2SR

SECOND REVISION TEST - 2023

10 - STD

MATHEMATICS

Time : 3.00 hours

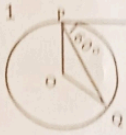
Salem(D.T)

Marks : 100

14 X 1 = 14

i) Answer all the 14 questions. ii) Choose the most suitable answer from the given four alternatives and write the option code.

1. $A = \{a,b,p\}$, $B = \{2,3\}$, $C = \{p,q,r,s\}$ then $n[(A \cup C) \times B]$ is a) 8 b) 20 c) 12 d) 16
2. $f(x) = (x + 1)^3 - (x - 1)^3$ represents a function which is
   a) Linear b) Cubic c) Reciprocal d) Quadratic
3. The sum of the exponents of the prime factors is the prime factorization of 1729 is
   a) 1 b) 2 c) 3 d) 4
4. If the sequence $t_1, t_2, t_3, \ldots\ldots$ are in A.P. then the sequence $t_6, t_{12}, t_{18}, \ldots\ldots$ is
   a) Geometric progression b) an Arithmetic progression
   c) neither an A.P nor a G.P. d) a constant sequence
5. $y^2 + \frac{1}{y^2}$ is not equal to a) $\frac{y^4+1}{y^2}$ b) $\left(y + \frac{1}{y}\right)^2$ c) $\left(y - \frac{1}{y}\right)^2 + 2$ d) $\left(y + \frac{1}{y}\right)^2 - 2$
6. If $(4 \quad 3 \quad 2)\begin{pmatrix} 1 \\ -2 \\ x \end{pmatrix} = (6)$ then x is a) 4 b) 3 c) 2 d) 1
7. In the figure If PR is tangent to the circle at P and O is the centre of the circle, then $\angle POQ$ is
   a) 120° b) 100° c) 110° d) 90°



8. The slope of the line joining (12,3) and (4, a) is 1/8. The value of 'a' is
   a) 1 b) 4 c) - 5 d) 2
9. (2,1) is the point of intersection of two lines a) x - y - 3 = 0, 3x - y - 7 = 0
   b) x + y = 3, 3x + y = 7 c) 3x + y = 3, x + y = 7 d) x + 3y - 3 = 0, x - y - 7 = 0
10. a cot θ + b cosec θ = P and b cot θ + a cosec θ = q then $p^2 - q^2$ is equal to
    a) $a^2 - b^2$ b) $b^2 - a^2$ c) $a^2 + b^2$ d) b - a
11. The ratio of the volumes of a cylinder, a cone and a sphere, if each has the same diameter and same height is a) 1 : 2 : 3 b) 2 : 1 : 3 c) 1 : 3 : 2 d) 3 : 1 : 2
12. When Karuna divided surface area of a sphere by the sphere's volume, he got the answer as 1/3, what is the radius of the sphere?
    a) 24 cm b) 9 cm c) 54 cm d) 4.5 cm
13. The mean of 100 observations is 40 and their standard deviation is 3. The sum of squares of all observations is a) 40000 b) 160900 c) 160000 d) 30000
14. The probability of getting a job for a person is x/3. If the probability of not getting the job is 2/3 then the value of x is a) 2 b) 1 c) 3 d) 1.5

Answer any 10 questions. Q.No. 28 is compulsory. 10 X 2 = 20

15. If A = {1,3,5} and B = {2,3} the i) find A X B ii) find B X A.
16. If $f(x) = x^2 - 1$, $g(x) = x - 2$ find a, if gof(a) = 1.
17. Find the number of terms in the A.P. 3,6,9, 12, ... 111.
18. If the first term of an infinite G.P. is 8 and its sum to infinity is 32/3 then find the common ratio.
19. Find the square toot of $\frac{144\, a^8 b^{12} c^{16}}{81\, f^{12} g^4 h^{14}}$.
20. Verify that $A^2 = I$ when $A = \begin{pmatrix} 5 & -4 \\ 6 & -5 \end{pmatrix}$.

21. State Ceva's theorem.
22. Show that the straight lines x - 2y + 3 = 0 and 6x + 3y + 8 = 0 are perpendicular.
23. Find the angle of elevation of the top of a tower from a point on the ground, which is 30m away from the foot of a tower of height $10\sqrt{3}$ m.
24. If the total surface area of a cone of radius 7cm is 704cm², then find its slant height.
25. If the ratio of radii of two spheres is 4 : 7, find the radio of their volumes.
26. The standard deviation and mean of a data are 6.5 and 12.5 respectively. Find the coefficient of variation.
27. What is the probability that a leap year selected at random will contain 53 Saturdays.
28. Prove that $\sin^2\theta + \frac{1}{1+\tan^2\theta} = 1$.

