Statistics for Strategy Whitten Spring 2012
Exam 1 1:30 pm Monday, Feb. 6 100 points

EXAM INSTRUCTIONS

SPECIAL EXAM INSTRUCTIONS: Carry all calculations to at least four decimal places.

1. Bubble Sheet:
   (a) Write and bubble your Name (last name, first name.)
   (b) Write and bubble your 8-digit Student ID Number (Begin in the leftmost box.)
2. Exam Booklet: Write the information below.

   Name _____

   Student ID Number _____

   TA's Name _____

   Discussion Day and Time _____

   Section Number _____
3. Please sign the Tippie Honor Pledge:

   "I have neither given nor received assistance on this exam."

   Signature: _____
4. This is a closed-book exam. Use a calculator (but no cell phones) and pencils only.
5. There are **25 questions**, two tables, and a formula sheet on **14 pages.** Check your exam for these.
6. The exam format is multiple choice. Circle the **single best answer** on the exam booklet and fill the corresponding bubble on the bubble sheet with a No. 2 pencil. Carefully erase any answers on the bubble sheet which you wish to change.
7. You have 50 minutes to complete the b exam.
8. When finished, **place the bubble sheet inside the first page of the exam booklet. Deposit bubble sheet and exam booklet together into your TA's box.**
9. The base score for built-in partial credit is 25 points. In addition, 3 points are earned for each question which is answered correctly on the bubble sheet. Check ICON to see your score and a list of exam questions which were answered incorrectly.

Questions 1–8.
The University of Iowa has a "health and fitness" goal that more than 40% of all students visit the Campus Rec Center at least once each semester. A survey of 80 UI students shows that 36 of these students did not visit the Rec Center in Fall 2011, often citing time pressure due to school and work as reasons in the survey. Did the university meet its goal in Fall 2011, at 1% significance?

1. True or False: The number 36 is a statistic.

   (a) True
   (b) False
   (c) Additional information is needed before this question can be answered.

2. True or False: The number 40% is a statistic.

   (a) True
   (b) False
   (c) Additional information is needed before this question can be answered.

3. True or False: The number 1% is a statistic.

   (a) True
   (b) False
   (c) Additional information is needed before this question can be answered.

4. Find the P-value.

   (a) 0.0031 (b) 0.1841 (c) 0.8159 (d) 0.9969
   (e) None of the answers is correct to the fourth decimal place.

(continued)

5. Interpret the test.

   (a) There is insufficient evidence to show that the university met its goal in Fall 2011.

   (b) There is sufficient evidence to show that the university met its goal in Fall 2011.

   (c) There is insufficient evidence to show that more than 40% of the 80 surveyed students attended the Campus Rec Center at least once in Fall 2011.

   (d) There is sufficient evidence to show that more than 40% of the 80 surveyed students attended the Campus Rec Center at least once in Fall 2011.

   (e) None of the answers is correct.

6. Suppose that you open MINITAB and perform only the steps shown below. Will these steps produce the correct P-value?

   > Stat > Basic Statistics > 1 Proportion > (Choose "Summarized data", enter Number of events = 36, Number of trials = 80) > Check the box "Perform hypothesis test" and enter 0.60 for the hypothesized value > Options > (Select Alternative greater than) > (Check the box "Use test and interval based on normal distribution") > OK > OK

   (a) Yes

   (b) No

   (c) Additional information is needed before this question can be answered.

7. Find a 99% confidence interval for the percentage of UI students who did not attend the Campus Rec Center at least once in Fall 2011.

   (a) (30.2, 59.8) (b) (30.7, 59.3) (c) (34.1, 55.9) (d) (40.2, 69.8) (e) (40.7, 69.3)

8. Based on the confidence interval in the previous question, is it plausible that the university did not meet its goal in Fall 2011?

   (a) Yes

   (b) No

   (c) Additional information is needed before this question can be answered.

