

Exercise 1.2

Question 1:

Which of the following are examples of the null set

- (i) Set of odd natural numbers divisible by 2
- (ii) Set of even prime numbers
- (iii) $\{x : x \text{ is a natural numbers, } x < 5 \text{ and } x > 7\}$
- (iv) $\{y : y \text{ is a point common to any two parallel lines}\}$

Solution 1:

- (i) A set of odd natural numbers divisible by 2 is a null set because no odd number is divisible by 2.
 - (ii) A set of even prime numbers is not a null set because 2 is an even prime number.
 - (iii) $\{x : x \text{ is a natural number, } x < 5 \text{ and } x > 7\}$ is a null set because a number cannot be simultaneously less than 5 and greater than 7.
 - (vi) $\{y : y \text{ is a point common to any two parallel lines}\}$ is a null set because parallel lines do not intersect. Hence, they have no common point.
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Question 2:

Which of the following sets are finite or infinite

- (i) The set of months of a year
- (ii) $\{1, 2, 3, \dots\}$
- (iii) $\{1, 2, 3, \dots, 99, 100\}$
- (iv) The set of positive integers greater than 100

(v) The set of prime numbers less than 99

Solution 2:

- (i) The set of months of a year is a finite set because it has 12 elements.
 - (ii) $\{1, 2, 3 \dots\}$ is an infinite set as it has infinite number of natural numbers.
 - (iii) $\{1, 2, 3 \dots 99, 100\}$ is a finite set because the numbers from 1 to 100 are finite in number.
 - (iv) The set of positive integers greater than 100 is an infinite set because positive integers greater than 100 are infinite in number.
 - (v) The set of prime numbers less than 99 is a finite set because prime numbers less than 99 are finite in number.
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Question 3:

State whether each of the following set is finite or infinite:

- (i) The set of lines which are parallel to the x-axis
- (ii) The set of letters in the English alphabet
- (iii) The set of numbers which are multiple of 5
- (iv) The set of animals living on the earth
- (v) The set of circles passing through the origin $(0, 0)$

Solution 3:

- (i) The set of lines which are parallel to the x-axis is an infinite set because lines parallel to the x-axis are infinite in number.
 - (ii) The set of letters in the English alphabet is a finite set because it has 26 elements.
 - (iii) The set of numbers which are multiple of 5 is an infinite set because multiple of 5 are infinite in number.
 - (iv) The set of animals living on the earth is a finite set because the number of animals living on the earth is finite (although it is quite a big number).
 - (v) The set of circles passing through the origin $(0, 0)$ is an infinite set because infinite number of circles can pass through the origin.
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Question 4:

In the following, state whether $A = B$ or not:

- (i) $A = \{a, b, c, d\}$; $B = \{d, c, b, a\}$

$$(ii) A = \{4, 8, 12, 16\}; B = \{8, 4, 16, 18\}$$

$$(iii) A = \{2, 4, 6, 8, 10\}; B = \{x : x \text{ is positive even integer and } x \leq 10\}$$

$$(iv) A = \{x : x \text{ is a multiple of } 10\}; B = \{10, 15, 20, 25, 30, \dots\}$$

Solution 4:

$$(i) A = \{a, b, c, d\}; B = \{d, c, b, a\}$$

The order in which the elements of a set are listed is not significant.

$$\therefore A = B$$

$$(ii) A = \{4, 8, 12, 16\}; B = \{8, 4, 16, 18\}$$

It can be seen that $12 \in A$ but $12 \notin B$.

$$\therefore A \neq B$$

$$(iii) A = \{2, 4, 6, 8, 10\}$$

$$B = \{x : x \text{ is a positive even integer and } x \leq 10\}$$

$$= \{2, 4, 6, 8, 10\}$$

$$\therefore A = B$$

$$(iv) A = \{x : x \text{ is a multiple of } 10\}$$

$$B = \{10, 15, 20, 25, 30, \dots\}$$

It can be seen that $15 \in B$ but $15 \notin A$.

$$\therefore A \neq B$$

Question 5:

Are the following pair of sets equal? Give reasons.

$$(i) A = \{2, 3\}; B = \{x : x \text{ is solution of } x^2 + 5x + 6 = 0\}$$

$$(ii) A = \{x : x \text{ is a letter in the word FOLLOW}\}; B = \{y : y \text{ is a letter in the word WOLF}\}$$

Solution 5:

$$(i) A = \{2, 3\}; B = \{x : x \text{ is a solution of } x^2 + 5x + 6 = 0\}$$

The equation $x^2 + 5x + 6 = 0$ can be solved as:

$$x(x+3)+2(x+3)=0$$

$$(x+2)(x+3)=0$$

$$x = -2 \text{ or } x = -3$$

$$\therefore A = \{2, 3\}; B = \{-2, -3\}$$

$$\therefore A \neq B$$

$$(ii) A = \{x : x \text{ is a letter in the word FOLLOW}\} = \{F, O, L, W\}$$

$$B = \{y : y \text{ is a letter in the word WOLF}\} = \{W, O, L, F\}$$

The order in which the elements of a set are listed is not significant.

$$\therefore A = B$$

Question 6:

From the sets given below, select equal sets:

$$A = \{2, 4, 8, 12\}, B = \{1, 2, 3, 4\}, C = \{4, 8, 12, 14\}, D = \{3, 1, 4, 2\}$$

$$E = \{-1, 1\}, F = \{0, a\}, G = \{1, -1\}, H = \{0, 1\}$$

Solution 6:

$$A = \{2, 4, 8, 12\}; B = \{1, 2, 3, 4\}; C = \{4, 8, 12, 14\}$$

$$D = \{3, 1, 4, 2\}; E = \{-1, 1\}; F = \{0, a\}$$

$$G = \{1, -1\}; H = \{0, 1\}$$

It can be seen that

$$8 \in A, 8 \notin B, 8 \notin D, 8 \notin E, 8 \notin F, 8 \notin G, 8 \notin H$$

$$\Rightarrow A \neq B, A \neq D, A \neq E, A \neq F, A \neq G, A \neq H$$

$$\text{Also, } 2 \in A, 2 \notin C$$

$$\therefore A \neq C$$

$$3 \in B, 3 \notin C, 3 \notin E, 3 \notin F, 3 \notin G, 3 \notin H$$

$$\therefore B \neq C, B \neq E, B \neq F, B \neq G, B \neq H$$

$$12 \in C, 12 \notin D, 12 \notin E, 12 \notin F, 12 \notin G, 12 \notin H$$

$$\therefore C \neq D, C \neq E, C \neq F, C \neq G, C \neq H$$

$4 \in D, 4 \notin E, 4 \notin F, 4 \notin G, 4 \notin H$

$\therefore D \neq E, D \neq F, D \neq G, D \neq H$

Similarly, $E \neq F, E \neq G, E \neq H$

$F \neq G, F \neq H, G \neq H$

The order in which the elements of a set are listed is not significant.

$\therefore B = D$ and $E = G$

Hence, among the given sets, $B = D$ and $E = G$.

