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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 m^2
- 6 m^2
- 9 m^2
- 13.5 m^2

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

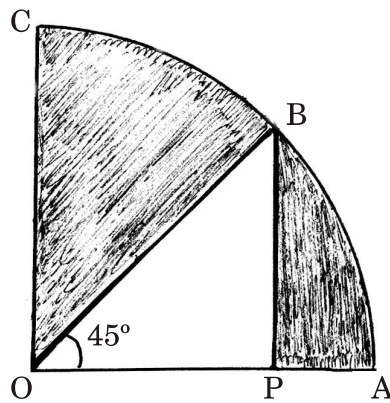
- 308 cm^2
- 462 cm^2
- 616 cm^2
- 1848 cm^2

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 $\pi = 3.14$)



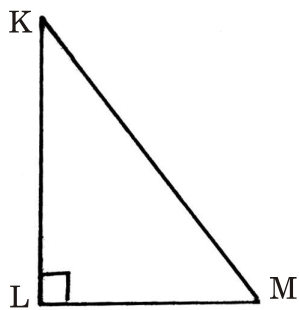
23. In $\triangle ABC$, points D and E are on side AB and AC respectively such that $DE \parallel BC$. If $AD = (x - 2)$ cm, $AB = x$ cm, $DE = (x - 1)$ cm and $BC = (x + 2)$ cm, then find the value of x .
24. Find the coordinates of a point M which lies on the y-axis and is equidistant from the points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

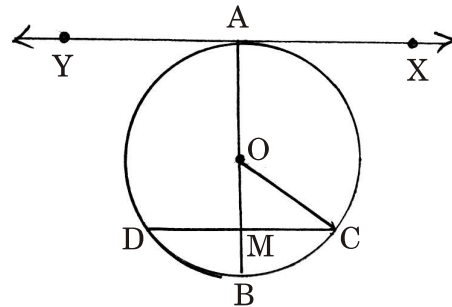
Evaluate the following trigonometric expression using known numerical values of trigonometrical ratios :

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

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.

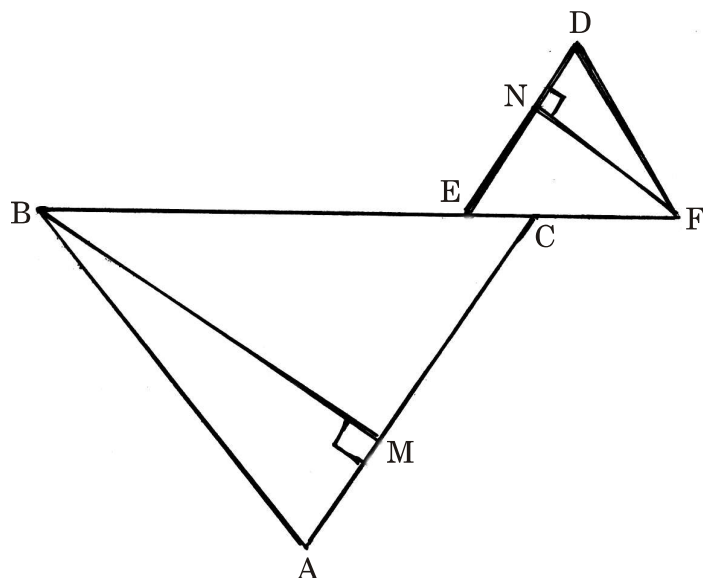
Or

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.

