UNIVERSITY OF COLOMBO, SRI LANKA

FACULTY OF ARTS

FIRST YEAR EXAMINATION IN ARTS (SEMESTER II) – 2017/2018

FND 1206 – INTERMEDIATE MATHEMATICS

(Time: Two Hours)

Answer any five (05) questions

No. of questions: 07

No. of pages: 04

(Each question carries equal marks)

Calculators are not permitted

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01. (a) State whether the following numbers are rational or irrational.

$x = \frac{17}{\sqrt{100}} + \frac{3}{10}$ **(2 marks)**

$y = \frac{17}{\sqrt{10}} + \frac{3}{\sqrt{10}}$ **(3 marks)**

(b) Simplify.

$a = \left\{\left(\frac{\sqrt{2}+\sqrt{3}+\sqrt{4}}{\sqrt{5}+\sqrt{6}+\sqrt{7}}\right)^{0}\right\}^{2}$ **(5 marks)**

$b = \frac{\sqrt[4]{16} \times (2)^{-1}}{\left(\sqrt[3]{3}\right)^{3} \times 2^{2}}$ **(5 marks)**

(c) Rationalize the denominator and simplify.

$\frac{21}{5-\sqrt{4}}$ **(5 marks)**

(Total: 20 marks)

02. (a) Solve the following quadratic equations.

(i) $x^2 - 9x + 14 = 0$ **(2 marks)**

(ii) $x^2 - 2x - 2 = 0$ **(3 marks)**

(b) If $x : y = 2 : 3$, then find $2x + y : 3x - y$ **(3 marks)**

(c) Solve for x.

$2 \log_2 x - 2 \log_2 7 = \log_2 8 - \log_2 2$ **(5 marks)**

(d) (i) Solve the equation.

$| x + 1 | = 2018$ **(3 marks)**

(ii) Solve the following simultaneous equations.

$4x - y = 8$

$7x + 2y = 29$ **(4 marks)**

(Total: 20 marks)

03. (a) Let $\varepsilon(the\ iniversal\ set) = \{a, b, c, \ldots, x, y, z\}$, $X = \{c, a, s, h\}$, $Y = \{h, a, b, i, t\}$, and $Z = \{t, a, x, i\}$

(i) Find the sets $X \cap Y \cap Z$, $Y \cap Z$, $X \cup Y$, $X \cup Z$, and $(X \cup Y) \cap (X \cup Z)$.

(5 marks)

(ii) Verify that $n(X \cap Y \cap Z) + n[(X \cup Y) \cap (X \cup Z)] = n(X) + n(Y \cap Z)$ for the sets X, Y and Z. **(5 marks)**

(b) Consider the random experiment of tossing two dice at once.

(i) What is the probability of getting an even number at the first die? **(3 marks)**

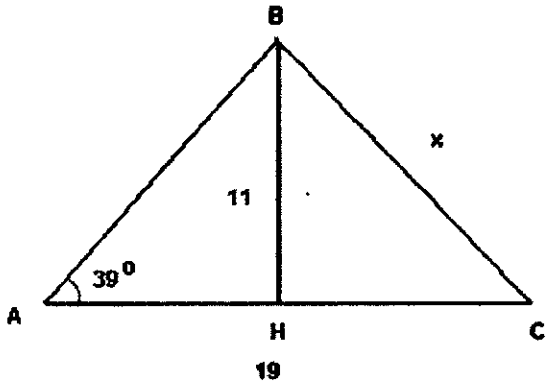
(ii) What is the probability of getting a total of 8? **(3 marks)**

(iii) Find the probability of getting an even number at the first die or a total of 8?

(**Hint:** Use the formula $P(A \cup B) = P(A) + P(B) - P(A \cap B)$) **(4 marks)**

(Total: 20 marks)

04. (a) In the given figure BH is perpendicular to AC. Find x (the length of BC).



(10 marks)

(b) From the top of a 200 meters high building, the angle of depression to the bottom of a second building is 20 degrees. From the same point, the angle of elevation to the top of the second building is 10 degrees. Calculate the height of the second building.

(10 marks)

(Total: 20 marks)

05. (a) Find the length of the line segment joining (a, b) and $(-b, a)$. **(3 marks)**

(b) Vertices of a triangle are given by $A = (3,1)$, $B = (7,11)$ and $C = (-1,5)$. Find midpoints of AB, and AC. Find the equation of line joining the points B and C.

