DPP - Daily Practice Problems

Date : | **Start Time :** | **End Time :**

MATHEMATICS CM01

SYLLABUS : Sets

Max. Marks : 67 **Time : 60 min.**

GENERAL INSTRUCTIONS

- The Daily Practice Problem Sheet contains 20 Questions divided into 5 sections.
  Section I has **6** MCQs with ONLY 1 Correct Option, **3** marks for each correct answer and **–1** for each incorrect answer.
  Section II has **4** MCQs with ONE or MORE THAN ONE Correct options.
  For each question, marks will be awarded in one of the following categories:
  Full marks: **+4** If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.
  Partial marks: **+1** For darkening a bubble corresponding to each correct option provided NO INCORRECT option is darkened.
  Zero marks: If none of the bubbles is darkened.
  Negative marks: **–2** In all other cases.
  Section III has **5** Single Digit Integer Answer Type Questions, **3** marks for each Correct Answer and **0** mark in all other cases.
  Section IV has Comprehension Type Questions having **4** MCQs with ONLY ONE corect option, **3** marks for each Correct Answer and **0** mark in all other cases.
  Section V has **1** Matching Type Question, **2** marks for the correct matching of each row and **0** mark in all other cases.
- You have to evaluate your Response Grids yourself with the help of Solutions.

Section I - Straight Objective Type

This section contains 6 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which **ONLY ONE** is correct.

1. Consider the following relations:
1. $A - B = A - (A \cap B)$
2. $A = (A \cap B) \cup (A - B)$
3. $A - (B \cup C) = (A - B) \cup (A - C)$

Which of these is/are correct?

(a) (1) and (3) (b) (2) only
(c) (2) and (3) (d) (1) and (2)

2. The value of $(A \cup B \cup C) \cap (A \cap B^c \cap C^c)^c \cap C^c$, is
(a) $B \cap C^c$ (b) $B^c \cap C^c$
(c) $B \cap C$ (d) $A \cap B \cap C$

3. A survey shows that 63% of the Americans like cheese whereas 76% like apples. If x% of the Americans like both cheese and apples, then
(a) $x = 39$ (b) $x = 63$
(c) $39 \le x \le 63$ (d) None of these

RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ

Space for Rough Work

4. Let X and Y be two non-empty sets such that $X \cap A = Y \cap A = \phi$ and $X \cup A = Y \cup A$ for some non-empty set A. Then
(a) X is a proper subset of Y
(b) Y is a proper subset of X
(c) $X = Y$
(d) X and Y are disjoint sets

5. If $n(A) = 1000$, $n(B) = 500$ and if $n(A \cap B) \geq 1$ and $n(A \cup B) = p$, then
(a) $500 \leq p \leq 1000$ (b) $1001 \leq p \leq 1498$
(c) $1000 \leq p \leq 1498$ (d) $1000 \leq p \leq 1499$

6. 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

Section II - Multiple Correct Answer Type

This section contains 4 multiple correct answer(s) type questions. Each question has 4 choices (a), (b), (c) and (d), out of which **ONE OR MORE** is/are correct.

7. In a certain town 25% families own a phone and 15% own a car 65% own neither a phone nor a car. 2000 families own both a car and a phone.
(a) 10% families own both a car and a phone
(b) 35% families own either a car or a phone.
(c) 40,000 families live in the town.
(d) All above are correct

8. 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. If the no. of foreigners and women doctors who are attending the conference are n_1 and n_2.
(a) $n_1^2 + n_2^2 = 2305$ (b) $n_1 + n_2 - n_1 n_2 = 1$
(c) $n_1^2 - n_2^2 = 2303$ (d) $n_1 + n_2 + n_1 n_2 = 98$

9. Let A, B, C be finite sets. Suppose that n (A) = 10, n (B) = 15, n (C) = 20, n (A∩B) = 8 and n (B∩C) = 9. Then the possible value of n (A∪B∪C) is
(a) 26
(b) 27
(c) 28
(d) 29

10. In a class of 60 students, 23 play Hockey 15 Play Basket-ball and 20 play cricket. 7 play Hockey and Basket-ball, 5 play cricket and Basket-ball, 4 play Hockey and Cricket and 15 students do not play any of these games. Then
(a) 4 play Hockey, Basket-ball and Cricket
(b) 19 play Hockey but not Cricket
(c) 1 plays Hockey and Cricket but not Basket-ball
(d) All above are correct

Section III - Integer Type

This section contains 5 questions. The answer to each of the questions is a single digit integer ranging from 0 to 9.

