid x \in Q \wedge 0 < x \leq 2\}$

Solution:

$\{x \mid x \in Q \wedge 0 < x \leq 2\}$

Take any two positive rational number.

Two proper subsets: $\left\{\frac{1}{2}\right\}$ $\left\{\frac{2}{3}\right\}$

Q. 4 Is there any set which has proper subset? If so, name that set.

Solution:

Yes, there is empty set has no proper subset.

Q. 5 What is the difference between $\{a, b\}$ and $\{\{a, b\}\}$?

Solution

$\{a, b\}$ is a set containing two elements a and b while $\{\{a, b\}\}$ is a singleton set having only one element $\{a, b\}$

Q. 6 What is the number of elements of the power set of each of the following sets?

(i) $\{\}$

Solution:

No. of elements = $n = 0$

No. of elements in power set = $2^n = 2^0 = 1$

(ii) $\{0,1\}$

Solution:

$\{0,1\}$

No. of elements in given set = $n = 2$

No. of elements in power set $2^n = 2^2 = 4$

(iii) $\{1,2,3,4,5,6,7\}$

Solution:

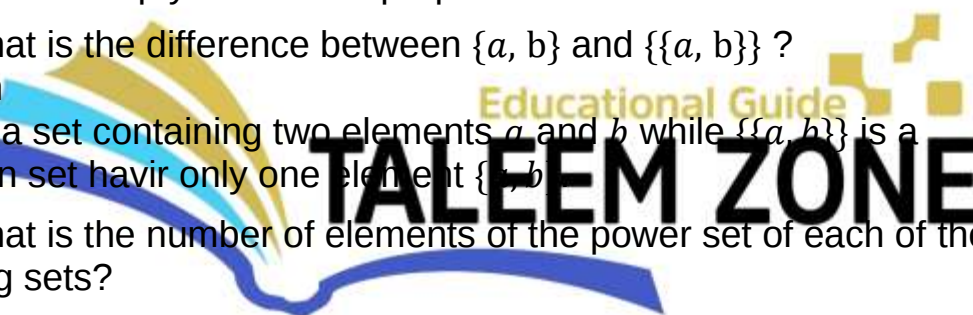
$\{1,2,3,4,5,6,7\}$

No. of elements in given set = $n = 7$

No. of elements in power set = $2^n = 2^7 = 128$

(iv) $\{0,1,2,3,4,5,6,7\}$

Solution:



$$\{0,1,2,3,4,5,6,7\}$$

No. of elements in given set = $n = 8$

No. of elements in power set = $2^n = 2^8 = 256$

(v) $\{a, \{b, c\}\}$

Solution:

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

No. of elements in given set = $n = 2$

No. of elements in power set = $2^n = 2^2 = 4$

(vi) $\{\{a, b\}, \{b, c\}, \{d, e\}\}$

Solution:

$\{\{a, b\}, \{b, c\}, \{d, e\}\}$

No. of elements in given set = $n = 3$

No. of elements in power set = $2^n = 2^3 = 8$

Q. 7 Write down the power set of each of the following sets:

(i) $\{9, 11\}$

Solution

$\{9, 11\}$

No. of elements in given set = $n = 2$

No. of elements in power set = $2^n = 2^2 = 4$

Power set: $\{\phi, \{9\}, \{11\}, \{9, 11\}\}$

(ii) $\{+, -, x, \div\}$

Solution:

$\{+, -, x, \div\}$

No. of elements in power set = $2^n = 2^4 = 16$

Power set:

$\{\phi, \{+\}, \{-\}, \{x\}, \{\div\}, \{+, -\}, \{+, x\}, \{+, \div\},$
 $\{-, x\}, \{-, \div\}, \{x, \div\}, \{+, -, x\}, \{+, -, \div\},$
 $\{+, x, \div\}, \{-, x, \div\}, \{+, -, x, \div\}\}$

(iii) $\{\phi\}$

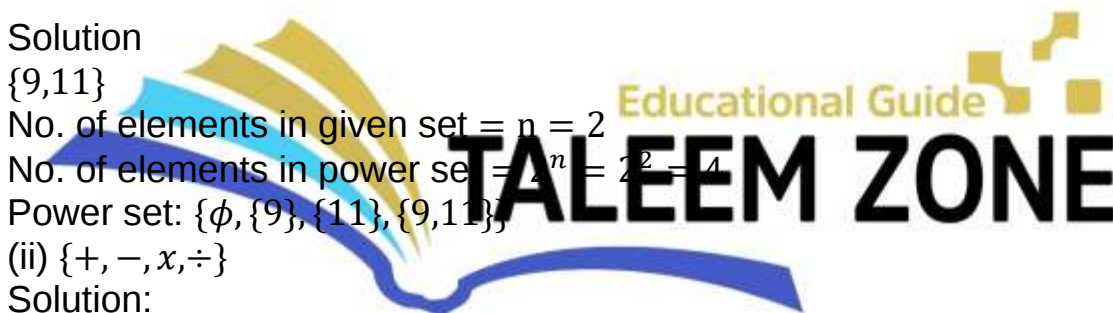
Solution:

$\{\phi\}$

No. of elements in power set = $2^n = 2^1 = 2$ Power set:

$\{\phi, \{\phi\}\}$

(iv) $\{a, \{b, c\}\}$



Solution:

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

No. of elements in power set = $2^n = 2^2 = 4$ Power set:

$\{\phi, \{a\}, \{b, c\}, \{a, \{b, c\}\}\}$

