BINDURA UNIVERSITY OF SCIENCE EDUCATION
FACULTY OF SCIENCE & ENGINEERING
DEPARTMENT OF OPTOMETRY
BACHELOR OF SCIENCE HONOURS DEGREE IN OPTOMETRY
(OPT 310): EPIDEMIOLOGY AND BIOSTATISTICS
DURATION: 3 HOURS   TOTAL MARKS: 100

CANDIDATE NUMBER:

INSTRUCTIONS:
Write your registration number in the space provided above and submit both the answer booklet and the question paper at the end of the examination.
This paper consists of two sections. Answer section A on the question paper (Some questions may have more than one correct answer. Please (Circle ALL that apply)

SECTION A Attempt all questions (60 MARKS)

1. In the definition of epidemiology, the terms "distribution" and "determinants" taken together refer to:
A. frequency, pattern, and causes of health events
B. dissemination of information to those who need to know
C. knowledge, attitudes, and practices related to health
D. public health services and resources

2. Descriptive epidemiology includes all EXCEPT:
A. what
B. who
C. when
D. why

3. The London cholera epidemic of 1848 was traced to the Broad Street pump by whom?
A. Graunt
B. Snow
C. Farr
D. Doll

4. The components of a case definition are:
A. Money
B. Time
C. Place
D. Clinical criteria

5. The primary difference between an experimental and observational study is:
A. the investigator is "blinded" (prevented from knowing the subjects' true exposure status until the end of the study) in an experimental study but not in an observational study
B. the investigator controls the subject's exposure in an experimental study but not in an observational study
C. the investigator controls the subject's outcome in an experimental study but not in an observational study
D. experimental studies are conducted with animals; observational studies are conducted with humans

6. The functions of public health surveillance include which of the following? (Circle ALL that apply.)
A. Collection of health data
B. Analysis of health data
C. Interpretation of health data
D. Dissemination of health data

7. Of the variables listed below, which would you use a nominal scale for?
A. Antibody titers against influenza A/H1N1
B. Sex
C. Height in centimeters
D. "Were you hospitalized in the week?"

8. Frequency distributions are appropriate for:
A. nominal scale variables only
B. ordinal scale variables only
C. both nominal scale and ordinal scale variables
D. neither nominal scale nor ordinal scale variables

9. Fraction for question 1:
children in the U.S. who became blind from retinoblastoma in 1991 /# children in the U.S. who became blind from retinopathy of prematurity in 1991
The fraction shown above is a: (Circle ALL that apply.)
A. ratio
B. proportion
C. attack rate
D. mortality rate

10. Fraction for question 2:

women in the U.S. who died from heart disease in 1991 /# women in the U.S. who died in 1991

The fraction shown above is a: (Circle ALL that apply.)

A. ratio

B. proportion

C. attack rate

D. mortality rate

11. Fraction for question 3:

women in the U.S. who died from heart disease in 1991/ # women in the U.S. population, midyear in 1991

The fraction shown above is a: (Circle ALL that apply.)

A. ratio

B. proportion

C. attack rate

D. mortality rate

12. Both incidence and prevalence can be represented by the formula $(x/y) \times 10n$ for a specified time period. The primary difference between incidence and prevalence is in:

A. x

B. y

C. 10n

D. the time period of reference

13. Both point prevalence and period prevalence can be represented by the formula $(x/y) \times 10n$ for a specified time period. The primary difference between point prevalence and period prevalence is in:

A. x

B. y

C. 10n

D. the time period of reference

14. In a recent survey, investigators found that the prevalence of Disease A was higher than the prevalence of Disease B. The incidence and seasonal pattern of both diseases are similar. Explanations consistent with this observation include: (Circle ALL that apply.)

