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Time : 3 Hours

MATHEMATICS REGULAR LEVEL 1 (E)

Subject Code

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Total No. of Questions : 42 (Printed Pages : 19)

Maximum Marks : 80

- INSTRUCTIONS :**
- (i) This question paper consists of **42** questions. All questions are compulsory.
 - (ii) This question paper is divided into four sections-A, B, C and D.
 - (iii) In Section A–Question Nos. **1** to **16** are multiple choice questions (MCQs) and Question Nos. **17** to **20** are very short answer type (VSA) questions carrying **1** mark each.
 - (iv) In Section B–Question Nos. **21** to **29** are short answer type-I (SA-I) questions carrying **2** marks each.
 - (v) In Section C–Question Nos. **30** to **39** are short answer type-II (SA-II) questions carrying **3** marks each.
 - (vi) In Section D–Question Nos. **40** to **42** are long answer (LA) questions carrying **4** marks each.
 - (vii) There is no overall choice. However an internal choice has been provided in *two* questions of **2** marks each in Section B and *two* questions of **3** marks each in Section C.
 - (viii) In questions on constructions, the drawing should be clear and exact as per given measurements. The construction lines and arcs should also be maintained.
 - (ix) Graph paper is provided on the answer booklet.
 - (x) Logarithm and Antilogarithm tables are printed on the last pages of the question paper.
 - (xi) Use of calculator is not permitted.

Section A (1 mark each)

Select and write the correct alternative from those given below each statement for questions 1 to 16 :

1. The sum of the zeroes of the quadratic polynomial $6x^2 - 7x - 3$ is :

- $\frac{-7}{6}$
- $\frac{-3}{6}$
- $\frac{6}{7}$
- $\frac{7}{6}$

2. The zeroes of the polynomial $6x^2 - 3$ are :

- $0, \frac{1}{2}$
- $\frac{-1}{2}, \frac{1}{2}$
- $\frac{-1}{\sqrt{2}}, \frac{1}{\sqrt{2}}$
- $\frac{1}{2}, \frac{1}{\sqrt{2}}$

3. The pair of linear equations $x + 3y = 6$ and $2x - 3y = 12$ have :
- no solution
 - unique solution
 - exactly two solutions
 - infinitely many solutions
4. The ages of father and his son 3 years ago was x and y years respectively.
Therefore the sum of their ages five years from now will be :
- $(x + y - 3)$ years
 - $(x + y + 6)$ years
 - $(x + y + 10)$ years
 - $(x + y + 16)$ years
5. The common difference of the arithmetic progression $-10, -6, -2, 2, \dots$
is :
- -16
 - -4
 - 4
 - 16

6. In $\triangle ABC$, points D and E are on side AB and AC respectively. $DE \parallel BC$

and $\frac{AD}{DB} = \frac{3}{5}$. If $AC = 5.6$ cm, then the length of AE is :

- 2.1 cm
- 16.8 cm
- 15 cm
- 3 cm

7. The value of $\sin 90^\circ \times \cos 90^\circ$ is :

- 1
- $\frac{\sqrt{3}}{2}$
- $\frac{1}{2}$
- 0

8. The value of $\sin 56^\circ - \cos 34^\circ$ is :

- 0°
- 22°
- 34°
- 56°

9. If $\tan\theta + \cot\theta = 2$, then the value of $\tan^2\theta + \cot^2\theta$ is :

- 1
- 2
- 4
- 10

10. If an angle between radii of a circle is 130° , then the angle between the tangents at the ends of the radii is :

- 90°
- 70°
- 50°
- 40°

11. The area of a circle that can be inscribed in a square with a side length of 6 cm is :

- $36 \pi \text{ cm}^2$
- $18 \pi \text{ cm}^2$
- $12 \pi \text{ cm}^2$
- $9 \pi \text{ cm}^2$

12. If the sum of the areas of two circles with radii R_1 and R_2 is equal to the area of a circle with radius R , then :

