

INDIAN SCHOOL SALALAH  
SECOND TERM EXAMINATION, 2018-19  
MATHEMATICS

CLASS: XI

Time Allowed: 3 hours

Maximum Marks: 100

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**General Instructions:**

- i. All questions are compulsory.
- ii. This question paper contains 29 questions.
- iii. Question 1-4 in Section A are very short-answer type questions carrying 1 mark each.
- iv. Question 5-12 in Section B are short-answer type questions carrying 2 marks each.
- v. Question 13-23 in Section C are long-answer **I** type questions carrying 4 marks each.
- vi. Question 24-29 in Section D are long-answer **II** type questions carrying 6 marks each.

**SECTION.A**

**Questions 1 to 4 carry 1 mark each.**

1. If a set A has 2 elements and set B has 3 elements, then what is the number of possible relations from A to B ?
2. What is the distance between the lines  $y = mx + c_1$  and  $y = mx + c_2$  ?
3. In how many different ways can the letters of the word 'ASSASSINATION' be arranged?

**OR**

If  ${}^n P_r = 840$  and  ${}^n C_r = 35$  find the value of 'r'.

4. Find  $\cot(-870)^\circ$

**SECTION.B**

**Questions 5 to 12 carry 2 marks each.**

5. In a group of 26 persons, 8 take tea but not coffee and 16 take tea. How many take coffee but not tea?
6. If  $\left(\frac{1-i}{1+i}\right)^{100} = a + bi$  find  $a$  and  $b$ .
7. Find the number of 4 digit numbers that can be formed by using the digits 1, 2,3,4,5 such that at least one digit is repeated.
8. In a G.P, the 3<sup>rd</sup> term is 24 and the 6<sup>th</sup> term is 192. Find the 10<sup>th</sup> term.

**OR**

Evaluate:  $\sum_{i=1}^{11} (2 + 3^i)$

9. Find domain and range of the function  $f(x) = \frac{5-x}{x-5}$ .
10. The large hand of a clock is 42cm long. How many centimetres does its extremity move in 20 minutes?

**OR**

If  $x = y \cos \frac{2\pi}{3} = z \cos \frac{4\pi}{3}$ , then find the value of  $xy + yz + zx$ .

11. Find the centre and the radius of the circle  $x^2 + y^2 - 2x + 4y - 4 = 0$ .
12. Line through the points  $(-2, 6)$  and  $(4, 8)$  is perpendicular to the line through the points  $(8, 12)$  and  $(x, 24)$ . Find the value of  $x$ .

**OR**

If the line  $\frac{x}{a} + \frac{y}{b} = 1$  passes through the points  $(2, -3)$  and  $(4, -5)$  then find  $(a, b)$ .

### SECTION.C

#### Questions 13 to 23 carry 4 marks each.

13. If  $a, b, c$  are in A.P,  $b, c, d$  are in G.P and  $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$  are in A.P. Prove that  $a, c, e$  are in G.P.

**OR**

The product of three numbers in G.P is 216. If 2, 8, 6, be added to them, the results are in A.P. Find the numbers.

14. a) If  $P = \{x: x < 3, x \in N\}, Q = \{x: x \leq 2, x \in W\}$ , where  $W$  is the set of whole numbers, then find  $(P \cup Q) \times (P \cap Q)$
- a) Let  $A = \{1, 2, 3, \dots, 14\}$ . Define a relation  $R$  from  $A$  to  $A$  by  $R = \{(x, y): 3x - y = 0, \text{ where } x, y \in A\}$ . Write down domain and range of  $R$ .

15. Prove that  $a \cos A + b \cos B + c \cos C = 2a \sin B \sin C$

16. a) Solve the inequality:  $\frac{4}{x+1} \leq 3 \leq \frac{6}{x+1}$

- b) In drilling world's deepest hole it was found that the temperature  $T$  in degree Celsius,  $x$  km below the surface of Earth, was given by  $T = 30 + 25(x - 3), 3 < x < 15$ .

At what depth will the temperature be between  $200^\circ C$  and  $300^\circ C$  ?