Answer any 10 questions. Question No. 42 is compulsory. 10 X 5 = 50

29. Let f : A → B be a function defined by f(x) = $\frac{x}{2}$ - 1, where A = {2,4,6,10,12}, B= {0,1,2,4,5,9} represent f by
    i) set of ordered pairs ii) a table iii) an arrow diagram iv) a graph.
30. If f(x) = 2x + 3, g (x) = 1-2x, h(x) = 3x. Prove that fo(goh) = (fog)oh.
31. The product of three consecutive terms of a Geometric progression is 343 and their sum is 91/3. Find the three terms.
32. Find the sum of $6^2 + 7^2 + 8^2 + \ldots\ldots\ldots + 21^2$.
33. If $9x^4 + 12x^3 + 28x^2 + ax + b$ is a perfect square, find the values of a and b.
34. A passenger train takes 1 hour more than an express train to travel a distance of 240km from Chennai to Virudhachalam. The speed of passenger train is less than that of an express train by 20km per hour. Find the average speed of both the trains.
35. If $A = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 2 \\ -4 & 2 \end{pmatrix}$, $C = \begin{pmatrix} -7 & 6 \\ 3 & 2 \end{pmatrix}$ verify that A(B + C) = AB + AC.
36. State and prove Angle bisector theorem.
37. If the points A(-3,a), B(a,b) and C (4,-5) are Collinear and if a + b = 1, then find a and b.
38. Find the equation of the perpendicular bisector of the line joing the points A(-4, 2) and B (6, -4).
39. From the top of a 12m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 30°. Determine the height of the tower.
40. A metallic sphere of radius 16cm is melted and recast into small spheres each of radius 2cm. How many small spheres can be obtained?
41. A teacher asked the students to complete 60 pages of a record note book. Eight students have completed only 32,35,37, 30, 33, 36, 35 and 37 pages. Find the standard deviation of the pages completed by them.
42. Two dice are thrown simultaneously. Find the probability of getting.
    i) Sum of the face value as 10. ii) an even prime number on the first die.
    iii) an even prime number on the second die. iv) Same number on both dice.

Answer both questions. 2 X 8 = 16

43. a) Construct a triangle similar to a given triangle PQR with its sides equal to 3/5 of the corresponding sides of the triangle PQR (scale factor 3/5 <1) ***(OR)***
    b) Take a point which is 11cm away from the centre of a circle of radius 4cm and draw the two tangents to the circle from that point.
44. a) A company initially started with 40 workers to complete the work by 150 days, later it decided to fasten up the work increasing the number of workers as shown below.

No. of workers (x)	40	50	60	75
No. of days (y)	150	120	100	80

    i) Graph the above data and identify the type of variation.
    ii) From the graph, find the numbers of days required to complete the work if the company decides to opt for 120 workers?
    iii) If the work has to be completed by 200 days, how many workers are required? ***(OR)***
    b) Draw the graph of : (2x - 3) (x+2) = 0

SECOND REVISION TEST - 2023

CLASS: 10th

Date: 27.02.2023

Subject: Mathematics

I. Choose it

1. (c) 12
2. (d) Quadratic
3. (c) 3
4. (b) an arithmetic Progression
5. (b) $\left(y+\frac{1}{y}\right)^2$
6. (a) 4
7. (a) 120°
8. (d) 2
9. (b) $x+y=3 \quad 3x+y=7$
10. (b) b^2-a^2
11. (d) 3:1:2
12. (b) 9cm
13. (b) 160900
14. (b) 1

II

15. Solution

$A \times B = \{(1,2)(1,3)(3,2)(3,3)(5,2)(5,3)\}$

$B \times A = \{(2,1)(2,3)(2,5)(3,1)(3,3)(3,5)\}$

16. Solution

$gof(x) = g\,f(x)$

$= g(x^2-1)$

$= x^2-1-2$

$= x^2-3$

$gof(a) = 1$

$a^2-3 = 1$

$a^2 = 4$

$a = \pm 2$

17. Solu

$a=3 \quad d=3 \quad l=111$

$n = \left(\frac{l-a}{d}\right)+1$

$= \left[\frac{111-3}{3}\right]+1 = 37$ Ans.

18. Solution

$a=8 \quad S_\infty = \frac{32}{3}$

$S_\infty = \frac{a}{1-r}$

$\frac{32}{3} = \frac{8}{1-r}$

$1-r = 8 \times \frac{3}{32}$

$1-r = \frac{3}{4}$

$-r = \frac{3}{4}-1$

$-r = -\frac{1}{4}$

$\therefore r = \frac{1}{4}$ Ans.