- $R_1 + R_2 = R$
- $R_1^2 + R_2^2 = R^2$
- $R_1 + R_2 < R$
- $R_1^2 + R_2^2 < R^2$

13. If the length of each edge of a cubical box is 1.5 m, then its lateral surface area is :

- 2.25 m²
- 6 m²
- 9 m²
- 13.5 m²

14. The total surface area of a hemispherical solid with a diameter of 14 cm, using $\pi = \frac{22}{7}$, is :

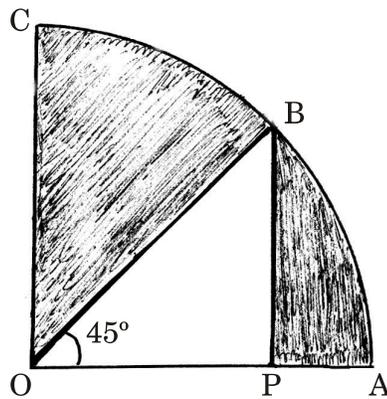
- 308 cm²
- 462 cm²
- 616 cm²
- 1848 cm²

15. Playing cards numbered from 2 to 101 are placed in a bag and mixed thoroughly. If one card is randomly drawn from the bag, then the probability that the number on the card is a perfect square is :
- 0.1
 - 0.3
 - 0.9
 - 0.09
16. The value of $\log 10^2$ is :
- 100
 - 10
 - 20
 - 2
17. If the system of linear equations $2x + ky = 1$ and $3x - 5y = 7$ has no solution, then find the value of k .
18. A chord AB of a circle subtends a right angle at the centre of the circle. If the radius is 10 cm, then find the length of the chord AB.
19. The diameter of a circle is 7 cm. Find the area of the quadrant of the circle.
(Do not substitute for π)
20. Two dice are rolled simultaneously. Find the probability of getting the same number on both dice.

Section B (2 marks each)

21. Find the HCF of 112 and 84 by prime factorisation method.
22. In the given figure, O-ABC is a quadrant of a circle with centre O. If $BP \perp OA$, $\angle BOA = 45^\circ$ and $BP = 6$ cm, then find the area of the shaded region.

(Take $\pi = 3.14$)



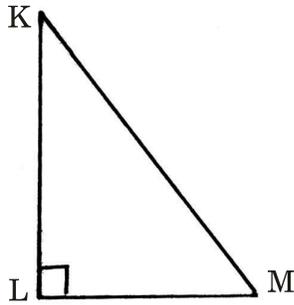
23. In $\triangle ABC$, points D and E are on side AB and AC respectively such that $DE \parallel BC$. If $AD = (x - 2)$ cm, $AB = x$ cm, $DE = (x - 1)$ cm and $BC = (x + 2)$ cm, then find the value of x .
24. Find the coordinates of a point M which lies on the y -axis and is equidistant from the points $A(5, -2)$ and $(-3, 2)$.

25. The coordinates of the vertices of a triangle are $P(1, -3)$, $Q(4, k)$ and $R(-9, 7)$. If its area is 15 cm^2 , then find the value of k .

Or

The coordinate $A(3, 0)$, $B(4, 5)$, $C(-1, 4)$ and $D(-2, -1)$ are the vertices of a rhombus $ABCD$. Find the $ar(ABCD)$.

26. In $\triangle KLM$, $\angle KLM = 90^\circ$ and $\sin M = \frac{\sqrt{5}}{3}$. Find the length of LM and the value of $\cot K$.



Or

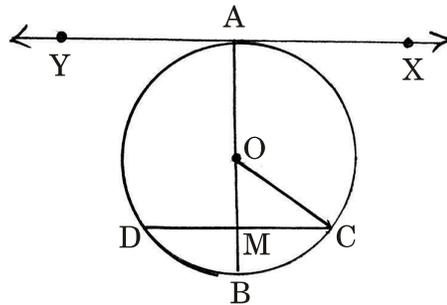
Evaluate the following trigonometric expression using known numerical values of trigonometrical ratios :

$$\frac{1}{3}\sec^2 30^\circ - \frac{5}{6}\sin^2 45^\circ.$$

27. Prove the following identity :

$$\frac{\tan \theta - \cot \theta}{\sin \theta \cos \theta} = \sec^2 \theta - \operatorname{cosec}^2 \theta.$$

28. In the given figure O is the centre of the circle with radius 5 cm. A tangent XAY is parallel to the chord CD of the circle. The diameter AB intersects chord CD at point M. If the length of AM = 8 cm, then find the length of chord CD.



29. The following table shows the grouped frequency distribution of the daily income of 50 workers of a factory :

Daily Income (in ₹)	No. of Workers
100—120	12
120—140	14
140—160	8
160—180	6
180—200	10

Find the mode of the above data.

Section C (3 marks each)

30. If $\sqrt{3}$ and $-\sqrt{3}$ are two zeroes of the polynomial $x^4 - 3x^3 - 7x^2 + 9x + 12$, then find the other two zeroes.