(7 marks)

(c) The equation of the straight line having gradient m and y-intercept c can be written in the form

$$y = m\,x + c$$

(i) Find the equation of the straight line whose gradient is 5 and y-intercept is 0.

(4 marks)

(ii) Find the equation of the straight line passing through (2,1) and parallel to $y = 4x - 5$ **(6 marks)**

(Total: 20 marks)

06. (a) If $A = \begin{pmatrix} 1 & -3 & 5 \\ 7 & 1 & 1 \\ -2 & 1 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 1 & 1 \\ 2 & 9 & 2 \\ 3 & 6 & 4 \end{pmatrix}$, then find $2A+B$ and $A+2B$.

(5 marks)

(b) Let $X = \begin{pmatrix} 1 & -1 \\ 7 & 4 \end{pmatrix}$, and $Y = \begin{pmatrix} 3 & 8 \\ -3 & 1 \end{pmatrix}$

(i) Find $3X + 4Y$. **(3 marks)**

(ii) Show that $(3X + 4Y)^T = 3X^T + 4Y^T$ **(5 marks)**

(iii) If $Z = (3X + 4Y)^T + \begin{pmatrix} 1 & -2 \\ 0 & 1 \end{pmatrix}$, then find Z. **(7 marks)**

(Total: 20 marks)

07. (i) Evaluate the following limits.

(a) $\lim_{x \to 3} \frac{x^2-9}{x-3}$ **(2 marks)**

(b) $\lim_{x \to 1} \frac{2x^2-x-1}{x-1}$ **(3 marks)**

(ii) Let $f(x) = 4x^4 + 3x^3 + 2x^2 + x$ and $g(x) = (x - 1)(x - 2)$

(a) Find the derivative of f and the derivative of g. **(5 marks)**

(b) Find the derivative of $f.g$ given that $(fg)' = f'g + g'f$. **(5 marks)**

(c) What is the value of $(fg)'$ when x=1? **(5 marks)**

(Total: 20 marks)