A. patients recover more quickly from Disease A than from Disease B

B. patients recover more quickly from Disease B than from Disease A

C. patients die quickly from Disease A but not from Disease B

D. patients die quickly from Disease B but not from Disease A

15. To investigate the association between Allergic conjunctivitis (AC) and dust, investigators conducted a case-control study with 100 cases (100 children with AC) and 100 controls (100 children without AC). Among children with AC, 50 gave a history of recent exposure to dust. Among those without AC, 25 gave a history of recent exposure to dust. For this study, the odds ratio is:
A. 1.0
B. 3.0
C. 2.0
D. 1.5

16. All of the following are measures of central location EXCEPT:
A. arithmetic mean
B. geometric mean
C. range
D. mode

17. The measure of central location that has half of the observations below it and half of the observations above it is the:
A. arithmetic mean
B. geometric mean
C. median
D. mode

18. The most commonly used measure of central location is the:
A. arithmetic mean
B. geometric mean
C. median
D. mode E. range

19. The measure of central location most affected by one extreme value is the:
A. arithmetic mean
B. geometric mean
C. median
D. mode

20. The value that occurs most frequently in a set of data is defined as the: A. arithmetic mean
B. geometric mean
C. median
D. mode

21. The most commonly used measure of central location for antibody titers is the:
A. arithmetic mean
B. geometric mean
C. median
D. mode

22. The measure of dispersion most affected by one extreme value is the:
A. interquartile range
B. range
C. standard deviation
D. variance

23. Which range characterizes the interquartile range?
A. From 5th percentile to 95th percentile
B. From 10th percentile to 90th percentile
C. From 25th percentile to 75th percentile
D. From 1 standard deviation below the mean to 1 standard deviation above the mean
E. From 1.96 standard deviations below the mean to 1.96 standard deviations above the mean

24. The measure of dispersion most commonly used in conjunction with the arithmetic mean is the:
A. interquartile range
B. range
C. standard deviation
D. variance

25. Given the area under a normal curve, which two of the following ranges are the same? (Circle the TWO that are the same.)
A. From 2.5th percentile to 97.5th percentile
B. From 5th percentile to 95th percentile
C. From 1.96 standard deviations below the mean to 1.96 standard deviations above the mean
D. From 25th percentile to 75th percentile

26. Simply by scanning the values in each distribution below, identify the distribution with the smallest standard deviation.
A. 7, 9, 9, 10, 11, 12, 14, 17, 20, 90
B. 90, 90, 90, 90, 90, 90, 90, 90, 90,90
C. 7, 9, 9, 10, 11, 12, 14, 17, 17, 17
D. 9, 9, 9, 10, 10, 10, 10, 10, 11, 11

27. The standard error of the mean represents:
A. the difference between the sample mean and the true population mean
B. the systematic error in measuring the mean
C. the variability of a set of observations about the mean
D. the variability of a set of sample means about the true population mean

28. Investigators conducted a survey of nutritional status among a sample of children living in a refugee camp. The following data were obtained:
mean nutritional index = 89.5 standard deviation = 9.9 standard error of mean = 0.7
The 95% confidence limits around the mean are approximately:
A. 70.1 and 108.9
B. 79.6 and 99.4
C. 88.1 and 90.9
D. 88.8 and 90.2

29. Tables, graphs, and charts are important tools for which tasks of an epidemiologist? (Circle ALL that apply.)
A. Data collection
B. Data summarization (descriptive epidemiology)
C. Data analysis
D. Data presentation

30. The main distinction between an arithmetic-scale line graph and a semilogarithmic-scale line graph is that the arithmetic scale:
A. measures the rate of change between successive points on a graph
B. is preferred when the range of values to be graphed is very large
C. uses equal distances on each axis to represent equal quantities
D. is the best method of showing changes in the magnitude of numbers

31. Which type of graph is recommended for showing annual mortality rates for Disease Z, for 1940 to 1990? (Circle ALL that apply.)
A. Arithmetic-scale line graph
B. Semilogarithmic-scale line graph
C. Histogram
D. Frequency polygon

32. Which of the following sets of values would be inappropriate for identifying equidistant intervals on the y-axis of a semilogarithmic-scale line graph?
A. 1, 10, 100, 1,000
B. 10, 20, 30, 40
C. 7, 70, 700, 7,000
D. 0.003, 0.03, 0.3, 3

33. Bar charts may be distinguished from histograms at a glance because:
A. bar charts are not used for time series data
B. histograms are used to display discrete data
C. bar charts are based on area under the curve
D. histograms do not have spaces between consecutive columns

34. Which of the following statements are true of an epidemic curve? (Circle ALL that apply.)
A. An epidemic curve is a histogram.
B. An epidemic curve shows number of cases by date of exposure.
C. An epidemic curve should begin with the first case of the outbreak.
D. An epidemic curve should use time intervals on the x-axis of about 1/2 of the incubation period.