31. Find the solution of the given pair of linear equations by elimination method :

$$3x + 4y = 24 \text{ and } 20x - 11y = 47$$

Or

Find the solution of the given pair of linear equations by cross multiplication method :

$$2x + y = 11 \text{ and } 3x + 4y = 9$$

32. Find the roots of the quadratic equation $4x^2 - 5x - 21 = 0$ by the factorisation method.

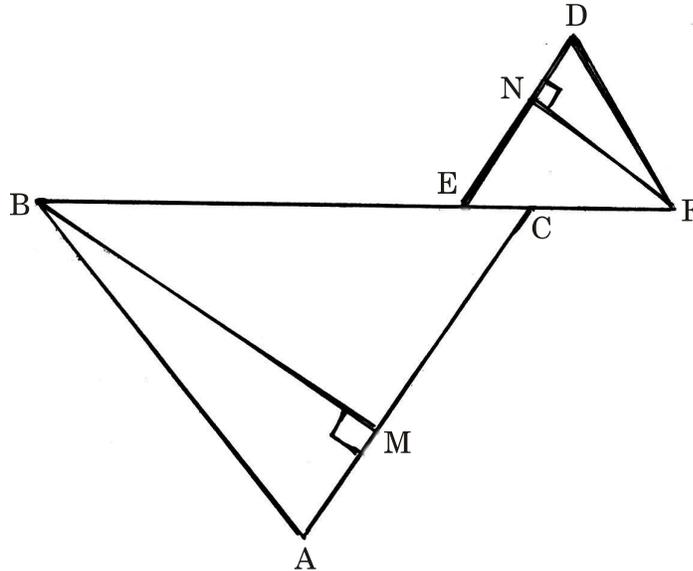
Or

Find the roots of the quadratic equation $2x^2 - 9x + 10 = 0$ by completing the square method.

33. If the sum of first 14 terms of an arithmetic progression is 1505 and its first term is 10, then find the 25th term of the arithmetic progression.

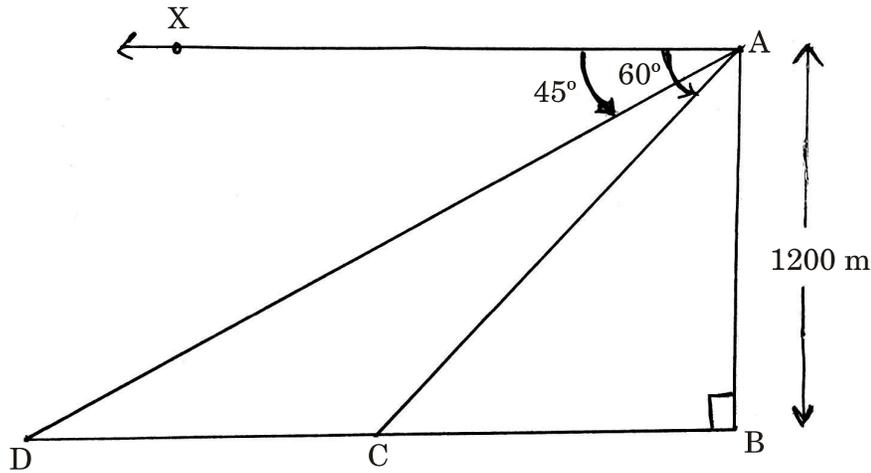
34. Given : Points E and C are on segment BF such that $BE = 5 EC$,
 $CF = 2EC$. $DE \parallel CA$ and $DE = \frac{1}{2} CA$

Prove that : $ar(\triangle AMB) = 4 \times ar(\triangle DNF)$.



35. A helicopter is flying at an altitude of 1200 m above sea level. A man seated inside the helicopter observes two ships, C and D, positioned directly behind one another on the same side of the helicopter. The angles of depression to the ships, as observed from the helicopter, are 60° and 45° respectively as shown in the figure. Find the distance between the two ships.

