Department of Statistics & Operations Research
College of Science
KingSaudUniversity
STAT-324: Probability and Statistics for Engineers
Final Exam
Summer Semester 1436 – 1437

Student's Name (In Arabic):		Section's Number:	
Student's Number:		Attendance number:	
Teacher's Name:			

Instructions:

- There are 32 multiple choice questions.
- Time allowed is 120 minute (2 Hours).
- For each question, put the code of the correct answer in the following table beneath the question number.
- Please, use capital letters: A, B, C, and D.
- Do not copy answers from your neighbors; they have different question forms.
- Mobile Telephones are not allowed in the classroom.

1	2	3	4	5	6	7	8	9	10

11	12	13	14	15	16	17	18	19	20

21	22	23	24	25	26	27	28	29	30

31	32

Question 1:4

The average life (mean) of a manufacturer's blender is 10 years, with a standard deviation of 3 years. Assuming the live of the blender follows approximately a normal distribution. If a random sample of 9blenders are selected at random, then:

[1].	The expected value (mean) of the sample mean $\overline{X}$ ($\mu_{\overline{X}}$) is:							
	(A)	2	(B)	9	(C)	**10**	(D)	15
[2].	The variance of the sample mean $\overline{X}$ ($\sigma^2_{\overline{X}}$) is:							
	(A)	**1**	(B)	10	(C)	3	(D)	9
[3].	The probability that the mean life of this random sample $\overline{X}$ of such blenders will be less than 10.4 years is:							
	(A)	**0.6554**	(B)	0.2135	(C)	0.7865	(D)	0.3446
[4].	The probability that the mean life of this random sample $\overline{X}$ of such blenders will be more than 9.5 years is:							
	(A)	0.3085	(B)	**0.6915**	(C)	0.9223	(D)	0.1039

Question 5:7

A random sample of size 64 is drawn from a normal distribution with $\mu_1 = 35$ and $\sigma_1^2 = 16$. A second random sample of size 36 is drawn from another normal distribution with $\mu_2 = 30$ and $\sigma_2^2 = 9$. Let $\overline{X}_1$ and $\overline{X}_2$ be the averages of the first and the second samples, respectively[we use $X \sim N(\mu, \sigma)$].Then:

[5].	The expected value of $(\overline{X}_1 - \overline{X}_2)$, [the mean of ($\overline{X}_1$ - $\overline{X}_2$) $= \mu_{\overline{X}_1 - \overline{X}_2}$]is:							
	(A)	36	(B)	**5**	(C)	30	(D)	65
[6].	The standard error of ($\overline{X}_1 - \overline{X}_2$) [$s.e(\overline{X}_1 - \overline{X}_2) = \sigma_{\overline{X}_1 - \overline{X}_2}$], is:							
	(A)	0.254	(B)	0	(C)	0.321	(D)	**0.707**
[7].	The probability that the sample mean computed from the first population will be more than sample mean computed from the second population by 5.9 is:							
	(A)	0.496	(B)	**0.102**	(C)	0.898	(D)	0.065

Question 8:11

Suppose that 25% of the male students and 20% of the female students in a certain university areenrolled in the Probability & Statistics for Engineers course. A random sample of 50 male students is taken and another random sample of 100 female students is independently taken from this university. Let $\hat{p}_1$ and $\hat{p}_2$ be the proportions of the students enrolled in the Probability & Statistics for Engineers coursein the two samples, respectively. Then:

[8].	The expected value of ($\hat{p}_M - \hat{p}_F$) [the mean of $(\hat{p}_M - \hat{p}_F) = \mu_{\hat{p}_M - \hat{p}_F}$], is:							
	(A)	0.10	(B)	0.20	(C)	0.25	(D)	**0.05**
[9].	The variance of ($\hat{p}_M - \hat{p}_F$) [$Var(\hat{p}_M - \hat{p}_F) = \sigma^2_{\hat{p}_M - \hat{p}_F}$], is:							
	(A)	**0.00535**	(B)	0.03265	(C)	0.02319	(D)	0.02615