11. 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?

RESPONSE GRID					
4. ⓐⓑⓒⓓ	**5.** ⓐⓑⓒⓓ	**6.** ⓐⓑⓒⓓ	**7.** ⓐⓑⓒⓓ	**8.** ⓐⓑⓒⓓ
9. ⓐⓑⓒⓓ	**10.** ⓐⓑⓒⓓ	**11.** ⓪①②③④⑤⑥⑦⑧⑨		

Space for Rough Work

12. 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 values of $m - n$ is

13. There are 20 students in a chemistry class and 30 students in a physics class. If ten students are to be enrolled in both the courses. Let k be the number of students which are either in physics class or chemistry class if two classes meet at different hours, then find $\frac{k}{8}$.

14. If A is the set of the divisors of the number 15, B is the set of prime numbers smaller than 10 and C is the set of even numbers smaller than 9, then the number of elements in $(A \cup C) \cap B$ is

15. The number of elements in the set

$\{\frac{a}{b} \in I^+ : 2a^2 + 3b^2 = 35, a, b \in Z\}$, where Z is the set of all integers, is

Section IV - Comprehension Type

Based upon the given paragraphs, 4 multiple choice questions have to be answered. Each question has 4 choices (a), (b), (c) and (d), out of which **ONLY ONE** is correct.

PARAGRAPH-1

In a society 60 family read Times Of India (TOI), 70 read Hindustan Times (HT), and 40 read Telegraph (Tel). 10 family read both HT and Tel but not TOI, 18 family read HT & TOI, number of family who read only TOI & Tel but not HT is 10 less than the number of family who read all the three newspaper.

16. What could be the total number of family in the society assuming that each family read at least one news paper?

(a) 114 (b) 126

(c) 129 (d) None of these

17. If number of family who read both TOI and HT but not Tel is more than the number of family who read both TOI and Tel but not HT then what could be the number of family who read only Tel?

(a) 15 (b) 10

(c) 16 (d) None of these

PARAGRAPH-2

In a college student can opt for any one or more available sports, these are Foot Ball (FB), Carom (Cr), Chess (Ch), and Volley Ball (VB), number of students who play FB and any one more game is 10, (I.e FB and Ch is 10, FB and Cr is 10 and so on), similarly number of students who play Cr and any one more game (Except FB as it is already defined as 10) is 8 and number of students who play FB and any two more games is 12. Total count for each of four Game is 100.

18. How many student play Cricket and exactly one more game?

(a) 26 (b) 28

(c) 32 (d) None of these

19. If number of students who play Ch and Exactly one more game is maximum possible then what is the number of students who play only Cr.

(a) 25 (b) 50

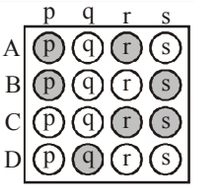
(c) 46 (d) None of these

RESPONSE GRID	
	12. ⓪①②③④⑤⑥⑦⑧⑨ **13.** ⓪①②③④⑤⑥⑦⑧⑨
	14. ⓪①②③④⑤⑥⑦⑧⑨ **15.** ⓪①②③④⑤⑥⑦⑧⑨
	16. ⓐⓑⓒⓓ **17.** ⓐⓑⓒⓓ **18.** ⓐⓑⓒⓓ **19.** ⓐⓑⓒⓓ

Space for Rough Work

Section V - Matrix-Match Type

This section contains 1 question. It contains statements given in two columns, which have to be matched. Statements in column I are labelled as A, B, C and D whereas statements in column II are labelled as p, q, r and s. The answers to these questions have to be appropriately bubbled as illustrated in the following example. If the correct matches are A-p, A-r, B-p, B-s, C-r, C-s and D-q, then the correctly bubbled matrix will look like the following:



20. The proportion of male students and the proportion of vegetarian students in a school are given below. The school has a total of 800 students, 80% of whom are in the secondary section and rest equally divided between class 11 & 12.

