MATHS

NCERT - NCERT MATHEMATICS(HINGLISH)

SETS

Miscellaneous Exercise

1. Show that $A \cap B = A \cap C$ need not imply $B = C$.

2. Let A and B be sets. If $A \cap X = B \cap X = \varphi$ and $A \cup X = B \cup X$ for some set X, show that $A = B$. (Hints $A = A \cap (A \cup X), B = B \cap (B \cup X)$ and use Distributive law)

3. In a group of students, 100 students know Hindi, 50 know English and 25 know both. Each of the students knows either Hindi or English. How many students are there in the group?

4. Using properties of sets, show that(i) $A \cup (A \cap B) = A$ (ii) $A \cap (A \cup B) = A$.

5. Show that for any sets A and B,

$$A = (A \cap B) \cup (A - B) \text{ and}$$

$$A \cup (B - A) = (A \cup B)$$

6.

Decide, among the following sets, which sets are subsets of one and another:

A = { $x : x \in R$ and x satisfy $x^2 - 8x + 12 = 0$ },

B = { 2, 4, 6 }, C = { 2, 4, 6, 8, . . . }, D = { 6 }.

7. Let A, B and C be the sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$. show that $B = C$

8. In each of the following, determine whether the statement is true or false. If it is true, prove it. If it is false, give an example.(i) If

$x \subset A$ and $A \subset B$, then $x \subset B$(ii) If $A \subset B$ and $B \subset C$ then $A \subset C$

9. Show that if $A \subset B$, then $C - B \subset C - A$.

10. Show that the following four conditions are equivalent:(i)$A \subset B$ (ii) $AB = \varphi$ (iii) $A \cup B = B$ (iv) $A \cap B = A$

11. Is it true that for any sets A and B,
$P(A) \cup P(B) = P(A \cup B)$? Justify your
answer.

12. Assume that $P(A) = P(B)$. Show that
$A = B$

13. In a survey it was found that 21 people liked product A, 26 liked product B and 29 liked product C. If 14 people liked products A and B, 12 people liked products C and A, 14 people liked products B and C and 8 liked all the three products. Find how many liked product C only.

▶ **Watch Video Solution**

Exercise 1 1

1. 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$\}$.

▶ **Watch Video Solution**

2. List all the elements of the following sets :

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

(ii) B = {x : x is an integer, `-1/2 (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 precedes k }.

3. Write the following sets m the setbuilder form:(i) $(3, 6, 9, 12\}$ (ii) $\{2, 4, 8, 16, 32\}$ (iii) $\{5, 25, 125, 625\}$(iv) $\{2, 4, 6, \ldots\}$ (v) $\{1, 4, 9, \ldots, 100\}$

4. Write the following sets in roster form:

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

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

(iii) C = {x: x is a two digit natural number such

that the sum of its digits

(iv) D = {x : x 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

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

(i) 5.... A

(ii) 8...A

(iii) 0.... A

(iv) 4. .... A

(v) 2. .... A

(vi) 10.... . A

▶ **Watch Video Solution**

6. Which of the following are sets? Justify your answer.(i) The collection of all the months of a year beginning with the letter J.(ii) The

collection of ten most talented writers of India.(iii) A team of elevens 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.

1. What universal set(s) would you propose for each of the following :(i) The set of right triangles. (ii) The set of isosceles triangles.

> ▶ **Watch Video Solution**

2. Make correct statements by filling the symbols $\subset$ or $\not\subset$ in the blank spaces :

(i) {2, 3,4}. . .{1, 2, 3, 4,5}

(ii) { a , b , c }. . .{b , c , d }

(iii) {x: x is a student of Class XI of your school}.