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	0'	10'	20'	30'	40'	50'	60'		මධ්‍යන අන්තරය இடை வித்தியாசங்கள் Mean Differences 1'	2'	3'	4'	5'	6'	7'	8'	9'
0°	0.0000	0.0029	0.0058	0.0087	0.0116	0.0145	0.0175	89°	3	6	9	12	15	17	20	23	26
1	.0175	.0204	.0233	.0262	.0291	.0320	.0349	88	3	6	9	12	15	17	20	23	26
2	.0349	.0378	.0407	.0436	.0465	.0494	.0523	87	3	6	9	12	15	17	20	23	26
3	.0523	.0552	.0581	.0610	.0640	.0669	.0698	86	3	6	9	12	15	17	20	23	26
4	.0698	.0727	.0756	.0785	.0814	.0843	.0872	85	3	6	9	12	15	17	20	23	26
5	0.0872	0.0901	0.0929	0.0958	0.0987	0.1016	0.1045	84	3	6	9	12	14	17	20	23	26
6	.1045	.1074	.1103	.1132	.1161	.1190	.1219	83	3	6	9	12	14	17	20	23	26
7	.1219	.1248	.1276	.1305	.1334	.1363	.1392	82	3	6	9	12	14	17	20	23	26
8	.1392	.1421	.1449	.1478	.1507	.1536	.1564	81	3	6	9	11	14	17	20	23	26
9	.1564	.1593	.1622	.1650	.1679	.1708	.1736	80°	3	6	9	11	14	17	20	23	26
10°	0.1736	0.1765	0.1794	0.1822	0.1851	0.1880	0.1908	79	3	6	9	11	14	17	20	23	26
11	.1908	.1937	.1965	.1994	.2022	.2051	.2079	78	3	6	9	11	14	17	20	23	26
12	.2079	.2108	.2136	.2164	.2193	.2221	.2250	77	3	6	9	11	14	17	20	23	26
13	.2250	.2278	.2306	.2334	.2363	.2391	.2419	76	3	6	8	11	14	17	20	23	25
14	.2419	.2447	.2476	.2504	.2532	.2560	.2588	75	3	6	8	11	14	17	20	23	25
15	0.2588	0.2616	0.2644	0.2672	0.2700	0.2728	0.2756	74	3	6	8	11	14	17	20	22	25
16	.2756	.2784	.2812	.2840	.2868	.2896	.2924	73	3	6	8	11	14	17	20	22	25
17	.2924	.2952	.2979	.3007	.3035	.3062	.3090	72	3	6	8	11	14	17	19	22	25
18	.3090	.3118	.3145	.3173	.3201	.3228	.3256	71	3	6	8	11	14	17	19	22	25
19	.3256	.3283	.3311	.3338	.3365	.3393	.3420	70°	3	5	8	11	14	16	19	22	25
20°	0.3420	0.3448	0.3475	0.3502	0.3529	0.3557	0.3584	69	3	5	8	11	14	16	19	22	25
21	.3584	.3611	.3638	.3665	.3692	.3719	.3746	68	3	5	8	11	14	16	19	22	24
22	.3746	.3773	.3800	.3827	.3854	.3881	.3907	67	3	5	8	11	13	16	19	21	24
23	.3907	.3934	.3961	.3987	.4014	.4041	.4067	66	3	5	8	11	13	16	19	21	24
24	.4067	.4094	.4120	.4147	.4173	.4200	.4226	65	3	5	8	11	13	16	19	21	24
25	0.4226	0.4253	0.4279	0.4305	0.4331	0.4358	0.4384	64	3	5	8	10	13	16	18	21	24
26	.4384	.4410	.4436	.4462	.4488	.4514	.4540	63	3	5	8	10	13	16	18	21	23
27	.4540	.4566	.4592	.4617	.4643	.4669	.4695	62	3	5	8	10	13	15	18	21	23
28	.4695	.4720	.4746	.4772	.4797	.4823	.4884	61	3	5	8	10	13	15	18	20	23
29	.4848	.4874	.4899	.4924	.4950	.4975	.5000	60°	3	5	8	10	13	15	18	20	23
30°	0.5000	0.5025	0.5050	0.5075	0.5100	0.5125	0.5150	59	3	5	8	10	13	15	18	20	23
31	.5150	.5175	.5200	.5225	.5250	.5275	.5299	58	2	5	7	10	12	15	17	20	22
32	.5299	.5324	.5348	.5373	.5398	.5422	.5446	57	2	5	7	10	12	15	17	20	22
33	.5446	.5471	.5495	.5519	.5544	.5568	.5592	56	2	5	7	10	12	15	17	19	22
34	.5592	.5616	.5640	.5664	.5688	.5712	.5736	55	2	5	7	10	12	14	17	19	22
35	0.5736	0.5760	0.5783	0.5807	0.5831	0.5854	0.5878	54	2	5	7	9	12	14	17	19	21
36	.5878	.5901	.5925	.5948	.5972	.5995	.6018	53	2	5	7	9	12	14	16	19	21
37	.6018	.6041	.6065	.6088	.6111	.6134	.6157	52	2	5	7	9	12	14	16	18	21
38	.6157	.6180	.6202	.6225	.6248	.6271	.6293	51	2	5	7	9	11	14	16	18	20
39	.6293	.6316	.6338	.6361	.6383	.6406	.6428	50°	2	4	7	9	11	13	16	18	20
40°	0.6428	0.6450	0.6472	0.6494	0.6517	0.6539	0.6561	49	2	4	7	9	11	13	15	18	20
41	.6561	.6583	.6604	.6626	.6648	.6670	.6691	48	2	4	7	9	11	13	15	17	20
42	.6691	.6713	.6734	.6756	.6777	.6799	.6820	47	2	4	6	9	11	13	15	17	19
43	.6820	.6841	.6862	.6884	.6905	.6926	.6947	46	2	4	6	8	11	13	15	17	19
44	.6947	.6967	.6988	.7009	.7030	.7050	.7071	45	2	4	6	8	10	12	15	17	19
	60'	50'	40'	30'	20'	10'	0'		1'	2'	3'	4'	5'	6'	7'	8'	9'

