

### MCQs with One Correct Answer

- 1. If A and B are non-empty sets such that  $A \supset B$ , then
  - (a) B'-A'=A-B (b) B'-A'=B-A
  - (c) A'-B'=A-B (d)  $A' \cap B'=B-A$
- 2. Let  $A = \{\theta : \sin(\theta) = \tan(\theta)\}$  and  $B = \{\theta : \cos(\theta) = 1\}$ be two sets. Then :
  - (a) A = B
  - (b)  $A \not\subset B$
  - (c)  $B \not\subset A$

5.

- (d)  $A \subset B$  and  $B A \neq \phi$
- **3.** A set S contains 3 elements, the number of subsets of which of following sets is 256.
  - (a) S (b) P(S)
  - (c) P(P(S)) (d) None of these
- 4. In a college of 300 students every student reads 5 newspapers and every newspaper is read by 60 students. The number of newpapers is
  - (a) at least 30 (b) at most 20
  - (c) exactly 25 (d) None of these Let A and B be two sets then

 $(A \cup B)' \cup (A' \cap B)$  is equal to

(c) B' (d) None of these

6. The set  $(A \setminus B) \cup (B \setminus A)$  is equal to

- (a)  $[A \setminus (A \cap B)] \cap [B \setminus (A \cap B)]$
- (b)  $(A \cup B) \setminus (A \cap B)$
- (c)  $A \setminus (A \cap B)$
- (d)  $\overline{A \cap B} \setminus A \cup B$
- 7. Let  $A = \{x : x \in \mathbf{R}, |x| < 1\}$   $B = \{x : x \in \mathbf{R}, |x-1| \ge 1\}$  and  $A \cup B = \mathbf{R} - D$ , then the set D is :

- (a)  $\{x: 1 \le x \le 2\}$  (b)  $\{x: 1 \le x \le 2\}$
- (c)  $\{x:-2 \le x \le 2\}$  (d) None of these
- 8. If  $aN = \{ax : x \in N\}$  and  $bN \cap cN = dN$ , where b,  $c \in N$  are relatively prime, then
  - (a) d = bc (b) c = bd
  - (c) b = cd (d) None of these
- 9. The set  $(A \cup B \cup C) \cup (A \cap B' \cap C')' \cap C'$  is equal to
  - (a)  $B \cap C'$  (b)  $A \cap C$
  - (c)  $B' \cap C'$  (d) None of these
- **10.** A dinner party is to be fixed for a group of 100 persons. In this party, 50 persons do not prefer fish, 60 prefer chicken and 10 do not prefer either chicken or fish. The number of persons who prefer both fish and chicken is
  - (a) 20 (b) 22
  - (c) 25 (d) None of these
- 11. Let U be the universal set and  $A \cup B \cup C = U$ . Then  $\{(A-B) \cup (B-C) \cup (C-A)\}'$  is equal to: (a)  $A \cup B \cup C$  (b)  $A \cup (B \cap C)$ 
  - (c)  $A \cap B \cap C$  (d)  $A \cap (B \cup C)$
- 12. If n(A) = 1000, n(B) = 500 and if  $n(A \cap B) \ge 1$  and  $n(A \cup B) = p$ , then
  - (a)  $500 \le p \le 1000$  (b)  $1001 \le p \le 1498$
  - (c)  $1000 \le p \le 1498$  (d)  $1000 \le p \le 1499$
- 13. In a battle 70% of the combatants lost one eye, 80% an ear, 75% an arm, 85% a leg, x% lost all the four limbs. The minimum value of x is
  - (a) 10 (b) 12
  - (c) 15 (d) None of these
- 14. The number of students who take both the subjects mathematics and chemistry is 30. This represents 10% of the enrolment in mathematics and 12% of the enrolment in chemistry. How

many students take at least one of these two subjects?