(Take $\sqrt{3} = 1.732$)



36. Using a pair of compasses and ruler, construct $\triangle ABC$ with $AB = 5$ cm, $BC = 6$ cm and $AC = 7$ cm. Then construct $\triangle A'BC'$ similar to $\triangle ABC$ whose sides are $\frac{5}{4}$ of the corresponding sides of $\triangle ABC$.
37. Draw a circle with centre P and radius 3.5 cm. Then take a point Q at a distance of 8 cm from the centre of the circle. Using a pair of compasses and ruler construct two tangents QA and QB touching the circle at A and B respectively. Measure and state the length of the tangent segments.
38. A wooden block is in shape of a cylinder. Its height is 10 cm and the diameter of its base is 8 cm. If two equal cones of diameter 6 cm and height 5 cm is hollowed out from both its end, then find the volume of the remaining solid.

(Take $\pi = \frac{22}{7}$)

39. Evaluate the following by using the logarithm method :

$$\frac{(5.96)^2 \times 29}{\sqrt{21.56}} .$$

Section-D (4 marks each)

40. A particular engineering college has two classrooms A and B, for first-year mechanical students. If 5 students are moved from classroom A to classroom B, the number of student in each room becomes equal. However, if 10 students are moved from classroom B to classroom A, the number of students in classroom A becomes twice that of classroom B. Using linear equations in two variables, solve for the initial number of students in each classroom.
41. A man bought some pens, each costing the same amount as the total number of pens purchased. The shopkeeper, who enjoys applying discounts in a mathematical way, offers a special deal if the quantity of pens is doubled. The discount on each pen is calculated as ₹ 3 less than one fourth of the original price. As a result of doubling the number of pens, the total cost increases by ₹ 432. Find the original cost of each pen.

42. The following table represents the frequency distribution of rainfall (in cm) recorded in a city over 66 days.

Rainfall (in cm) (C.I.)	Number of Days (f)	Cumulative frequency
0—10	22
10—20	10
20—30	8
30—40	15
40—50	5
50—60	6

Rewrite and complete the table by adding the cumulative frequency in the third column and then draw a 'less than' type ogive based on the data provided.

	LOGARITHMS									Mean Differences									
	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
10	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374	4	8	12	17	21	25	29	33	37
11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755	4	8	11	15	19	23	26	30	34
12	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106	3	7	10	14	17	21	24	28	31
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430	3	6	10	13	16	19	23	26	29
14	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732	3	6	9	12	15	18	21	24	27
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	3	6	8	11	14	17	20	22	25
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279	3	5	8	11	13	16	18	21	24
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529	2	5	7	10	12	15	17	20	22
18	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765	2	5	7	9	12	14	16	19	21
19	2788	2810	2833	2856	2878	2900	2923	2945	2967	2989	2	4	7	9	11	13	16	18	20
20	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201	2	4	6	8	11	13	15	17	19
21	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404	2	4	6	8	10	12	14	16	18
22	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	2	4	6	8	10	12	14	15	17
23	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784	2	4	6	7	9	11	13	15	17
24	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962	2	4	5	7	9	11	12	14	16
25	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	2	3	5	7	9	10	12	14	15
26	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	2	3	5	7	8	10	11	13	15
27	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456	2	3	5	6	8	9	11	13	14
28	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	1	3	4	5	6	8	9	11	12
29	4624	4639	4654	4669	4683	4698	4713	4728	4742	4757	1	3	4	5	6	8	9	10	11
30	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900	1	3	4	5	6	7	9	10	11
31	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038	1	3	4	5	6	7	8	10	11
32	5051	5065	5079	5092	5105	5119	5132	5145	5159	5172	1	3	4	5	6	7	8	9	11
33	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302	1	3	4	5	6	8	9	10	12
34	5315	5328	5340	5353	5366	5378	5391	5403	5416	5428	1	3	4	5	6	8	9	10	11
35	5441	5453	5465	5478	5490	5502	5514	5527	5539	5551	1	2	4	5	6	7	9	10	11
36	5563	5575	5587	5599	5611	5623	5635	5647	5659	5670	1	2	4	5	6	7	8	10	11
37	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786	1	2	3	5	6	7	8	9	10
38	5798	5809	5821	5832	5843	5855	5867	5877	5888	5899	1	2	3	5	6	7	8	9	10
39	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010	1	2	3	4	5	7	8	9	10
40	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	1	2	3	4	5	6	8	9	10
41	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222	1	2	3	4	5	6	7	8	9
42	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	1	2	3	4	5	6	7	8	9
43	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	1	2	3	4	5	6	7	8	9
44	6435	6444	6454	6464	6474	6484	6493	6503	6513	6522	1	2	3	4	5	6	7	8	9
45	6532	6542	6551	6561	6571	6580	6590	6600	6610	6618	1	2	3	4	5	6	7	8	9
46	6628	6637	6646	6656	6665	6675	6684	6693	6702	6712	1	2	3	4	5	6	7	8	9
47	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803	1	2	3	4	5	6	7	8	9
48	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893	1	2	3	4	4	5	6	7	8
49	6902	6911	6920	6928	6937	6946	6955	6964	6972	6981	1	2	3	3	4	4	5	6	7
50	6990	6999	7007	7016	7024	7033	7042	7050	7059	7067	1	2	3	3	4	4	5	6	7
51	7076	7084	7093	7101	7110	7118	7126	7135	7143	7152	1	2	3	3	4	4	5	6	7
52	7160	7168	7177	7185	7193	7202	7210	7218	7226	7235	1	2	2	3	4	4	5	6	7
53	7243	7251	7259	7267	7275	7284	7292	7300	7308	7316	1	2	2	3	4	4	5	6	7
54	7324	7332	7340	7348	7356	7364	7372	7380	7388	7396	1	2	2	3	4	4	5	6	7