Questions 9–14.
The distance of the route used for the Annual Old Capitol 10,000 Meter Race is measured independently 56 times. The average observed distance is 9996 meters, with a standard deviation of 15.2 meters. Does the actual mean distance of the route differ from the advertised distance of 10,000 meters? Test at 5% significance.

9. True or False: The number 5% represents the risk of error if the null hypothesis is rejected on the basis of the sample (or stronger) evidence, assuming that the null hypothesis is true.

   (a) True

   (b) False

   (c) Additional information is needed before this question can be answered.

10. Which of the following is a correct expression?

    (a) $\bar{x} = 10,000$ (b) $\sigma = 15.2$ (c) $\bar{x} = 10,004$ (d) $\bar{x} = 15.2$

    (e) None of the expressions is correct.

11. Calculate the value of the test statistic.

    (a) -1.97 (b) 0.00 (c) 1.97

    (d) None of the answers is correct to the second decimal place.

12. Make a decision.

    (a) Reject H_0 (b) Fail to Reject H_0 (c) Reject H_A (d) Fail to Reject H_A

(continued)

13. Interpret the decision.

    (a) There is enough evidence to show that the actual mean distance of the route is 10,000 meters.

    (b) There is not enough evidence to show that the actual mean distance of the route is 10,000 meters.

    (c) There is enough evidence to show that the actual mean distance of the route is not 10,000 meters.

    (d) There is not enough evidence to show that the actual mean distance of the route is not 10,000 meters.

    (e) None of the answers is correct.

14. Find a 95% confidence interval for the actual mean distance of the route, in meters.

    (a) (9991.92, 10000.08)

    (b) (9992.02, 9999.98)

    (c) (9999.92, 10008.08)

    (d) (10000.02, 10007.98)

    (e) (10003.45, 10004.55)

Questions 15–20.
Allstate Insurance company recently surveyed houses in both Iowa City and Cedar Rapids for evidence of long-term hail damage to their roofs. 21 of 51 houses inspected in Iowa City show hail damage, while 10 of 50 houses in Cedar Rapids show hail damage.

Are houses in Iowa City more likely than houses in Cedar Rapids to show hail damage? Test using 1% significance.

Note: The three MINITAB outputs (and associated commands) shown on the next two pages may contain useful information.

15. The parameters are defined as

    (a) $\widehat{p}_1$ = average hail damage in Iowa City
    $\widehat{p}_2$ = average hail damage in Cedar Rapids

    (b) μ_1 = percentage of Iowa City houses which show hail damage
    μ_2 = percentage of Cedar Rapids houses which show hail damage

    (c) μ_1 = average hail damage in Iowa City
    μ_2 = average hail damage in Cedar Rapids

    (d) $\widehat{p}_1$ = percentage of Iowa City houses which show hail damage
    $\widehat{p}_2$ = percentage of Cedar Rapids houses which show hail damage

    (e) None of the answers is correct.

16. True or False: The answer to this hypothesis test can be determined by calculating two separate confidence intervals — one for Iowa City and another for Cedar Rapids — then observing whether or not the two confidence intervals overlap.

    (a) True

    (b) False

17. Find the P-value.

    (a) 0.009 (b) 0.011 (c) 0.018 (d) 0.022
    (e) None of the answers is correct

18. Make a decision.

    (a) Reject H_0

    (b) Fail to Reject H_0

    (c) Reject H_A

    (d) Fail to Reject H_A

19. Interpret the decision.

(a) There is sufficient evidence to show that houses in Iowa City are more likely than houses in Cedar Rapids to show hail damage.

(b) There is insufficient evidence to show that houses in Iowa City are more likely than houses in Cedar Rapids to show hail damage.

(c) There is sufficient evidence to show that houses in both Iowa City and Cedar Rapids show hail damage.

(d) There is insufficient evidence to show that houses in both Iowa City and Cedar Rapids show hail damage.

(e) None of the answers is correct.

20. Which of the following conclusions is correct, with 95% confidence?

(a) Between 3.7% and 38.7% of all houses in Cedar Rapids show hail damage.

(b) Between 3.7% and 38.7% of all houses in Iowa City show hail damage.

