

DEPARTMENT OF STATISTICS AND DEMOGRAPHY

SUPPLEMENTARY EXAMINATION, 2017/18

COURSE TITLE: INTRODUCTION TO STATISTICS

COURSE CODE: STA 141

TIME ALLOWED: TWO (2) HOURS

INSTRUCTION: ANSWER ALL QUESTIONS IN SECTION A AND ANY TWO QUESTIONS IN SECTION B

SPECIAL REQUIREMENTS: SCIENTIFIC CALCULATORS, GRAPH PAPER AND STATISTICAL TABLES

DO NOT OPEN THIS PAGE UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR

SECTION A

Question 1

(a) Determine the following probabilities using the standard normal distribution:

(i) $P(z < -0.6)$

(ii) $P(0.17 \leq z \leq 2.49)$

(iii) $P(-1.57 \leq z \leq 0.93)$

(iv) $P(z > -1.85)$

(2+3+3+2 marks)

Question 2

An appliance store purchases electric ranges from two companies. From company A, 500 ranges are purchased, and 2 % are defective. From Company B, 850 ranges are purchased, and 2 % are defective. Given that a range is defective, find the probability that it came from company B. (10 marks)

Question 3

A shop has 11 video games to choose, 4 of them contain extreme violence. A customer picks 3 of these games at random. What is the probability that the number of extremely violent games among the three selected games is:

- (a) Exactly two
- (b) More than one
- (c) None

(10 marks)

Question 4

On average, two new accounts are opened at a Savings Bank based in Manzini. Find the probability that on a given day, the number of new accounts opened at this bank will be: (10 marks)

- (a) Exactly six
- (b) At most three
- (c) At least 7

Question 5

A study of the relationship between age and various visual functions (such as acuity and depth perception) reported the following observations on area of sclera lamina (mm^2) from human optic nerve heads:

2.75 2.62 2.74 3.85 2.34 2.74 3.93 4.21 3.88
4.33 3.46 4.52 2.43 3.65 2.78 3.56 3.01

- a. Calculate $\sum x_i$ and $\sum x_i^2$.
- b. Use the values calculated in part (a) to compute the sample variance (s^2) and then the standard deviation s . (10 marks)

SECTION B

Question 6

The following are numbers of whales seen breaching on 60 whale-watching trips off the coast of Baja:

10 18 14 9 7 3 14 16 15 8 12 18
 13 6 11 22 18 8 22 13 10 14 8 5
 8 12 16 21 13 10 7 3 15 24 16 18
 12 18 10 8 6 13 12 9 18 23 15 11
 19 10 11 15 12 6 4 10 13 27 14 6

(a) Group the data into a distribution using the classes 0-4, 5-9, 10-14, 15-19, 20-24 and 25-29.

(b) Determine the mean, median and standard deviation of the data **(25 marks)**

Question 7

The length of bus routes from any particular transit system will typically vary from one route to another. The study by a City council gives the following information on lengths in (km) for one particular system:

Length	Frequency
5 - < 10	6
10 - < 15	23
15 - < 20	30
20 - < 25	35
25 - < 30	32
30 - < 35	48
35 - < 40	42
40 - < 45	40
45 - < 50	28

Find the:

- Mean
- Median
- Mode
- Variance and standard deviation **(5+5+5+10 marks)**

Question 8

(b) The average score for all candidates taking the TOEFL exam in 2002 was 516. Suppose that the TOEFL scores of all students who sat for this exam in 2002 were normally distributed with a mean 516 and a standard deviation of 90.

- What percentage of students scored higher than 600 on this exam?
- What percentage of the students scored lower than 450 on this exam?
- An elite technical college requires students' TOEFL scores to be 700 or more to be considered for admission. What percentage of the students who took the TOEFL exam in 2002 is eligible for consideration by this college? **(5+5+5 marks)**

(c) Given a normal distribution with $\mu=50$ and $\sigma=5$, find the value of 'x' that has:

- 54% of the area to the left
- 14% of the area to the left
- 35% of the area to the right. **(4+3+3 marks)**

Question 9

- (a) A market research organisation has studied the service under warranty provided by 200 tyre dealers in a large city. Their findings are summarised in the following table:

Dealer	Good service under warranty (G)	Poor service under warranty (P)	Total
Name-Brand tyres (N)	64	16	80
Off-brand tyres (N')	42	78	120
Total	106	94	200

If one of these tyre dealers is randomly selected, find the probability of choosing:

- (i) $P(N)$
- (ii) $P(G)$
- (iii) $P(P|N)$
- (iv) $P(G \cap N')$
- (v) $P(G|N')$
- (vi) Are G and N independent? Support your answer. (2+2+3+2+3+3 marks)

- (b) The probability that Henry will like a movie is 0.70 and the probability that Jean, his girlfriend will like the movie is 0.60. If the probability that he will like it and she will dislike it is 0.28, what is the probability that he will like it given that she will dislike it? (5 marks)
- (c) A worker-operated machine produces a defective item with probability .01 if the worker follows the machine's operating instructions exactly and with probability .03 if he does not. If the worker follows the instructions 90% of the time, what proportion of all items produced by the machine will be defective? (5 marks)

END OF EXAM!!

Standard Normal Probabilities

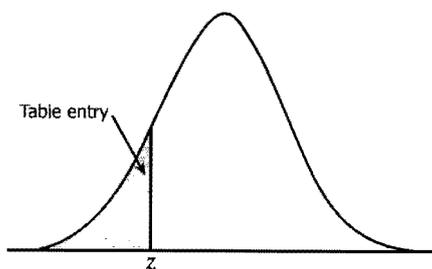


Table entry for z is the area under the standard normal curve to the left of z .

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
-3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
-3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
-3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
-1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
-1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
-1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
-0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641