	Male (M)	Vegetarian (V)
Class 12	0.60	
Class 11	0.55	0.55
Secondary Section		0.55
Total	0.475	0.53

Now, Match the columns.

	Column-I		**Column-II**
(A)	What is the percentage of vegetarian students in class-12	(p)	45
(B)	In class 12, 25% of vegetarians are male. What is the difference between the number of female vegetarians and male non-vegetarians.	(q)	40
(C)	What is the percentage of Male students in the secondary section	(r)	38
		(s)	16

RESPONSE GRID	**20. A - ⓟⓠⓡⓢ; B - ⓟⓠⓡⓢ; C - ⓟⓠⓡⓢ**

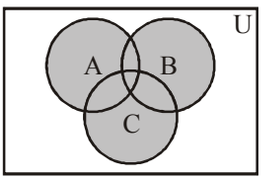
DAILY PRACTICE PROBLEM DPP CM01 - MATHEMATICS			
Total Questions	20	Total Marks	67
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	27	Qualifying Score	38

$$\text{Net Score} = \sum_{i=1}^{V} \left[\left(\text{correct}_i \times MM_i \right) - \left(In_i - NM_i \right) \right]$$

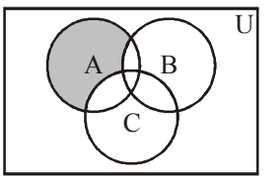
Space for Rough Work

1. **(d)** Statement (1) and (2) are correct. Hence, option (d) is correct.

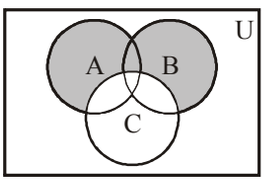
2. **(b)**



(i) $A \cup B \cup C$



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



(iii) C^c

From Fig. (i), (ii) and (iii), we get

$(A \cup B \cup C) \cap (A \cap B^c \cap C^c)^c \cap C^c = (B^c \cap C^c)$

3. **(c)** Let C represents the set of Americans like cheese and A represents the set of Americans like apples.

$C \cap A$ represents the set of Americans like both cheese and apples.

$\therefore\ n(C) = 63, n(A) = 76$, and $n(C \cap A) = x$

We know that,

$n(C \cup A) = n(C) + n(A) - n(C \cap A)$

$100 = 63 + 76 - x$

$\Rightarrow x = 139 - 100 = 39$ and $n(C \cap A) \le n(C)$

$\Rightarrow x \le 63$

$\therefore\ 39 \le x \le 63.$

4. **(c)** Suppose $a \in X$ and $a \in A$

$\Rightarrow a \in X \cup A \Rightarrow a \in Y \cup A$

$\Rightarrow a \in Y$ and $a \in A \cap (\because X \cup A = Y \cup A)$

$\Rightarrow a \in Y \cap A \Rightarrow Y \cap A$ is non-empty

This contradicts that $Y \cap A = \phi$

So, $X = Y$

5. **(d)** $n(A) = 1000, n(B) = 500, n(A \cap B) \ge 1,$

$n(A \cup B) = p$

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$p = 1000 + 500 - n(A \cap B)$

$1 \le n(A \cap B) \le 500$

Hence $p \le 1499$ and $p \ge 1000$

$1000 \le p \le 1499$

6. **(a)** Minimum value of $x = 100 - (30 + 20 + 25 + 15)$

$= 100 - 90 = 10$

7. **(b, c)** Let there are x families

$a + b + c + d = x$

$a + c = 2.5\ x,\ b + c = 0.15\ x$

$d = 0.65x,\ c = 2000$

$\therefore\ a + b + 2c + d = 1.05x$

$x + c = 1.05x$

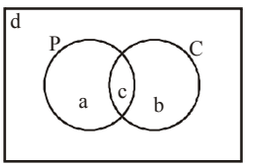
$\therefore\ 0.05x = c = 2000 \Rightarrow x = 40{,}000$

So $a = 8000, b = 4000\ d = 26000$

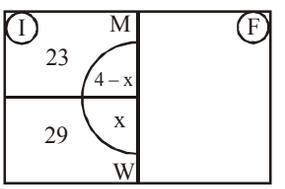
$c = 2000 \Rightarrow 5\%$ families own both a car and a phone