(a)	520	(b)	490

- (c) 560 (d) 480
- **15.** At a certain conference of 100 people, there are 29 Indian women and 23 Indian men. Of these Indian people 4 are doctors and 24 are either men or doctors. There are no foreign doctors. How many foreigners and women doctors are attending the conference?
  - (a) 48,1 (b) 34,3
  - (c) 46,4 (d) 42,2
- 16. Each student in a class of 40, studies at least one of the subjects English, Mathematics and Economics. 16 study English, 22 Economics and 26 Mathematics, 5 study English and Economics, 14 Mathematics and Economics and 2 study all the three subjects. The number of students who study English and Mathematics but not Economics is
  - (a) 7 (b) 5
  - (c) 10 (d) 4
- 17. In a market research project, 20% opted for 'Nirma' detergent whereas 60% opted for 'Surf blue' detergent. The remaining individuals were not certain. If the difference between those who opted for 'Surf blue' and those who were uncertain was 720, how many respondents were covered in the survey
  - (a) 1100 (b) 1150
    - (d) None of these
- **18.** In a school 80 students like chocolate, 40 like coffee if the number of students doesn't like any of them is equal to the number of students who like both of them then what is the total number of students in the school?
  - (a) 115 (b) 90

(c) 1800

- (c) 120 (d) None of these
- **19.** In a school there are 100 students 60 of them don't like Chocolate and 50 don't like Biscuit and 10 of them like none then how many of them like both?
  - (a) 20 (b) 30
  - (c) 40 (d) None of these
- **20.** A survey was conducted of 100 people whether they have read recent issues of 'Golmal', a

monthly magazine. Summarized information is presented below: Only September: 18 September but not August: 23 September and July: 8 September: 28 July: 48 July and August: 10 None of the three months: 24 What is the number of surveyed people who have read exactly for two consecutive months? (a) 7 (b) 9 (c) 12 (d) 14

## Numeric Value Answer

**21.** An investigator interviewed 100 students to determine their preferences for the three drinks : milk (*M*), coffee (*C*) and tea (*T*). He reported the following : 10 students had all the three drinks *M*, *C* and *T*; 20 had *M* and *C*; 30 had *C* and *T*; 25 had *M* and *T*; 12 had *M* only; 5 had *C* only; and 8 had *T* only. If number of students who did not

take any of the three drinks is n, then  $\frac{n}{5}$  is

- 22. In a class of 80 students numbered 1 to 80, all odd numbered students opt of Cricket, students whose numbers are divisible by 5 opt for Football and those whose numbers are divisible by 7 opt for Hockey. If the number of students who do not opt any of the three games is n, then
  - $\frac{n}{4}$  is equal to
- **23.** A survey shows that 61%, 46% and 29% of the people watched "3 idiots", "Rajneeti" and "Avatar" respectively. 25% people watched exactly two of the three movies and 3% watched none. What percentage of people watched all the three movies?
- 24. If n(A) = 4 and n(B) = 7, then the difference between maximum and minimum value of  $n(A \cup B)$  is
- 25. Two finite sets have *m* and *n* elements. The number of subsets of the first set is 112 more than that of the second set. The value of m n is

ANSWER KEY																	
1	(a)	4	(c)	7	(b)	10	(a)	13	(a)	16	(b)	19	(d)	22	(7)	25	(3)
2	(b)	5	(a)	8	(a)	11	(c)	14	(a)	17	(c)	20	(b)	23	(7)		
3	(c)	6	(b)	9	(a)	12	(d)	15	(a)	18	(c)	21	(4)	24	(4)		

# **Hints & Solutions**

1.



2. **(b)** Let  $A = \{\theta : \sin \theta = \tan \theta\}$ and  $B = \{\theta : \cos \theta = 1\}$ 

$$\therefore A = \left\{ \theta : \sin \theta = \frac{\sin \theta}{\cos \theta} \right\}$$

 $= \{\theta : \sin \theta (\cos \theta - 1) = 0\} = \{\theta = 0, \pi, 2\pi, 3\pi, \dots\}$ For B : cos  $\theta = 1 \implies \theta = \pi, 2\pi, 4\pi, \dots$ This shows that A is not contained in B. i.e. A  $\not\subset$  B. but B  $\subset$  A.

- 3. (c)  $n(P(S)) = 2^3 = 8$  elements.  $n(P(P(S))) = 2^8 = 256$  elements.
- 4. (c) Let *n* be the number of newspapers which are read. Then  $60 n = (300)(5) \Rightarrow n = 25$
- 5. (a) From Venn-Euler's Diagram.



