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DAV BR PUBLIC SCHOOL, BINA
HALF YEARLY SAMPLE PAPER SESSION 2024-25
Class: XI **Subject: Mathematics**
Time Allowed: 3 Hrs **MM: 80**

Section A

1 The number of elements in the Power set P(S) of the set S = {1, 2, 3} is: **1**
(a) 4 (b) 8
(c) 2 (d) None of these

2 Which of the following two sets are equal? **1**
(a) A = {1, 2} and B = {1} (b) A = {1, 2} and B = {1, 2, 3}
(c) A = {1, 2, 3} and B = {2, 1, 3} (d) A = {1, 2, 4} and B = {1, 2, 3}

3 The set $(A \cup B \cup C) \cap (A \cap B' \cap C')' \cap C'$ is equal to **1**
(a) $B \cap C'$ (b) $B \cup C'$
(c) $A \cap C$ (d) $A \cap C'$

4 If A is a finite set containing n element, then number of subsets of A is **1**
(a) 2n (c) 2n-1
(b) 2^n (d) 2^{n-1}

5 Two finite sets have m and n elements respectively. The total number of subsets of first set is 56 more than the total number of subsets of the second set. The values of m and n respectively are. **1**
(a) 7, 6 (c) 6, 3
(b) 5, 1 (d) 8, 7

6 If $[x]^2 - 5[x] + 6 = 0$, where [.] denote the greatest integer function, then **1**
(a) $x \in [3, 4]$ (c) $x \in [2, 3]$
(b) $x \in (2, 3]$ (d) $x \in [2, 4)$

7 Let n (A) = m, and n (B) = n. Then the total number of non-empty relations that can be defined from A to B is **1**
(a) m^n (c) mn – 1
(b) $n^m - 1$ (d) $2^{mn} - 1$

8 Let S = set of points inside the square, T = the set of points inside the triangle and C = the set of points inside the circle. If the triangle and circle intersect each other and are contained in a square. Then **1**
(a) $S \cap T \cap C = \phi$ (b) $S \cup T \cup C = C$
(c) $S \cup T \cup C = S$ (d) $S \cup T = S \cap C$

9 If tan A = 1/2 and tan B = 1/3, then the value of A + B is **1**
(a) $\pi/6$ (b) π
(c) 0 (d) $\pi/4$

10 If sin θ and cos θ are the roots of the equation $ax^2 - bx + c = 0$, then a, b and c satisfy the relation. **1**
(a) $a^2 + b^2 + 2ac = 0$ (b) $a^2 - b^2 + 2ac = 0$

(c) $a^2 + c^2 + 2ab = 0$ (d) $a^2 - b^2 - 2ac = 0$

11 Let $x, y \in R$, then $x + iy$ is a non real complex number if: **1**

(a) $x = 0$ (b) $y = 0$

(c) $x \neq 0$ (d) $y \neq 0$

12 If $|z - 2| = |z - 6|$ then locus of z is given by : **1**

(a) a straight line parallel to x axis (b) a straight line parallel to y axis

(c) a circle (d) none of these

13 The value of $1 + i^2 + i^4 + i^6 + \ldots + i^{2n}$ is **1**

(a) positive (b) negative

(c) 0 (d) cannot be evaluated

14 Given that x is an integer, find the values of x which satisfy both $2x + 3 > 7$ and $x + 4 < 10$ **1**

(a) 4, 5 (b) 4

(c) 3, 4, 5 (d) 3

15 If $x < 5$, then **1**

(a) $-x < -5$ (b) $-x \leq -5$

(c) $-x > -5$ (d) $-x \geq -5$

16 In an examination there are three multiple choice questions and each question has 4 choices. Number of ways in which a student can fail to get all answer correct is **1**

(a) 11 (b) 12

(c) 27 (d) 63

17 Between two junction stations A and B there are 12 intermediate stations. The number of ways in which a train can be made to stop at 4 of these stations so that no two of these halting stations are consecutive is **1**

(a) ${}^{8}C_4$ (b) ${}^{9}C_4$

(c) ${}^{5}C_4$ (d) ${}^{6}C_4$

18 If ${}^{n}P_5 = 60\,{}^{n-1}P_3$, the value of n is **1**

(a) 6 (b) 10

(c) 12 (d)16

19 **Assertion(A):** If A = {1, 2, 3}, B = {2, 4}, then the number of relation from A to B is equal to 26. **1**

Reason (R): The total number of relation from set A to set B is equal to $\{2^{n(A).n(B)}\}$

(a) Both A and R are individually true and R is the correct explanation of A.

(b) Both A and R are individually true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true

20 **Assertion (A)**: The value of $\sin(-690^\circ)\cos(-300^\circ) + \cos(-750^\circ)\sin(-240^\circ) = 1$ **1**

Reason (R): The values of sin and cos is negative in the third and fourth quadrant respectively.

(a) Both A and R are individually true and R is the correct explanation of A.