19. Solution

$\sqrt{\frac{144a^8b^{12}c^{16}}{81f^{12}g^4h^{14}}} = \frac{4}{3}\left|\frac{a^4b^6c^8}{f^6g^2h^7}\right|$ A.

20. $A^2 = A \times A \qquad A = \begin{bmatrix} 5 & -4 \\ 6 & -5 \end{bmatrix}$

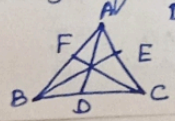
$= \begin{bmatrix} 5 & -4 \\ 6 & -5 \end{bmatrix}\begin{bmatrix} 5 & -4 \\ 6 & -5 \end{bmatrix}$

$= \begin{bmatrix} 25-24 & -20+20 \\ 30-30 & -24+25 \end{bmatrix}$

$= \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = I$

$A^2 = I$

21. Let ABC be a triangle and let D, E, F be points on lines BC, CA AB respectively. Then the cevians AD, BE, CF are Concurrent if and only if $\frac{BD}{DC} \times \frac{CE}{EA} \times \frac{AF}{FB} = 1$



22. $x-2y+3=0$

$a=1 \quad b=-2$

$m_1 = -\frac{a}{b} = \frac{-1}{-2} = \frac{1}{2}$

$6x+3y+8=0$

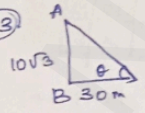
$a=6 \quad b=3$

$m_2 = -\frac{6}{3} = -2$

$m_1 \times m_2 = \frac{1}{2} \times -2 = -1$

∴ This lines are perpendicular

23.



$\tan\theta = \frac{AB}{BC}$

$\theta = \frac{10\sqrt{3}}{30} \qquad \theta = \frac{1}{\sqrt{3}}$

$\tan 30^\circ = \frac{1}{\sqrt{3}}$ $\quad \theta = 30^\circ$ A.

24.

T.S.A of Cone $= \pi r(l+r) = 704\,cm^2$

$704 = \frac{22}{7} \times 7(l+7)$

$\frac{704}{22} = l+7$

$32-7 = l$

$\therefore l = 25$ cm

25. Given

$\frac{r_1}{r_2} = \frac{4}{7}$

$\frac{\text{V. of } S_1}{\text{V. of } S_2} = \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \left(\frac{r_1}{r_2}\right)^3$

$= \left(\frac{4}{7}\right)^3 = \frac{64}{343}$

Ratio of Volume = 64:343

26.

Co.ef. Va $= \frac{\sigma}{\bar{x}} \times 100\,\%$

$= \frac{6.5}{12.5} \times 100$

C.V = 52%

27. (366 = 52 ÷ 7 + 2)

$S = \{S\text{-}M, M\text{-}Tu, Tu\text{-}W, W\text{-}Th, Th\text{-}S, S\text{-}Su\}$

$n(S) = 7$

$n(A) = 2$

$P(A) = \frac{2}{7}$

28. $\sin^2\theta + \frac{1}{\sec^2\theta}$

$= \sin^2\theta + \cos^2\theta$

$= 1$ H.Proved.

31.

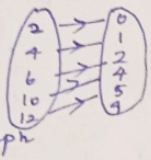
29. i) set of ordered pairs

$f = \{(2,0), (4,1), (6,2), (10,4), (12,5)\}$

ii)

x	2	4	6	10	12
f(x)	0	1	2	4	5

iii) An arrow diagram



iv) Graph

30. $f(x) = 2x + 3$

$g(x) = 1 - 2x$

$h(x) = 3x$

$fog(x) = 5 - 4x$

$fogoh(x) = 5 - 12x$

$goh(x) = 1 - 6x$

$fogoh(x) = 5 - 12x$

31. Con:1

$\frac{a}{r} \times a \times ar = 343$

$a^3 = 7^3$ $\boxed{a = 7}$

Con:2

$\frac{a}{r} + a + ar = \frac{91}{3}$

$a\left[\frac{1}{r} + 1 + r\right] = \frac{91}{3}$

$3r^2 - 10r + 3 = 0$

$a = 7 \quad r = 3$

$\frac{7}{3}, 7, 21$

$a = 7 \quad r = \frac{1}{3}$

$21, 7, \frac{7}{3}$

32.

$(1^2 + 2^2 + 3^2 + \dots + 21^2) - (1^2 + 2^2 + \dots + 5^2)$

$= \frac{21(21+1)(2\times21+1)}{6} - \frac{5(5+1)(2\times5+1)}{6}$

$= 3311 - 55 = 3256$

33.

