

## MATHS

### BOOKS - PEARSON IIT JEE FOUNDATION

#### SETS

##### Example

1. Are the sets given below equal ?

$$A = \{x : x \text{ is an even prime, } x > 2\}$$

$$B = \{\}$$



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2. Are the sets given below equal ?

$$C = \{x : x \in R, 2 < x < 5\}$$

$$B = \{x : x \in N, 2 < x < 5\}$$



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3. Given  $A = \{1, 2, 3, 4, 5, 8\}$  and  $B = \{2, 4, 6, 8, 9, 11\}$ . Find  $A \cup B$ .



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4. Given  $A = \{2, 3, 5, 9\}$  and  $B = \{3, 4, 9, 12\}$ . Find  $A \cap B$ .



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5. Given  $A = \{1, 2, 4, 5, 6, 8, 20\}$  and  $B = \{2, 3, 4, 5, 9, 20\}$ . Find  $A - B$  and  $B - A$ .



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6. If  $n(A) = 10$ ,  $n(B) = 21$  and  $n(A \cap B) = 5$ , then find  $n(A \cup B)$ .



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7. If  $n(A) = 4$ ,  $n(B) = 6$  and  $n(A \cup B) = 8$ , then find  $n(A \cap B)$ .



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8. If  $n(A) = 8$ ,  $n(B) = 6$  and the sets  $A$  and  $B$  are disjoint, then find  $n(A \cup B)$ .

A. 12

B. 14

C. 16

D.

**Answer:**  $B$



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1. If  $A = \{\phi\}$ , then  $n(A) = \underline{\hspace{2cm}}$ .

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2. The set builder form of  $A = \{1, 4, 9, 16, 25\}$  is           .

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3. If A and B are two equivalent sets and  $n(A) = 2016$ , then  $n(B) = \underline{\hspace{2cm}}$ .

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4. If  $\phi$  is an empty set, then  $n(\phi) = \underline{\hspace{2cm}}$ .

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5. The set of prime number which are having more then two factor is a/an \_\_\_\_\_ set (empty/singleton).



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6. Which of the following is a singleton set ?

- A. The set of all the months in a year having exactly 30 days.
- B. The set of all the days in a week.
- C. The set of all the natural satellites of the earth in the solar system.
- D. The set of all the intersecting points of two parallel lines in a plane.

**Answer: C**



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7. Let  $A$  be the set of all triangles in a plane having the sum of three interior angles is greater than  $180^\circ$ , then  $A$  is a/an \_\_\_\_\_ set.

- A. Empty
- B. Singleton
- C. Infinite
- D. None of these

**Answer: A**



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8. Which of the following is an infinite set ?

- A.  $\{x : x \text{ is a prime, } x < 10\}$
- B.  $\{x : x \text{ is a vowel in the word MATHEMATICS}\}$
- C.  $\{x : x \text{ is a natural number, } 2015 < x < 2016\}$
- D.  $\{x : x \in \mathbb{Z}, x \text{ is a non-negative integer}\}$

**Answer: D**



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**9. Which of the following is an empty set ?**

- A.  $\{x : x \in N, x \text{ is divisible by } 2\}$
- B.  $\{x : x \in N, x \text{ is the additive inverse of } 2016\}$
- C.  $\{x : x \text{ is a binary digit}\}$
- D.  $\{x : x \text{ is either prime or composite}\}$

**Answer: B**



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**10. Which of the following collection is not a set ?**

- A. The colours in RAINBOW.

B. All good books in a school library.

C. The members of your family.

D. The principals of your school.

**Answer: B**



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11. Match the following Column A to Column B

Column A		Column B
(a) $\{x: x \text{ is a two digit number, whose units digit is equal to tens digit.}\}$	( )	(p) Empty set
(b) The collection of natural numbers each of which is reciprocal of itself.	( )	(q) Finite set
(c) The collection of odd numbers which are multiples of 6.	( )	(r) Infinite set
(d) The set of straight lines passing through a point in a plane.	( )	(s) Singleton set

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12. If A and B are disjoint sets, then  $n(A \cup B) =$  \_\_\_\_\_

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13. If  $A = \{x : x \text{ is prime}\}$  and  $B = \{x : x \text{ is even}\}$ , then  $A \cap B =$   
\_\_\_\_\_

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14. If  $A \cap B = \phi$ , then A and B are called \_\_\_\_\_ sets.

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15. If A and B are two non-empty sets, then the minimum number of elements in  $A \cap B$  is \_\_\_\_\_

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16. If all the elements of set A are present in set B, then  $A \cup B =$  \_\_\_\_\_.

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17. If  $n(A) = 2016$  and  $n(B) = 2017$ , then the minimum number of elements in  $A \cup B$  is \_\_\_\_\_.

A. 0

B. 1

C. 2016

D. 2017

**Answer: D**



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18. If  $A$  is collection of natural numbers which are less than 2 and  $B = \{x : x \in N, x \text{ is neither prime nor composite}\}$  then  $A \cap B =$  \_\_\_\_\_.

