

Sets Exercise 1

Question 1:

Which of the following are sets? Justify your answer.

(i) The collection of all months of a year beginning with the letter J.

(ii) The collection of ten most talented writers of India.

(iii) A team of eleven best-cricket batsmen of the world.

(iv) The collection of all boys in your class.

(v) The collection of all natural numbers less than 100.

(vi) A collection of novels written by the writer Munshi Prem Chand.

(vii) The collection of all even integers.

(viii) The collection of questions in this Chapter.

(ix) A collection of most dangerous animals of the world.

Question 2:

Let $A = \{1, 2, 3, 4, 5, 6\}$. Insert the appropriate symbol \in or \notin in the blank spaces:

(i) $5 \underline{\quad} A$ (ii) $8 \underline{\quad} A$ (iii) $0 \underline{\quad} A$

(iv) $4 \underline{\quad} A$ (v) $2 \underline{\quad} A$ (vi) $10 \underline{\quad} A$

Question 3:

Write the following sets in roster form:

(i) $A = \{x: x \text{ is an integer and } -3 < x < 7\}$.

(ii) $B = \{x: x \text{ is a natural number less than } 6\}$.

(iii) $C = \{x: x \text{ is a two-digit natural number such that the sum of its digits is } 8\}$

(iv) $D = \{x: x \text{ is a prime number which is divisor of } 60\}$.

(v) E = The set of all letters in the word TRIGONOMETRY.

(vi) F = The set of all letters in the word BETTER.

Question 4:

Write the following sets in the set-builder form:

(i) {3, 6, 9, 12} (ii) {2, 4, 8, 16, 32}

(iii) {5, 25, 125, 625} (iv) {2, 4, 6 ...}

(v) {1, 4, 9 ... 100}

Question 5:

List all the elements of the following sets:

(i) A = {x: x is an odd natural number}

(ii) B = {x: x is an integer, $\frac{1}{2} < x < \frac{9}{2}$ }

(iii) C = {x: x is an integer; $x^2 \leq 4$ }

(iv) D = {x: x is a letter in the word "LOYAL"}

(v) E = {x: x is a month of a year not having 31 days}

(vi) F = {x: x is a consonant in the English alphabet which proceeds k}.

Question 6:

Match each of the set on the left in the roster form with the same set on the right described in set-builder form:

(I) {1, 2, 3, 6} (A) {X: X IS A PRIME NUMBER AND A DIVISOR OF 6}

(II) {2, 3} (B) {X: X IS AN ODD NATURAL NUMBER LESS THAN 10}

(III) {M, A, T, H, E, I, C, S} (C) {X: X IS NATURAL NUMBER AND DIVISOR OF 6}

(IV) {1, 3, 5, 7, 9} (D) {X: X IS A LETTER OF THE WORD MATHEMATICS}

Solution 1

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(i) The collection of all months of a year beginning with the letter J is a well-defined collection of objects because one can definitely identify a month that belongs to this collection.

Hence, this collection is a set.

(ii) The collection of ten most talented writers of India is not a well-defined collection because determination of a writer's talent may vary from person to person.

Hence, this collection is not a set.

(iii) A team of eleven best cricket batsmen of the world is not a well-defined collection because the determination a batsman's talent may vary from person to person.

Hence, this collection is not a set.

(iv) The collection of all boys in your class is a well-defined collection because you can definitely identify a boy who belongs to this collection.

Hence, this collection is a set.

(v) The collection of all natural numbers less than 100 is a well-defined collection because one can definitely identify a number that belongs to this collection.

Hence, this collection is a set.

(vi) A collection of novels written by the writer Munshi Prem Chand is a well-defined collection because one can definitely identify a book that belongs to this collection.

Hence, this collection is a set.

(vii) The collection of all even integers is a well-defined collection because one can definitely identify an even integer that belongs to this collection.

Hence, this collection is a set.

(viii) The collection of questions in this chapter is a well-defined collection because one can definitely identify a question that belongs to this chapter.

Hence, this collection is a set.

(ix) The collection of most dangerous animals of the world is not a well defined collection because the determination of the dangerousness of an animal can vary from person to person.

Hence, this collection is not a set.