	LOGARITHMS									Mean Differences									
	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
55	7404	7412	7419	7427	7435	7443	7451	7459	7466	7474	1	2	2	3	4	5	5	6	7
56	7482	7490	7497	7505	7513	7520	7528	7536	7543	7551	1	2	2	3	4	4	5	5	6
57	7559	7566	7574	7582	7589	7597	7604	7612	7619	7627	1	2	2	3	4	4	5	5	6
58	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701	1	1	2	3	4	4	4	5	6
59	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774	1	1	2	3	4	4	4	5	6
60	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846	1	1	2	3	4	4	4	5	6
61	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917	1	1	2	3	4	4	4	5	6
62	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987	1	1	2	3	3	4	4	5	6
63	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055	1	1	2	3	3	4	4	5	6
64	8062	8069	8075	8082	8089	8096	8102	8109	8116	8122	1	1	2	3	3	4	4	5	6
65	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189	1	1	2	3	3	4	4	5	6
66	8195	8202	8209	8215	8222	8228	8235	8241	8248	8254	1	1	2	3	3	4	4	5	6
67	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319	1	1	2	3	3	4	4	5	6
68	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382	1	1	2	3	3	4	4	5	6
69	8388	8395	8401	8407	8414	8420	8426	8432	8439	8445	1	1	2	2	3	4	4	5	6
70	8451	8457	8463	8470	8476	8482	8488	8494	8500	8506	1	1	2	2	3	4	4	5	6
71	8513	8519	8525	8531	8537	8543	8549	8555	8561	8567	1	1	2	2	3	4	4	5	5
72	8573	8579	8585	8591	8597	8603	8609	8615	8621	8627	1	1	2	2	3	4	4	5	5
73	8633	8639	8645	8651	8657	8663	8669	8675	8681	8686	1	1	2	2	3	4	4	5	5
74	8692	8698	8704	8710	8716	8722	8727	8733	8739	8745	1	1	2	2	3	4	4	5	5
75	8751	8756	8762	8768	8774	8779	8785	8791	8797	8802	1	1	2	2	3	4	4	5	5
76	8808	8814	8820	8825	8831	8837	8842	8848	8854	8859	1	1	2	2	3	4	4	5	5
77	8865	8871	8876	8882	8887	8893	8899	8904	8910	8915	1	1	2	2	3	4	4	5	5
78	8921	8927	8932	8938	8943	8949	8954	8960	8965	8971	1	1	2	2	3	4	4	5	5
79	8976	8982	8987	8993	8998	9004	9009	9015	9020	9025	1	1	2	2	3	4	4	5	5
80	9031	9036	9042	9047	9053	9058	9063	9069	9074	9079	1	1	2	2	3	4	4	5	5
81	9085	9090	9096	9101	9106	9112	9117	9122	9128	9133	1	1	2	2	3	4	4	5	5
82	9138	9143	9149	9154	9159	9165	9170	9175	9180	9186	1	1	2	2	3	4	4	5	5
83	9191	9196	9201	9206	9212	9217	9222	9227	9232	9238	1	1	2	2	3	4	4	5	5
84	9243	9248	9253	9258	9263	9269	9274	9279	9284	9289	1	1	2	2	3	4	4	5	5
85	9294	9299	9304	9309	9315	9320	9325	9330	9335	9340	1	1	2	2	3	4	4		

Space for rough work

Space for rough work