[10].	P($\hat{p}_F$ <0.20) is:							
	(A)	0.9814	(B)	0.6321	(C)	0	(D)	**0.50**
[11].	P[$\hat{p}_M - \hat{p}_F$ <0.20] is:							
	(A)	**0.9798**	(B)	0.2578	(C)	0.3479	(D)	0.3184

Question 12:18

We consider a sample of 25packets of sugar. The average weight obtained for this sampleis 336 g and the sample standard deviationis 0.86 g. Then:

[12].	The point estimate for the true mean packet weight μ is:							
	(A)	25	(B)	**336**	(C)	0.86	(D)	100
[13].	The standard error of the sample mean $\bar{X}$ [$s.e(\overline{X}) = \sigma_{\overline{X}}$], is:							
	(A)	0.238	(B)	0.514	(C)	0.329	(D)	**0.172**

[14].	Alower limit of 99% confidence interval for the mean packet weight μ is:			
	(A)	332.76	(B)	**335.52**
	(C)	330.21	(D	331.15
[15].	An upper limit of 99% confidence interval for the mean packet weight μ is::			
	(A)	334.23	(B)	338.23
	(C)	337.56	(D)	**336.48**
To test at level 0.05 the claim that μ is greater than 335 i.e ($H_0: \mu = 335$ vs $H_1: \mu > 335$):				
[16].	The value of the test statistic is:			
	(A)	3.12	(B)	0.14
	(C)	**5.81**	(D)	2.75
[17].	The Rejection Region of H_0 (R.R. of H_0) is:			
	(A)	$(1.645, \infty)$	(B)	$(-\infty, 1.711)$
	(C)	$(-\infty, 1.645)$	**(D)**	$(1.711, \infty)$
[18].	The decision is:			
	(A)	Accept H_0	**(B)**	Reject H_0
	(C)	No decision is possible	(D	None of them

Question 19:24

Small screens are built by two manufacturing processes A and B. Two samples of these screens were drawn and the measures of diameters (in mm) are shown in the following table:

Screen	1	2	3	4	5	$\overline{X}$	S^2
Process A	63.1	63.5	62.8	64.3	63.76	63.492	0.33932
Process B	62.5	63.2	62.3	62.2	---	62.55	0.20333

It is assumed that the diameters of the screens are distributed according to normal laws with unknown but equal variances.

[19].	The pooled estimate of the variance is:			
	(A)	0.584	(B)	**0.281**
	(C)	0.817	(D	0.549
[20].	The point estimate of standard error of $\overline{X}_1 - \overline{X}_2 \, (S_{\overline{X}_1 - \overline{X}_2})$ is:			
	(A)	**0.3556**	(B)	0.6257
	(C)	0.4871	(D	0.2892
[21].	The 99% confidence interval for the difference $\mu_1 - \mu_2$ is:			
	(A)	$3.2321 \le \mu_1 - \mu_2 \le 4.5627$	(B)	$0.2781 \le \mu_1 - \mu_2 \le 3.5853$
	(C)	$-0.3022 \le \mu_1 - \mu_2 \le 2.1862$	(D	$-4.2624 \le \mu_1 - \mu_2 \le 4.698$
To test at level of significance 0.05 if $H_0: \mu_1 = \mu_2 \; vs \; H_1: \mu_1 > \mu_2$:				
[22].	The value of the test statistic is:			
	(A)	**2.649**	(B)	3.217
	(C)	0.029	(D)	5.471
[23].	The Acceptance Region of H_0 (A.R. of H_0) is:			
	(A)	$(1.895, \infty)$	(B)	$(-\infty, 1.645)$
	(C)	(-1.645, 1.645)	**(D)**	$(-\infty, 1.895)$
[24].	The decision is:			
	(A)	Accept H_0	**(B)**	Reject H_0
	(C)	No decision is possible	(D)	None of them