Solution 2

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$A = \{1, 2, 3, 4, 5, 6\}$. The answer are quite apparent

(i) $5 \in A$ as 5 belongs to A

(ii) $8 \notin A$ as 8 does not belongs to A

(iii) $0 \notin A$ as 0 does not belongs to A

(iv) $4 \in A$ as 4 does belongs to A

(v) $2 \in A$ as 2 does belongs to A

(vi) $10 \notin A$ as 10 does not belongs to A

Solution 3

1	$A = \{x: x \text{ is an integer and } -3 < x < 7\}$	The elements of this set are $-2, -1, 0, 1, 2, 3, 4, 5$, and 6 only. Therefore, the given set can be written in roster form as $A = \{-2, -1, 0, 1, 2, 3, 4, 5, 6\}$
2	$B = \{x: x \text{ is a natural number less than } 6\}$	The elements of this set are 1, 2, 3, 4, and 5 only. Therefore, the given set can be written in roster form as $B = \{1, 2, 3, 4, 5\}$
3	$C = \{x: x \text{ is a two-digit natural number such that the sum of its digits is } 8\}$	The numbers whose sum is 8 can be (1,7) (4,4) (2,6) (3,5), (8,0) So The elements of this set are 17, 26, 35, 44, 53, 62, 71, and 80 only. Therefore, this set can be written in roster form as $C = \{17, 26, 35, 44, 53, 62, 71, 80\}$
4	$D = \{x: x \text{ is a prime number which is a divisor of } 60\}$	$60 = 2 \times 2 \times 3 \times 5$ The elements of this set are 2, 3, and 5 only.

		Therefore, this set can be written in roster form as $D = \{2, 3, 5\}$.
5	E = The set of all letters in the word TRIGONOMETRY	There are 12 letters in the word TRIGONOMETRY, out of which letters T, R, and O are repeated. Therefore, this set can be written in roster form as $E = \{T, R, I, G, O, N, M, E, Y\}$
6	F = The set of all letters in the word BETTER	There are 6 letters in the word BETTER, out of which letters E and T are repeated. Therefore, this set can be written in roster form as $F = \{B, E, T, R\}$

Solution 4:

1	$\{3, 6, 9, 12\}$	$\{x: x = 3n, n \in \mathbb{N} \text{ and } 1 \leq n \leq 4\}$
2	$\{2, 4, 8, 16, 32\}$	It can be seen that $2 = 2^1, 4 = 2^2, 8 = 2^3, 16 = 2^4, \text{ and } 32 = 2^5$ $\therefore \{2, 4, 8, 16, 32\} = \{x: x = 2^n, n \in \mathbb{N} \text{ and } 1 \leq n \leq 5\}$
3	$\{5, 25, 125, 625\}$	It can be seen that $5 = 5^1, 25 = 5^2, 125 = 5^3, \text{ and } 625 = 5^4$. $\therefore \{5, 25, 125, 625\} = \{x: x = 5^n, n \in \mathbb{N} \text{ and } 1 \leq n \leq 4\}$

4	{2, 4, 6 ...}	{x: x is an even natural number}
5	{1, 4, 9 ... 100}	It can be seen that $1 = 1^1$, $4 = 2^2$, $9 = 3^3$... $100 = 10^2$. $\therefore \{1, 4, 9 \dots 100\} = \{x: x = n^2, n \in \mathbb{N} \text{ and } 1 \leq n \leq 10\}$

Solution 5:

1	A = {x: x is an odd natural number}	{1, 3, 5, 7, 9 ...}
2	B = {x: x is an integer, $\frac{1}{2} < x < \frac{9}{2}$ }	As $\frac{1}{2} = .5$ and $\frac{9}{2} = 4.5$, the only integer are 1,2,3,,4
3	C = {x: x is an integer; $x^2 \leq 4$ }	Given that $x^2 \leq 4$ taking root both sides we get $- 2 \leq x \leq 2$ Integers number between and including -2 and 2 are -2, -1, 0, 1, and 2 Hence C = {-2, -1, 0, 1, 2}
4	D = {x: x is a letter in the word "LOYAL"}	Word LOYAL has alphabet L, O, Y and A Hence D = {L, O, Y, A}
5	E = {x: x is a month of a year not having 31 days}	Month of year having 31 days are February, April, June, September and November. Hence E= {February, April, June, September, November} E = {T, R, I, G, O, N, M, E, Y}
6	F = {x: x is a consonant in the English alphabet which	Consonant in the English alphabet before alphabet k are b, c, d, f, g, and j.

	precedes $k\} = \{b, c, d, f, g, h, j\}$	Hence $E = \{b, c, d, f, g, h, j\}$
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Solution 6:

(i) All the elements of this set are natural numbers as well as the divisors of 6

Therefore, (i) matches with (c).

(ii) It can be seen that 2 and 3 are prime numbers. They are also the divisors of 6.

Therefore, (ii) matches with (a).

(iii) All the elements of this set are letters of the word MATHEMATICS.

Therefore, (iii) matches with (d).

(iv) All the elements of this set are odd natural numbers less than 10.

Therefore, (iv) matches with (b).