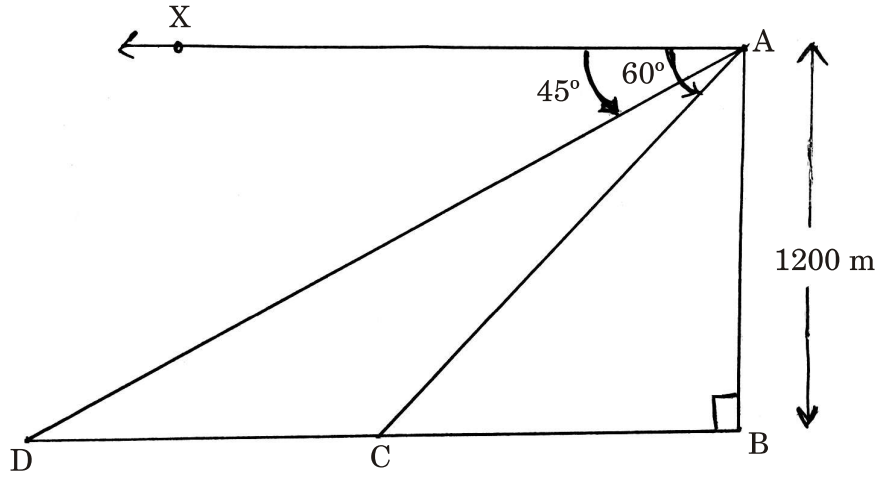
34. Given : Points E and C are on segment BF such that $BE = 5 EC$,
 $CF = 2EC$. $DE \parallel CA$ and $DE = \frac{1}{2} CA$

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.

[illegible]

LOGARITHMS																			
	0	1	2	3	4	5	6	7	8	9	Mean Differences								
											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	5	5	6	7
57	7569	7566	7574	7582	7589	7597	7604	7612	7619	7627	1	2	2	3	4	5	5	6	7
58	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701	1	1	2	3	4	5	5	6	7
59	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774	1	1	2	3	4	5	5	6	7
60	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846	1	1	2	3	4	5	5	6	7
61	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917	1	1	2	3	4	5	5	6	6
62	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987	1	1	2	3	3	4	5	6	6
63	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055	1	1	2	3	3	4	5	6	6
64	8063	8069	8075	8082	8089	8096	8102	8109	8116	8122	1	1	2	3	3	4	5	6	6
65	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189	1	1	2	3	3	4	5	6	6
66	8195	8202	8209	8215	8222	8228	8235	8241	8248	8254	1	1	2	3	3	4	5	6	6
67	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319	1	1	2	3	3	4	5	6	6
68	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382	1	1	2	3	3	4	4	5	6
69	8398	8395	8401	8407	8414	8420	8426	8432	8438	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	3	4	4	5
76	8808	8814	8820	8825	8831	8837	8843	8848	8854	8859	1	1	2	2	3	3	4	4	5
77	8865	8871	8876	8882	8888	8893	8899	8904	8910	8915	1	1	2	2	3	3	4	4	5
78	8921	8927	8932	8938	8943	8949	8954	8960	8965	8971	1	1	2	2	3	3	4	4	5
79	8976	8982	8987	8993	8998	9004	9009	9015	9020	9025	1	1	2	2	3	3	4	4	5
80	9031	9036	9042	9047	9053	9058	9063	9069	9074	9079	1	1	2	2	3	3	4	4	5
81	9085	9090	9096	9101	9106	9112	9117	9122	9128	9133	1	1	2	2	3	3	4	4	5
82	9138	9143	9149	9154	9159	9165	9170	9175	9180	9186	1	1	2	2	3	3	4	4	5
83	9191	9196	9201	9206	9212	9217	9222	9227	9232	9238	1	1	2	2	3	3	4	4	5
84	9243	9248	9253	9258	9263	9269	9274	9279	9284	9289	1	1	2	2	3	3	4	4	5
85	9294	9299	9304	9309	9315	9320	9325	9330	9335	9340	1	1	2	2	3	3	4	4	5
86	9345	9350	9355	9360	9365	9370	9375	9380	9385	9390	1	1	2	2	3	3	4	4	5
87	9395	9400	9405	9410	9415	9420	9425	9430	9435	9440	0	1	1	2	2	3	3	4	4
88	9445	9450	9455	9460	9465	9469	9474	9479	9484	9489	0	1	1	2	2	3	3	4	4
89	9494	9499	9504	9509	9513	9518	9523	9528	9533	9538	0	1	1	2	2	3	3	4	4
90	9542	9547	9552	9557	9562	9566	9571	9576	9581	9586	0	1	1	2	2	3	3	4	4
91	9590	9595	9600	9605	9609	9614	9619	9624	9628	9633	0	1	1	2	2	3	3	4	4
92	9638	9643	9647	9652	9657	9661	9666	9671	9675	9680	0	1	1	2	2	3	3	4	4
93	9685	9689	9694	9699	9703	9708	9713	9717	9722	9727	0	1	1	2	2	3	3	4	4
94	9731	9736	9741	9745	9750	9754	9759	9763	9768	9773	0	1	1	2	2	3	3	4	4
95	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818	0	1	1	2	2	3	3	4	4
96	9823	9827	9832	9836	9841	9845	9850	9854	9858	9863	0	1	1	2	2	3	3	4	4
97	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908	0	1	1	2	2	3	3	4	4
98	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952	0	1	1	2	2	3	3	4	4
99	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996	0	1	1	2	2	3	3	4	4

