



کراچی یونیورسٹی
University of Karachi
Department of Mathematics
MATH 609 • Biomathematics I

Time Allowed: 3 hours • Maximum Marks: 80 • Date: Friday, May 18, 2012 • Paper Format: A

Student's Name _____ (in CAPITAL LETTERS using a "marker")

Questions 1-4 constitute the terminal and 5-7 midterm. Each part of **Question 1** is of 4 marks. **Questions 2-7** are of 10 marks each. Note down the time spent on solving each part of question and time spent on revision by making the following "Time Chart" on the answerbook front page (2 marks). Time spent on revision must be at least 10% of the total time.

Question No.	1a	1b	1c	1d	2	3	4	5	6	7	Revision
Time (minutes)											

a) DO NOT TURN PAPER AROUND unless the invigilator says: *Start now*

b) This is a closed-book examination. Deposit all BOOKS, NOTES, MOBILE PHONES (switched off), DIGITAL DIARIES and LAPTOPS in the designated area. Remove everything from your desk, except markers, pens, pencils, stapler and calculator.

c) If you want to use a calculator, **it must bear a "sticker"** displaying your NAME and your SEAT NUMBER, large enough so that it is visible from a distance of 5 meters. **Absolutely, NO sharing of calculators.**

d) Use your own material. **Nothing can be borrowed from or given to** a friend.

e) The papers may be of different formats. Therefore, work on your own **without consulting anyone** (We have a record of your seating arrangement).

f) Write your "NAME" on all pages of **your question paper** (5 marks shall be deducted for failing to comply) [NOTHING ELSE SHOULD BE WRITTEN ON THE QUESTION PAPER] and "PAPER FORMAT" on the front page of **your answerbook** (the upper-right-hand corner) and **the Yellow Sheet** using a "marker". Start your work from **Page 2** of your answerbook. The only thing that could be written on the front page is the "Time Chart" (see above) and the "Honor Statement" (see below).

g) The following statement must be copied on the front page of your answerbook and signed (2 marks): "My signatures, below, testify that I am the person, whose name and photograph appear on the Admit Card. Upon my honor, I declare that the following work is my own, completed without giving or receiving unacknowledged help, without copying, or the use of any unfair means." Signatures _____

h) This paper contains TWO PAGES (this page and the back page). On invigilator's signal (Start now) turn the paper around, check if you have the back page printed, correctly. Last line of the second

page reads: <END>. Start working on the paper, immediately.

i) Put your pens down and your papers turned (so that this page is facing you) and the FRONT PAGE of your answerbook should be facing you as soon as you hear "ALL PENS DOWN". Failure to do as directed shall result in "deduction of 5 marks" from your score.

j) If you use extra copies, it is "your responsibility" to write YOUR NAME, COPY NUMBER and all OTHER INFORMATION on each copy used. All the extra copies must be stapled with the main copy, before turning in your paper (you may wish to bring in a stapler with you for this purpose).

k) If you have a question of "Fill in the blanks" in your paper you must write the complete sentence with the filled word underlined.

l) Nobody is allowed to leave the examination hall, **for whatsoever reason**, once the examination has started. Bring your own DRINKING WATER.

m) Students are not allowed to LEAVE THEIR SEATS or STAND UP during the examination. If you have a query, "raise your hand" and someone will help you.

n) All work, including rough work, must be on the official answerbook. No extra sheet may be used.

o) Students are *not* allowed to use RED anywhere. All work (except figures) must be in pen or ballpoint.

p) The result shall be displayed on my homepage on **Friday, June 15, 2012 at 0900h**. DO NOT contact the Course Supervisor. Students are not permitted to see the answerbooks.

q) Anyone found cheating in the examination should be facing disciplinary action, which may result in **EXPLUSION or SUSPENSION** for 2 or more years as per University of Karachi rules. **Absolutely, no conversation among students. DON'T TURN THE PAPER, YET. Wait for "signal" from the invigilator.**

Student's Name _____ (in CAPITAL LETTERS using a "marker")

TERMINAL

- 1-a) In the following table we have dates of birth and check up for 2 children (dates in the format *Year-Month-Day*). Compute their ages on the dates of check up in decimal form (note that each month has different number of days, leap year has 29 days in February):

Child Initial	Gender	Date of Birth	Date of Check up
AI	Girl	2005-06-16	2012-05-13
BW	Boy	2004-04-23	2012-05-13

- 1-b) Prove $m = m_a + m_b - m_{a+b}$, where m is nude mass, m_a mass with one set of clothing worn, m_b mass with the other set of clothing worn and m_{a+b} mass with both sets of clothing worn (this formula could be used to compute nude mass without asking the subject to disrobe completely), and write the equivalent formula for computing nude weight. Describe a simple experiment to implement this (remember, you are not allowed to disrobe the patient, completely).
- 1-c) The observations on which a scientific theory is based must be _____ (*thinkable, reproducible, tolerable*) by anyone with the proper training and the facilities. If one takes observations at different places and at different times, one must obtain the same results. Such observations are called _____ (*stable, identifiable, acceptable*). Error is _____ (*distortion, disagreement, deviation*) from the actual value. _____ (*Accuracy, Precision, Reliability*) is concerned with how far away, on the average, the observations are from the actual value.
- 1-d) Define sagittal plane, frontal plane, transverse plane, transverse axis, longitudinal axis and anteroposterior axis as used in biomechanics.
- 2) How can the activity of measurement of height be used to teach concepts in Biology, Chemistry, Engineering, Health and Safety, Mathematics and Physics? A medical student (she just started her clerkship in pediatrics) and a professional anthropometrist (who forgot her glasses on the day of measurement), both took heights of an 8-year-old girl in the dress code 0/0.5. The data are given below. By computing accuracy and precision, identify medical student/anthropometrist (measurer A or B) — reference value of height is 126.51 cm:

Height (cm)	1 st	2 nd	3 rd	4 th	5 th
Measurer A	125.63	125.91	125.43	126.63	125.71
Measurer B	125.71	125.73	125.74	125.72	125.71

- 3) Compute the obesity profile of the following female (SGPP-KHI-20120513-01) [height = 171.2 cm; gross mass = 75.1 kg; clothing correction = 0.35 kg, dress code = 2/2, date of birth = 1980-06-10, date of check up = 2012-05-13 (see Q. 1-a)] using the height and weight data:

Percentiles	3	5	10	25	50	75	90	95	97
Height (cm)	151.50	152.50	154.75	159.00	163.50	167.50	172.50	174.00	175.25
Mass (kg)	45.25	46.50	48.25	52.25	55.25	66.00	75.25	82.50	88.75

- 4) Write short notes on any TWO of the following:
- Models of child growth
 - Body-mass index as indicator of obesity
 - Difference between mathematical biology and biomathematics

MIDTERM

- 5) Write down the steps in measuring mass of a child. What is the highest level of accuracy with which mass of a person could be measured? When was this achieved and where? Name one instrument (mentioning the principle used) to measure weight and one instrument (mentioning the principle used) to measure mass. Is *lb-oz* representing mass or weight? Give 5 reasons, which illustrate the importance of weighing children in the dress code 0/0.5.
- 6) Describe briefly mathematical concepts involved in the physical examination performed by a medical doctor.
- 7) List the sources of error and sources of hazard/injury in the measurement of MUAC.

Web address of this document: http://www.ngds-ku.org/M609-10/Exams609-10/609-12_Paper.pdf
(to be uploaded 12 hours after the conclusion of examination)

Exam paper solution: Friday, July 20, 2012 at 1030h, i. e., 10: 30 a. m., Room F13 (Mathematics)

<END>

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