ST. XAVIER'S SENIOR SECONDARY SCHOOL, DELHI – 110 054

Class 10 Time: 3 hrs.

27-9-2023 MID TERM EXAMINATION - **MATHEMATICS** Max. Marks : 80

General Instructions:

i) This Question Paper has 5 Sections A - E.
ii) Section A has 20 MCQs carrying 1 mark each.
iii) Section B has 5 questions carrying 02 marks each.
iv) Section C has 6 questions carrying 03 marks each.
v) Section D has 4 questions carrying 05 marks each.
vi) Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1,1 and 2 marks each respectively.
vii) All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
viii) Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section – A

1. The sum of the HCF and LCM of 12, 21 and 15 is
a) 423 b) 420 c) 417 d) 140

2. If α and β are the zeroes of the polynomial $p(x) = x^2 + x + 1$, then $\frac{1}{\alpha} + \frac{1}{\beta} =$
a) 1 b) -1 c) 0 d) None of these

3. The value of k for which the lines $5x + 7y = 3$ and $15x + 21y = k$ coincide is
a) 9 b) 5 c) 7 d) 18

4. The next term of the AP. $\sqrt{7}, \sqrt{28}, \sqrt{63}, \ldots\ldots\ldots\ldots$
a) $\sqrt{70}$ b) $\sqrt{84}$ c) $\sqrt{97}$ d) $\sqrt{112}$

5. A bag contains 3 red balls and 5 black balls. A ball is drawn at random from the bag. What is the probability that the drawn ball is not red?
a) $\frac{3}{8}$ b) $\frac{2}{8}$ c) $\frac{3}{5}$ d) $\frac{5}{8}$

6. If in two triangles ABC and PQR, $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$, then
a) $\Delta PQR \sim \Delta CAB$ b) $\Delta PQR \sim \Delta ABC$
c) $\Delta PQR \sim \Delta CBA$ d) $\Delta PQR \sim \Delta BCA$

7. If $\cos\theta = \frac{1}{2}$ then $\sec\theta$ is
a) $-\frac{1}{2}$ b) 2 c) -2 d) None of these

8. If HCF (x, 8) = 4, LCM (x, 8) = 24, then x is
a) 8 b) 10 c) 12 d) 14

9. The number of polynomials having -3 and 5 as zeroes is
a) 2 b) Infinitely many solutions
c) 5 d) None of these

10. The pair of equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ have
a) Unique solution b) Exactly two solutions
c) infinitely many solutions d) No solution

11. The list of numbers -10, -6, -2, 2 ………………… is
a) An A.P. with $d = -16$ b) An A.P. with $d = -4$
c) An A.P. with $d = 4$ d) Not an A.P.

12. A card is drawn from a well shuffled deck of 52 playing cards. The probability that it is not a face card is
a) $\frac{12}{52}$ b) $\frac{16}{52}$ c) $\frac{10}{13}$ d) $\frac{9}{13}$

13. If $\sqrt{3}\tan 2\theta - 3 = 0$, then $\theta =$
a) 15^0 b) 30^0 c) 45^0 d) 60^0

14. If one of the zeroes of a quadratic polynomial $(k-1)x^2 + kx + 1$ is -3, then the value of k is
a) $\frac{4}{3}$ b) $\frac{-4}{3}$ c) $\frac{2}{3}$ d) $\frac{-2}{3}$

15. The graphs of the equation $2x + 3y - 2 = 0$ and $x - 2y - 8 = 0$ are two lines which are
  a) Coincident b) Parallel
  c) Intersecting d) Perpendicular

16. The 4th term from the end of the A.P. $-11, -8, -5, \ldots\ldots\ldots\ldots\ldots.., 49$ is
  a) 37 b) 40 c) 4 d) 58

17. If $\tan\theta + \frac{1}{\tan\theta} = 2$ then the value of $\tan^2\theta + \frac{1}{\tan^2\theta}$ is
  a) 3 b) 4 c) 2 d) -4

18. A box contains cards numbered 6 to 50. A card is drawn at random from the box. The probability that the drawn card has a number which is a perfect square is
  a) $\frac{1}{45}$ b) $\frac{2}{15}$ c) $\frac{1}{9}$ d) $\frac{4}{45}$

DIRECTION: In the question numbers **19** and **20,** a statement of **Assertion (A)** is followed by a statement of **Reason(R).** Choose the correct option.

