UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DGE 2133
COURSE	: MATHEMATICS III
SEMESTER/SESSION	: 2 – 2024/2025
DURATION	: 3 HOURS

Instructions:

1. This booklet contains **8** questions. Answer **ALL** questions.
2. All answers should be written in the answer booklet.
3. Write legibly and draw sketches whenever required.
4. If in doubt, raise your hand and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 8 PRINTED PAGES INCLUDING COVER PAGE

INSTRUCTION: ANSWER ALL QUESTIONS. (100 MARKS)

QUESTION 1

a) Convert $304° 15'$ to radian. (1 mark)

b) Figure 1 shows a semicircle PQR with centre, O. Given the length of arc PQ is $9\,cm$ and the perimeter POQ is $19\ cm$.

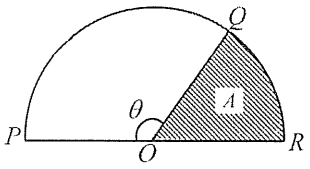


Figure 1

Calculate:

i. the radius, r, in cm. (1 mark)

ii. the value of θ, in radian, (2 marks)

iii. the shaded area, A in cm^2. (3 marks)

QUESTION 2

Table 1 shows the price indices in the year 2021 based on the year 2015 of four items, A, B, C, and D used in the production of a pair of shoes and their weightages.

Table 1

Material	Price index in the year 2021	Weightage
A	140	$2p$
B	135	3
C	120	1
D	130	p

a) Given that the price of material A is RM 3.00 in the year 2015, calculate its price in the year 2021. (2 marks)

b) Given that the composite index for the year 2021 based on the year 2015 is 134.5, find the value of p. (3 marks)

c) Find the price of a pair of shoes in the year 2015 if its corresponding price in the year 2021 is RM 25.00. (2 marks)

QUESTION 3

a) Given the first three terms of an arithmetic progression are 5,9,13. Calculate:

i. the common difference, (1 mark)

ii. the value of 10th term, (2 marks)

iii. the value of n if $T_n = 177$, (2 marks)

iv. the sum of first 23rd terms. (2 marks)

b) Saiful has saved some money in n months. His savings increased and formed a geometric progression. It is given that the savings in the fifth month are 4 times the savings in the third month.

i. Find the common ration, r. (2 marks)

ii. If the starting saving is RM 3 and the total savings is RM 1533, calculate the value of n and his last saving, T_n. (5 marks)

QUESTION 4

a) Find the equation of a straight line, $y = mx + c$ that has passes through the points, $(1,4)$ and $(9,-2)$. (4 marks)

b) *Use graph paper to answer this question.*

Table 2 shows the values of two variables, x and y, obtained from an experiment. The variables x and y are related by the equation $y = \sqrt{k} + \frac{hk}{x}$, where k and h are constants.

Table 2

x	1.5	2	3	4.5	5	6
y	4.5	5.25	5.8	6.2	6.34	6.5

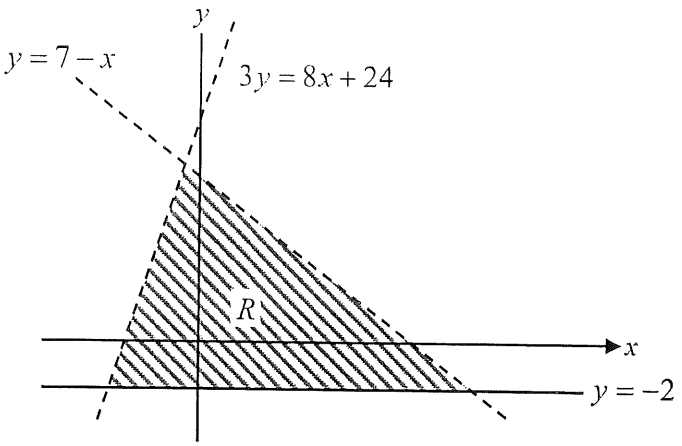
i. Plot xy against x, using a scale of 2 cm to 1 unit on the $x-$axis and 2 cm to 5 units on the $xy-$axis. Hence, draw the line of best fit. (5 marks)

ii. Write $y = \sqrt{k} + \frac{hk}{x}$ in linear form. (2 marks)

iii. Using the graph from (b)(i), find the value of k and h. (4 marks)

QUESTION 5

a) Write down three inequalities which define the shaded region R in the graph below.



(3 marks)

b) Sketch and shade the region R that satisfies the following linear inequality.

$$7x - 2y > 14$$

(3 marks)

c) *Use graph paper to answer this question.*

An institution of higher learning offers undergraduate course in information technology and engineering. The number of information technology student is x and engineering student is y. The enrolment of these two courses are based on the following constraints:

I :	The total number of students for these two courses is at most 250.
II :	The number of engineering students exceeds the number of information technology student by at least 50.
III :	The number of engineering student is not more than three times the number of information technology student.

i. Write three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfies all the given constraints. (3 marks)

ii. Using a scale of 2 cm to 50 students on both axes, construct and shade the region R that satisfies all the given constraints. (5 marks)

QUESTION 6

a) Given a set of data as below, determine the mode and the standard deviation.

12, 9, 7, 4, 10, 5, 3, 5, 11

(5 marks)

b) Table 3 shows the number of books read by 50 students in a year.

Table 3

Books	Frequency, f
6 – 10	5
11 – 15	10
16 – 20	11
21 – 25	16
26 – 30	8

Calculate:

i. the mean, (3 marks)

ii. the median, (4 marks)

iii. the mode of the data. (4 marks)

QUESTION 7

a) Figure 2 shows nine numbered cards.