ප්‍රකෘති කෝසයින இயற்கைச் கோசைன்கள் NATURAL COSINES

	0'	10'	20'	30'	40'	50'	60'		මධ්‍යන අන්තරය இடை வித்தியாசங்கள் Mean Differences 1'	2'	3'	4'	5'	6'	7'	8'	9'
45°	0.7071	0.7092	0.7112	0.7133	0.7153	0.7173	0.7193	44°	2	4	6	8	10	12	14	16	18
46	.7193	.7214	.7234	.7254	.7274	.7294	.7314	43	2	4	6	8	10	12	14	16	18
47	.7314	.7333	.7353	.7373	.7392	.7412	.7431	42	2	4	6	8	10	12	14	16	18
48	.7431	.7451	.7470	.7490	.7509	.7528	.7547	41	2	4	6	8	10	12	13	15	17
49	.7547	.7566	.7585	.7604	.7623	.7642	.7660	40°	2	4	6	8	9	11	13	15	17
50°	0.7660	0.7679	0.7698	0.7716	0.7735	0.7753	0.7771	39	2	4	6	7	9	11	13	15	17
51	.7771	.7790	.7808	.7826	.7844	.7862	.7880	38	2	4	5	7	9	11	13	14	16
52	.7880	.7898	.7916	.7934	.7951	.7969	.7986	37	2	4	5	7	9	11	12	14	16
53	.7986	.8004	.8021	.8039	.8056	.8073	.8090	36	2	3	5	7	9	10	12	14	16
54	.8090	.8107	.8124	.8141	.8158	.8175	.8192	35	2	3	5	7	8	10	12	14	15
55	0.8192	0.8208	0.8225	0.8241	0.8258	0.8274	0.8290	34	2	3	5	7	8	10	12	13	15
56	.8290	.8307	.8323	.8339	.8355	.8371	.8387	33	2	3	5	6	8	10	11	13	14
57	.8387	.8403	.8418	.8434	.8450	.8465	.8480	32	2	3	5	6	8	9	11	13	14
58	.8480	.8496	.8511	.8526	.8542	.8557	.8572	31	2	3	5	6	8	9	11	12	14
59	.8572	.8587	.8601	.8616	.8631	.8646	.8660	30°	1	3	4	6	7	9	10	12	13
60°	0.8660	0.8675	0.8689	0.8704	0.8718	0.8732	0.8746	29	1	3	4	6	7	9	10	11	13
61	.8746	.8760	.8774	.8788	.8802	.8816	.8829	28	1	3	4	6	7	8	10	11	12
62	.8829	.8843	.8857	.8870	.8884	.8897	.8910	27	1	3	4	5	7	8	9	11	12
63	.8910	.8923	.8936	.8949	.8962	.8975	.8988	26	1	3	4	5	6	8	9	10	12
64	.8988	.9001	.9013	.9026	.9038	.9051	.9063	25	1	3	4	5	6	8	9	10	11
65	0.9063	0.9075	0.9088	0.9100	0.9112	0.9124	0.9135	24	1	2	4	5	6	7	8	10	11