 $\therefore (A \cup B)' \cup (A' \cap B) = A'$ 

- (b) Given set can be written as
  (A B) ∪ (B A) = (A ∪ B) (A ∩ B)
  (By definition of symmetric difference)
  Hence, (A \ B) ∪ (B \ A) = (A ∪ B) \ (A ∩ B)
- 7. **(b)**  $A = \{x : |x| < 1\} = (-1, 1)$ Since,  $|x| < 1 \Rightarrow -1 < x < 1$   $B = \{x : |x-1| \ge 1\} = (-\infty, 0] \cup [2, \infty)$ Since,  $|x-1| \ge 1 \Rightarrow x-1 \le -1$  or  $x - 1 \ge 1$   $\Rightarrow x \le 0$  or  $x \ge 2$   $\therefore A \cup B = (-\infty, 0] \cup [2, \infty) \cup (-1, 1)$   $= (-\infty, 1) \cup [2, \infty) = \mathbf{R} - [1, 2)$  $\therefore D = [1, 2] = \{x : 1 \le x < 2\}$

## Sets

- 8. (a)  $bN = \{bx : x \in N\}; cN = \{cx : x \in N\}$   $\therefore bN \cap cN = \{x : x \text{ is multiple of b and c both}\}$ 
  - = { x: x is multiple of l.c.m. of b and c }
  - $= \{ x : x \text{ is multiple of } b c \}$

[given b and c are relatively prime  $\therefore$  l.c.m. of b and c = bc]

 $\therefore bN \cap cN = \{bc x : x \in \mathbf{N}\} = d\mathbf{N} (Given)$  $\therefore d = bc.$ 

9. (a)  $(A \cup B \cup C) \cup (A \cap B' \cap C')' \cap C'$   $= (A \cup B \cup C) \cap (A' \cup B \cup C) \cap C'$   $= [(A \cap A') \cup (B \cup C)] \cap C' = (\phi \cup B \cup C) \cap C'$   $= (B \cup C) \cap C' = (B \cap C') \cup (C \cap C')$  $= (B \cap C') \cup \phi = B \cap C'$ 

$$= (B \cap C) \cup \phi = B \cap C$$

10. (a) Total number of persons = a + b + c + n= 100



Do not prefer fish b + n = 5060 prefer chicken hence b + c = 60Do not like fish and chicken is n = 10On solving these equations we will get a = 30, b = 40, c = 20

The number of persons who prefer both fish and chicken is = c = 20

11. (c)  $\{(A-B) \cup (B-C) \cup (C-A)\}'$ =  $(A-B)' \cap (B-C)' (C-A)'$ 

$$= [(U - (A - B)) \cap (U - (B - C) \cap (U - (C - A)))]$$



By Venn - diagram =  $(A \cap B \cap C)$ 

- 12. (d) n(A) = 1000, n(B) = 500,  $n(A \cap B) \ge 1 \& n(A \cup B) = p$ Also,  $n(A \cup B) = n(A) + n(B) - n(A \cap B)$   $\Rightarrow p = 1000 + 500 - n(A \cap B)$   $\therefore 1 \le n(A \cap B) \le 500$ Hence  $p \le 1499$  and  $p \ge 1000 \Rightarrow 1000 \le p \le 1499$
- **13.** (a) Minimum value of n(20 + 20 + 25 + 15) = 100, 00 = 10
- =100-(30+20+25+15)=100-90=10**14.** (a) Let the number of students who take only
- **14.** (a) Let the number of students who take only Math be x and only Chemistry be y.



So, from the Venn diagram, we have total number of students who take Math = x + 30 and take Chemistry=y+30.

According to question, we have

$$30 = \frac{10}{100}(x+30)$$

$$\Rightarrow$$
 x = 270 and 30 =  $\frac{12}{100}(30 + y)$ 

$$\Rightarrow y=220$$

x + y + 30 = 270 + 220 + 30 = 520.

**15.** (a) See the following Venn diagram



 $\therefore n(W \cap D) = 4 - 3 = 1$ 

16. (b) C stands for set of students taking economics



17. (c) Let those who opted for Nirma = a and those who opted Surf Blue = b and those who opted for none is n.