. . {x : x student of your school}

(iv) {x : x is a circle in the plane} . . .{x : x is a circle in the same plane with radius 1 unit}

(v) {x : x is a triangle in a plane} . . . {x : x is a rectangle in the plane}

(vi) { x : x is an equilateral triangle in a plane} . . . { x : x is a triangle in the same plane}

(vii) {x : x is an even natural number} . . . {x : x is an integer}

3. Let $A = \{1, 2, \{3, 4\}, 5\}$. Which of the following statements are incorrect and why?

(i) $\{3, 4\} \subset A$

(ii) $\{3, 4\} \in A$

(iii) $\{\{3, 4\}\} \subset A$

(iv) $1 \in A$

(v) $1 \subset A$ (vi) $\{1, 2, 5\} \subset A$

(vi) $\{1, 2, 5\} \subset A$

(vii) $\{1, 2, 5\} \in A$

(viii) $\{1, 2, 3\} \subset A$

(ix) $\varphi \in A$

(x) $\varphi \subset A$

(xi) $\{\varphi\} \subset A$

4. Examine whether the following statements are true or false:

(i) $\{ a, b \} \not\subset \{ b, c, a \}$

(ii) $\{ a, e \} \subset \{ x : x$ is a vowel in the English alphabet$\}$

(iii) $\{ 1, 2, 3 \} \subset \{ 1, 3, 5 \}$

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

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

(vi) $\{ x : x$ is an even natural number less than

6} $\subset$ { x : x is a natural number which divides 36}

5. How many elements has P(A), if $A = \varphi$?

6. Write down all the subsets of the following sets (i) $\{a\}$ (ii) $\{a, b\}$ (iii) $\{1, 2, 3\}$ (iv) φ

7. Write the following intervals in set builder form:(i) $(3, 0)$ (ii) $[6, 12]$ (iii) $(6, 12]$ (iv) $[23, 5)$

8. Write the following as intervals : (i) $\{x : x \in R, 4 < x \le 6\}$(ii) $\{x : x \in R, 12 < x < 10\}$(iii) $\{x : x \in R, 0 \le x < 7\}$ (iv) $\{x : x \in R, 3 \le x \le 4\}$

Exercise 1 2

1. From the sets given below, select equal sets :

$A = \{2, 4, 8, 12\},$ $\qquad$ $B = \{1, 2, 3, 4\},$

$C = \{4, 8. \ 12, 14\},$ $\qquad$ $D = \{3, 1, 4, 2\}$

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

$H = \{0, 1\}$

2. 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 is po

3. Are the following pair of sets equal? Give reasons.

(i) $A = \{2, 3\}$, B = {x: x is solution of

$x^2 + 5x + 6 = 0\}$

(ii) A = { x : x is a letter in the word FOLLOW} B

= { y : y is a letter in the word WOLF}

4. Which of the following sets are finite or infinite(i) The set of months of a year(ii) $\{1, 2, 3, ...\}$(iii) $\{1, 2, 3, ...99, 100\}$(iv) The set of positive integers greater than 100(v) The set of prime numbers less than 99

5. 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)

6. 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 is a natural numbers, $x < 5$and $x > 7$}(iv) {y: y is a point common to any two parallel lines}

 Watch Video Solution

Solved Examples

1. For any sets A and B. show that $P(A \cap B) = P(A) \cap P(B).$

 Watch Video Solution

2. Out of 500 car owners investigated, 400 owned car A and 200 owned car B, 50 owned both A and B cars. Is this data correct?

3. Write the solution set of the equation $x^2 + x - 2 = 0$ in roster form.

    A. $\{-1, \ -2\}$

    B. $\{1, 2\}$

C. $\{1, \ -2\}$

D. $\{-1, 2\}$

Answer: C

▶ **Watch Video Solution**

4. Write the set {x : x i s a positive integer and $x^2 < 40$}in the roster form.

▶ **Watch Video Solution**

5. Write the set $A = \{1, 4, 9, 16, 25, \ldots\}$ in set builder form.

6. Write the set $\left\{ \dfrac{1}{2}, \dfrac{2}{3}, \dfrac{3}{4}, \dfrac{4}{5}, \dfrac{5}{6}, \dfrac{6}{7} \right\}$ in the setbuilder form.