66	.9135	.9147	.9159	.9171	.9182	.9194	.9205	23	1	2	3	5	6	7	8	9	10
67	.9205	.9216	.9228	.9239	.9250	.9261	.9272	22	1	2	3	4	6	7	8	9	10
68	.9272	.9283	.9293	.9304	.9315	.9325	.9336	21	1	2	3	4	5	6	7	9	10
69	.9336	.9346	.9356	.9367	.9377	.9387	.9397	20°	1	2	3	4	5	6	7	8	9
70°	0.9397	0.9407	0.9417	0.9426	0.9436	0.9446	0.9455	19	1	2	3	4	5	6	7	8	9
71	.9455	.9465	.9474	.9483	.9492	.9502	.9511	18	1	2	3	4	5	6	6	7	8
72	.9511	.9520	.9528	.9537	.9546	.9555	.9563	17	1	2	3	4	4	5	6	7	8
73	.9563	.9572	.9580	.9588	.9596	.9605	.9613	16	1	2	2	3	4	5	6	7	7
74	.9613	.9621	.9628	.9636	.9644	.9652	.9659	15	1	2	2	3	4	5	5	6	7
75	0.9659	0.9667	0.9674	0.9681	0.9689	0.9696	0.9703	14	1	1	2	3	4	4	5	6	7
76	.9703	.9710	.9717	.9724	.9730	.9737	.9744	13	1	1	2	3	3	4	5	5	6
77	.9744	.9750	.9757	.9763	.9769	.9775	.9781	12	1	1	2	3	3	4	4	5	6
78	.9781	.9787	.9793	.9799	.9805	.9811	.9816	11	1	1	2	2	3	3	4	5	5
79	.9816	.9822	.9827	.9833	.9838	.9843	.9848	10°	1	1	2	2	3	3	4	4	5
80°	0.9848	0.9853	0.9858	0.9863	0.9868	0.9872	0.9877	9	0	1	1	2	2	3	3	4	4
81	.9877	.9881	.9886	.9890	.9894	.9899	.9903	8	0	1	1	2	2	3	3	3	4
82	.9903	.9907	.9911	.9914	.9918	.9922	.9925	7	0	1	1	2	2	2	3	3	3
83	.9925	.9929	.9932	.9936	.9939	.9942	.9945	6	0	1	1	1	2	2	2	3	3
84	.9945	.9948	.9951	.9954	.9957	.9959	.9962	5	0	1	1	1	1	2	2	2	3
85	0.9962	0.9964	0.9967	0.9969	0.9971	0.9974	0.9976	4	0	1	1	1	1	1	2	2	2
86	.9976	.9978	.9980	.9981	.9983	.9985	.9986	3	0	0	1	1	1	1	1	1	2
87	.9986	.9988	.9989	.9990	.9992	.9993	.9994	2	0	0	0	1	1	1	1	1	1
88	.9994	.9995	.9996	.9997	.9997	.9998	.9998	1°									
89	0.9998	0.9999	0.9999	1.0000	1.0000	1.0000	1.0000	0°									
	60'	50'	40'	30'	20'	10'	0'		1'	2'	3'	4'	5'	6'	7'	8'	9'