- Hence a = 20k and b = 60k, then n = 100k - 20k - 60k = 20kThe difference between those who opted for 'Surf blue' and those who were uncertain = 60k - 20k = 40k = 720 hence, k = 18, Hence total number of persons covered in survey = 100k = 1800(c) Even the size information (C) = 80
- **18.** (c) From the given information (C) = 80, (F) = 40, and (C  $\cap$  F) = (n) Hence (U) = (C) + (F) - (C  $\cap$  F) + (n) Or 80 + 40 - x + x = 120
- 19. (d) If number of students who like chocolate = a + cNumber of students who like Biscuit = b + c

Number of students who like Both = c Number of students who like none = n = 10From the given condition 100 = a + b + c + nSince 60 of them don't like Chocolate, hence b + n = 60 or b = 50And 50 of them don't like Biscuit hence a + n

= 50, a = 40Hence 100 = 40 + 50 + c + 10 or c = 0

**20.** (b) The given information can be represented as follows.



Now from the given information we can frame following equations-

c = 18, f + c = 23, f + g = 8,  
c + f + g + e = 28, a + d + f + g = 48,  
d + g = 10, n = 24  
People who read exactly two consecutive  
months is represented by d and e.  
f + c = 23 and c = 18 
$$\therefore$$
 f = 5  
f + g = 8 and f = 5  $\therefore$  g = 3  
d + g = 10 and g = 3  $\therefore$  d = 7  
c + f + g + e = 28, c = 18, f = 5 and g = 3  
 $\therefore$  e = 2 or  $\therefore$  d + e = 9  
(4) We have  
n (U) = 100 where U stands for universal set

n(U) = 100, where U stands for universal set  $n(M \cap C \cap T) = 10$ ;  $n(M \cap C) = 20$ ;  $n(C \cap T) = 30$ ;  $n(M \cap T) = 25$ ; n(only M) = 12; n(only C) = 5; n(only T) = 8Filling all the entries we obtain the Venn diagram as shown below :

21.



So,  $\frac{n}{5} = \frac{20}{5} = 4$ 22. (7) Numbers which are divisible by 5 are 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80 they are 16 in numbers. Now, Numbers which are divisible by 7 are 7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77 they are 11 in numbers. Also, total odd numbers = 40Let C represents the students who opt. for cricket, F for football and H for hockey. : we have n(C) = 40, n(F) = 16, n(H) = 11Now,  $C \cap F = Odd$  numbers which are divisible by 5.  $C \cap H = \text{Odd}$  numbers which are divisible by 7.  $F \cap H$  = Numbers which are divisible by both 5 and 7.  $n(C \cap F)$ , 8,  $n(C \cap H) = 6$ ,  $n(F \cap H) = 2$ ,  $n(C \cap F \cap H) = 1$ We Know  $n(C \cup F \cup H) = n(C) + n(F) + n(H)$  $-n(C \cap F) - n(C \cap H)$  $-n(F \cap H) + n(C \cap H \cap F)$ 

 $n(C \cup F \cup H) = 67 - 16 + 1 = 52$ 

 $\therefore n(C' \cap F' \cap H')$ 

= Total students – 
$$n(C \cup F \cup H)$$

$$n(C' \cap F' \cap H') = 80 - 52 = 28$$
, So  $\frac{n}{4} = \frac{28}{4} = 7$ 

23. (7) The given condition is as follows-



We know that  $\{(a+d+e+g)+(b+d+f+g)\}$ +(c + e + f + g) - (d + e + f) - 2g= a + b + c + d + e + f + g

or 61x + 46x + 29x - 25x - 2g = 97xor 2g = 14x or g = 7x. So 7% of people watched all the three movies)

24. (4)  $n(A \cup B)$  is minimum when  $A \subseteq B$ . In this case,  $(A \cup B) = B$  and hence minimum value of  $n(A \cup B) = n(B) = 7.$  $n(A \cup B)$  is maximum when A and B are disjoint.  $\therefore$  Maximum value of n (A  $\cup$  B) = 4 + 7 = 11. So 11 - 7 = 4

**25.** (3) 
$$2^m - 2^n = 112 \Rightarrow 2^n (2^{m-n} - 1) = 16.7$$

 $2^{n}(2^{m-n}-1) = 2^{4}(2^{3}-1)$ *.*.. Comparing, we get n = 4 and m - n = 3 $\Rightarrow$  n=4 and m=7Som - n = 7 - 4 = 3