A.  $\phi$

B.  $\{1\}$

C.  $N$

D. None of these

**Answer: B**



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19. If  $A = \{x : x \in N, x \text{ is an additive inverse of } 2017\}$  and  $B = \{x : x \in N, x \text{ is a multiplicative inverse of } 2017\}$ . Then  $A \cup B = \underline{\hspace{2cm}}$ .

A.  $\phi$

B.  $\left\{ -2017, \frac{1}{2017} \right\}$

C. 1

D.  $\left\{ 2017, \frac{-1}{2017} \right\}$

**Answer: A**



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20.

If

$$A = \{x : x \in N, 2015 < x < 2017\} B = \{x : x \in N, x + 1 = 2017\},$$

then  $A - B =$  \_\_\_\_\_.

A.  $\phi$

B.  $\{2016\}$

C.  $\{2015, 2016, 2017\}$

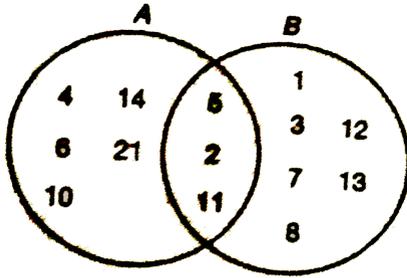
D.  $\{1, 2, 3, \dots, 2017\}$

**Answer: A**



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21. Match the following Column A to Column B



**Column A**

**Column B**

- |                   |     |        |
|-------------------|-----|--------|
| (a) $n(A - B)$    | ( ) | (p) 14 |
| (b) $n(A \cup B)$ | ( ) | (q) 3  |
| (c) $n(A \cap B)$ | ( ) | (r) 5  |
| (d) $n(B - A)$    | ( ) | (s) 6  |

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**Short Answer Type**

1. Let  $A = \{x : x \text{ is the nearest star to the earth}\}$ . Find the set A.

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2. (a) Describe the following sets in the description form.

(i) {A river}

(ii) { Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday}

(b) Describe the following in set builder form.

(i) {2, 4, 6, 8}

(ii) {3, 6, 9, 12, 15, 21 ...}



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3. Check whether the following sets are equivalent ?

(i)  $A = \{x : x \text{ is a letter in the word SOLUTION}\}$   $B = \{P, R, O, B, L, E, M\}$

(ii)  $C = \{x : x \text{ is either prime or composite, } x < 10\}$

$D = \{1\}$



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4. Check whether the following sets are equal ?

(i)  $A = \{\text{The set of the first five elements of the periodic table}\}$

$$B = \{H, He, Li, Be, B\}$$

(ii)  $C = \{x : x \text{ is a prime number}\}$

$$D = \{x : x \text{ is an odd number}\}$$



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5. Classify the following into empty sets or singleton sets.

(i)  $A = \{x : x \text{ is a composite number which is having less than three factors}\}$

(ii)  $B = \{x : x \in R, x \text{ is a multiplicative inverse of } 2016\}$

(iii)

$C = \{x : x \in N, x \text{ is neither prime number nor composite number}\}$



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6. All equal sets are equivalent. Is the converse true ? Support your answer with suitable examples.



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7. Let  $A = \{x : x \text{ is a letter in the word INDIA}\}$  and  $B = \{x : x \text{ is a vowel in the word EDUCATION}\}$  Verify :  $n(A \cup B) = n(A) + n(B) - n(A \cap B)$



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8. Let  $A = \{x : x \in \mathbb{Z}, 2 \leq x \leq 5\}$  and  $B = \{x : x \in \mathbb{Z}, -2 \leq x < 4\}$ .

Find the following :

(i)  $n(A \cup B)$  (ii)  $n(A \cap B)$

(iii)  $n(A - B)$  (iv)  $n(B - A)$



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9. Let  $A = \{x : x \text{ is an even natural number, } x < 10\}$  and  $B = \{x : x \text{ is a factor of } 24\}$

(i) Draw venn diagram to represent these sets.

(ii) Find : (a)  $A \cup B$  (b)  $A \cap B$



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10. If  $n(A) = 20$  and  $n(A \cap B) = 5$ , then find the value of  $n(A - B)$ .



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11. If  $n(A) = x$ ,  $n(B) = 2[n(A)]$ ,  $n(A \cup B) = 2017$  and  $n(A \cap B) = 1007$ . Find the value of  $x$ .



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12. If  $F(n)$  is the set of all factors of 'n' excluding 1 and  $F(16) \cap F(24) = F(x)$ , then find the value of  $x$ .



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Concept Application

1. A and B are any two sets,  $n(A) = 17$  and  $n(B) = 13$ . What is the maximum possible value of  $n(A \cup B) - n(A \cap B)$  ?

A. 4

B. 13

C. 17

D. 30

**Answer: D**



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2. A and B are two equivalent sets, what is the maximum possible value of  $n(A \cap B)$  ?

A.  $n(A)$

B.  $n(A \cup B)$

C.  $n(A) + n(B)$

D.  $n(A) - n(B)$

**Answer: A**



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3. In a class of 25 students, 18 of them passed in maths, 14 of them passed in Science and 3 of them failed in both the exams. How many students passed in both the exams ?

