K R MANGALAM WORLD SCHOOL, GK II

FIRST TERM EXAMINATION| SESSION 2025-26

CLASS XI | MATHEMATICS | SIXTH SUBJECT

MM:80 TIME: 3 HRS

General Instructions

1.The Question paper contains- five sections A,B, C, D and E. Each section is compulsory.

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

3. Section B has 5 very short (VSA)- type questions of 2 marks each.

4. Section C has 6 short (SA)- type questions of 3 marks each.

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

6. Section E has 3 source based/case-based questions of 4 marks each.

SECTION A

1. If $z = 1 - 2i$ then $|z| =$

   a) $\sqrt{5}$ b) $-\sqrt{5}$

   c) $\sqrt{5}i$ d) $-\sqrt{5}i$

2. School A has eight players. A five-member team will be selected out of these eight players. How many different selections can be made?

   a) 66 b) 56 c) 46 d) 36

3. If $-2x - 9 < x - 3$, then

   a) $(-\infty, -2)$ b) $(-2, 0)$

   c) $(-2, \infty)$ d) $(2, \infty)$

4. The greatest value of $\sin x + \cos x$ is

   a) 1 b) 2 c) $\sqrt{2}$ d) $\frac{1}{2}$

5. The real values of x, y for $(1 + i)(x + iy) = 2 - 5i$ are

   a) $x = \frac{7}{2}, y = \frac{3}{2}$ b) $x = \frac{3}{2}, y = \frac{7}{2}$

   c) $x = -\frac{3}{2}, y = -\frac{7}{2}$ d) $x = 2, y = -5$

6. The length of an arc of a circle of radius 5 cm subtending a central angle measuring 15 degrees is

   a) $\frac{5\pi}{12}$ b) $\frac{5\pi}{8}$ c) $\frac{12\pi}{5}$ d) $\frac{\pi}{12}$

(d) A is false but R is true.

19. **Assertion (A):** Let A = {a, b, c} and B = {a, b, c, d}. Then, $A \subset B$.
Reason (R): If every element of A is also an element of B, then A is a subset of B.

20. **Assertion (A):** A three-digit number divisible by 3 is to be formed using the digits 1, 2, 3, 4, and 5 with no repetition. The total number formed is 26.
Reason (R): If the sum of digits of any number is divisible by 3 then the number must be divisible by 3.

SECTION B

21. In how many ways can the letters of the word "ABACUS" be arranged such that the vowels always appear together? 2

22. Simplify: $\left(\frac{1}{1-i}-\frac{3}{2+i}\right)\left(\frac{2+i}{1+i}\right)$ 2

23. Define signum function. Draw its graph for $-8 < x < 8$ 2

24. Solve the inequation: $\frac{2x+4}{x-3} \leq 4$ 2

25. Find the degree measure for 4 radians 2

SECTION C

26. Let $A = \{x: x = 6n, n \in N\}, B = \{x: x = 9n, n \in N\}$. Find $A \cap B$. 3

27. Show that: $\cos A \cos 2A \cos 4A \cos 8A = \frac{\sin 16A}{16 \sin A}$ 3

Or

Prove that $\sqrt{2+\sqrt{2+2\cos 4\theta}} = 2\cos\theta$

28. Prove that: $\sin A + \sin\left(A+\frac{2\pi}{3}\right) + \sin\left(A+\frac{4\pi}{3}\right) = 0$ 3

29. Find $|z|$ for $z = \left(-2-\frac{1}{3}i\right)^3$ 3

30. Find the domain and range of the function: $f(x) = \frac{1}{1+x^2}$ 3

31. Find the rank of the word "MOTHER" 3

SECTION D

32. There are 15 points in a plane out of which only 6 are in a straight line, then 5
(a) how many different straight lines can be made?
(b) how many triangles can be made?

33. Prove that: $\cos 2x \cos\left(\frac{x}{2}\right) - \cos 3x \cos\left(\frac{9x}{2}\right) = \sin 5x \sin\left(\frac{5x}{2}\right)$ 5

Or

Prove that: $\tan 4x = \frac{4\tan x(1-\tan^2 x)}{1-6\tan^2 x+\tan^4 x}$

34. Prove that: $\cos^4\left(\frac{\pi}{8}\right) + \cos^4\left(\frac{3\pi}{8}\right) + \cos^4\left(\frac{5\pi}{8}\right) + \cos^4\left(\frac{7\pi}{8}\right) = \frac{3}{2}$ 5