(c) Between 3.7% and 38.7% of all houses in both Iowa City and Cedar Rapids show hail damage.

(d) Between 3.7% and 38.7% more houses in Cedar Rapids than Iowa City show hail damage.

(e) Between 3.7% and 38.7% more houses in Iowa City than Cedar Rapids show hail damage.

Output #1 (and associated commands)

Stat > Basic Statistics > 2 Proportions > (Choose "Summarized data")

	Events	Trials
First:	21	51
Second:	10	50

> Options > (Select Alternative greater than) > OK > OK

```
Test and CI for Two Proportions

Sample   X   N  Sample p
1       21  51  0.411765
2       10  50  0.200000

Difference = p (1) - p (2)
Estimate for difference:  0.211765
95% lower bound for difference:  0.0651114
Test for difference = 0 (vs > 0):  Z = 2.38  P-Value = 0.009
```

(two more outputs on next page)

Output #2 (and associated commands)

Stat > Basic Statistics > 2 Proportions > (Choose "Summarized data")

	Events	Trials
First:	21	51
Second:	10	50

> Options > (Select Alternative greater than)

> (Click box "Use pooled estimate of p for test") > OK > OK

```
Test and CI for Two Proportions

Sample   X   N  Sample p
1       21  51  0.411765
2       10  50  0.200000

Difference = p (1) - p (2)
Estimate for difference:  0.211765
95% lower bound for difference:  0.0651114
Test for difference = 0 (vs > 0):  Z = 2.31  P-Value = 0.011
```

Output #3 (and associated commands)

Stat > Basic Statistics > 2 Proportions > (Choose "Summarized data")

	Events	Trials
First:	21	51
Second:	10	50

> Options > (Select Alternative not equal) > OK > OK

```
Test and CI for Two Proportions

Sample   X   N  Sample p
1       21  51  0.411765
2       10  50  0.200000

Difference = p (1) - p (2)
Estimate for difference:  0.211765
95% CI for difference:  (0.0370165, 0.386513)
Test for difference = 0 (vs not = 0):  Z = 2.31  P-Value = 0.021
```

Questions 21–25.
A medicine intended to lower blood pressure (BP) is given to five patients, with the following results:

	Patient				
	1	2	3	4	5
BP before medicine	155	160	172	180	190
BP after medicine	148	152	173	170	174
Difference	7	8	−1	10	16

Does the medicine succeed in lowering BP, on average? Use $\alpha = 1\%$.

(Hint: Use the alternative hypothesis $\mu > 0$.)

21. Find the value of the test statistic.

    (a) 1.13 (b) 2.92 (c) 6.53 (d) 29.46

    (e) None of the answers is correct to the second decimal place

(continued)

22. Find the P-value.

    (a) $0.15 < P\text{-value} < 0.20$
    (b) $0.02 < P\text{-value} < 0.025$
    (c) $0.001 < P\text{-value} < 0.0025$
    (d) $P\text{-value} < 0.0005$

23. Make a decision.

    (a) Reject H_0
    (b) Fail to Reject H_0
    (c) Reject H_A
    (d) Fail to Reject H_A

24. Interpret the decision.

    (a) There is enough evidence to show that the medicine lowers BP, on average.
    (b) There is not enough evidence to show that the medicine lowers BP, on average.
    (c) There is enough evidence to show that the medicine raises BP, on average.
    (d) There is not enough evidence to show that the medicine raises BP, on average.

