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Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2019/2020**

COURSE NAME : ENGINEERING ECONOMY  
COURSE CODE : BFC44602  
PROGRAMME CODE : BFF  
EXAMINATION DATE : DECEMBER 2019/ JANUARY 2020  
DURATION : 2 HOURS  
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF TEN (10) PAGES

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- Q1** (a) Identify **FIVE (5)** areas of personal finances in which you can use engineering economic analysis in the future. (5 marks)
- (b) In engineering economy, cost categorizes in varies classification according to the frequency of occurrence, relative magnitude, and degree of impact on the study. Explain about life-cycle costs with appropriate example. (8 marks)
- (c) Based on the break-even graph for an investment as shown in **FIGURE Q1(c)**, answer the following questions.
- i. Explain about break-even analysis? (2 marks)
- ii. Construct the equation for total revenue for X units per year. (3 marks)
- iii. Construct the equation for total costs for X units per year. (3 marks)
- iv. Calculate either profit or loss, if 1500 units been sold this year. (4 marks)
- Q2** (a) Explain the Work Breakdown Structure (WBS) using an example of three levels of WBS for any construction project. (8 marks)
- (b) The SME snack factory was built in 2012 at a total cost of RM 650,000. Additional information is given in **TABLE 1**. Calculate a weighted index for the factory construction in 2016, when 2012 is the reference year having an index value of 143.8 (7 marks)
- (c) The Department of the Navy estimates that the learning rate for shipbuilding of nuclear submarine is 85%. Assuming the first unit took 56 months to complete,
- i. Calculate duration to build the 12<sup>th</sup> vessel? (5 marks)
- ii. Calculate total time required to build the first 12 vessel. (5 marks)

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- Q3** (a) How long will it take for an investment to double at;
- i. 4% per year simple interest rate
  - ii. 4% per year compounding annually
- (6 marks)
- (b) Major overhaul expenses of RM 5,000 each are anticipated for a large piece of earthmoving equipment. The costs will occur at the end of year four and will continue every three years after that up to and including year 13. The interest rate is 12% per year.
- i. Draw a cash-flow diagram.
- (3 marks)
- ii. Calculate the present equivalent of the overhaul expenses at time 0
- (4 marks)
- (c) Izz is a 30 years old engineer in oil and gas company. If he saves RM1,000 every month, made his consistent savings of RM12,000 each year, for the first 5-years of his career. At the end of year two, he withdrew RM10,000 from his savings for Gold Coast trip. He then spent RM30,000 for his wedding ceremony in year 4. With an interest rate of 5% compounded annually, how much will Izz have at the end of the fifth year?
- (12 marks)
- 
- Q4** (a) A city government is considering increasing the capacity of the current wastewater treatment plant. The estimated financial data for the project is presented in **TABLE 2**. Calculate the present worth benefit-cost ratio for both conventional and modified method for this capacity expansion project.
- (10 marks)
- (b) A school is overcrowded and there are three options. The do-nothing alternative corresponds to continuing to use modular classrooms. The school can be expanded, or a new school can be built to “split the load” between the schools. User benefits come from improvements in school performance for the expanded or new schools. If a new school is built, there are more benefits because more students will be able to walk to school, the average distance for those who ride the school buses will be shorter, and the schools will be smaller and more “student-friendly.” The disbenefits for the expanded school are due to the impact of the construction process during the school year. The interest rate is 8%, and the life of each alternative is 20 years. Based on the data given in **TABLE 3**, determine the best alternative that should be chosen by using the conventional benefit-cost ratio and modified benefit-cost ratio for annual worth value.

