

**UNIVERSITY OF SWAZILAND**



**Faculty of Health Sciences  
DEGREE IN ENVIRONMENTAL HEALTH  
FINAL EXAMINATION PAPER 2009**

**TITLE OF PAPER : HEALTH STATISTICS**

**COURSE CODE : HSC 307**

**DURATION : 2 HOURS**

**MARKS : 100**

**INSTRUCTIONS :**

- READ THE QUESTIONS & INSTRUCTIONS CAREFULLY**
- : ANSWER ANY FOUR QUESTIONS**
- : EACH QUESTION CARRIES 25 MARKS.**
- : WRITE NEATLY & CLEARLY**
- : SHOW ALL YOUR WORK**
- : NO PAPER SHOULD BE BROUGHT INTO NOR OUT OF THE EXAMINATION ROOM.**
- : BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.**

**DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR.**

### QUESTION 1

- A. For the following scenarios find the mean, mode, median, range, variance and standard deviation. Please show your calculations. (10 marks each)
- Twelve students were given a statistics test, and the times in minutes to complete it were: 10, 9, 12, 11, 8, 15, 9, 7, 8, 6, 12, 10
  - Below are the numbers of the stories in the 11 tallest buildings in Mbabane: 32, 36, 46, 20, 32, 18, 16, 34, 26, 27, 26
- B. Simply by scanning the values in each distribution below, identify the distribution with the smallest standard deviation. Choose the correct answer (5 marks)
- 7, 9, 9, 10, 11, 12, 14, 17, 20, 90
  - 7, 9, 9, 10, 11, 12, 14, 17, 17, 17
  - 9, 9, 9, 10, 10, 10, 10, 10, 11, 11
  - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
  - 90, 90, 90, 90, 90, 90, 90, 90, 90, 90

### QUESTION 2

- A recent train derailment exposed residents of a community to a chemical hazard. Many residents became ill; some died. To calculate the **probability** or **risk** of illness, which denominator would you use? Choose the correct answer (5 marks)
  - The size of the population at risk at the beginning of the period
  - The size of the population at risk at the midpoint of the period
  - The size of the population at risk at the end of the period
  - The average size of the population at risk during the period
- In a survey conducted at a local restaurant, during breakfast hours, 20 people preferred orange juice, 16 preferred grape juice, and 9 preferred apple juice with breakfast. If a person is selected at random, find the probability that she or he prefers grape fruit juice. (10 marks)

Compute the following (10 marks)

- If an event cannot happen, what is assigned to its probability?
- What is the range of the values of the probability of an event?

### QUESTION 3

- a. Find the area under the standard normal distribution curve for each. **(10 marks)**
- (i) Between  $z=0$  and  $z= 1.95$
  - (ii) Between  $z=0$  and  $z= 0.37$
  - (iii) Between  $z= 1.32$  and  $z= 1.82$
  - (iv) Between  $z= -1.05$  and  $z= 2.05$
  - (v) Between  $z= -0.03$  and  $z= 0.53$
  - (vi) Between  $z= 1.10$  and  $z= -1.80$
  - (vii) To the right of  $z = 1.99$
  - (viii) To the right of  $z = -1.36$
  - (ix) To the left of  $z = -2.09$
  - (x) To the left of  $z = 1.68$
- b. The average height of a certain age group of students is 53 inches. The standard deviation is 4 inches. If the variable is normally distributed, find the probability that a selected individual's height will be : **(15 marks)**
- (i) Greater than 59 inches
  - (ii) Less than 45 inches
  - (iii) Between 50 and 55 inches

### QUESTION 4

- a. When all subjects under study are used, the group is called what? Choose the correct answer **(5 marks)**
- A. Population
  - B. Large group
  - C. Sample
  - D. Study group
- b. Interviewing selected people at a local supermarket can be considered an example of ----- sampling. Fill the blank. **(5 marks)**
- c. The **standard error of the mean** represents: Choose the correct answer **(10 marks)**
- 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
- d. When a 99% confidence interval is calculated instead of a 95% confidence interval. **(5 marks)**
- (i) Smaller
  - (ii) Larger
  - (iii) The same
  - (iv) It cannot be determined

### QUESTION 5

- a. A radio manufacture claims that 65% of teenagers 13 to 16 years old have their own portable radios. A researcher wishes to test the claim and selects a random sample of 80 teenagers. She finds that 57 have their own portable radios at  $\alpha = 0.05$ . Should the claim be rejected? Use the P value method **(15 marks)**
- b. Determine whether each of the statement is true or false. If the statement is false, explain why **(10 marks)**
- No error is committed when the null hypothesis is rejected when it is false
  - When one is conducting the t-test, the population must be approximately normally distributed
  - The test value separates the critical region from the noncritical region
  - The values of a chi-square test cannot be negative
  - The chi-square test for variance is always one- tailed

### QUESTION 6

- a. A questionnaire on housing arrangements showed this information obtained from 25 respondents. Construct a frequency distribution for the data. (H = house, A = apartment, M = mobile home, C = cottage). **(15 marks)**
- |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|
| H | C | H | M | H | A | C | A | M |
| C | M | C | A | M | A | C | C | M |
| C | C | H | A | H | H | M |   |   |
- b. Using the same data above, construct a histogram and a pie chart **(10 marks)**

**B**

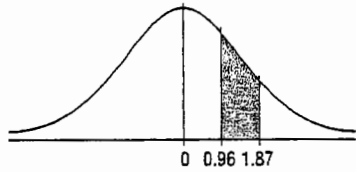
**Example B-6**

Find the area under the standard normal distribution between  $z = 0.96$  and  $z = 1.87$ .

The area corresponding to  $z = 0.96$  is 0.8315, and the area corresponding to  $z = 1.87$  is 0.9693. Hence, the area between  $z = 0.96$  and  $z = 1.87$  is  $0.9693 - 0.8315 = 0.1378$ .

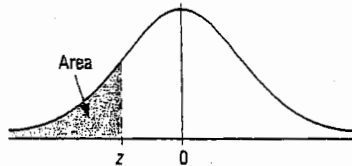
**Solution**

The area is shown as



Cumulative Standard Normal Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-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



B

## Cumulative Standard Normal Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990