17. Find the square root of  $-2 + 2\sqrt{3}i$ .

18. If  $A = \{1, 2, 3\}, B = \{2, 3, 4, 5\}$  and  $C = \{2, 4, 6, 8\}$  verify that

a)  $A - (A - B) = A \cap B$                       b)  $A \cap (B - C) = (A \cap B) - (B \cap C)$

19. i) What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these (ii) four cards are of the same suit, (iii) two are red cards and two are black cards, (iv) are face cards?

**OR**

If  ${}^{n+1}C_{r+1} : {}^nC_r = 11:6$  then find 'n'.

20. The sum of the coefficients of the first three terms in the expansion of  $\left(x - \frac{3}{x^2}\right)^n$ ,  $x \neq 0$  being a natural number is 559. Find the term of the expansion containing  $x^3$ .

**OR**

Find the term independent of  $x$  in the expansion of  $\left[\sqrt{x} - \frac{2}{\sqrt{x}}\right]^{18}$

21. Show that three points A (2, 3, 4), B (-1, 2, -3) and C (-4, 1, -10) are collinear and find the ratio in which C divides AB.
22. Find the coordinates of the foci, the vertices, the eccentricity and the latus rectum of the hyperbola  $9x^2 - 16y^2 = 144$ .
23. Find the equation of the lines which passes through the point (3, 4) and cuts off intercepts from the coordinate axes such that their sum is 14.

### **SECTION.D**

**Questions 24 to 29 carry 6 marks each.**

24. a) Write the complex number  $\frac{(1+i)(1+\sqrt{3}i)}{1-i}$  in the polar form.

b) If  $\frac{(a^2+1)^2}{2a-i} = x + iy$ , find  $x^2 + y^2$

25. a) Find the general solution of  $\sec^2 2x = 1 - \tan 2x$

b) Prove that  $\sin 3x + \sin 2x - \sin x = 4 \sin x \cos \frac{x}{2} \cos \frac{3x}{2}$

**.OR**

a) Prove that  $\cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$

b) Find  $\sin \frac{x}{2}$  and  $\tan \frac{x}{2}$  if  $\cos x = \frac{-1}{3}$ ,  $x$  is in 3<sup>rd</sup> quadrant.

26. By using the principle of mathematical induction prove that

$$\left(1 + \frac{3}{1}\right) \left(1 + \frac{5}{4}\right) \left(1 + \frac{7}{9}\right) \dots \dots \dots \left(1 + \frac{(2n+1)}{n^2}\right) = (n+1)^2 \text{ for all } n \in N.$$

27. a) Find the equation of the right bisector of the line segment joining the points (3, 4) and (-1, 2).

b) Find the angle between the lines  $y = (2 - \sqrt{3})(x + 5)$  and  $y = (2 + \sqrt{3})(x - 7)$ .

**OR**

a) Show that the tangent of an angle between the lines  $\frac{x}{a} + \frac{y}{b} = 1$  and  $\frac{x}{a} - \frac{y}{b} = 1$

is  $\pm \left( \frac{2ab}{a^2 - b^2} \right)$ .

b) If the lines  $2x + y - 3 = 0$ ,  $5x - ky - 3 = 0$  and  $3x - y - 2 = 0$  are concurrent, find the value of  $k$ .

28. a) The first, second and last terms of an AP are  $a$ ,  $b$  and  $2a$  respectively. Show that its sum is  $\frac{3ab}{2(b-a)}$

b) If  $a, b, c$  are in AP, prove that  $x^a, x^b, x^c$  are in GP.

**OR**

a) The 4<sup>th</sup> term of an AP is equal to 3 times the first term and the 7<sup>th</sup> term exceeds twice the 3<sup>rd</sup> term by 1. Find first term and common difference.

b) If the first and the  $n$ th term of a G.P are  $a$  and  $b$ , respectively, and if  $P$  is the product of  $n$  terms, prove that  $P^2 = (ab)^n$ .

29. Find 'n', if the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of  $\left( \sqrt[4]{2} + \frac{1}{\sqrt[4]{3}} \right)^n$  is  $\sqrt{6}:1$

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