25. Estimate the percentage of all patients whose BP is lowered by the medicine.

    (a) 0
    (b) 10
    (c) 50
    (d) 80
    (e) 100

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

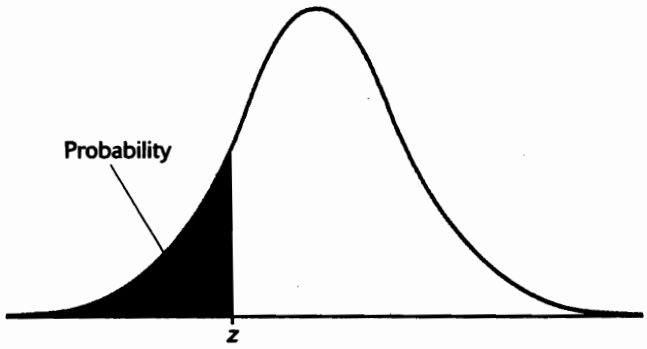

TABLE A Standard normal probabilities

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

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

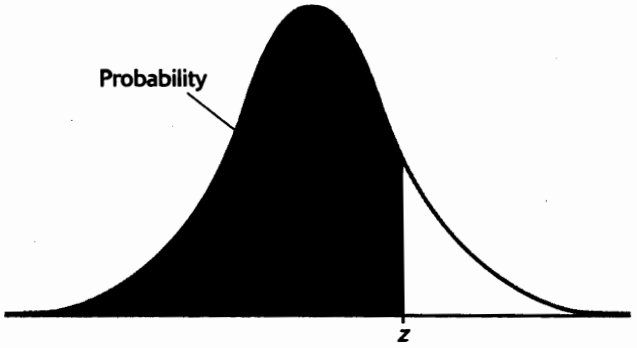

TABLE A Standard normal probabilities (*continued*)

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
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

Table entry for p and C is the critical value t^* with probability p lying to its right and probability C lying between $-t^*$ and t^*.