7. Match each of the set on the left described in the roster form with the same set on the light described in the setbuilder form :(i) $\{P, R, I, N, C, A, L\}$(a) { x : x is a positive integer and is a divisor of 18}(ii) `{ 0

8. If $A \times B = \{(p, q), (p, r), (m, q), (m, r)\}$, Find A and B
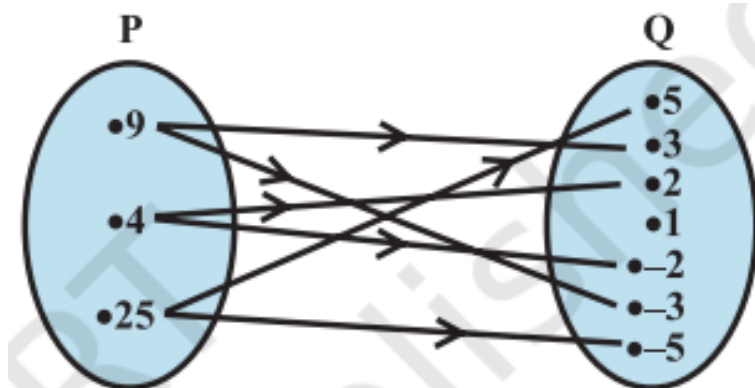
9. Find the pairs of equal sets, if any, give reasons:

A = {0}, B = {x : x > 15 and x < 5}, C = {x : x − 5 = 0 }, D = {x: x 2 = 25}, E = {x : x is an integral positive root of the equation $x^2 - 2x - 15 = 0$}

> ▶ Watch Video Solution

10. The Fig 2.6 shows a relation between the sets P and Q. Write tins relation (i) in set-builder form, (ii) in roster form.What is its

domain and range?

> ▶ Watch Video Solution

11. Consider the sets

$\phi, A = \{1, 3\}, B = \{1, 5, 9\}, C = \{1, 3, 5, 7, 9\}$

.

Insert the symbol $\subset$ or $\not\subset$ between each of the

following pair of sets:

(i) ϕ . . . B

(ii) A . . . B

(iii) A . . . C

(iv) B . . . C

▶ Watch Video Solution

12. Let $A = \{a, e, i, o, u\}$ and $B = \{a, i, u\}$ .Show that $A \cup B = A$

▶ Watch Video Solution

13. Let $A = \{2, 4, 6, 8\}$ and $B = \{6, 8, 10, 12\}$.

Find $A \cup B$.

14. Let A, B and C be three sets. If $A \in B$ and $B \subset C$. is it true that $A \subset C$? If not give an example.

15. Let $A = \{a, e, i, o, u\}$ and $B = \{a, b, c, d\}$.

Is A a subset of B? No.(Why?). Is B a subset of

A? No. (Why?)

16. let f(x) = $\sqrt{x}$ and g(x) = x be function defined

over the set of non negative real numbers .

find $(f + g)(x), (fg)(x)$ and $\left(\dfrac{f}{g}\right)(x)$.

17. Consider the sets X and Y . Find $X \cap Y$ Let

X = {Ram, Geeta, Akbar} be the set of students

of Class XI, who are in school hockey team. Let

Y = {Geeta, David, Ashok} be the set of students

from Class XI who are in the school football

team

18. Let X = {Rani, Geeta, Akbar} be the set of

students of Class XI who are in school hockey

team. Let Y = {Geeta, David, Ashok} be the set

of students from Class XI who are in the

school football team. Find X ∪ Y and interpret

the set

19. Let $V = \{a, e, i, o, u\}$ and $B = \{a, i, k, u\}$.

Find $V - B$ and $B - V$

20. Let $A = \{1, 2, 3, 4, 5, 6\}$, $B = \{2, 4, 6, 8\}$.

Find $A - B$ and $B - A$.

21. Show that the set of letters needed to spell "CATARACT" and the set of letters needed to spell "TRACT" are equal.

22. List all the subsets of the set $\{1, 0, 1\}$.

23. In a survey of 400 students in a school, 100 were listed as taking apple juice, 150 as taking orange juice and 75 were listed as taking both apple as well as orange juice. Find how many students were taking neither apple juice nor orange juice.