$3x^2 + 0x + 4 \;\big|\; 9x^4 + 12x^3 + 28x^2 + ax + b$

$9x^4$

$6x^3 + 0x^2$

$12x^3 + 28x^2$

$12x^3 + 4x^2$

$6x^2 + 4x + 4$ | $24x^2 + ax + b$

$24x^2 + 16x + 16$

$\boxed{a = 16}$

$\boxed{b = 16}$

34. Pass

Average S. of. x km/h

A. S. of $(x+20)$ km/h

$\frac{240}{x} = \frac{240}{x+20} + 1$

$x^2 + 20x - 4800 = 0$

$(x+80)(x-60)$

A. S. of bus 60 km/hr

A. S. of express train 80 km/h

35.

$B + C = \begin{bmatrix} 1 & 2 \\ -4 & 2 \end{bmatrix} + \begin{bmatrix} -7 & 6 \\ 3 & 2 \end{bmatrix} = \begin{bmatrix} -6 & 8 \\ -1 & 4 \end{bmatrix}$

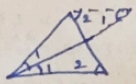
$A(B+C) = \begin{bmatrix} -7 & 12 \\ 3 & 4 \end{bmatrix}$

$AB = \begin{bmatrix} -3 & 4 \\ -13 & 4 \end{bmatrix}$

$AC = \begin{bmatrix} -4 & 8 \\ 16 & 0 \end{bmatrix}$

36. Statement.

The internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the corresponding sides containing angle



To Prove: $\frac{AB}{AC} = \frac{BD}{CD}$

$\angle AEC = \angle BAE = 1$ $\triangle ACE$ isosceles

$\triangle ABD \sim \triangle ECD$ $AC = CE$

$\frac{AB}{CE} = \frac{BD}{CD}$ $\frac{AB}{AC} = \frac{BD}{CD}$

37.

$\frac{1}{2}\begin{bmatrix} -3 & 9 \\ 9 & 5 \end{bmatrix}\begin{bmatrix} a & 5 \\ b & -5 \end{bmatrix} = \begin{bmatrix} 3 \\ 9 \end{bmatrix}$

$[(3b - 5a + 36) - (9a + 4b + 45)] = 0$

$-14a - 7b + 21 = 0$

$2a + b = 3$

$a + b = 1$ $\boxed{a = 2, \; b = -1}$

38. A(1,2) B(6,−7)

Midpoint of AB = (1, −1)

slope of $AB = \frac{-7-2}{6-1} = -\frac{9}{5}$

$m_2 = \frac{5}{9}$

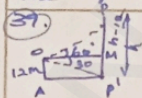
Passing through point (1, −1)

$y + 1 = \frac{5}{9}(x - 1)$

$9y + 9 = 5x - 5$

The req. eq $5x - 9y - 14 = 0$

39.



$\triangle OMP$ $\frac{h-12}{OM} = \sqrt{3}$

$OM = \frac{h-12}{\sqrt{3}}$ — (1)

$\triangle OMP'$ $\frac{MP'}{OM} = \frac{1}{\sqrt{3}} = \frac{12}{OM}$

$OM = 12\sqrt{3}$

$\frac{h-12}{\sqrt{3}} = 12\sqrt{3}$ $\boxed{h = 48 \text{ m}}$

40.

$n \times$ (V. of. small sphere) = V. of. big sphere

$n \frac{4}{3}\pi r^3 = \frac{4}{3}\pi R^3$

$n \times 2^3 = 16^3$

$n = \frac{4096}{8} = 512$

41.

$\bar{x} = \frac{275}{8} = 34.375$

x	$d = x - A$ $d = x - 35$	d^2
30	−5	25
32	−3	9
33	−2	4
35	0	0
35	0	0
36	1	1
37	2	4
37	2	4

$\Sigma d = -5 \quad \Sigma d^2 = 47$

$\sigma = \sqrt{\frac{47}{8} - \left(\frac{-5}{8}\right)^2}$

$= \sqrt{5.875 - 0.390625}$

$\sigma = 2.34$

42. $n(S) = 36$

i) $n(A) = 3$ $P(A) = \frac{3}{36} = \frac{1}{12}$

ii) $n(B) = 6$ $P(B) = \frac{6}{36} = \frac{1}{6}$

iii) $n(C) =$ $P(C) = \frac{6}{36} = \frac{1}{6}$

iv) $n(D) =$ $P(D) = \frac{6}{36} = \frac{1}{6}$