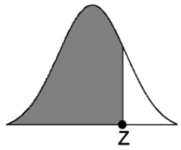
Question 25:32

Ashoes factory distributesits brand of shoes Adidas in two cities (A) and (B).A random sample of 400 consumers from the first city (A) showed that 100 consumers prefer the Adidasbrand. Another independent random sample of 500 consumers from the second city (B) showed that 200 consumers prefer the Adidasbrand. Let P_A and P_B be the true proportions of consumers preferring the Adidasbrand in the first city (A) and the second city (B), respectively. Then:

[25].	A 95% confidence interval for the true proportion of consumers preferring Adidasbrand in city (A) is:			
	(A)	$0.125 \le P_A \le 0.385$	**(B)**	$0.208 \le P_A \le 0.292$
	(C)	$0.078 \le P_A \le 0.324$	(D)	$0.014 \le P_A \le 0.295$
[26].	The upper limit of 95% confidence interval for $P_B - P_A$ is:			
	(A)	1.2573	(B)	0.3487
	(C)	2.6587	(D)	**0.2104**
[27].	The lower limit of 95% confidence interval for $P_B - P_A$ is:			
	(A)	0.0621	(B)	0.6784
	(C)	**0.0896**	(D)	- 1.3587

At a 0.05 level of significance to test H_0: $P_A = 0.24$ against H_1: $P_A < 0.24$:								
[28].	The value of the test statistic is:							
	(A)	0.2478	(B)	1.2357	(C)	**0.468**	(D)	-3.2194
[29].	The decision is:							
	(A)	Reject H_0			**(B)**	Accept H_0		
	(C)	No decision is possible			(D)	None of them		
At a 0.05 level of significance to test H_0: $P_B = P_A$ against H_1: $P_B > P_A$:								
[30].	The pooled estimate of the proportion is:							
	(A)	**0.33**	(B)	0.25	(C)	0.40	(D)	0.65
[31].	The value of the test statistic is:							
	(A)	1.329	(B)	0.487	(C)	**4.755**	(D)	3.571
[32].	The decision is:							
	(A)	Reject H_0			(B)	Accept H_0		
	(C)	No decision is possible			(D)	None of them		

End of the Exam, good luck

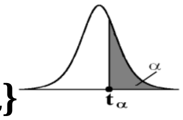


Areas under the Standard Normal Curve

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247

-0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Percentage Points of the *t* Distribution; $t_{\nu,\alpha}$ $\{P(T > t_{\nu,\alpha}) = \alpha\}$