$a + b + c = 14000$

$\Rightarrow 35\%$ families own either a car or a phone



8. **(a, b, c)** See the following Venn diagram



$n(I) = 29 + 23 = 52$

$n(F) = 100 - 52 = 48 = n_1$

$n(m \cup D) = n(m) + n(D) - n(m \cap D)$

$24 = 23 + 4 - n(m \cap D)$

$\therefore\ n(m \cap D) = 3$

$\therefore\ n(W \cap D) = 4 - 3 = 1 = n_2$

9. **(a, b, c)** We have

$n(A \cup B \cup C) = n(A) + n(B) + n(C) -$

$n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$

$= 10 + 15 + 20 - 8 - 9 - n\ (C \cap A) + n(A \cap B \cap C)$

$= 28 - \{n(C \cap A) - n(A \cap B \cap C)\}$ ...(i)

Since $n(C \cap A) \ge n(A \cap B \cap C)$

We have $n(C \cap A) - n(A \cap B \cap C) \ge 0$...(ii)

From (i) and (ii)

$n(A \cup B \cup C) \le 28$ ...(iii)

Now, $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$= 10 + 15 - 8 = 17$

and $n(B \cup C) = n(B) + n(C) - n(B \cap C)$

$= 15 + 20 - 9 = 26$

Since, $n(A \cup B \cup C) \ge n(A \cup C)$ and

$n(A \cup B \cup C) \ge n(B \cup C)$, we have

$n(A \cup B \cup C) \ge 17$ and $n(A \cup B \cup C) \ge 26$

Hence $n(A \cup B \cup C) \ge 26$ ...(iv)

From (iii) and (iv) we obtain

$26 \le n(A \cup B \cup C) \le 28$

Also $n(A \cup B \cup C)$ is a positive integer

$\therefore\ n(A \cup B \cup C) = 26$ or 27 or 28

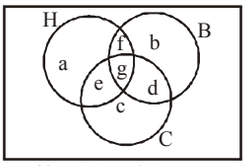
10. **(b, c)** $a+e+f+g=23$

$b+d+f+g=15$

$c+d+e+g=20$

$f+g=7;\ d+g=5$

$e+g=4$



$a+b+c+d+e+f+g=60-15=45$

By substitutions,

$a+e=16,\ b+d=8,\ b+f=10, c+e=15,\ c+d=16$

Also, $b+c+d=22$

$a+c+e=30,\ a+b+f=25$

From these, we get

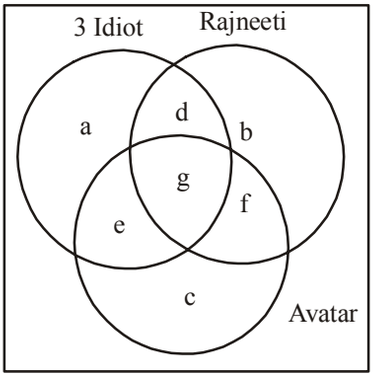
$b=6, a=15, c=14\ e=1, d=2, f=4$ and $g=3$

Clearly(a) is not correct

for (b) $a+f=19 \Rightarrow$ (b)is correct

for (c) $e=1 \Rightarrow$ (c) is correct

11. **(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 $61x+46x+29x-25x-2g=97x$

or $2g=14x$ or $g=7x$

12. **(3)** $2^m-2^n=112 \Rightarrow 2^n(2^{m-n}-1)=16.7$

$\therefore\ 2^n(2^{m-n}-1)=2^4(2^3-1)$

Comparing we get $n=4$ and $m-n=3$

$\Rightarrow\ n=4$ and $m=7 \Rightarrow m-n=3$

13. **(5)** Let C be the set of students in chemistry class and P be the set of students in physics class.

