



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

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| QUALIFICATION: Bachelor of science ; Bachelor of science in Applied Mathematics and Statistics | |
| QUALIFICATION CODE: 07BSOC; 07BSAM | LEVEL: 5 |
| COURSE CODE: IAS501S | COURSE NAME: INTRODUCTION TO APPLIED STATISTICS |
| SESSION: JANUARY 2023 | PAPER: THEORY |
| DURATION: 3 HOURS | MARKS: 100 |

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|--|-------------------|
| SUPPLEMENTARY / SECOND OPPORTUNITY EXAMINATION QUESTION PAPER | |
| EXAMINER | Mr. A.J. ROUX |
| MODERATOR: | Dr. D. Ntirampeba |

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|---|
| INSTRUCTIONS |
| <ol style="list-style-type: none">1. Answer ALL the questions in the booklet provided.2. Show clearly all the steps used in the calculations.3. All written work must be done in blue or black ink and sketches must be done in pencil. |

PERMISSIBLE MATERIALS

1. Non-programmable calculator without a cover.

ATTACHMENTS

- 1 The Standard Normal (z) Probability Distribution Table

THIS QUESTION PAPER CONSISTS OF 5 PAGES (Including this front page)

QUESTION 1 [20]

In questions 1.1 – 1.10 below, write down the correct word which completes each sentence.

1.1 The type of graph most appropriate to represent categorical data which indicates proportions that make up a given total:

- a. Line graph
 - b. Pie chart
 - c. Bar chart
 - d. Histogram
- [2]

1.2 Another term for the median is:

- a. Range
- b. Average
- c. 2nd Quartile
- d. Quartile deviation

[2]

1.3 A data set consists of 125 observations that range between 38 and 138. The appropriate width of the class is equal to:

- a. 20.00
 - b. 21.50
 - c. 8.80
 - d. 8.85
- [2]

1.4 Eye colors of students enrolled in a statistics class are called:

- a. qualitative data
 - b. quantitative data
 - c. interval data
 - d. class data
- [2]

1.5 Fifteen percent of the students in a School of Business Administration are majoring in Economics, 20% in Finance, 35% in Management, and 30% in Accounting. The graphical device(s) that can be used to present these data is (are)

- a. a line graph
 - b. only a bar graph
 - c. only a pie chart
 - d. both a bar graph and a pie chart
- [2]

1.6 The 50th percentile is the

- a. mode
 - b. median
 - c. mean
 - d. third quartile
- [2]

1.7 The interquartile range is

- a. the 50th percentile
- b. another name for the variance

- c. the range for the middle 50% of the data values
- d. the difference between the largest and smallest values [2]

1.8 The weight of an object is an example of

- a. a continuous random variable
- b. a discrete random variable
- c. either a continuous or a discrete random variable, depending on the weight of the object
- d. either a continuous or a discrete random variable depending on the units of measurement [2]

1.9 In a frequency distribution, the sum of frequencies for all classes will always equal to :

- a. 1
- b. the number of elements in a data set
- c. the number of classes
- d. a value between 0 and 1 [2]

1.10 The semester test scores of 15 students enrolled in a Business Statistics class were recorded in ascending order as follows:

4, 7, 7, 9, 10, 11, 13, 15, 15, 15, 17, 17, 19, 19, 20

After calculating the mean, median, and mode, an error is discovered: one of the 15's should be a 17. The measures of central tendency which will change are:

- a. the mean only
- b. the mode only
- c. the median only
- d. the mean and mode [2]

QUESTION 2 [16]

A manufacturer of car oil sells bottles that he claims to contain 500 ml each. A quality control inspector has recorded the actual contents of a random sample of 40 bottles.

The results are shown below.

| Contents (ml) | f |
|-----------------|---|
| 485 – under 490 | 4 |

| | |
|-----------------|----|
| 490 – under 495 | 5 |
| 495 – under 500 | 13 |
| 500 – under 505 | 12 |
| 505 – under 510 | 6 |
| Total | 40 |

- 2.1) Complete the table and estimate the mean contents of these bottles. [4]
- 2.2) Calculate the median content of these bottles. [6]
- 2.3) Calculate the modal content of these bottles [6]

QUESTION 3 [40]

- 3.1) The outstanding accounts of people at Jet Stores are categorized by age of account and balance in account. We are going to select an account at random from this group of 2000 accounts.

| Age of account/Balance | \$0-\$99 | \$100-\$499 | \$500 or more |
|------------------------|----------|-------------|---------------|
| Less than 3 years | 700 | 100 | 400 |
| 3 or more years | 200 | 400 | 200 |

Find the following probabilities:

- 3.1.1) $P(\$500 \text{ or more and less than 3 years})$ [2]
- 3.1.2) $P[(\$0 - \$99) \text{ or } (3 \text{ years or more})]$ [3]
- 3.1.3) What is the probability that the account has a balance of (\$0-99), **given** that it is (less than 3 years) old. [5]
- 3.2) Pulse rates of adult men are approximately normally distributed with a mean of 70 and a standard deviation of 8. What is the probability of selecting a man with pulse rate of :-
- 3.2.1) Higher than 74.9 [5]
- 3.2.2) Lower than 64.1 [5]
- 3.2.3) Lower than 82.3 [5]

3.3) A popular retail store receives, on average 6 calls per day.