24. There are 200 individuals with a skin disorder, 120 had been exposed to the chemical C_1? 50 to chemical C_2, and 30 to both the chemicals C_1 and C_2. Find the number of individuals exposed to(i) Chemical C_1 but not chemical C_2

▶ **Watch Video Solution**

25. In a school there are 20 teachers who teach mathematics or physics. Of these, 12

teach mathematics and 4 teach both physics and mathematics. How many teach physics?

26. In a class of 35 students, 24 like to play cricket and 16 like to play football. Also, each student likes to play at least one of the two games. How many students like to play both cricket and football?

27. Let $U = \{1, 2, 3, 4, 5, 6\}$, $A = \{2, 3\}$and $B = \{3, 4, 5\}$Find A', B', $A' \cap B'$, $A \cup B$ and hence show that $(A \cup B)' = A' \cap B'$..

▶ Watch Video Solution

28. If X and Y are two sets such that X $\cup$ Y has 50 elements, X has 28 elements and Y has 32 elements, how many elements does X $\cap$ Y have?

▶ Watch Video Solution

29. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ and $A = \{1, 3, 5, 7, 9\}$. Find A'.

▶ Watch Video Solution

30. Let u be universal set of all the students of Class XI of a coeducational school and A be the set of all girls in Class XI. Find A'.

▶ Watch Video Solution

Exercise 1 6

1. If X and Y are two sets such that has 18 elements, X has 8 elements and Y has 15 elements; how many elements does $X \cap Y$ have?

2. In a group of 400 people, 250 can speak Hindi and 200 can speak English. How many people can speak both Hindi and English?

3. If X and Y are two sets such that $n(X) = 17$, $n(Y) = 23$ and $n(X \cup Y) = 38$, find $n(X \cap Y)$.

4. In a group of 65 people, 40 like cricket, 10 like both cricket and tennis. How many like tennis only and not cricket? How many like tennis?

5. If S and T are two sets such that S has 21 elements, T has 32 elements, and $S \cap T$ has 11 elements, how many elements does $S \cup T$ have?

6. If X and Y are two sets such that X has 40 elements, $X \cup Y$ has 60 elements and $X \cap Y$

has 10 elements, how many elements does Y have?

▶ **Watch Video Solution**

7. In a committee, 50 people speak French, 20 speak Spanish and 10 speak both Spanish and French. How many speak at least one of these two languages?

▶ **Watch Video Solution**

1. Find the union of each of the following pairs of sets :

(i) $X = \{1, 3, 5\}\ Y = \{1, 2, 3\}$

(ii) $A = [a, e, i, o, u\}\ B = [a, b, c\}$

(iii) $A =$ {x : x is a natural number and multiple of 3} $B =$ {x : x is a natural number less than 6}

(iv) $A =$ {x : x is a natural number and $1 < x \leq 6$ } $B =$ {x : x is a natural number

and $6 < x < 10 \}$

(v)$A = \{1, 2, 3\}, B = \varphi$

2. Let $A = \{a, b\}, B = \{a, b, c\}$.Is $A \subset B$?

What is $A \cup B$?

3. If A and B are two sets such that $A \subset B$,

then what is $A \cup B$?

4. If $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6\}$, $C = \{5, 6, 7, 8\}$ and $D = \{7, 8, 9, 10\}$: find (i) $A \cup B$ (ii) $A \cup C$ (iii) $B \cup C$ (iv) $B \cup D$ (v) $A \cup B \cup C$ (vi) $A \cup B \cup D$ (vii) $B \cup C \cup D$

