



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

Time Allowed: 3 hours • Maximum Marks: 80 • Date: Monday, June 13, 2011 • 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 after all project viva-voce are conducted. 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 3 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
NF	Girl	1994-09-16	2011-05-22
BF	Boy	1999-05-09	2011-05-22
AF	Boy	2003-02-21	2011-05-22

- 1-b) What is the meaning of peripubertal in the context of child growth? In the light of ICP model, which mathematical property shall indicate that the child is in peripubertal state? What is the average age of hitting puberty for boys and girls worldwide (also, write down standard deviation)?
- 1-c) List 4 techniques used in the physical examination and identify the sense (sight, hearing, *etc.*) used in these techniques.
- 1-d) Define optimal mass by making reference to percentiles. If optimal mass is more than actual mass, is the person stunted, obese or wasted? What is BMI? Give its units in SI.
- 2) How can the activity of measurement of MUAC be used to teach concepts in Biology, Chemistry, Engineering, Health and Safety, Mathematics and Physics? A medical student (he just started his clerkship in pediatrics) and a professional anthropometrist (who forgot her glasses on the day of measurement), both took MUAC of right arm of a 4-year-old boy 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 MUAC is 16.5 cm:

MUAC (cm)	1 st	2 nd	3 rd	4 th	5 th
Measurer A	16.4	16.3	16.7	16.8	17.1
Measurer B	16.5	16.6	16.4	16.6	16.4

- 3) Compute the obesity profile of the following female (SGPP-KHI-20110522-03) [height = 171.0 cm; gross mass = 75.1 kg; clothing correction = 0.35 kg, dress code = 2/2, date of birth = 1971-07-04, date of check up = 2011-05-22 (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:
- Pitfalls in the measurement of mass
 - Health effects of obesity
 - Difference between anthropometry and anthromathematics

MIDTERM

- 5) Write down the steps in measuring height 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? In USA a child accompanying an adult can travel free in a bus if the child is shorter than the mark painted on a rod next to driver. A boy accompanying his mother had to PAY FARE in the morning, but could travel FREE in the evening. Why?
- 6) Prove the formula for MUAC, $g = G' + 2a(1-p)$, where a = thickness of clothing (obtained using micro-meter screw gauge), g = MUAC on bare skin, G' = MUAC on loose-fitting clothing, not including 2 layers, held in front to fix things.
- 7) List the sources of error and sources of hazard/injury in the measurement of weight.

Web address of this document: http://www.ngds-ku.org/M609-10/Exams609-10/609-11_Paper.pdf
(to be uploaded 12 hours after the conclusion of examination)

Exam paper solution: Friday, September 23, 2011 at 0950h, i. e., 9: 50 a. m., Room G08 (Mathematics)