(15 marks)

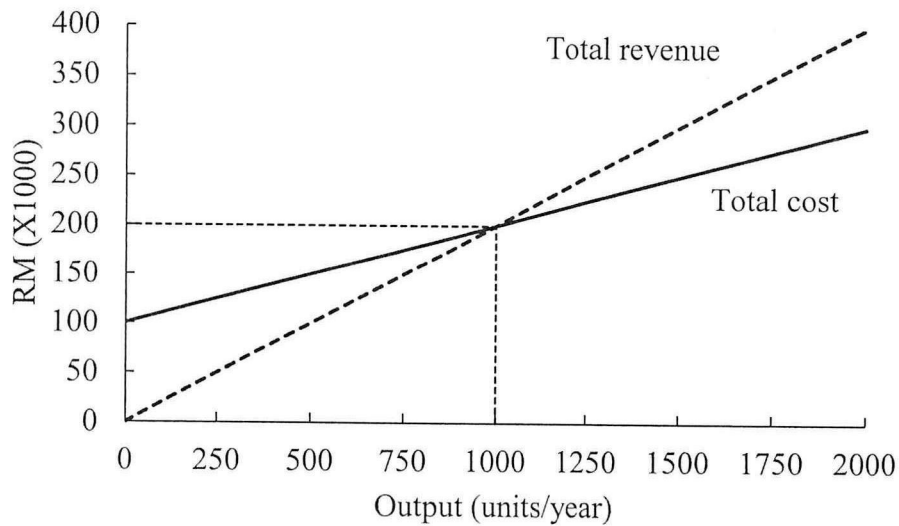
– END OF QUESTIONS –



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**FIGURE Q1(c)**

**TABLE 1**

Cost Element	Percentage	Index (2012)	Index (2016)
Labor	30	160	200
Materials	20	145	175
Equipment	50	135	162

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**TABLE 2**

<b>Description</b>	<b>Data</b>
Capital investment	RM 1,000,000
Project life	20 years
Incremental annual benefits	RM 220,000
Incremental annual O&M costs	RM 80,000
Salvage value	RM 40,000
Interest rate	5%

**TABLE 3**

<b>Alternative</b>	<b>School expansion</b>	<b>New school</b>
<b>User benefits (per year)</b>	RM 2.1 million	RM 3.1 million
<b>User disbenefits (per year)</b>	RM 0.8 million	-
<b>First cost</b>	RM 8.8 million	RM 10.4 million
<b>Operation and maintenance (per year)</b>	RM 0.95 million	RM 1.7 million

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*The following information may be useful. The symbols have their usual meaning.*

B-C Ratio using present worth:

$$B - C = \frac{PW(B)}{I - PW(MV) + PW(O\&M)}$$

Modified B-C Ratio using present worth:

$$B - C = \frac{PW(B) - PW(O\&M)}{I - PW(MV)}$$

B-C Ratio using annual worth:

$$B - C = \frac{AW(B)}{CR + AW(O\&M)}$$

Modified B-C Ratio using annual worth:

