East Los Angeles College
Department of Mathematics
Math 227

Test 4

solutions

The wait time for an order at Husky Café is Normally Distributed with a mean of 8.5 min and a standard deviation of 1.8 min. What percent of customers wait for:

1. Less than 5 minutes?
2. No More than 10 minutes?
3. At least 12 minutes?
4. Between 5 and 12 minutes?
5. What wait time represents the top 5%?
6. What wait time represents the bottom 5%?
7. What wait time represents the 3rd Quartile?

A sample of 120 college students reveal that 45 are willing to study statistics for an additional semester. Use the 99% confidence level to:

8. Determine the sample proportion.
9. Determine the margin of error.
10. Estimate the true proportion.

A sample of 150 college students reveal that they spend a mean of 6.8 years in obtaining a 4-year degree with a standard deviation of 1.2 years. Use the 90% confidence level to:

11. Determine the margin of error associated with estimating the true mean.
12. Estimate the true mean.

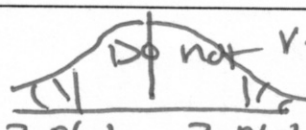
Professor Snodgrass claims that the proportion of students who have a social media account is at least 75%. A sample of 85 college students reports that 60 have a social media account.

13. Determine the Hypothesis Testing hypothesis (Null and Alternate).
14. Determine the Hypothesis Testing decision rule using the 5% level of significance.
15. Determine the samples test statistic.
16. What's the conclusion of this test?

Professor Snodgrass claims that the mean age of evening college students is not 20 years of age. A sample of 25 college students report a mean age of 24.5 with a standard deviation of 2.2 years.

17. Determine the Hypothesis Testing hypothesis (Null and Alternate).
18. Determine the Hypothesis Testing decision rule using the 5% level of significance.
19. Determine the samples test statistic.
20. What's the conclusion of this test?

Math 227 Test 4 Answer Sheet

1)	2.62%	11)	1.612
2)	79.67%	12)	$5.188 < \mu < 8.412$
3)	2.62%	13)	$H_0: p \geq 0.75$ $H_1: p < 0.75$
4)	94.76%	14)	 Reject Ho Do not reject Ho −1.645
5)	11.4	15)	TS = 0.89
6)	5.5	16)	Do not reject Ho Sample Data ~~does~~ ~~not~~ supports ~~the~~ claim
7)	9.7	17)	$H_0: \mu = 20$ $H_1: \mu \neq 20$
8)	0.375	18)	 Do not reject Ho −2.064 2.064
9)	0.114	19)	TS = 10.227
10)	$0.261 < p < 0.499$	20)	Reject Ho Sample data Supports the claim

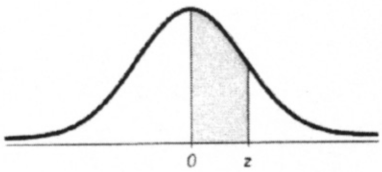


TABLE A-2 Standard Normal (z) Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495 *	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	$\boxed{.4750}$	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949 *	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.10 and higher	.4999									

NOTE: For values of z above 3.09, use 0.4999 for the area.
*Use these common values that result from interpolation:

z score	Area
1.645	0.4500
2.575	0.4950

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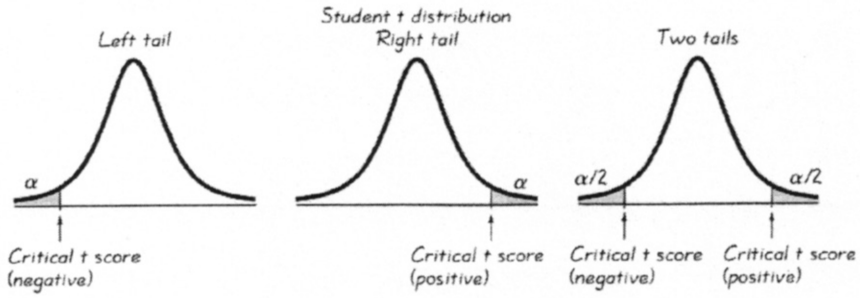