	0'	10'	20'	30'	40'	50'	60'		මධ්‍යන්‍ය අන්තර්ය இடை வித்தியாசங்கள் Mean Differences 1'	2'	3'	4'	5'	6'	7'	8'	9'
0°	0.0000	0.0029	0.0058	0.0087	0.0116	0.0145	0.0175	89°	3	6	9	12	15	17	20	23	26
1	.0175	.0204	.0233	.0262	.0291	.0320	.0349	88	3	6	9	12	15	17	20	23	26
2	.0349	.0378	.0407	.0437	.0466	.0495	.0524	87	3	6	9	12	15	18	20	23	26
3	.0524	.0553	.0582	.0612	.0641	.0670	.0699	86	3	6	9	12	15	18	20	23	26
4	.0699	.0729	.0758	.0787	.0816	.0846	.0875	85	3	6	9	12	15	18	21	23	26
5	0.0875	0.0904	0.0934	0.0963	0.0992	0.1022	0.1051	84	3	6	9	12	15	18	21	24	26
6	.1051	.1080	.1110	.1139	.1169	.1198	.1228	83	3	6	9	12	15	18	21	24	27
7	.1228	.1257	.1287	.1317	.1346	.1376	.1405	82	3	6	9	12	15	18	21	24	27
8	.1405	.1435	.1465	.1495	.1524	.1554	.1584	81	3	6	9	12	15	18	21	24	27
9	.1584	.1614	.1644	.1673	.1703	.1733	.1763	80°	3	6	9	12	15	18	21	24	27
10°	0.1763	0.1793	0.1823	0.1853	0.1883	0.1914	0.1944	79	3	6	9	12	15	18	21	24	27
11	.1944	.1974	.2004	.2035	.2065	.2095	.2126	78	3	6	9	12	15	18	21	24	27
12	.2126	.2156	.2186	.2217	.2247	.2278	.2309	77	3	6	9	12	15	18	21	24	27
13	.2309	.2339	.2370	.2401	.2432	.2462	.2493	76	3	6	9	12	15	18	22	25	28
14	.2493	.2524	.2555	.2586	.2617	.2648	.2679	75	3	6	9	12	16	19	22	25	28
15	0.2679	0.2711	0.2742	0.2773	0.2805	0.2836	0.2867	74	3	6	9	13	16	19	22	25	28
16	.2867	.2899	.2931	.2962	.2994	.3026	.3057	73	3	6	9	13	16	19	22	25	28
17	.3057	.3089	.3121	.3153	.3185	.3217	.3249	72	3	6	10	13	16	19	22	26	29
18	.3249	.3281	.3314	.3346	.3378	.3411	.3443	71	3	6	10	13	16	19	23	26	29
19	.3443	.3476	.3508	.3541	.3574	.3607	.3640	70°	3	7	10	13	16	20	23	26	29
20°	0.3640	0.3673	0.3706	0.3739	0.3772	0.3805	0.3839	69	3	7	10	13	17	20	23	27	30
21	.3839	.3872	.3906	.3939	.3973	.4006	.4040	68	3	7	10	13	17	20	24	27	30
22	.4040	.4074	.4108	.4142	.4176	.4210	.4245	67	3	7	10	14	17	20	24	27	31
23	.4245	.4279	.4314	.4348	.4383	.4417	.4452	66	3	7	10	14	17	21	24	28	31
24	.4452	.4487	.4522	.4557	.4592	.4628	.4663	65	4	7	11	14	18	21	25	28	32
25	0.4663	0.4699	0.4734	0.4770	0.4806	0.4841	0.4877	64	4	7	11	14	18	21	25	29	32
26	.4877	.4913	.4950	.4986	.5022	.5059	.5095	63	4	7	11	15	18	22	25	29	33
27	.5095	.5132	.5169	.5206	.5243	.5280	.5317	62	4	7	11	15	18	22	26	30	33
28	.5317	.5354	.5392	.5430	.5467	.5505	.5543	61	4	8	11	15	19	23	26	30	34
29	.5543	.5581	.5619	.5658	.5696	.5735	.5774	60°	4	8	12	15	19	23	27	31	35
30°	0.5774	0.5812	0.5851	0.5890	0.5930	0.5969	0.6009	59	4	8	12	16	20	24	27	31	35
31	.6009	.6048	.6088	.6128	.6168	.6208	.6249	58	4	8	12	16	20	24	28	32	36
32	.6249	.6289	.6330	.6371	.6412	.6453	.6494	57	4	8	12	16	20	25	29	33	37
33	.6494	.6536	.6577	.6619	.6661	.6703	.6745	56	4	8	13	17	21	25	29	33	38
34	.6745	.6787	.6830	.6873	.6916	.6959	.7002	55	4	9	13	17	21	26	30	34	39
35	0.7002	0.7046	0.7089	0.7133	0.7177	0.7221	0.7265	54	4	9	13	18	22	26	31	35	40
36	.7265	.7310	.7355	.7400	.7445	.7490	.7536	53	5	9	14	18	23	27	32	36	41
37	.7536	.7581	.7627	.7673	.7720	.7766	.7813	52	5	9	14	19	23	28	32	37	42
38	.7813	.7860	.7907	.7954	.8002	.8050	.8098	51	5	10	14	19	24	29	33	38	43
39	.8098	.8146	.8195	.8243	.8292	.8342	.8391	50°	5	10	15	20	24	29	34	39	44
40°	0.8391	0.8441	0.8491	.8541	0.8591	0.8642	0.8693	49	5	10	15	20	25	30	35	40	45
41	.8693	.8744	.8796	.8847	.8899	.8952	.9004	48	5	10	16	21	26	31	36	41	47
42	.9004	.9057	.9110	.9163	.9217	.9271	.9325	47	5	11	16	21	27	32	37	43	48
43	.9325	.9380	.9435	.9490	.9545	.9601	.9657	46	6	11	17	22	28	33	39	44	50
44	.9657	.9731	.9770	.9827	.9884	.9942	1.0000	45	6	11	17	23	29	34	40	46	51
	60'	50'	40'	30'	20'	10'	0'		1'	2'	3'	4'	5'	6'	7'	8'	9'