$$B - C = \frac{AW(B) - AW(O\&M)}{CR}$$

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5% Discrete Cash Flow: Compound Interest Factors 5%								
n	Single Payments		Uniform Series Payments				Arithmetic Gradients	
	F/P Compound Amount	P/F Present Worth	A/F Sinking Fund	F/A Compound Amount	A/P Capital Recovery	P/A Present Worth	P/G Gradient Present Worth	A/G Gradient Uniform Series
1	1.0500	0.9524	1.00000	1.0000	1.05000	0.9524		
2	1.1025	0.9070	0.48780	2.0500	0.53780	1.8594	0.9070	0.4878
3	1.1576	0.8638	0.31721	3.1525	0.36721	2.7232	2.6347	0.9675
4	1.2155	0.8227	0.23201	4.3101	0.28201	3.5460	5.1028	1.4391
5	1.2763	0.7835	0.18097	5.5256	0.23097	4.3295	8.2369	1.9025
6	1.3401	0.7462	0.14702	6.8019	0.19702	5.0757	11.9680	2.3579
7	1.4071	0.7107	0.12282	8.1420	0.17282	5.7864	16.2321	2.8052
8	1.4775	0.6768	0.10472	9.5491	0.15472	6.4632	20.9700	3.2445
9	1.5513	0.6446	0.09069	11.0266	0.14069	7.1078	26.1268	3.6758
10	1.6289	0.6139	0.07950	12.5779	0.12950	7.7217	31.6520	4.0991
11	1.7103	0.5847	0.07039	14.2068	0.12039	8.3064	37.4988	4.5144
12	1.7959	0.5568	0.06283	15.9171	0.11283	8.8633	43.6241	4.9219
13	1.8856	0.5303	0.05646	17.7130	0.10646	9.3936	49.9879	5.3215
14	1.9799	0.5051	0.05102	19.5986	0.10102	9.8986	56.5538	5.7133
15	2.0789	0.4810	0.04634	21.5786	0.09634	10.3797	63.2880	6.0973
16	2.1829	0.4581	0.04227	23.6575	0.09227	10.8378	70.1597	6.4736
17	2.2920	0.4363	0.03870	25.8404	0.08870	11.2741	77.1405	6.8423
18	2.4066	0.4155	0.03555	28.1324	0.08555	11.6896	84.2043	7.2034
19	2.5270	0.3957	0.03275	30.5390	0.08275	12.0853	91.3275	7.5569
20	2.6533	0.3769	0.03024	33.0660	0.08024	12.4622	98.4884	7.9030
21	2.7860	0.3589	0.02800	35.7193	0.07800	12.8212	105.6673	8.2416
22	2.9253	0.3418	0.02597	38.5052	0.07597	13.1630	112.8461	8.5730
23	3.0715	0.3256	0.02414	41.4305	0.07414	13.4886	120.0087	8.8971