19. Statement A (Assertion): $\sqrt{2} + \sqrt{3}$ is an irrational number.
  Statement R (Reason): If p and q are prime positive integers, then $\sqrt{p} + \sqrt{q}$ is an irrational number.
  a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
  b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
  c) Assertion (A) is true but reason (R) is false.
  d) Assertion (A) is false but reason (R) is true.

20. Statement A (Assertion): Two similar triangles are always congruent.
  Statement R (Reason): Two congruent triangles are always similar.
  a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
  b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
  c) Assertion (A) is true but reason (R) is false.
  d) Assertion (A) is false but reason (R) is true.

Section – B

21. If one zero of the quadratic polynomial $p(x) = 4x^2 - 8kx - 9$ is negative of the other, find the value of k.

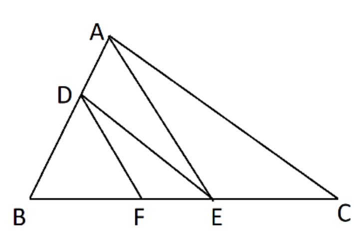
(OR)

Write a quadratic polynomial with -5 and 2 as the sum and product of its zeroes respectively.

22. Which term of the A.P. 4, 9, 14, 19, ………. is 124?

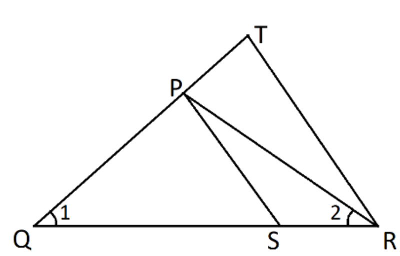
23. If 8th term of an A.P. is 31 and the 15th term is 16 more than the 11th term, find the A.P.

24. In the given fig, $DE \parallel AC$ and $DF \parallel AE$.
  Prove that $\frac{\mathrm{BF}}{\mathrm{FE}} = \frac{\mathrm{BE}}{\mathrm{EC}}$.



(OR)

In the following fig, $\frac{\mathrm{QR}}{\mathrm{QS}} = \frac{\mathrm{QT}}{\mathrm{PR}}$ and $\angle 1 = \angle 2$.
  Prove that $\Delta PQS \sim \Delta TQR$.



25. If $\sin(A + B) = 1$ and $\cos(A - B) = \frac{\sqrt{3}}{2}$, $0^0 < A + B \leq 90^0$, $A > B$ then find A and B.

Section – C

26. Find the zeroes of the quadratic polynomial $p(x) = x^2 - 11x - 12$ and verify the relation between the zeroes and its coefficients.

27. The sum of a two-digit number and the number formed by interchanging its digits is 110. If 10 is subtracted from the 1st number, the new number is 4 more than 5 times the sum of the digits in the first number. Find the first number.

(OR)

Points A and B are 90 km apart from each other on a highway. A car starts from A and another car from B at the same time. If they go in the same direction, they meet in 9 hrs and if they go in opposite direction, they meet in $\frac{9}{7}$ hrs. Find their speeds.

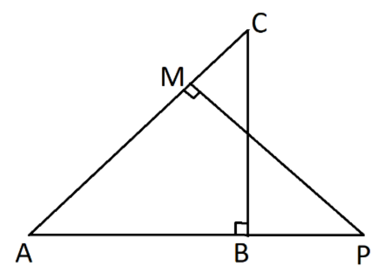
28. Find the sum of all three-digit natural numbers which are divisible by 7.