(b) Both A and R are individually true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true

Section B

21 If n(A) = 3 and n(B) = 5, find: the maximum number of elements in A ∪ B. **2**

22 If the arcs of the same lengths in two circles subtend angles 65°and 110° at the centre, find the ratio of their radii. **2**

OR

Find the value of sin 15°

23 If 1 – i, is a root of the equation $x^2 + ax + b = 0$, where a, b ∈ R, then find the values of a and b. **2**

24 If the letters of the word RACHIT are arranged in all possible ways as listed in dictionary. Then what is the rank of the word RACHIT? **2**

25 In how many ways can a student choose a programme of 5 courses if 9 courses are available and 2 specific courses are compulsory for every student? **2**

26 If tanθ + sinθ = m and tanθ – sinθ = n, then prove that $m^2 – n^2 = 4\sin\theta \tan\theta$ **3**

27 Find the domain and range of the real functions: **3**

$$f(x) = \sqrt{9 - x^2}$$

OR

Find the domain of the function $f(x) = \frac{x^2+2x+1}{x^2-8x+12}$

28 The longest side of a triangle is 3 times the shortest side and the third side is 2 cm shorter than the longest side. If the perimeter of the triangle is at least 61 cm, find the minimum length of the shortest side. **3**

OR

A manufacturer has 600 litres of a 12% solution of acid. How many litres of a 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%?

29 Find the modulus of the number $(1+i)^2$ **3**

30 In an examination, a question paper consists of 12 questions divided into two parts i.e., Part I and Part II, containing 5 and 7 questions, respectively. A student is required to attempt 8 questions in all, selecting at least 3 from each part. In how many ways can a student select the questions? **3**

31 Given that E = {2, 4, 6, 8, 10}. If n represents any member of E, then, write the following sets containing all numbers represented by **3**

(i) n + 1 (ii) n^2

32 Prove that: 4 sin A sin (60° - A) sin (60° + A) = sin 3A. **5**

Hence deduce that: sin 20° × sin 40° × sin 60° × sin 80° = 3/16

33 Draw the Venn diagrams to illustrate the followoing relationship among sets E, M and U, where E is the set of students studying English in a school, M is the set of students studying Mathematics in the same school, U is the set of all students in that school. **5**

(i) All the students who study Mathematics study English, but some students who study English do not study Mathematics.

(ii) There is no student who studies both Mathematics and English.

(iii) Some of the students study Mathematics but do not study English, some study English but do not study Mathematics, and some study both.

(iv) Not all students study Mathematics, but every students studying English studies Mathematics.

OR

Let A, B and C be sets. Then show that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

34 Is g = {(1, 1), (2, 3), (3, 5), (4, 7)} a function? Justify. If this is described by the relation, $g(x) = \alpha x + \beta$, then what values should be assigned to α and β? **5**

35 If θ lies in the first quadrant and cos θ = 8/17, then find the value of $\cos(30° + \theta) + \cos(45° - \theta) + \cos(120° - \theta)$. **5**

OR

Prove that $\sin 4A = 4\sin A \cos^3 A - 4\cos A \sin^3 A$

Section E

36 **Case Study 1** **4**

A state cricket authority has to choose a team of 11 members, to do it so the authority asks 2 coaches of a government academy to select the team members that have experience as well as the best performers in last 15 matches.
They can make up a team of 11 cricketers amongst 15 possible candidates. In how many ways can the final eleven be selected from 15 cricket players if:

(i) there is no restriction

(ii) one of then must be included

(iii) Two of them being leg spinners, one and only one leg spinner must be included

37 **Case Study 1** **4**

The school organised a farewell party for 100 students and school management decided three types of drinks will be distributed in farewell party i.e., Milk (M), Coffee (C) and Tea (T).

Organiser reported that 10 students had all three drinks M, C, T. 20 students had M and C; 30 students and C and T; 25 students had M and T. 12 students had M only; 5 students had C only; 8 students had T only.

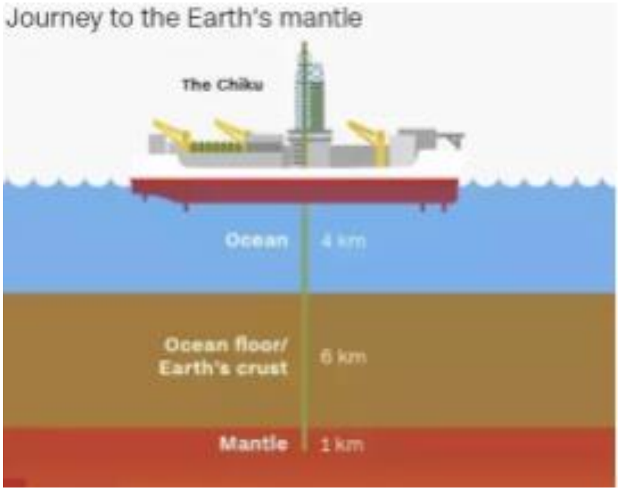
i. Find the number of students who prefer Milk and Coffee but not tea?

ii. Find the number of students who prefer Tea.

38 In drilling world's deepest hole, the Kola Superdeep Borehole, the deepest manmade hole on Earth and deepest artificial point on Earth, as a result of a scientific drilling project, it was found that the temperature T in degree Celsius, x km below the surface of Earth, was given by: **4**

T = 30 + 25 (x – 3), 3 < x < 15.

If the required temperature lies between 200° C and 300° C, then



i. Find the depth x

ii. Solve for x. -9x+2> 18

OR

iii. If |x| < 5 then find the value of x