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CUMULATIVE (HALF YEARLY) EXAMINATION 2022-23
CLASS XI
SUBJECT- MATHEMATICS

Time allowed: 3Hours   **Maximum marks: 80**

General Instructions :

1. This question paper contains- **five sections** A, B,C,D and E. Each section is compulsory. However there are internal choices in some questions.

2**. Section A** has 18 MCQ's and 02 Assertion-Reason based question of 1 mark each.

3. **Section B** has 5 Very Short Answer (VSA) type questions of 2 marks each.

4. **Section C** has 6 Short Answer (SA) type questions of 3 marks each

5. **Section D** has 4 long answer (LA) type questions of 5 marks each

5. **Section E** has 3 source- based/case based/ passage based/ integrated units of assessment (4 marks each) with sub parts.

SECTION A
(MULTIPLE CHOICE QUESTIONS)
Each question carries 1 mark

1. Roster form of A={x: x^2+7x-8=0, x € R} is

(a) {-1,8}   (b) {-1,-8}

(c) {1,-8}   (d) {1,8}

2. Empty set is a _____.

(a) infinite set   (b) Finite set

(c) Unknown set   (d) Universal set

3. If f(x) = x^3 – (1/x^3), then f(x) + f(1/x) is equal to

(a) 2x^3 (b) 2/x^3 (c) 0   (d) 1

4. If f(x) = x^2 + 2, x ∈ R, then the range of f(x) is

(a) [2, ∞)   (b) (-∞, 2]   (c) (2, ∞)   (d) (-∞, 2) U (2, ∞)

5. Domain of function f(x) = $\frac{x-1}{x^2+5x+6}$

(a) R-{-2,-3}   (b) R-{-2, 3}   (c) R-{2,-3}   (d) R-{2,3}

6. Radian measure of 40^0 20' is

(a)120 $\frac{\pi}{540}$ (b)121 $\frac{\pi}{560}$ (c) 120 $\frac{\pi}{560}$ (d)121 $\frac{\pi}{540}$

7. If tan A = 1/2 and tan B = 1/3, then the value of A + B is

(a) π/6   (b) π   (c) 0   (d) π/4

8. If cot x = $\frac{-5}{12}$, x lies in ii quadrant, the value of sec x is

(a) $\frac{13}{5}$ (b) $\frac{-13}{5}$ (c) $\frac{-5}{13}$ (d) $\frac{5}{13}$

9. The least value of n for which {(1 + i)/(1 – i)}^{n} is real, is
(a) 1   (b) 2   (c) 3   (d) 4

10. The value of x and y if (3y – 2) + i(7 – 2x) = 0
(a) x = 7/2, y = 2/3   (b) x = 2/7, y = 2/3
(c) x = 7/2, y = 3/2   (d) x = 2/7, y = 3/2

11. If (x + 3)/(x – 2) > 1/2 then x lies in the interval
(a) (-8, ∞)   (b) (8, ∞)   (c) (∞, -8)   (d) (∞, 8)

12. If -2 < 2x – 1 < 2 then the value of x lies in the interval
(a) (1/2, 3/2)   (b) (-1/2, 3/2)   (c) (3/2, 1/2)   (d) (3/2, -1/2)

13. The solution of the 15 < 3(x – 2)/5 < 0 is
(a) 27 < x < 2   (b) 27 < x < -2   (c) -27 < x < 2   (d) -27 < x < -2

14. How many two digit even numbers can be formed from digit 1,2,3,4,5 if digit can be repeated

(a) 8   (b) 10   (c)12   (d)15

15. Value of 7! - 5! Is

(a) 2!   (b) 9204   (c) 4920   (d) 4902

16. If $\frac{1}{8!}+\frac{1}{9!}=\frac{x}{10!}$, value of x is

(a)8   (b)9   (c)10   (d)100

17. The coefficient of x^3y^4 is $(2x+3y^2)^5$ is

(a)240   (b) 360   (c) 720   (d) 1080

18. If third term of binomial expansion of (1+x)^m is $(\frac{-1}{8})x^2$, then rational value of m is

(a) $\frac{1}{2}$ (b)$\frac{1}{3}$ (c)$\frac{1}{4}$ (d)none of these

ASSERTION-REASON BASED QUESTIONS

In the following questions, a statement of assertion(A) is followed by a statement of Reason(R). Choose the correct answer out of the following choices