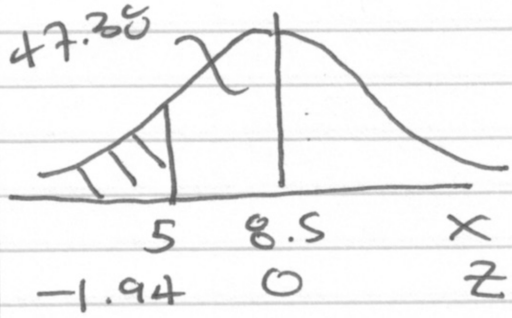
TABLE A-3 *t* Distribution

	α					
Degrees of Freedom	.005 (one tail) 0.1 (two tails)	.01 (one tail) .02 (two tails)	.025 (one tail) .05 (two tails)	.05 (one tail) .10 (two tails)	.10 (one tail) .20 (two tails)	.25 (one tail) .50 (two tails)
1	63.657	31.821	12.706	6.314	3.078	1.000
2	9.925	6.965	4.303	2.920	1.886	.816
3	5.841	4.541	3.182	2.353	1.638	.765
4	4.604	3.747	2.776	2.132	1.533	.741
5	4.032	3.365	2.571	2.015	1.476	.727
6	3.707	3.143	2.447	1.943	1.440	.718
7	3.500	2.998	2.365	1.895	1.415	.711
8	3.355	2.896	2.306	1.860	1.397	.706
9	3.250	2.821	2.262	1.833	1.383	.703
10	3.169	2.764	2.228	1.812	1.372	.700
11	3.106	2.718	2.201	1.796	1.363	.697
12	3.054	2.681	2.179	1.782	1.356	.696
13	3.012	2.650	2.160	1.771	1.350	.694
14	2.977	2.625	2.145	1.761	1.345	.692
15	2.947	2.602	2.132	1.753	1.341	.691
16	2.921	2.584	2.120	1.746	1.337	.690
17	2.898	2.567	2.110	1.740	1.333	.689
18	2.878	2.552	2.101	1.734	1.330	.688
19	2.861	2.540	2.093	1.729	1.328	.688
20	2.845	2.528	2.086	1.725	1.325	.687
21	2.831	2.518	2.080	1.721	1.323	.686
22	2.819	2.508	2.074	1.717	1.321	.686
23	2.807	2.500	2.069	1.714	1.320	.685
24	2.797	2.492	2.064	1.711	1.318	.685
25	2.787	2.485	2.060	1.708	1.316	.684
26	2.779	2.479	2.056	1.706	1.315	.684
27	2.771	2.473	2.052	1.703	1.314	.684
28	2.763	2.467	2.048	1.701	1.313	.683
29	2.756	2.462	2.045	1.699	1.311	.683
Large (z)	2.575	2.326	1.960	1.645	1.282	.675