	0'	10'	20'	30'	40'	50'	60'		මධ්‍යන්‍ය අන්තර්ය இடை வித்தியாசங்கள் Mean Differences 1'	2'	3'	4'	5'	6'	7'	8'	9'
45°	1.0000	1.0058	1.0117	1.0176	1.0235	1.0295	1.0355	44°	6	12	18	24	30	36	41	47	53
46	.0355	.0416	.0477	.0538	.0599	.0661	.0724	43	6	12	18	25	31	37	43	49	55
47	.0724	.0786	.0850	.0913	.0977	.1041	.1106	42	6	13	19	26	32	38	45	51	57
48	.1106	.1171	.1237	.1303	.1369	.1436	.1504	41	7	13	20	27	33	40	46	53	60
49	.1504	.1571	.1640	.1708	.1778	.1847	.1918	40°	7	14	21	28	34	41	48	55	62
50°	1.1918	1.1988	1.2059	1.2131	1.2203	1.2276	1.2349	39	7	14	22	29	36	43	50	58	65
51	.2349	.2423	.2497	.2572	.2647	.2723	.2799	38	8	15	23	30	38	45	53	60	68
52	.2799	.2876	.2954	.3032	.3111	.3190	.3270	37	8	16	24	31	39	47	55	63	71
53	.3270	.3351	.3432	.3514	.3597	.3680	.3764	36	8	16	25	33	41	49	58	66	74
54	.3764	.3848	.3934	.4019	.4106	.4193	.4281	35	9	17	26	35	43	52	60	69	78
55	1.4281	1.4370	1.4460	1.4550	1.4641	1.4733	1.4826	34	9	18	27	36	45	54	63	73	82
56	.4826	.4919	.5013	.5108	.5204	.5301	.5399	33	10	19	29	38	48	57	67	76	86
57	.5399	.5497	.5597	.5697	.5798	.5900	.6003	32	10	20	30	40	50	60	71	81	91
58	.6003	.6107	.6212	.6319	.6426	.6534	.6643	31	11	21	32	43	53	64	75	85	96
59	.6643	.6753	.6864	.6977	.7090	.7205	.7321	30°	11	23	34	45	56	68	79	90	102
60°	1.732	1.744	1.756	1.767	1.780	1.792	1.804	29	1	2	4	5	6	7	8	10	11
61	1.804	1.816	1.829	1.842	1.855	1.868	1.881	28	1	3	4	5	6	8	9	10	12
62	1.881	1.894	1.907	1.921	1.935	1.949	1.963	27	1	3	4	5	7	8	10	11	12
63	1.963	1.977	1.991	2.006	2.020	2.035	2.050	26	1	3	4	6	7	9	10	12	13
64	2.050	2.066	2.081	2.097	2.112	2.128	2.145	25	2	3	5	6	8	9	11	13	14
65	2.145	2.161	2.177	2.194	2.211	2.229	2.246	24	2	3	5	7	8	10	12	14	15
66	2.246	2.264	2.282	2.300	2.318	2.337	2.356	23	2	4	5	7	9	11	13	15	16
67	2.356	2.375	2.394	2.414	2.434	2.455	2.475	22	2	4	6	8	10	12	14	16	18
68	2.475	2.496	2.517	2.539	2.560	2.583	2.605	21	2	4	6	9	11	13	15	17	20
69	2.605	2.628	2.651	2.675	2.699	2.723	2.747	20°	2	5	7	9	12	14	17	19	21
70°	2.747	2.773	2.798	2.824	2.850	2.877	2.904	19	3	5	8	10	13	16	18	21	23
71	2.904	2.932	2.960	2.989	3.018	3.047	3.078	18	3	6	9	12	14	17	20	23	26
72	3.078	3.108	3.140	3.172	3.204	3.237	3.271	17	3	6	10	13	16	19	23	26	29
73	3.271	3.305	3.340	3.376	3.412	3.450	3.487	16	4	7	11	14	18	22	25	29	32
74	3.487	3.526	3.566	3.606	3.647	3.689	3.732	15	4	8	12	16	20	24	29	33	37
75	3.732	3.776	3.821	3.867	3.914	3.962	4.011	14°	5	9	14	19	23	28	33	37	42
76	4.011	4.061	4.113	4.165	4.219	4.275	4.331	13	5	11	16	21	27	32	37	43	48
77	4.331	4.390	4.449	4.511	4.574	4.638	4.705	12	6	12	19	25	31	37	44	50	56
78	4.705	4.773	4.843	4.915	4.989	5.066	5.145	11	7	15	22	29	37	44	51	59	66
79	5.145	5.226	5.309	5.396	5.485	5.576	5.671	10°	9	18	26	35	44	53	61	70	79
80°	5.671	5.769	5.871	5.976	6.084	6.197	6.314	9									
81	6.314	6.435	6.561	6.691	6.827	6.968	7.115	8									
82	7.115	7.269	7.429	7.596	7.770	7.953	8.144	7									
83	8.144	8.345	8.556	8.777	9.010	9.255	9.514	6									
84	9.514	9.788	10.078	10.385	10.712	11.059	11.430	5									
85	11.43	11.83	12.25	12.71	13.20	13.73	14.30	4									
86	14.30	14.92	15.60	16.35	17.17	18.07	19.08	3									
87	19.08	20.21	21.47	22.90	24.54	26.43	28.64	2									
88	28.64	31.24	34.37	38.19	42.96	49.10	57.29	1									
89	57.29	68.75	85.94	114.59	171.89	343.77	×	0°									
	60'	50'	40'	30'	20'	10'	0'		1'	2'	3'	4'	5'	6'	7'	8'	9'

අන්තර අගයන් වේගයෙන් වෙනස් වේ
வித்தியாசங்கள் விரைந்து மாறுவன
Differences change rapidly