Figure 2

A card is chosen at random. Find the probability that,

i. a prime number is chosen, (2 marks)

ii. a multiple of 3 or an even number is chosen. (4 marks)

b) A bag contains 8 red marbles, 4 blue marbles and 5 white marbles. Two marbles are drawn at random from the bag without replacement. Find the probability that,

i. both marbles are white, (2 marks)

ii. both marbles are blue, (2 marks)

iii. a red marble followed by a blue marble. (2 marks)

QUESTION 8

a) In a survey conducted on students in a college, 20% students have an electronic dictionary. If 10 students from the college are randomly selected, calculate the probability that:

i. exactly 3 students have electronic dictionaries, (2 marks)

ii. more than 2 students have electronic dictionaries. (4 marks)

b) A computer software package generates random numbers that are normally distributed with a mean and standard deviation that are entered by the user. Suppose that a user enters a mean of 400 and a standard deviation of 100. Find the probability that a value will be:

i. above 619, (2 marks)

ii. below 535, (3 marks)

iii. between 320 and 485. (4 marks)

---------- **END OF QUESTIONS** ----------

FORMULA

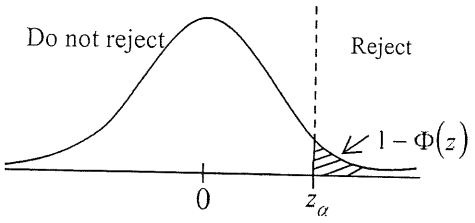
Arc Length of Circle	$S = r\theta$
Area of Sector	$A = \frac{1}{2}r^2\theta$
Price Index	$I = \frac{P_1}{P_0} \times 100$
Composite Index	$\bar{I} = \frac{\sum I_i W_i}{\sum W_i}$
The n^{th} term Arithmetic Progression	$T_n = a + (n-1)d$
The n^{th} term Geometric Progression	$T_n = ar^{n-1}$
Sum of Arithmetic Progression	$S_n = \frac{n}{2}\left[2a + (n-1)d\right]$ or $S_n = \frac{n}{2}(a+l)$
Sum of Geometric Progression	$S_n = \frac{a(1-r^n)}{1-r}, r<0$ or $S_n = \frac{a(r^n-1)}{r-1}, r>0$
Gradient	$m = \frac{y_2 - y_1}{x_2 - x_1}$
Mean	$\bar{x} = \frac{\sum x}{n}$ or $\bar{x} = \frac{\sum fx}{\sum f}$
Median	$x = L_m + \left(\frac{\frac{\sum f}{2} - \sum f_{m-1}}{f_m}\right) \times C_m$
Mode	$x = L_{mo} + \left(\frac{d_1}{d_1 + d_2}\right) \times C_{mo}$
Variance	$s^2 = \frac{1}{n-1}\left(\sum x^2 - \frac{(\Sigma x)^2}{n}\right)$
Standard Deviation	$s = \sqrt{\text{variance}}$
Probability of an Event	$P(A) = \frac{n(A)}{n(S)}$ $P(A \cap B) = P(A) \times P(B)$ $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
Binomial Distribution	$X \sim Bin(n, p)$, $P(X = x) = {}^n C_x p^x q^{n-x}$

STANDARD NORMAL DISTRIBUTION TABLE

$5.0 \rightarrow 0.0000002867$ $5.5 \rightarrow 0.0000000190$ $6.0 \rightarrow 0.0000000010$

$$1-\Phi(z)=P(Z>z)=\frac{1}{\sqrt{2\pi}}\int_{z}^{\infty}e^{-z^2/2}dz$$

$$z=\frac{x-\mu}{\sigma}$$



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641
0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
2.0	.02275	.02222	.02169	.02118	.02068	.02018	.01970	.01923	.01876	.01831
2.1	.01786	.01743	.01700	.01659	.01618	.01578	.01539	.01500	.01463	.01426
2.2	.01390	.01355	.01321	.01287	.01255	.01222	.01191	.01160	.01130	.01101
2.3	.01072	.01044	.01017	.00990	.00964	.00939	.00914	.00889	.00866	.00842
2.4	.00820	.00798	.00776	.00755	.00734	.00714	.00695	.00676	.00657	.00639
2.5	.00621	.00604	.00587	.00570	.00554	.00539	.00523	.00508	.00494	.00480
2.6	.00466	.00453	.00440	.00427	.00415	.00402	.00391	.00379	.00368	.00357
2.7	.00347	.00336	.00326	.00317	.00307	.00298	.00289	.00280	.00272	.00264
2.8	.00256	.00248	.00240	.00233	.00226	.00219	.00212	.00205	.00199	.00193
2.9	.00187	.00181	.00175	.00169	.00164	.00159	.00154	.00149	.00144	.00139
3.0	.00135	.00131	.00126	.00122	.00118	.00114	.00111	.00107	.00104	.00100
3.1	.00097	.00094	.00090	.00087	.00084	.00082	.00079	.00076	.00074	.00071
3.2	.00069	.00066	.00064	.00062	.00060	.00058	.00056	.00054	.00052	.00050
3.3	.00048	.00047	.00045	.00043	.00042	.00040	.00039	.00038	.00036	.00035
3.4	.00034	.00032	.00031	.00030	.00029	.00028	.00027	.00026	.00025	.00024
3.5	.00023	.00022	.00022	.00021	.00020	.00019	.00019	.00018	.00017	.00017
3.6	.00016	.00015	.00015	.00014	.00014	.00013	.00013	.00012	.00012	.00011
3.7	.000108	.000104	.000100	.000096	.000092	.000088	.000085	.000082	.000078	.000075
3.8	.000072	.000069	.000067	.000064	.000062	.000059	.000057	.000054	.000052	.000050
3.9	.000048	.000046	.000044	.000042	.000041	.000039	.000037	.000036	.000034	.000033
4.0	.000032									