	ANTILOGARITHMS								
	0	1	2	3	4	5	6	7	8
	Mean Differences	1	2	3	4	5	6	7	8
.00	1000	1002	1005	1007	1009	1012	1014	1016	1019
.01	1023	1026	1028	1030	1033	1035	1038	1040	1042
.02	1047	1050	1052	1054	1057	1059	1062	1064	1067
.03	1072	1074	1076	1079	1081	1084	1086	1089	1091
.04	1096	1099	1102	1104	1107	1109	1112	1114	1117
.05	1122	1125	1127	1130	1132	1135	1138	1140	1143
.06	1148	1151	1153	1156	1159	1161	1164	1167	1169
.07	1175	1178	1180	1183	1186	1189	1191	1194	1197
.08	1202	1205	1208	1211	1213	1216	1219	1222	1225
.09	1230	1233	1236	1239	1242	1245	1247	1250	1253
.10	1259	1262	1265	1268	1271	1274	1276	1279	1282
.11	1288	1291	1294	1297	1300	1303	1306	1309	1312
.12	1318	1321	1324	1327	1330	1334	1337	1340	1343
.13	1349	1352	1355	1358	1361	1365	1368	1371	1374
.14	1380	1384	1387	1390	1393	1396	1400	1403	1406
.15	1413	1416	1419	1422	1425	1428	1432	1435	1439
.16	1445	1449	1452	1455	1459	1462	1466	1469	1472
.17	1479	1483	1486	1489	1493	1496	1500	1503	1507
.18	1514	1517	1521	1524	1528	1531	1535	1538	1542
.19	1549	1552	1556	1560	1563	1567	1570	1574	1578
.20	1585	1589	1592	1596	1600	1603	1607	1611	1614
.21	1621	1626	1629	1633	1637	1641	1644	1648	1652
.22	1660	1663	1667	1671	1675	1679	1683	1687	1690
.23	1698	1702	1706	1710	1714	1718	1722	1726	1730
.24	1738	1742	1746	1750	1754	1758	1762	1766	1770
.25	1778	1782	1786	1791	1795	1799	1803	1807	1811
.26	1820	1824	1828	1832	1837	1841	1845	1849	1854
.27	1862	1866	1871	1875	1879	1884	1888	1892	1897
.28	1905	1910	1914	1919	1923	1928	1932	1936	1941
.29	1950	1954	1959	1963	1968	1972	1977	1982	1986
.30	1995	2000	2004	2009	2014	2018	2023	2028	2032
.31	2042	2046	2051	2056	2061	2065	2070	2075	2080
.32	2089	2094	2099	2104	2109	2113	2118	2123	2128
.33	2138	2143	2148	2153	2158	2163	2168	2173	2178
.34	2188	2193	2198	2203	2208	2213	2218	2223	2228
.35	2239	2244	2249	2254	2259	2265	2270	2275	2280
.36	2291	2296	2301	2307	2312	2317	2323	2328	2333
.37	2344	2350	2355	2360	2366	2371	2377	2382	2388
.38	2399	2404	2410	2415	2421	2427	2432	2438	2443
.39	2455	2460	2466	2472	2477	2483	2489	2495	2500
.40	2512	2518	2523	2529	2535	2541	2547	2553	2559
.41	2570	2576	2582	2588	2594	2600	2606	2612	2618
.42	2630	2636	2642	2649	2655	2661	2667	2673	2679
.43	2692	2698	2704	2710	2716	2723	2729	2735	2742
.44	2754	2761	2767	2773	2780	2786	2793	2799	2805
.45	2812	2818	2825	2831	2838	2844	2851	2858	2864
.46	2884	2891	2897	2904	2911	2917	2924	2931	2938
.47	2951	2958	2965	2972	2979	2985	2992	2999	3006
.48	3020	3027	3034	3041	3048	3055	3062	3069	3076
.49	3090	3097	3105	3112	3119	3126	3133	3141	3148