35. Which type of graph or chart would be appropriate for graphing blindness over time for a cohort of 100 alumni from the Class of 1907? (Circle ALL that apply.)
A. Bar chart
B. Cumulative frequency curve
C. Histogram
D. Survival curve

Choices for questions 36-41:
A. arithmetic-scale line graph
B. bar chart
C. series of box plots
D. series of dot plots
E. frequency polygon
F. scatter diagram

36. Number of cases by a continuous variable _____
37. Number of cases by a discrete (non-continuous) variable _____
38. Mean value of one continuous variable by a second continuous variable _____
39. Median value of continuous variable by a discrete (non-continuous) variable_____
40. Each value of one continuous variable by a second continuous variable _____
41. Each value of a continuous variable by a discrete (non-continuous) variable _____

42. What type of graph is most appropriate for comparing rates of change of disease occurrence over several years?
A. Arithmetic-scale line graph
B. Semilogarithmic-scale line graph
C. Histogram
D. Frequency polygon

43. What type of graph is most appropriate for comparing the magnitude of events which have occurred in different places, but no map is available?
A. Arithmetic-scale line graph
B. Bar chart
C. Frequency polygon
D. Histogram

44. The primary difference between a surveillance system and a survey is:
A. a surveillance system is population-based
B. a surveillance system is ongoing
C. a surveillance system cannot assure confidentiality
D. a survey is generally cheaper

45. In an ongoing outbreak of a disease with no known source and mode of transmission, the primary reason for an investigation relates to:
A. prevention and control
B. training of staff
C. learning more about the disease
D. being responsive to the concerns of the community

SECTION B. Attempt all questions. (40 MARKS)

1. Classify each of the following studies as experimental, observational/cohort, observational/case- control, or not an epidemiologic study.
a. Vietnam Experience Study: Subjects were several thousand soldiers stationed in Vietnam from 1969-1971 and several thousand soldiers stationed in Europe from 1969-1971. In the mid-1980's, investigators determined and compared the death rate and prevalence of illness in both groups. [3MARKS]
b. Subjects were 59 patients with end-stage cancer. All were given a new treatment. The monthly survival was charted over 2 years. [3MARKS]
c. Subjects were persons with laboratory-confirmed trichiasis, and one healthy friend of each. All subjects were asked about their practice of personal hygiene.
d. [3MARKS]
e. Subjects were children enrolled in a health maintenance organization. At 18 months, each child was randomly given one of two types of vaccine against *Haemophilus influenzae*. Parents were asked to record any side effects on a card, and mail it back after 2 weeks. [3MARKS]

2. Define "epidemiology." [2 MARKS]

3. List the four stages in the natural history of a disease [4 MARKS]

   a. _____

   b. _____

   c. _____

   d. _____

4. In plain terms, explain the meaning of the iceberg phenomenon. [2 MARKS]

5. One of the first steps in investigating an outbreak is to confirm the diagnosis of cases. Why is this important? [2 MARKS]

6. Why did John Snow remove the handle from the Broad Street Pump? [2 MARKS]

7. What is a reservoir? [2 MARKS]

8. Differentiate between primary, secondary and tertiary levels of disease prevention.

[6 MARKS]

Primary prevention aims to prevent disease or injury before it ever occurs. Secondary prevention aims to reduce the impact of a disease or injury that has already occurred. Tertiary prevention aims to soften the impact of an ongoing illness or injury that has lasting effects.

9. Briefly define the following:

a) Confounding   [2MARKS]

b) Information bias.   [2MARKS]

c) Selection bias   [2MARKS]

d) Reverse causality   [2MARKS]

END OF PAPER