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

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

(c) A is true but R is false

(d) A is false but R is true

19. Assertion(A) simplest form of i^{-35} is i

     Reason(R) Additive inverse of 1-i is equal to -1+i

20. Assertion(A): The expansion of $(1+x)^n = C_0 + C_1 x + C_2 x^2 + _____ + C_n x^n$

     Reason(R): If x=-1 then above expression is zero

SECTION B

This section comprises of very short answer type questions (VSA) of 2 marks each

21. Let A, B and C be three sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$.
         Show that   B = C.

<div align="center">OR</div>

  Give an example of three sets A,B&C such that $A \cap B$, $B \cap C$ and $C \cap A$ are non-empty and $A \cap B \cap C = \phi$

22. Find the value of $i^{2022} + 1/i^{2022}$

23. Solve the inequation $\frac{2x+1}{4} \geq \frac{3x-2}{5}, \ x \in R$

24. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has at least one boy and one girl?

<div align="center">OR</div>

In how many of the distinct permutations of the letters in MISSISSIPPI do the four I's not come together?

25. Find the co-efficient of x^5 in $(x + 3)^8$

SECTION C

This section comprises of short answer type questions (SA) of 3 marks each

26. Let $A = \{1,\ 2,\ 3\}\ and\ B = \{3,\ 4\ \}C = \{4,\ 5,\ 6\ \}\ then\ find$

$(i)A\times(B\cap C)$ $(ii)(A\times B)\cap(A\times C)$ (iii) $A\times(B\cup C)$

27. Find the domain and range for the real function f(x) $=\sqrt{9-x^2}$.

OR

Find the domain and range of $f(x) = \dfrac{x-2}{x-1}$

28. Show that tan7x tan4x tan3x= tan7x- tan4x- tan3x

OR

Prove that $2cos\dfrac{\pi}{13}cos\dfrac{9\pi}{13} + cos\dfrac{3\pi}{13} + cos\dfrac{5\pi}{13} = 0$

29. If (x+iy)^3 = u+iv, then show that $\dfrac{u}{x} + \dfrac{v}{x} = 4\left(x^2 - y^2\right)$

30. How many words, with or without meaning, each of 2 vowels and 3 consonants can be formed from the letters of the word DAUGHTER?

OR

How many numbers greater than 1000000 can be formed by using the digits 1,2,0,2,4,2,4 ?

31. Prove that $\displaystyle\sum_{r=0}^{n} 3^r\ ^nC_r = 4^n$

SECTION D

This section comprises of long answer type questions (LA) of 5 marks each

32. Let R be a relation from N to N defined by

R= {(a,b): a, b € N and a=b^2}. Are the following true?

i) (a,a) € R for all a € N

ii) (a,b) € R implies (b,a) € R

iii) (a,b) € R, (b,c) € R implies (a,c) € R

Justify your answer in each case.

33. Prove that
$$cos^2x + cos^2\left(x + \frac{\pi}{3}\right) + cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$$

<div align="center">**OR**</div>

Prove that $\quad$ Cos 20^0.Cos40^0. Cos60^0. Cos80^0 =1/16

34. In an experiment, a solution of hydrochloric acid is to be kept between 30° and 35°Celcius.What is the range of temperature in degree Fahrenheit if conversion formula is given by C= $\frac{5}{9}$(F- 32), where C and F represent temperature in degree Celsius and Fahrenheit respectively.