24	3.2251	0.3101	0.02247	44.5020	0.07247	13.7986	127.1402	9.2140
25	3.3864	0.2953	0.02095	47.7271	0.07095	14.0939	134.2275	9.5238
26	3.5557	0.2812	0.01956	51.1135	0.06956	14.3752	141.2585	9.8266
27	3.7335	0.2678	0.01829	54.6691	0.06829	14.6430	148.2226	10.1224
28	3.9201	0.2551	0.01712	58.4026	0.06712	14.8981	155.1101	10.4114
29	4.1161	0.2429	0.01605	62.3227	0.06605	15.1411	161.9126	10.6936
30	4.3219	0.2314	0.01505	66.4388	0.06505	15.3725	168.6226	10.9691
31	4.5380	0.2204	0.01413	70.7608	0.06413	15.5928	175.2333	11.2381
32	4.7649	0.2099	0.01328	75.2988	0.06328	15.8027	181.7392	11.5005
33	5.0032	0.1999	0.01249	80.0638	0.06249	16.0025	188.1351	11.7566
34	5.2533	0.1904	0.01176	85.0670	0.06176	16.1929	194.4168	12.0063
35	5.5160	0.1813	0.01107	90.3203	0.06107	16.3742	200.5807	12.2498
40	7.0400	0.1420	0.00828	120.7998	0.05828	17.1591	229.5452	13.3775
45	8.9850	0.1113	0.00626	159.7002	0.05626	17.7741	255.3145	14.3644
50	11.4674	0.0872	0.00478	209.3480	0.05478	18.2559	277.9148	15.2233
55	14.6356	0.0683	0.00367	272.7126	0.05367	18.6335	297.5104	15.9664
60	18.6792	0.0535	0.00283	353.5837	0.05283	18.9293	314.3432	16.6062
65	23.8399	0.0419	0.00219	456.7980	0.05219	19.1611	328.6910	17.1541
70	30.4264	0.0329	0.00170	588.5285	0.05170	19.3427	340.8409	17.6212
75	38.8327	0.0258	0.00132	756.6537	0.05132	19.4850	351.0721	18.0176
80	49.5614	0.0202	0.00103	971.2288	0.05103	19.5965	359.6460	18.3526
85	63.2544	0.0158	0.00080	1245.09	0.05080	19.6838	366.8007	18.6346
90	80.7304	0.0124	0.00063	1594.61	0.05063	19.7523	372.7488	18.8712
95	103.0347	0.0097	0.00049	2040.69	0.05049	19.8059	377.6774	19.0689
96	108.1864	0.0092	0.00047	2143.73	0.05047	19.8151	378.5555	19.1044
98	119.2755	0.0084	0.00042	2365.51	0.05042	19.8323	380.2139	19.1714
100	131.5013	0.0076	0.00038	2610.03	0.05038	19.8479	381.7492	19.2337