ν	α													
	0.40	**0.30**	**0.20**	**0.15**	**0.10**	**0.05**	**0.025**	**0.02**	**0.015**	**0.01**	**0.0075**	**0.005**	**0.0025**	**0.0005**
1	0.325	0.727	1.376	1.963	3.078	6.314	12.706	15.895	21.205	31.821	42.434	63.657	127.322	636.590
2	0.289	0.617	1.061	1.386	1.886	2.920	4.303	4.849	5.643	6.965	8.073	9.925	14.089	31.598
3	0.277	0.584	0.978	1.250	1.638	2.353	3.182	3.482	3.896	4.541	5.047	5.841	7.453	12.924
4	0.271	0.569	0.941	1.190	1.533	2.132	2.776	2.999	3.298	3.747	4.088	4.604	5.598	8.610
5	0.267	0.559	0.920	1.156	1.476	2.015	2.571	2.757	3.003	3.365	3.634	4.032	4.773	6.869
6	0.265	0.553	0.906	1.134	1.440	1.943	2.447	2.612	2.829	3.143	3.372	3.707	4.317	5.959
7	0.263	0.549	0.896	1.119	1.415	1.895	2.365	2.517	2.715	2.998	3.203	3.499	4.029	5.408
8	0.262	0.546	0.889	1.108	1.397	1.860	2.306	2.449	2.634	2.896	3.085	3.355	3.833	5.041
9	0.261	0.543	0.883	1.100	1.383	1.833	2.262	2.398	2.574	2.821	2.998	3.250	3.690	4.781
10	0.260	0.542	0.879	1.093	1.372	1.812	2.228	2.359	2.527	2.764	2.932	3.169	3.581	4.587
11	0.260	0.540	0.876	1.088	1.363	1.796	2.201	2.328	2.491	2.718	2.879	3.106	3.497	4.437
12	0.259	0.539	0.873	1.083	1.356	1.782	2.179	2.303	2.461	2.681	2.836	3.055	3.428	4.318
13	0.259	0.538	0.870	1.079	1.350	1.771	2.160	2.282	2.436	2.650	2.801	3.012	3.372	4.221
14	0.258	0.537	0.868	1.076	1.345	1.761	2.145	2.264	2.415	2.624	2.771	2.977	3.326	4.140
15	0.258	0.536	0.866	1.074	1.341	1.753	2.131	2.249	2.397	2.602	2.746	2.947	3.286	4.073
16	0.258	0.535	0.865	1.071	1.337	1.746	2.120	2.235	2.382	2.583	2.724	2.921	3.252	4.015
17	0.257	0.534	0.863	1.069	1.333	1.740	2.110	2.224	2.368	2.567	2.706	2.898	3.222	3.965
18	0.257	0.534	0.862	1.067	1.330	1.734	2.101	2.214	2.356	2.552	2.689	2.878	3.197	3.922
19	0.257	0.533	0.861	1.066	1.328	1.729	2.093	2.205	2.346	2.539	2.674	2.861	3.174	3.883
20	0.257	0.533	0.860	1.064	1.325	1.725	2.086	2.197	2.336	2.528	2.661	2.845	3.153	3.850
21	0.257	0.532	0.859	1.063	1.323	1.721	2.080	2.189	2.328	2.518	2.649	2.831	3.135	3.819
22	0.256	0.532	0.858	1.061	1.321	1.717	2.074	2.183	2.320	2.508	2.639	2.819	3.119	3.792
23	0.256	0.532	0.858	1.060	1.319	1.714	2.069	2.177	2.313	2.500	2.629	2.807	3.104	3.768
24	0.256	0.531	0.857	1.059	1.318	1.711	2.064	2.172	2.307	2.492	2.620	2.797	3.091	3.745
25	0.256	0.531	0.856	1.058	1.316	1.708	2.060	2.167	2.301	2.485	2.612	2.787	3.078	3.725
26	0.256	0.531	0.856	1.058	1.315	1.706	2.056	2.162	2.296	2.479	2.605	2.779	3.067	3.707
27	0.256	0.531	0.855	1.057	1.314	1.703	2.052	2.158	2.291	2.473	2.598	2.771	3.057	3.690
28	0.256	0.530	0.855	1.056	1.313	1.701	2.048	2.154	2.286	2.467	2.592	2.763	3.047	3.674
29	0.256	0.530	0.854	1.055	1.311	1.699	2.045	2.150	2.282	2.462	2.586	2.756	3.038	3.659
30	0.256	0.530	0.854	1.055	1.310	1.697	2.042	2.147	2.278	2.457	2.581	2.750	3.030	3.646
40	0.255	0.529	0.851	1.050	1.303	1.684	2.021	2.123	2.250	2.423	2.542	2.704	2.971	3.551
60	0.254	0.527	0.848	1.045	1.296	1.671	2.000	2.099	2.223	2.390	2.504	2.660	2.915	3.460
120	0.254	0.526	0.845	1.041	1.289	1.658	1.980	2.076	2.196	2.358	2.468	2.617	2.860	3.373
∞	0.253	0.524	0.842	1.036	1.282	1.645	1.960	2.054	2.170	2.326	2.432	2.576	2.807	3.291