math 227 Test 4

① less than 5

$\mu = 8.5$; $\sigma = 1.8$



$$z = \frac{x - \mu}{\sigma}$$

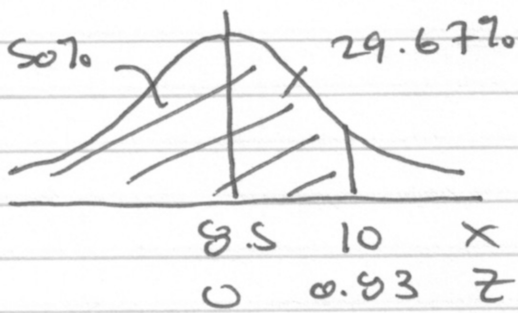
$$z = \frac{5 - 8.5}{1.8}$$

$$z \approx -1.94$$

50 − 47.38

$\boxed{2.62\%}$

② No more than 10 min



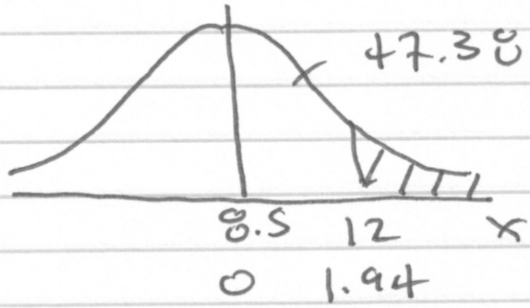
$$z = \frac{10 - 8.5}{1.8}$$

$$z = 0.83$$

50 + 29.67

$\boxed{79.67\%}$

③ at least 12 min



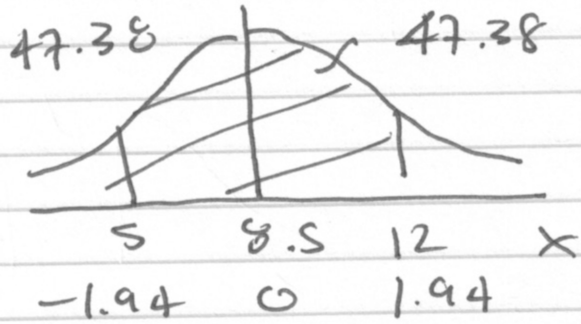
$$z = \frac{12 - 8.5}{1.8}$$

$$z = 1.94$$

50 − 47.38

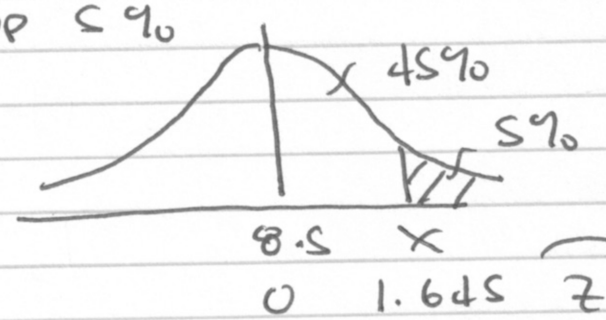
$\boxed{2.62\%}$

(4) Between 5 and 12



$\boxed{94.76\%}$

(5) Top 5%



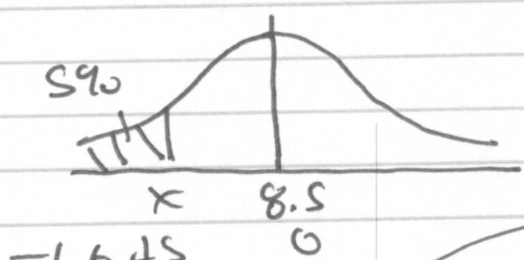
$x = \mu + z \cdot \sigma$

$x = 8.5 + 1.8z$

$x = 8.5 + 1.8 \cdot 1.645$

$x = 11.461$; $\boxed{x \approx 11.4 \text{ min}}$

(6) Bottom 5%



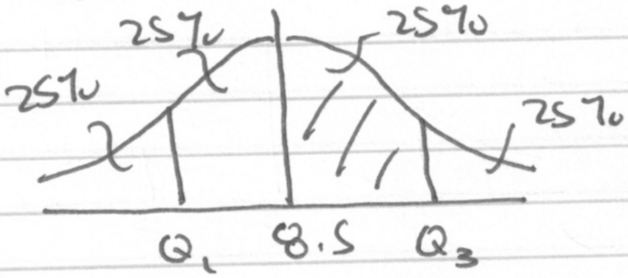
$x = \mu + z \cdot \sigma$

$x = 8.5 + z \cdot 1.8$

$x = 8.5 + -1.645 \cdot 1.8$

$\boxed{x \approx 5.5 \text{ min}}$

(7) $Q_3 = P_{75}$



$x = \mu + z \cdot \sigma$

$x = 8.5 + \cancel{z} \cdot 1.8$

P_{75}

0   0.655   z

0

$x = 8.5 + 0.655 \cdot 1.8$

$\boxed{x \approx 9.7 \text{ min}}$

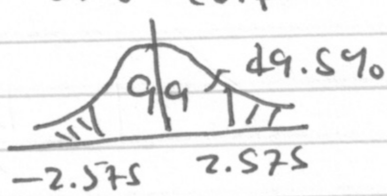
(8) $\bar{p} = \frac{x}{n}$; $\bar{p} = \frac{45}{120} \approx \boxed{0.375}$