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8% Discrete Cash Flow: Compound Interest Factors 8%								
n	Single Payments		Uniform Series Payments				Arithmetic Gradients	
	F/P Compound Amount	P/F Present Worth	A/F Sinking Fund	F/A Compound Amount	A/P Capital Recovery	P/A Present Worth	P/G Gradient Present Worth	A/G Gradient Uniform Series
1	1.0800	0.9259	1.00000	1.0000	1.08000	0.9259		
2	1.1664	0.8573	0.48077	2.0800	0.56077	1.7833	0.8573	0.4808
3	1.2597	0.7938	0.30803	3.2464	0.38803	2.5771	2.4450	0.9487
4	1.3605	0.7350	0.22192	4.5061	0.30192	3.3121	4.6501	1.4040
5	1.4693	0.6806	0.17046	5.8666	0.25046	3.9927	7.3724	1.8465
6	1.5869	0.6302	0.13632	7.3359	0.21632	4.6229	10.5233	2.2763
7	1.7138	0.5835	0.11207	8.9228	0.19207	5.2064	14.0242	2.6937
8	1.8509	0.5403	0.09401	10.6366	0.17401	5.7466	17.8061	3.0985
9	1.9990	0.5002	0.08008	12.4876	0.16008	6.2469	21.8081	3.4910
10	2.1589	0.4632	0.06903	14.4866	0.14903	6.7101	25.9768	3.8713
11	2.3316	0.4289	0.06008	16.6455	0.14008	7.1390	30.2657	4.2395
12	2.5182	0.3971	0.05270	18.9771	0.13270	7.5361	34.6339	4.5957
13	2.7196	0.3677	0.04652	21.4953	0.12652	7.9038	39.0463	4.9402
14	2.9372	0.3405	0.04130	24.2149	0.12130	8.2442	43.4723	5.2731
15	3.1722	0.3152	0.03683	27.1521	0.11683	8.5595	47.8857	5.5945
16	3.4259	0.2919	0.03298	30.3243	0.11298	8.8514	52.2640	5.9046
17	3.7000	0.2703	0.02963	33.7502	0.10963	9.1216	56.5883	6.2037
18	3.9960	0.2502	0.02670	37.4502	0.10670	9.3719	60.8426	6.4920
19	4.3157	0.2317	0.02413	41.4463	0.10413	9.6036	65.0134	6.7697
20	4.6610	0.2145	0.02185	45.7620	0.10185	9.8181	69.0898	7.0369
21	5.0338	0.1987	0.01983	50.4229	0.09983	10.0168	73.0629	7.2940
22	5.4365	0.1839	0.01803	55.4568	0.09803	10.2007	76.9257	7.5412
23	5.8715	0.1703	0.01642	60.8933	0.09642	10.3711	80.6726	7.7786
24	6.3412	0.1577	0.01498	66.7648	0.09498	10.5288	84.2997	8.0066
25	6.8485	0.1460	0.01368	73.1059	0.09368	10.6748	87.8041	8.2254
26	7.3964	0.1352	0.01251	79.9544	0.09251	10.8100	91.1842	8.4352
27	7.9881	0.1252	0.01145	87.3508	0.09145	10.9352	94.4390	8.6363
28	8.6271	0.1159	0.01049	95.3388	0.09049	11.0511	97.5687	8.8289
29	9.3173	0.1073	0.00962	103.9659	0.08962	11.1584	100.5738	9.0133
30	10.0627	0.0994	0.00883	113.2832	0.08883	11.2578	103.4558	9.1897
31	10.8677	0.0920	0.00811	123.3459	0.08811	11.3498	106.2163	9.3584
32	11.7371	0.0852	0.00745	134.2135	0.08745	11.4350	108.8575	9.5197
33	12.6760	0.0789	0.00685	145.9506	0.08685	11.5139	111.3819	9.6737
34	13.6901	0.0730	0.00630	158.6267	0.08630	11.5869	113.7924	9.8208
35	14.7853	0.0676	0.00580	172.3168	0.08580	11.6546	116.0920	9.9611
40	21.7245	0.0460	0.00386	259.0565	0.08386	11.9246	126.0422	10.5699
45	31.9204	0.0313	0.00259	386.5056	0.08259	12.1084	133.7331	11.0447
50	46.9016	0.0213	0.00174	573.7702	0.08174	12.2335	139.5928	11.4107
55	68.9139	0.0145	0.00118	848.9232	0.08118	12.3186	144.0065	11.6902
60	101.2571	0.0099	0.00080	1253.21	0.08080	12.3766	147.3000	11.9015
65	148.7798	0.0067	0.00054	1847.25	0.08054	12.4160	149.7387	12.0602
70	218.6064	0.0046	0.00037	2720.08	0.08037	12.4428	151.5326	12.1783
75	321.2045	0.0031	0.00025	4002.56	0.08025	12.4611	152.8448	12.2658
80	471.9548	0.0021	0.00017	5886.94	0.08017	12.4735	153.8001	12.3301
85	693.4565	0.0014	0.00012	8655.71	0.08012	12.4820	154.4925	12.3772
90	1018.92	0.0010	0.00008	12724	0.08008	12.4877	154.9925	12.4116
95	1497.12	0.0007	0.00005	18702	0.08005	12.4917	155.3524	12.4365
96	1616.89	0.0006	0.00005	20199	0.08005	12.4923	155.4112	12.4406
98	1885.94	0.0005	0.00004	23562	0.08004	12.4934	155.5176	12.4480
100	2199.76	0.0005	0.00004	27485	0.08004	12.4943	155.6107	12.4545