A. 3

B. 4

C. 10

D. 11

**Answer: C**



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4. A is set of the factors of 28, b is a set of the factors of 17 and C is a set of the odd multiples of 7 less than 50. Which of the following are singleton sets ?

(A)  $A \cap B$  (ii)  $C \cap B$

(C)  $A \cap C$

A. Only (A) and (B)

B. Only (B) and (C)

C. Only (A) and (C)

D. (A), (B) and (C)

**Answer: C**



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5. A is a set of all the prime numbers less than 20, B is a set of all the even natural numbers less than 20 and C is a set of all the odd natural numbers. Which of the following is/are true statements ?

(A)  $A \cap B$  is a singleton set.

(B) B and C are disjoint sets.

(C)  $A \cap C$  is an infinite set.

A. Only (B)

B. Both (A) and (B)

C. Both (B) and (C)

D. (A), (B) and (C)

**Answer: B**



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## Assessment Test

1. Write the set builder form of {January, June, July}.



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2. Write the Roster form of  $\{x : x \in \mathbb{Z}, -3 \leq x \leq 3\}$ .



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3. Let  $A = \{x : x \text{ is a factor of } 24 \text{ excluding } 1 \text{ and itself, } x \in \mathbb{N}\}$ .

Write  $A$  in Roster form. Find  $n(A)$ .



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4. Let  $A = \{x : x \text{ is a prime factor of } 2016\}$  and  $B = \{x : x \text{ is a prime factor of } 2025\}$ .

find : (i)  $A \cup B$  (ii)  $A \cap B$

(iii)  $A - B$  (iv)  $B - A$



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5. If  $n(G - H) = 15$  and  $n(G \cap H) = 10$ , then find the value of  $n(G)$ .



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6. Let  $A = \{x^2 : x^2 < 50, x \in N\}$  and  
 $B = \{x : x \text{ is a 2-digit number in which the sum of the digits is 7, } x \in N\}$

(i) Draw Venn diagram to represent these sets. (ii) Find : (a)  $A \cup B$  (b)

$A \cap B$

(c)  $A - B$  (d)  $B - A$



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7. Let  $A = \{x : x \text{ is a multiple of } 3, 5, < x < 19\}$  and

$B = \{x : x \text{ is a factor of } 18\}$ .

Find : (i)  $A - B$

(ii)  $B - A$

(iii) What do you notice ?



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8. Represent the following set in Descriptive and Set-builder forms.

$\{11, 22, 33, 44, 55, 66, 77, 88, 99\}$



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9. Make a set of all the consonants in the following words : MATHEMATICS, SCIENCE, ENGLISH



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10. Which of the following are sets ?

- (i) A collection of odd numbers
- (ii) A collection of small flowers in a garden
- (iii) All four-legged animals at Delhi Zoo.



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11. If  $A = \{4, 8, 12, 16, 20\}$

$B = \{8, 16, 24, 32, 40\}$ , then write the correct symbols ( $\in$ ,  $\notin$ ) in the following blanks.

(i)  $40 \underline{\hspace{1cm}}$  A

(ii)  $8 \underline{\hspace{1cm}}$  B

(iii)  $44 \underline{\hspace{1cm}}$  A



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12. Can the following be called sets ?

(i) Consonants in the word SETS

(ii) Names of days of the week that have at least 4 hours of sunshine.



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13. If  $M = \{\text{January, March, May, July}\}$  and  $M = \{\text{April, June, September, November}\}$ , then write the correct symbols ( $\in$ ,  $\notin$ ) in the following blanks.

February \_\_\_ M

February \_\_\_ N



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14. What is the cardinal number of the Set N of the natural numbers between 10 and 20 ?



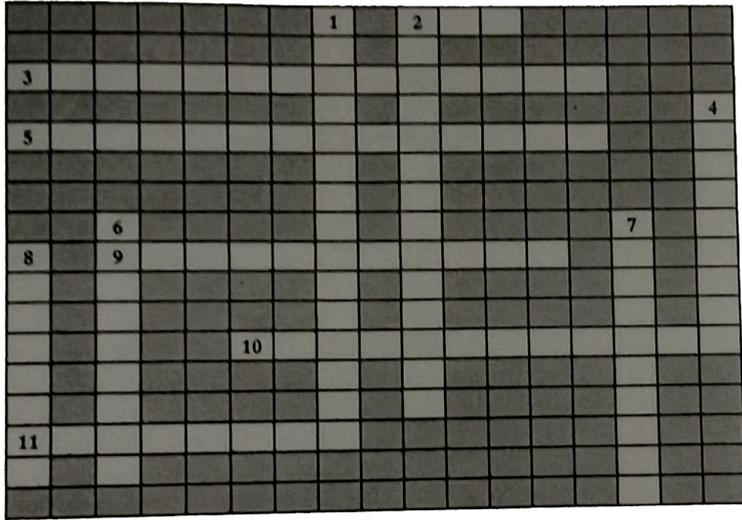
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15. What is the cardinal number of a set with the smallest odd number ?



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Crossword



1.

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