37.5%

(9) $E = z_{\alpha/2} \sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$

99% conf

$\cancel{E = 2.575 \sqrt{0.375 \cdot}}$



$E = 2.575 \sqrt{\frac{0.375 \cdot 0.625}{120}}$

$\boxed{E \approx 0.114}$

(10) $\bar{p} - E < p < \bar{p} + E$

$0.375 - 0.114 < p < 0.375 + 0.114$

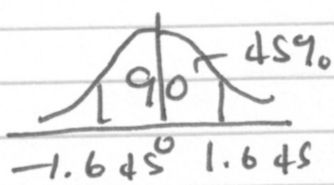
$$\boxed{0.261 < p < 0.489}$$

i.e.

note: $26.1\% < p < 48.9\%$

(11) $E = z_{\alpha/2} \dfrac{s}{\sqrt{n}}$; $E = 1.645 \cdot \dfrac{1.2}{\sqrt{150}}$

90% conf



$$\boxed{E = 1.612}$$

(12) $\bar{x} - E < \mu < \bar{x} + E$

$6.8 - 1.612 < \mu < 6.8 + 1.612$

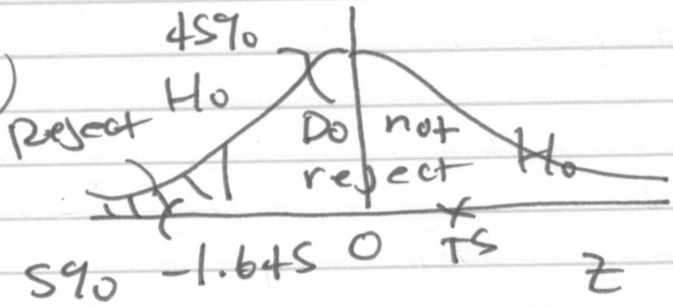
$$\boxed{5.188 < \mu < 8.412}$$

(13) $p \geq 75\%$ claim

$H_0: p \geq 0.75$ claim

$H_1: p < 0.75$

(14)



(15) $ts = \dfrac{\bar{p} - p}{\sqrt{\dfrac{p(1-p)}{n}}}$; $TS = \dfrac{0.706 - 0.75}{\sqrt{\dfrac{0.706 \cdot 0.294}{85}}}$

$\bar{p} = \dfrac{60}{85}$

$\bar{p} = 0.706$; $\boxed{TS = 0.89}$

$1 - \bar{p} = 0.294$

(16) Do not reject Ho

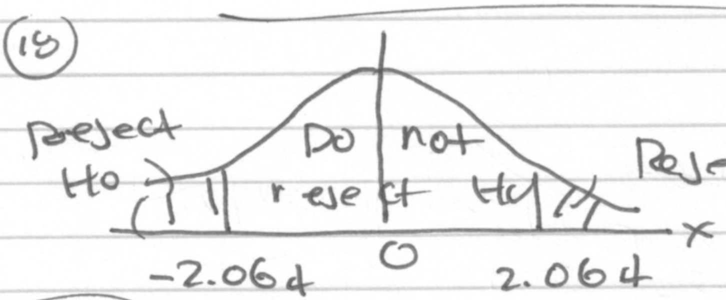
sample Data Supports the claim

(17) $\mu \neq 20$

$H_0: \mu = 20$

$H_1: \mu \neq 20$ claim

(18) $\alpha = 5\%$



$df = 25 - 1$

$df = 24$

Small Sample!

(19) $TS = \dfrac{\bar{x} - \mu}{s/\sqrt{n}}$

$TS = \dfrac{24.5 - 20}{2.2/\sqrt{25}}$

$TS = \dfrac{24.5 - 20}{2.2/5}$; $TS \approx$ ~~10.237~~ 10.227

(20) Reject H_0 ; The Sample Supports the claim