Given $n(C)=20, n(P)=30$ and $n(C\cap P)=10$. We have to find $n(C\cup P)$

If two classes meet at different hours, then

$n(C\cap P)=10$ (given)

So, $n(C\cup P)=n(C)+\cap(P)-(C\cap P)=40$

14. **(3)** $A=\{1,3,5,15\}, B=\{2,3,5,7\}\ C=\{2,4,6,8\}$

$\therefore A\cup C=\{1,2,3,4,5,6,7,8,15\}$

$(A\cup C)\cap B=\{2,3,5\}$

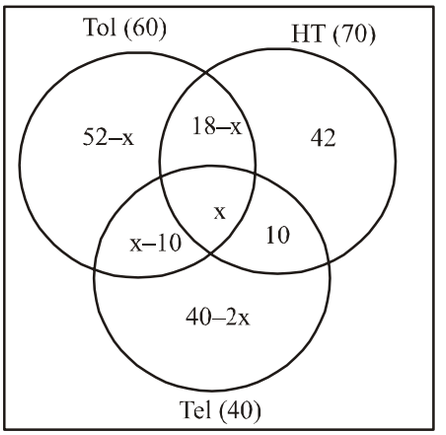
15. **(2)** Given set is $\{\frac{a}{b}\in I^+ : 2a^2+3b^2=35, a,b\in Z\}$

We can see that, $2(\pm2)^2+3(\pm3)^2=35$

and $2(\pm4)^2+3(\pm1)^2=35$

$\therefore\ (2,3),(2,-3),(-2,-3),(-2,3),(4,1),(4,-1),(-4,-1),(-4,1)$

For 16-17



Let us assume that the number of family who read all the news paper is x, then remaining is as given the venn diagram.

16. **(b)** Total number of family is $152-2x$

From venn diagram $10\le x\le 18$

So minimum total number of family

$=152-2\times18=152-36=116$

And maximum number of family

$=152-2\times10=152-20=132$

So total number of family must be between 132 and 116 and an even number hence 126 is a possible option.

17. **(c)** From the given condition $18-x>x-10$

or $28>2x$ or $x<14$

But we have seen that $x\ge10$ hence range of x is $10\le x<14$

Number of family who read only Tel is

$40-2x$ whose minimum value is 12 and maximum value is 20 with even number.

For 18-19

From the given condition number of students who play FB and any one more game is 10 we can conclude $e=g=i=10$,

From the given condition number of students who play Cr and any one more game is 8 we can conclude, $h=j=8$.

From the given condition number of students who play FB and any two more games is 12 we can conclude $k=n=l=12$

Hence the Venn diagram will be as follows -

Since total number of students who play FB is 100 hence

$a+e+g+k+l+o+i+n=100$

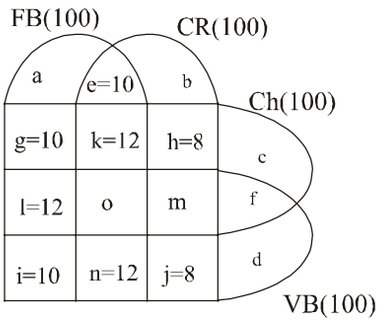
ora+o=34

Similarly $o+m+b=50$

$o+m+c+f=58$

o + m + d + f = 58

Or c + f = 8 + b



18. **(a)** From the Venn Diagram we have to find the value of Cr + FB, Cr + Ch , and Cr + VB or we have to find the value of e+ h + j = 10+8+8= 26

19. **(b)** Since number of students who play Chess and exactly 1 more game is g + h + f = 18 + f is maximum when f is maximum and since c+f = 8 + b hence for f is maximum b has to be maximum and maximum value of b is 50 when o = m = 0.

20. **(A) → (q); (B) → (s); (C) → (p)**

(A) Total no. of male students = 0.475 × 800 =380,

Total no. of veg. students = 0.53 × 800 = 424

Total number of students in secondary section = 0.80 × 800 = 640, out of these 0.55 × 640 = 352 are vegetarian, so we can re-write and complete the table as follows

	Male (M)	Vegetarian (V)
Class12	48	32
Class 11	44	40
Secondary Section	288	352
Total	380	424

Hence % of vegetarian students in class 12 = 32/80 ×100 = 40%

(B) The number of vegetarian male in class 12 = 0.25 × 32 =8, since total number of males in class 12 is 48, hence the number of non-vegetarian males in this class = 48 – 8 = 40.

The number of vegetarian female = 32 – 8 = 24

Hence required difference = 40 – 24 =16

(C) Total number of male students in secondary section = 288, and total number of students in this section is 640, hence required %

= 288/640 × 100 = 45%