35. If f and g are real functions such that $f(x) = \frac{x-3}{2x}$, 5
$g(x) = x^2 + 5$, then find
a) $f(-3) + g(5)$
b) $f(t) + g\left(\frac{1}{t}\right)$
c) $f(-x) + g(-x^2)$

SECTION E

36. Case study: An intelligence quotient (IQ) is a total score derived from a set of standardised tests or subtests designed to assess human intelligence. The abbreviation "IQ" was coined by the psychologist William Stern for the German term Intelligence quotient, his term for a scoring method for intelligence tests at University of Breslau he advocated in a 1912 book.
Manjula is a Psychology student and nowadays she is learning about Intelligence Quotient (IQ). She calculates the result as follows:

$$\text{Intelligence Quotient} = \frac{\text{Mental Age}}{\text{Chronological Age}} \times 100$$

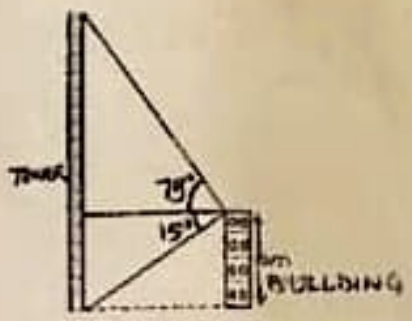
(a) What could be the range if mental age if a group of children with chronological age of 15 years have the IQ range as $90 \leq IQ \leq 150$? 2
(b) What could be the range of IQ if a group of children with age of 12 years have the mental age range as $9 \leq MA \leq 15$? 2

OR

(b) What could be the range of IQ if a group of children with mental age of 18 years have the mental age range as $12 \leq CA \leq 15$?

37. Read the following passage and answer the questions given below:
A school administration decides to send some of ils students of class XI to an educational tour. From a class of 25 students, 10 are to be chosen for the tour. There are 3 friends – Rajesh, Shreya, and Deepa who decide that either all of them will join or none of them will join the tour.
(i) In how many ways can the students be chosen for this educational tour, if these three friends will not join? 2
(ii) In how many ways can the students be chosen for this educational tour? 2

38. **From the top of a tower of 10 m high building the angle of elevation of top of a tower is 75° and the angle of depression of foot of the tower is 15°. If the tower and building are on the same horizontal surfaces.**



On the basis of above answer the following:

a) Find $tan15^0$ 2

b) Find $cos75^0$ 2

7. If $P(n, 3) = 990$, then n =

a) 9 b) 10 c) 11 d) 12

8. The sum of the digits in unit place of all the numbers formed with the help of 3, 4, 5, and 6 taken all at a time is

a) 432 b) 108 c) 36 d) 18

9. If sets A and B have 3 and 4 elements respectively then the number of subsets of a set (A × B) is

a) 1024 b) 2048 c) 512 d) 4096

10. Which of the following is an empty set?

a) {x | x is a prime number less than 5}

b) {x | x is an even number greater than 10}

c) {x | x is a multiple of 7}

d) {x | x is a number in the word "set"}

11. The value of i^{-999} is

a) 1 b) -1 c) i d) -i

12. If $3 \tan (x - 15°) = \tan (x + 15°)$, then the value of x is

a) 30° b) 45° c) 60° d) 90°

13. Given that x, y and b are real numbers and $x \geq y$, $b < 0$, then

a) $\frac{x}{b} < \frac{y}{b}$ b) $\frac{x}{b} \leq \frac{y}{b}$

c) $\frac{x}{b} > \frac{y}{b}$ d) $\frac{x}{b} \geq \frac{y}{b}$

14. The value of $\cos 5\pi$ is

a) 0 b) 1 c) -1 d) $\frac{1}{2}$

15. Let R be the relation in the set N given by $R = \{(a, b): a = b - 2, b > 6\}$. Choose the correct answer.

a) $(2, 4) \in R$

b) $(3, 8) \in R$

c) $(6, 8) \in R$

d) $(8, 7) \in R$

16. The domain of the function f defined by $f(x) = \sqrt{4 - x} + \frac{1}{\sqrt{x^2 - 1}}$ is equal to

a) $(-\infty, -1) \cup (1, 4]$ b) $(-\infty, -1]$

c) $[1, 4]$ d) $[4, \infty)$

17. In a chess tournament, each of the six players will play with every other player exactly once. What is the number of matches that will be played during the tournament?

a) 10 b) 15 c) 20 d) 25

18. $(A' \cup B)'$ is equal to

a) B-A b) A-B

c) A ∩ B 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 the correct explanation of A.

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

(c) A is true but R is false.