What is the probability that on any given day:

3.3.1) No calls will be received [3]

3.3.2) At most two calls will be received [6]

3.3.3) At least four calls will be received [6]

QUESTION 4 [9]

A shop owner has compiled the following information on the prices and quantities of fruit sales from December 2006 to December 2016

| ITEM | P_b | P_i | | Q_b | Q_i |
|---------|-------|-------|--|-------|-------|
| | 2016 | 2021 | | 2016 | 2021 |
| Apple | 1.85 | 3.75 | | 75 | 110 |
| Orange | 1.50 | 2.25 | | 140 | 260 |
| Avocado | 3.40 | 5.40 | | 250 | 335 |

Use December 2016 as the base period, and determine and interpret the simple price indexes for these three items in December 2021. [3 X 3 = 9]

QUESTION 5 [15]

The table below shows maximum speed (km/h) obtained by 25 cyclists during a recent cycle challenge.

| | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 56 | 43 | 56 | 48 | 82 | 52 | 71 | 68 | 75 | 91 | 69 | 28 | 64 | 58 |
| 61 | 74 | 77 | 83 | 25 | 55 | 34 | 79 | 71 | 63 | 64 | | | |

5.1) Display the data using an ordered stem-and-leaf plot. [5]

5.2) Comment on the distribution of the data [2]

5.3) Using classes 20 to less than 30, 30 to less than 40, and 40 to less than 50 , ... , 90 to less than 100, construct an absolute and a relative frequency distribution table for the data. [6]

5.4) Compile a less than cumulative percentage frequency distribution [2]

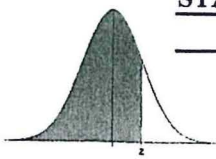
XXXXXXXXXXXXXXXXX END OF QUESTION PAPER XXXXXXXXXXXXXXXXXXXX



Standard Normal Distribution Tables

STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.