(OR)

If the sum of first n terms of an A.P. is $\frac{1}{2}(3n^2 + 7n)$, then find its nth term. Also find its 20th term.

29. One card is drawn from a well shuffled deck of playing cards. Find the probability of getting
   i) A red face card.
   ii) A spade.
   iii) A queen of black suit.

30. In the given fig, ABC and AMP are two right tringles, right angled at B and M respectively. Prove that



   i) $\triangle ABC \sim \triangle AMP$
   ii) $\frac{CA}{PA} = \frac{BC}{MP}$

31. Prove that $\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta} = 2\,\mathrm{cosec}\,\theta$.

Section – D

32. Prove that $3 + 8\sqrt{5}$ is an irrational number.

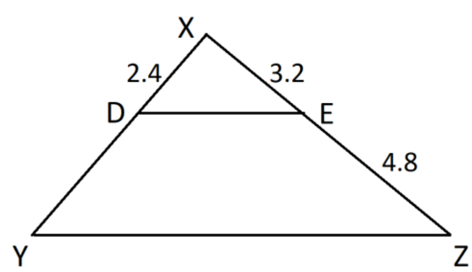
33. Solve the following system of linear equations graphically.

$2x - y - 4 = 0$

$x + y + 1 = 0$

Write the points where the lines meet y axis.
Shade the triangle formed by these lines and x-axis. Also find its area.

34. State and prove Thales Theorem.
In the following fig, $DE \parallel YZ$ and the lengths of line segments XD, XE and EZ are 2.4cm, 3.2cm, and 4.8cm respectively. Find the value of DY.



35. Evaluate
   a) $2\sin^2 30^\circ \tan 60^\circ - 3\cos^2 60^\circ \sec^2 30^\circ$
   b) $(\sin A + \mathrm{cosec}\, A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$

(OR)

   a) If $4\cot A = 3$, find the value of $\frac{\sin A+\cos A}{\sin A-\cos A}$
   b) Prove that $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$.

Section – E

36. The department of Computer Science and Technology is conducting an International Seminar. In the seminar, the number of participants in Mathematics, Science and Computer Science are 60, 84 and 108 respectively. The coordinator has made the arrangement such that in each room, the same number of participants are to be seated and all of them being in the same subject.

i) What is the maximum number of participants that can be accommodated in each room?
ii) What is the minimum number of rooms required during the event?
iii) Find the LCM of 60, 84 and 108
(OR)
Write the prime factors of 9375.

37. An alumni association is an association of former students. These associations often organize social events, publish newsletters or magazines and raise funds for the organization. The alumni meet of two batches of a college – batch A and batch B were held on the same day in the same hotel in two separate halls "Rose" and "Jasmine". The rents were the same for both the halls. The expense for each hall is equal to the fixed rent of each hall and proportional to the number of persons attending each meet. 50 persons attended the meet in Rose Hall, and the organizers had to pay Rs 10,000 towards the hotel charges. 25 guests attended the meet in Jasmine Hall and the organizers had to pay Rs 7,500 towards the hotel charges. Denote the fixed rent by Rs x and proportional expense per person by Rs y.

i) Represent algebraically the situation in hall "Rose".
ii) Represent algebraically the situation in hall "Jasmine".
iii) What is the fixed rent of the halls?
(OR)
If $27x + 33y = 31$ and $33x + 27y = 29$ then find $x + y$.

38. There is a game of tossing of two dice. The entry fee in the game is Rs. 250. Sam takes entry into the game by paying the entry fee. The rules of the game are: if by tossing two dice he gets only one perfect square, entry fee is refunded. If he gets perfect squares on both dice, he receives double the amount paid as entry fee. Otherwise, he loses the entry fee. Based on the above information answer the following questions:

i) Find the total number of possible outcomes of the game.
ii) Find the probability for Sam to get the entry fee.
iii) What is the probability of winning Rs 500?
(OR)
What is the probability of getting at least one multiple of 3.

-x-x-x-x-x-x-x-