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10%		Discrete Cash Flow: Compound Interest Factors						10%	
n	Single Payments		Uniform Series Payments				Arithmetic Gradients		
	F/P Compound Amount	P/F Present Worth	A/F Sinking Fund	F/A Compound Amount	A/P Capital Recovery	P/A Present Worth	P/G Gradient Present Worth	A/G Gradient Uniform Series	
1	1.1000	0.9091	1.00000	1.0000	1.10000	0.9091			
2	1.2100	0.8264	0.47619	2.1000	0.57619	1.7355	0.8264	0.4762	
3	1.3310	0.7513	0.30211	3.3100	0.40211	2.4869	2.3291	0.9366	
4	1.4641	0.6830	0.21547	4.6410	0.31547	3.1699	4.3781	1.3812	
5	1.6105	0.6209	0.16380	6.1051	0.26380	3.7908	6.8618	1.8101	
6	1.7716	0.5645	0.12961	7.7156	0.22961	4.3553	9.6842	2.2236	
7	1.9487	0.5132	0.10541	9.4872	0.20541	4.8684	12.7631	2.6216	
8	2.1436	0.4665	0.08744	11.4359	0.18744	5.3349	16.0287	3.0045	
9	2.3579	0.4241	0.07364	13.5795	0.17364	5.7590	19.4215	3.3724	
10	2.5937	0.3855	0.06275	15.9374	0.16275	6.1446	22.8913	3.7255	
11	2.8531	0.3505	0.05396	18.5312	0.15396	6.4951	26.3963	4.0641	
12	3.1384	0.3186	0.04676	21.3843	0.14676	6.8137	29.9012	4.3884	
13	3.4523	0.2897	0.04078	24.5227	0.14078	7.1034	33.3772	4.6988	
14	3.7975	0.2633	0.03575	27.9750	0.13575	7.3667	36.8005	4.9955	
15	4.1772	0.2394	0.03147	31.7725	0.13147	7.6061	40.1520	5.2789	
16	4.5950	0.2176	0.02782	35.9497	0.12782	7.8237	43.4164	5.5493	
17	5.0545	0.1978	0.02466	40.5447	0.12466	8.0216	46.5819	5.8071	
18	5.5599	0.1799	0.02193	45.5992	0.12193	8.2014	49.6395	6.0526	
19	6.1159	0.1635	0.01955	51.1591	0.11955	8.3649	52.5827	6.2861	
20	6.7275	0.1486	0.01746	57.2750	0.11746	8.5136	55.4069	6.5081	
21	7.4002	0.1351	0.01562	64.0025	0.11562	8.6487	58.1095	6.7189	
22	8.1403	0.1228	0.01401	71.4027	0.11401	8.7715	60.6893	6.9189	
23	8.9543	0.1117	0.01257	79.5430	0.11257	8.8832	63.1462	7.1085	
24	9.8497	0.1015	0.01130	88.4973	0.11130	8.9847	65.4813	7.2881	
25	10.8347	0.0923	0.01017	98.3471	0.11017	9.0770	67.6964	7.4580	
26	11.9182	0.0839	0.00916	109.1818	0.10916	9.1609	69.7940	7.6186	
27	13.1100	0.0763	0.00826	121.0999	0.10826	9.2372	71.7773	7.7704	
28	14.4210	0.0693	0.00745	134.2099	0.10745	9.3066	73.6495	7.9137	
29	15.8631	0.0630	0.00673	148.6309	0.10673	9.3696	75.4146	8.0489	
30	17.4494	0.0573	0.00608	164.4940	0.10608	9.4269	77.0766	8.1762	
31	19.1943	0.0521	0.00550	181.9434	0.10550	9.4790	78.6395	8.2962	
32	21.1138	0.0474	0.00497	201.1378	0.10497	9.5264	80.1078	8.4091	
33	23.2252	0.0431	0.00450	222.2515	0.10450	9.5694	81.4856	8.5152	
34	25.5477	0.0391	0.00407	245.4767	0.10407	9.6086	82.7773	8.6149	
35	28.1024	0.0356	0.00369	271.0244	0.10369	9.6442	83.9872	8.7086	
40	45.2593	0.0221	0.00226	442.5926	0.10226	9.7791	88.9525	9.0962	
45	72.8905	0.0137	0.00139	718.9048	0.10139	9.8628	92.4544	9.3740	
50	117.3909	0.0085	0.00086	1163.91	0.10086	9.9148	94.8889	9.5704	
55	189.0591	0.0053	0.00053	1880.59	0.10053	9.9471	96.5619	9.7075	
60	304.4816	0.0033	0.00033	3034.82	0.10033	9.9672	97.7010	9.8023	
65	490.3707	0.0020	0.00020	4893.71	0.10020	9.9796	98.4705	9.8672	
70	789.7470	0.0013	0.00013	7887.47	0.10013	9.9873	98.9870	9.9113	
75	1271.90	0.0008	0.00008	12709	0.10008	9.9921	99.3317	9.9410	
80	2048.40	0.0005	0.00005	20474	0.10005	9.9951	99.5606	9.9609	
85	3298.97	0.0003	0.00003	32980	0.10003	9.9970	99.7120	9.9742	
90	5313.02	0.0002	0.00002	53120	0.10002	9.9981	99.8118	9.9831	
95	8556.68	0.0001	0.00001	85557	0.10001	9.9988	99.8773	9.9889	
96	9412.34	0.0001	0.00001	94113	0.10001	9.9989	99.8874	9.9898	
98	11389	0.0001	0.00001		0.10001	9.9991	99.9052	9.9914	
100	13781	0.0001	0.00001		0.10001	9.9993	99.9202	9.9927	