| Z | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| -3.9 | .00005 | .00005 | .00004 | .00004 | .00004 | .00004 | .00004 | .00004 | .00003 | .00003 |
| -3.8 | .00007 | .00007 | .00007 | .00006 | .00006 | .00006 | .00006 | .00005 | .00005 | .00005 |
| -3.7 | .00011 | .00010 | .00010 | .00010 | .00009 | .00009 | .00008 | .00008 | .00008 | .00008 |
| -3.6 | .00016 | .00015 | .00015 | .00014 | .00014 | .00013 | .00013 | .00012 | .00012 | .00011 |
| -3.5 | .00023 | .00022 | .00022 | .00021 | .00020 | .00019 | .00019 | .00018 | .00017 | .00017 |
| -3.4 | .00034 | .00032 | .00031 | .00030 | .00029 | .00028 | .00027 | .00026 | .00025 | .00024 |
| -3.3 | .00048 | .00047 | .00045 | .00043 | .00042 | .00040 | .00039 | .00038 | .00036 | .00035 |
| -3.2 | .00069 | .00066 | .00064 | .00062 | .00060 | .00058 | .00056 | .00054 | .00052 | .00050 |
| -3.1 | .00097 | .00094 | .00090 | .00087 | .00084 | .00082 | .00079 | .00076 | .00074 | .00071 |
| -3.0 | .00135 | .00131 | .00126 | .00122 | .00118 | .00114 | .00111 | .00107 | .00104 | .00100 |
| -2.9 | .00187 | .00181 | .00175 | .00169 | .00164 | .00159 | .00154 | .00149 | .00144 | .00139 |
| -2.8 | .00256 | .00248 | .00240 | .00233 | .00226 | .00219 | .00212 | .00205 | .00199 | .00193 |
| -2.7 | .00347 | .00336 | .00326 | .00317 | .00307 | .00298 | .00289 | .00280 | .00272 | .00264 |
| -2.6 | .00466 | .00453 | .00440 | .00427 | .00415 | .00402 | .00391 | .00379 | .00368 | .00357 |
| -2.5 | .00621 | .00604 | .00587 | .00570 | .00554 | .00539 | .00523 | .00508 | .00494 | .00480 |
| -2.4 | .00820 | .00798 | .00776 | .00755 | .00734 | .00714 | .00695 | .00676 | .00657 | .00639 |
| -2.3 | .01072 | .01044 | .01017 | .00990 | .00964 | .00939 | .00914 | .00889 | .00866 | .00842 |
| -2.2 | .01390 | .01355 | .01321 | .01287 | .01255 | .01222 | .01191 | .01160 | .01130 | .01101 |
| -2.1 | .01786 | .01743 | .01700 | .01659 | .01618 | .01578 | .01539 | .01500 | .01463 | .01426 |
| -2.0 | .02275 | .02222 | .02169 | .02118 | .02068 | .02018 | .01970 | .01923 | .01876 | .01831 |
| -1.9 | .02872 | .02807 | .02743 | .02680 | .02619 | .02559 | .02500 | .02442 | .02385 | .02330 |
| -1.8 | .03593 | .03515 | .03438 | .03362 | .03288 | .03216 | .03144 | .03074 | .03005 | .02938 |
| -1.7 | .04457 | .04363 | .04272 | .04182 | .04093 | .04006 | .03920 | .03836 | .03754 | .03673 |
| -1.6 | .05480 | .05370 | .05262 | .05155 | .05050 | .04947 | .04846 | .04746 | .04648 | .04551 |
| -1.5 | .06681 | .06552 | .06426 | .06301 | .06178 | .06057 | .05938 | .05821 | .05705 | .05592 |
| -1.4 | .08076 | .07927 | .07780 | .07636 | .07493 | .07353 | .07215 | .07078 | .06944 | .06811 |
| -1.3 | .09680 | .09510 | .09342 | .09176 | .09012 | .08851 | .08691 | .08534 | .08379 | .08226 |
| -1.2 | .11507 | .11314 | .11123 | .10935 | .10749 | .10565 | .10383 | .10204 | .10027 | .09853 |
| -1.1 | .13567 | .13350 | .13136 | .12924 | .12714 | .12507 | .12302 | .12100 | .11900 | .11702 |
| -1.0 | .15866 | .15625 | .15386 | .15151 | .14917 | .14686 | .14457 | .14231 | .14007 | .13786 |
| -0.9 | .18406 | .18141 | .17879 | .17619 | .17361 | .17106 | .16853 | .16602 | .16354 | .16109 |
| -0.8 | .21186 | .20897 | .20611 | .20327 | .20045 | .19766 | .19489 | .19215 | .18943 | .18673 |
| -0.7 | .24196 | .23885 | .23576 | .23270 | .22965 | .22663 | .22363 | .22065 | .21770 | .21476 |
| -0.6 | .27425 | .27093 | .26763 | .26435 | .26109 | .25785 | .25463 | .25143 | .24825 | .24510 |
| -0.5 | .30854 | .30503 | .30153 | .29806 | .29460 | .29116 | .28774 | .28434 | .28096 | .27760 |
| -0.4 | .34458 | .34090 | .33724 | .33360 | .32997 | .32636 | .32276 | .31918 | .31561 | .31207 |
| -0.3 | .38209 | .37828 | .37448 | .37070 | .36693 | .36317 | .35942 | .35569 | .35197 | .34827 |
| -0.2 | .42074 | .41683 | .41294 | .40905 | .40517 | .40129 | .39743 | .39358 | .38974 | .38591 |
| -0.1 | .46017 | .45620 | .45224 | .44828 | .44433 | .44038 | .43644 | .43251 | .42858 | .42465 |
| -0.0 | .50000 | .49601 | .49202 | .48803 | .48405 | .48006 | .47608 | .47210 | .46812 | .46414 |



STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.