5. Find the intersection of each pair of sets of question 1 above.

6. If $A = \{3, 5, 7, 9, 11\}, \ B = \{7, 9, 11, 13\},$

$C = \{11, 13, 15\}$ and $D = \{15, 17\}$; find

(i) $A \cap B$

(ii) $B \cap C$

(iii) $A \cap C \cap D$

(iv) $A \cap C$

(v) $B \cap D$

(vi) $A \cap (B \cup C)$

(vii) $A \cap D$

7. If A= {x : x is a natural number}, B = {x : x is an even natural number}C = {x : x is an odd natural number} and D = {x : x is a prime number }, find(i) $A \cap B$ (ii) $A \cap C$ (iii) $A \cap D$ (iv) $B \cap C$ (v) $B \cap D$ (vi) $C \cap D$

8. Which of the following pairs of sets are disjoint

(i) $\{1, 2, 3, 4\}$and {x : x is a natural number

and $4 \leq x \leq 6$}

(ii) $\{a, e, i, o, u\}$ and $\{c, d, e, f\}$

(iii) {x : x is an even integer } and {x : x is an

odd integer}

9. If $A = \{3, 6, 9, 12, 15, 18, 21\}$,

$B = \{4, 8, 12, 16, 20\}$,

$C = \{2, 4, 6, 8, 10, 12, 14, 16\}$,

$D = \{5, 10, 15, 20\}$; find

(i) $A - B$

(ii) $A - C$

(iii) $A - D$

10. State whether each of the following statement is true or false. Justify your answer.

(i) $\{2, 3, 4, 5\}$ and $\{3, 6\}$ are disjoint sets,

(ii) $\{a, e, i, o, u\}$ and $\{a, b, c, d\}$ are disjoint sets,

(iii) $\{2, 6, 10, 14\}$ and $\{3, 7, 11, 15\}$ are

disjoint sets.

$(iv)\{2, 6, 10\}$ and $\{3, 7, 11\}$ are disjoint sets.

11. If R is the set of real numbers and Q is the set of rational numbers, then what is $R - Q$?

A. Set of rational numbers

B. Set of irrational numbers

C. Set of irrational numbers including 0

D. None

Answer: B

12. If $X = \{a, b, c, d\}$ and $Y = \{f, b, d, g\}$,

find

(i) $X - Y$

(ii) $Y - X$

(iii) $X \cap Y$

1. Taking the set of natural numbers as the universal set, write down the complements of the following sets:

(i) {x : x is an even natural number}

(ii) { x : x is an odd natural number }

(iii) {x : x is a positive multiple of 3} (iv) { x : x is a prime number }

(v) {x : x is a natural number divisible by 3 and 5}

(vi) { x : x is a perfect square } (vii) { x : x is a

perfect cube}

(viii) { x : x + 5 = 8 }(ix) { x : 2x + 5 = 9}

(x) { x : x ≥ 7 }(xi) { x : x ∈ N and 2x + 1 > 10 }

2. If $\sin\theta = \dfrac{1}{2}$ then $\theta =$

    A. $n\pi + (-1)^n\dfrac{\pi}{6}, n \in Z$

    B. $n\pi + (-1)^n\dfrac{\pi}{3}, n \in Z$

    C. $n\pi \pm \dfrac{\pi}{6}, n \in Z$

    D. $n\pi \pm \dfrac{\pi}{3}, n \in Z$

Answer: A

3. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$ and $C = \{3, 4, 5, 6\}$. Find

(i) A'

(ii) B'

(iii) $(A \cup C)'$

(iv) $(A \cup B)'$

(v) $(A')'$

(vi) $(B-C)'$

4. Fill in the blanks to make each of the following a true statement : (i) $A \cup A' = $ ...

(ii) $\varphi' \cap A = $ ...(iii) $A \cap A' = $ ... (iv)

$\cup' \cap A = $ ...

5. Let U be the set of all triangles in a plane. If A is the set of all triangles with at least one angle different from 60°, what is A' ?

6. Draw appropriate Venn diagram for each of the following :(i) $(A \cup B)'$ (ii) $A' \cap B'$ (iii) $(A \cap B)'$ (iv) $A' \cup B'$

7. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$ and $B = \{2, 3, 5, 7\}$. Verify that (i) $(A \cup B)' = A' \cap B'$ (ii) $(A \cup B)' = A' \cup B'$