FINAL EXAMINATION

SEMESTER/SESSION : SEM I / 2019/2020  
 COURSE NAME : ENGINEERING ECONOMY

PROGRAMME CODE : BFF  
 COURSE CODE : BFC44602

12% Discrete Cash Flow: Compound Interest Factors 12%								
n	Single Payments		Uniform Series Payments				Arithmetic Gradients	
	F/P Compound Amount	P/F Present Worth	A/F Sinking Fund	F/A Compound Amount	A/P Capital Recovery	P/A Present Worth	P/G Gradient Present Worth	A/G Gradient Uniform Series
1	1.1200	0.8929	1.00000	1.0000	1.12000	0.8929		
2	1.2544	0.7972	0.47170	2.1200	0.59170	1.6901	0.7972	0.4717
3	1.4049	0.7118	0.29635	3.3744	0.41635	2.4018	2.2208	0.9246
4	1.5735	0.6355	0.20923	4.7793	0.32923	3.0373	4.1273	1.3589
5	1.7623	0.5674	0.15741	6.3528	0.27741	3.6048	6.3970	1.7746
6	1.9738	0.5066	0.12323	8.1152	0.24323	4.1114	8.9302	2.1720
7	2.2107	0.4523	0.09912	10.0890	0.21912	4.5638	11.6443	2.5512
8	2.4760	0.4039	0.08130	12.2997	0.20130	4.9676	14.4714	2.9131
9	2.7731	0.3606	0.06768	14.7757	0.18768	5.3282	17.3563	3.2574
10	3.1058	0.3220	0.05698	17.5487	0.17698	5.6502	20.2541	3.5847
11	3.4785	0.2875	0.04842	20.6546	0.16842	5.9377	23.1288	3.8953
12	3.8960	0.2567	0.04144	24.1331	0.16144	6.1944	25.9523	4.1897
13	4.3635	0.2292	0.03568	28.0291	0.15568	6.4235	28.7024	4.4683
14	4.8871	0.2046	0.03087	32.3926	0.15087	6.6282	31.3624	4.7317
15	5.4736	0.1827	0.02682	37.2797	0.14682	6.8109	33.9202	4.9803
16	6.1304	0.1631	0.02339	42.7533	0.14339	6.9740	36.3670	5.2147
17	6.8660	0.1456	0.02046	48.8837	0.14046	7.1196	38.6973	5.4353
18	7.6900	0.1300	0.01794	55.7497	0.13794	7.2497	40.9080	5.6427
19	8.6128	0.1161	0.01576	63.4397	0.13576	7.3658	42.9979	5.8375
20	9.6463	0.1037	0.01388	72.0524	0.13388	7.4694	44.9676	6.0202
21	10.8038	0.0926	0.01224	81.6987	0.13224	7.5620	46.8188	6.1913
22	12.1003	0.0826	0.01081	92.5026	0.13081	7.6446	48.5543	6.3514
23	13.5523	0.0738	0.00956	104.6029	0.12956	7.7184	50.1776	6.5010
24	15.1786	0.0659	0.00846	118.1552	0.12846	7.7843	51.6929	6.6406
25	17.0001	0.0588	0.00750	133.3339	0.12750	7.8431	53.1046	6.7708
26	19.0401	0.0525	0.00665	150.3339	0.12665	7.8957	54.4177	6.8921
27	21.3249	0.0469	0.00590	169.3740	0.12590	7.9426	55.6369	7.0049
28	23.8839	0.0419	0.00524	190.6989	0.12524	7.9844	56.7674	7.1098
29	26.7499	0.0374	0.00466	214.5828	0.12466	8.0218	57.8141	7.2071
30	29.9599	0.0334	0.00414	241.3327	0.12414	8.0552	58.7821	7.2974
31	33.5551	0.0298	0.00369	271.2926	0.12369	8.0850	59.6761	7.3811
32	37.5817	0.0266	0.00328	304.8477	0.12328	8.1116	60.5010	7.4586
33	42.0915	0.0238	0.00292	342.4294	0.12292	8.1354	61.2612	7.5302
34	47.1425	0.0212	0.00260	384.5210	0.12260	8.1566	61.9612	7.5965
35	52.7996	0.0189	0.00232	431.6635	0.12232	8.1755	62.6052	7.6577
40	93.0510	0.0107	0.00130	767.0914	0.12130	8.2438	65.1159	7.8988
45	163.9876	0.0061	0.00074	1358.23	0.12074	8.2825	66.7342	8.0572
50	289.0022	0.0035	0.00042	2400.02	0.12042	8.3045	67.7624	8.1597
55	509.3206	0.0020	0.00024	4236.01	0.12024	8.3170	68.4082	8.2251
60	897.5969	0.0011	0.00013	7471.64	0.12013	8.3240	68.8100	8.2664
65	1581.87	0.0006	0.00008	13174	0.12008	8.3281	69.0581	8.2922
70	2787.80	0.0004	0.00004	23223	0.12004	8.3303	69.2103	8.3082
75	4913.06	0.0002	0.00002	40934	0.12002	8.3316	69.3031	8.3181
80	8658.48	0.0001	0.00001	72146	0.12001	8.3324	69.3594	8.3241
85	15259	0.0001	0.00001		0.12001	8.3328	69.3935	8.3278

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