35. Find $(a+b)^4$- $(a-b)^4$. Hence evaluate

$(\sqrt{3}+\sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4$

<div align="center">**OR**</div>

Write down the binomial expansion of $(1+x)^{n+1}$ when x =8. Deduce that 9^{n+1}- 8n- 9 is divisible by 64, where n is a positive integer

<div align="center">## SECTION E</div>

This section comprises of 3 case- study/ passage based questions of 4 marks each where each sub part carries 1 mark each

Case Study Based question

Q36 Two non empty sets A and B are given by
A={x: x is a letter in I LOVE MATHEMATICS}
B={x: x is a letter in I LOVE STATISTICS}.
Based on the above information, answer the following questions:
(i) Which of the following is true?

(a)A=B $\qquad$ (b) A⊂ B $\qquad$ (c) B⊂ A $\qquad$ (d) None of these

(ii) A **U** B is equal to

(a) A $\qquad\qquad\qquad\qquad$ (b) B $\qquad\qquad\qquad\qquad$ (c) A∩B
(d) φ

(iii) A∩B is equal to

(a) A $\qquad\qquad\qquad\qquad$ (b)B $\qquad\qquad\qquad\qquad$ (c) A **U** B
(d) φ

(iv) B-A is equal to

(a) A (b) B (c) A-B (d) φ

Q37. Given $\sin x - \sin y = p$ and $\cos x - \cos y = q$

Based on the above information answer the following questions

i) The value of $\tan(\frac{(x+y)}{2})$ is

a) $\frac{-q}{p}$ b) $\frac{p}{q}$ c) $\frac{q}{p}$ d) $\frac{-p}{q}$

ii) The value of $\sin(x+y)$ is

a) $\frac{2pq}{p2+q2}$ b) $\frac{-2pq}{p2+q2}$ c) $\frac{p2-q2}{p2+q2}$ d) $\frac{q2-p2}{p2+q2}$

iii) The value of $\cos(x+y)$ is

a) $\frac{2pq}{p2+q2}$ b) $\frac{-2pq}{p2+q2}$ c) $\frac{p2-q2}{p2+q2}$ d) $\frac{q2-p2}{p2+q2}$
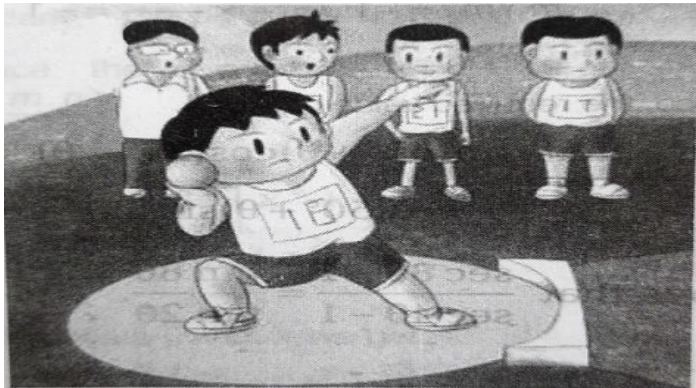
iv) The value of $\tan(x+y)$ is

a) $\frac{2pq}{p2+q2}$ b) $\frac{-2pq}{p2+q2}$ c) $\frac{2pq}{p2-q2}$ d) $\frac{-2pq}{p2-q2}$

Q 38: Five students Ramesh, Ashok, Mohan, Dinesh and Pawan are sitting in a play ground in a line.

Based on the above information answer the following

i) Total number of ways of sitting arrangement of five students is

a) 120 (b) 60 (c) 24 (d)None of these

ii) Total number of arrangement of sitting if Ramesh and Dinesh sit together is

a)60 (b)48 (c)72 (d)120

iii) Total number of arrangement Dinesh and Mohan sitting at extreme position is

a)24   (b)36   (c) 48   (d)12

iv)   Total number of arrangement if Ashok is sitting in the middle is

a)24   (b)12   (c)6   (d)36