	ANTILOGARITHMS								
	0	1	2	3	4	5	6	7	8
	Mean Differences	1	2	3	4	5	6	7	8
.50	3162	3170	3177	3184	3192	3199	3206	3214	3221
.51	3226	3243	3251	3258	3266	3273	3281	3289	3296
.52	3311	3319	3327	3334	3342	3350	3357	3365	3373
.53	3388	3396	3404	3412	3420	3428	3436	3443	3451
.54	3467	3475	3483	3491	3499	3508	3516	3524	3532
.55	3548	3556	3565	3573	3581	3589	3597	3606	3614
.56	3631	3639	3648	3656	3664	3673	3681	3690	3698
.57	3715	3724	3733	3741	3750	3758	3767	3776	3784
.58	3802	3811	3819	3828	3837	3846	3855	3864	3873
.59	3890	3899	3908	3917	3926	3935	3945	3954	3963
.60	3981	3990	3999	4009	4018	4027	4036	4046	4055
.61	4074	4083	4093	4102	4111	4121	4130	4140	4150
.62	4169	4178	4188	4198	4207	4217	4227	4236	4246
.63	4266	4276	4285	4295	4305	4315	4325	4335	4345
.64	4365	4375	4385	4395	4406	4416	4426	4436	4446
.65	4467	4477	4487	4498	4508	4519	4529	4539	4550
.66	4571	4581	4592	4603	4613	4624	4634	4645	4656
.67	4677	4688	4699	4710	4721	4732	4742	4753	4764
.68	4786	4797	4808	4819	4831	4842	4853	4864	4875
.69	4898	4909	4920	4932	4943	4955	4966	4977	4989
.70	5012	5023	5035	5047	5058	5070	5082	5093	5105
.71	5129	5140	5152	5164	5176	5188	5200	5212	5224
.72	5248	5260	5272	5284	5297	5309	5321	5333	5346
.73	5370	5383	5395	5408	5420	5433	5445	5458	5470
.74	5495	5508	5521	5534	5546	5559	5572	5585	5598
.75	5623	5636	5649	5662	5675	5688	5702	5715	5728
.76	5754	5768	5781	5794	5808	5821	5834	5848	5861
.77	5888	5902	5916	5929	5943	5957	5970	5984	5998
.78	6026	6039	6053	6067	6081	6095	6109	6124	6138
.79	6166	6180	6194	6209	6223	6237	6252	6266	6281
.80	6310	6324	6339	6353	6368	6383	6397	6412	6427
.81	6457	6471	6486	6501	6516	6531	6546	6561	6577
.82	6607	6622	6637	6653	6668	6683	6699	6714	6730
.83	6761	6776	6792	6808	6823	6839	6855	6871	6887
.84	6918	6934	6950	6966	6982	6998	7015	7031	7047
.85	7079	7096	7112	7129	7145	7161	7178	7194	7211
.86	7244	7261	7278	7295	7311	7328	7345	7362	7379
.87	7413	7430	7447	7464	7482	7499	7516	7534	7551
.88	7586	7603	7621	7638	7656	7674	7691	7709	7727
.89	7762	7780	7798	7816	7834	7852	7870	7889	7907
.90	7943	7962	7980	7998	8017	8035	8054	8072	8091
.91	8128	8147	8166	8185	8204	8222	8241	8260	8279
.92	8318	8337	8356	8375	8395	8414	8433	8453	8472
.93	8511	8531	8551	8570	8590	8610	8630	8650	8670
.94	8710	8730	8750	8770	8790	8810	8831	8851	8872
.95	8913	8933	8954	8974	8995	9016	9036	9057	9078
.96	9120	9141	9162	9183	9204	9226	9247	9268	9290
.97	9333	9354	9376	9397	9419	9441	9462	9484	9506
.98	9530	9572	9594	9616	9638	9661	9683	9705	9727
.99	9772	9795	9817	9840	9863	9886	9908	9931	9954

Space for rough work

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