| Z | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0.0 | .50000 | .50399 | .50798 | .51197 | .51595 | .51994 | .52392 | .52790 | .53188 | .53586 |
| 0.1 | .53983 | .54380 | .54776 | .55172 | .55567 | .55962 | .56356 | .56749 | .57142 | .57535 |
| 0.2 | .57926 | .58317 | .58706 | .59095 | .59483 | .59871 | .60257 | .60642 | .61026 | .61409 |
| 0.3 | .61791 | .62172 | .62552 | .62930 | .63307 | .63683 | .64058 | .64431 | .64803 | .65173 |
| 0.4 | .65542 | .65910 | .66276 | .66640 | .67003 | .67364 | .67724 | .68082 | .68439 | .68793 |
| 0.5 | .69146 | .69497 | .69847 | .70194 | .70540 | .70884 | .71226 | .71566 | .71904 | .72240 |
| 0.6 | .72575 | .72907 | .73237 | .73565 | .73891 | .74215 | .74537 | .74857 | .75175 | .75490 |
| 0.7 | .75804 | .76115 | .76424 | .76730 | .77035 | .77337 | .77637 | .77935 | .78230 | .78524 |
| 0.8 | .78814 | .79103 | .79389 | .79673 | .79955 | .80234 | .80511 | .80785 | .81057 | .81327 |
| 0.9 | .81594 | .81859 | .82121 | .82381 | .82639 | .82894 | .83147 | .83398 | .83646 | .83891 |
| 1.0 | .84134 | .84375 | .84614 | .84849 | .85083 | .85314 | .85543 | .85769 | .85993 | .86214 |
| 1.1 | .86433 | .86650 | .86864 | .87076 | .87286 | .87493 | .87698 | .87900 | .88100 | .88298 |
| 1.2 | .88493 | .88686 | .88877 | .89065 | .89251 | .89435 | .89617 | .89796 | .89973 | .90147 |
| 1.3 | .90320 | .90490 | .90658 | .90824 | .90988 | .91149 | .91309 | .91466 | .91621 | .91774 |
| 1.4 | .91924 | .92073 | .92220 | .92364 | .92507 | .92647 | .92785 | .92922 | .93056 | .93189 |
| 1.5 | .93319 | .93448 | .93574 | .93699 | .93822 | .93943 | .94062 | .94179 | .94295 | .94408 |
| 1.6 | .94520 | .94630 | .94738 | .94845 | .94950 | .95053 | .95154 | .95254 | .95352 | .95449 |
| 1.7 | .95543 | .95637 | .95728 | .95818 | .95907 | .95994 | .96080 | .96164 | .96246 | .96327 |
| 1.8 | .96407 | .96485 | .96562 | .96638 | .96712 | .96784 | .96856 | .96926 | .96995 | .97062 |
| 1.9 | .97128 | .97193 | .97257 | .97320 | .97381 | .97441 | .97500 | .97558 | .97615 | .97670 |
| 2.0 | .97725 | .97778 | .97831 | .97882 | .97932 | .97982 | .98030 | .98077 | .98124 | .98169 |
| 2.1 | .98214 | .98257 | .98300 | .98341 | .98382 | .98422 | .98461 | .98500 | .98537 | .98574 |
| 2.2 | .98610 | .98645 | .98679 | .98713 | .98745 | .98778 | .98809 | .98840 | .98870 | .98899 |
| 2.3 | .98928 | .98956 | .98983 | .99010 | .99036 | .99061 | .99086 | .99111 | .99134 | .99158 |
| 2.4 | .99180 | .99202 | .99224 | .99245 | .99266 | .99286 | .99305 | .99324 | .99343 | .99361 |
| 2.5 | .99379 | .99396 | .99413 | .99430 | .99446 | .99461 | .99477 | .99492 | .99506 | .99520 |
| 2.6 | .99534 | .99547 | .99560 | .99573 | .99585 | .99598 | .99609 | .99621 | .99632 | .99643 |
| 2.7 | .99653 | .99664 | .99674 | .99683 | .99693 | .99702 | .99711 | .99720 | .99728 | .99736 |
| 2.8 | .99744 | .99752 | .99760 | .99767 | .99774 | .99781 | .99788 | .99795 | .99801 | .99807 |
| 2.9 | .99813 | .99819 | .99825 | .99831 | .99836 | .99841 | .99846 | .99851 | .99856 | .99861 |
| 3.0 | .99865 | .99869 | .99874 | .99878 | .99882 | .99886 | .99889 | .99893 | .99896 | .99900 |
| 3.1 | .99903 | .99906 | .99910 | .99913 | .99916 | .99918 | .99921 | .99924 | .99926 | .99929 |
| 3.2 | .99931 | .99934 | .99936 | .99938 | .99940 | .99942 | .99944 | .99946 | .99948 | .99950 |
| 3.3 | .99952 | .99953 | .99955 | .99957 | .99958 | .99960 | .99961 | .99962 | .99964 | .99965 |
| 3.4 | .99966 | .99968 | .99969 | .99970 | .99971 | .99972 | .99973 | .99974 | .99975 | .99976 |
| 3.5 | .99977 | .99978 | .99978 | .99979 | .99980 | .99981 | .99981 | .99982 | .99983 | .99983 |
| 3.6 | .99984 | .99985 | .99985 | .99986 | .99986 | .99987 | .99987 | .99988 | .99988 | .99989 |
| 3.7 | .99989 | .99990 | .99990 | .99990 | .99991 | .99991 | .99992 | .99992 | .99992 | .99992 |
| 3.8 | .99993 | .99993 | .99993 | .99994 | .99994 | .99994 | .99994 | .99995 | .99995 | .99995 |
| 3.9 | .99995 | .99995 | .99996 | .99996 | .99996 | .99996 | .99996 | .99996 | .99997 | .99997 |