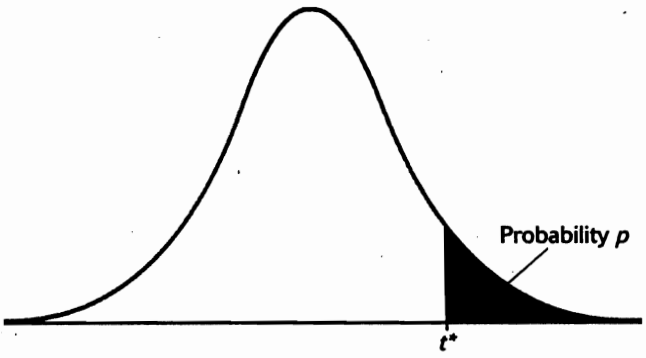

TABLE D t distribution critical values

	Upper tail probability p											
df	.25	.20	.15	.10	.05	.025	.02	.01	.005	.0025	.001	.0005
1	1.000	1.376	1.963	3.078	6.314	12.71	15.89	31.82	63.66	127.3	318.3	636.6
2	0.816	1.061	1.386	1.886	2.920	4.303	4.849	6.965	9.925	14.09	22.33	31.60
3	0.765	0.978	1.250	1.638	2.353	3.182	3.482	4.541	5.841	7.453	10.21	12.92
4	0.741	0.941	1.190	1.533	2.132	2.776	2.999	3.747	4.604	5.598	7.173	8.610
5	0.727	0.920	1.156	1.476	2.015	2.571	2.757	3.365	4.032	4.773	5.893	6.869
6	0.718	0.906	1.134	1.440	1.943	2.447	2.612	3.143	3.707	4.317	5.208	5.959
7	0.711	0.896	1.119	1.415	1.895	2.365	2.517	2.998	3.499	4.029	4.785	5.408
8	0.706	0.889	1.108	1.397	1.860	2.306	2.449	2.896	3.355	3.833	4.501	5.041
9	0.703	0.883	1.100	1.383	1.833	2.262	2.398	2.821	3.250	3.690	4.297	4.781
10	0.700	0.879	1.093	1.372	1.812	2.228	2.359	2.764	3.169	3.581	4.144	4.587
11	0.697	0.876	1.088	1.363	1.796	2.201	2.328	2.718	3.106	3.497	4.025	4.437
12	0.695	0.873	1.083	1.356	1.782	2.179	2.303	2.681	3.055	3.428	3.930	4.318
13	0.694	0.870	1.079	1.350	1.771	2.160	2.282	2.650	3.012	3.372	3.852	4.221
14	0.692	0.868	1.076	1.345	1.761	2.145	2.264	2.624	2.977	3.326	3.787	4.140
15	0.691	0.866	1.074	1.341	1.753	2.131	2.249	2.602	2.947	3.286	3.733	4.073
16	0.690	0.865	1.071	1.337	1.746	2.120	2.235	2.583	2.921	3.252	3.686	4.015
17	0.689	0.863	1.069	1.333	1.740	2.110	2.224	2.567	2.898	3.222	3.646	3.965
18	0.688	0.862	1.067	1.330	1.734	2.101	2.214	2.552	2.878	3.197	3.611	3.922
19	0.688	0.861	1.066	1.328	1.729	2.093	2.205	2.539	2.861	3.174	3.579	3.883
20	0.687	0.860	1.064	1.325	1.725	2.086	2.197	2.528	2.845	3.153	3.552	3.850
21	0.686	0.859	1.063	1.323	1.721	2.080	2.189	2.518	2.831	3.135	3.527	3.819
22	0.686	0.858	1.061	1.321	1.717	2.074	2.183	2.508	2.819	3.119	3.505	3.792
23	0.685	0.858	1.060	1.319	1.714	2.069	2.177	2.500	2.807	3.104	3.485	3.768
24	0.685	0.857	1.059	1.318	1.711	2.064	2.172	2.492	2.797	3.091	3.467	3.745
25	0.684	0.856	1.058	1.316	1.708	2.060	2.167	2.485	2.787	3.078	3.450	3.725
26	0.684	0.856	1.058	1.315	1.706	2.056	2.162	2.479	2.779	3.067	3.435	3.707
27	0.684	0.855	1.057	1.314	1.703	2.052	2.158	2.473	2.771	3.057	3.421	3.690
28	0.683	0.855	1.056	1.313	1.701	2.048	2.154	2.467	2.763	3.047	3.408	3.674
29	0.683	0.854	1.055	1.311	1.699	2.045	2.150	2.462	2.756	3.038	3.396	3.659
30	0.683	0.854	1.055	1.310	1.697	2.042	2.147	2.457	2.750	3.030	3.385	3.646
40	0.681	0.851	1.050	1.303	1.684	2.021	2.123	2.423	2.704	2.971	3.307	3.551
50	0.679	0.849	1.047	1.299	1.676	2.009	2.109	2.403	2.678	2.937	3.261	3.496
60	0.679	0.848	1.045	1.296	1.671	2.000	2.099	2.390	2.660	2.915	3.232	3.460
80	0.678	0.846	1.043	1.292	1.664	1.990	2.088	2.374	2.639	2.887	3.195	3.416
100	0.677	0.845	1.042	1.290	1.660	1.984	2.081	2.364	2.626	2.871	3.174	3.390
1000	0.675	0.842	1.037	1.282	1.646	1.962	2.056	2.330	2.581	2.813	3.098	3.300
z^*	0.674	0.841	1.036	1.282	1.645	1.960	2.054	2.326	2.576	2.807	3.091	3.291
	50%	60%	70%	80%	90%	95%	96%	98%	99%	99.5%	99.8%	99.9%
	Confidence level C											

Exam 1 Formulas

Confidence Intervals

$$\bar{x} \ \pm \ t^* \frac{s}{\sqrt{n}} \qquad\qquad \widehat{p} \ \pm \ z^* \sqrt{\frac{\widehat{p}\,(1-\widehat{p}\,)}{n}}$$

Hypothesis Tests

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} \qquad\qquad Z = \frac{\widehat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

Two Populations

$$(\widehat{p}_1 - \widehat{p}_2) \pm z^* \, \sigma_{\widehat{p}_1 - \widehat{p}_2}$$

$$\sigma_{\widehat{p}_1 - \widehat{p}_2} \approx \sqrt{\frac{\widehat{p}_1\,(1-\widehat{p}_1)}{n_1} + \frac{\widehat{p}_2\,(1-\widehat{p}_2)}{n_2}}$$

$$Z = \frac{(\widehat{p}_1 - \widehat{p}_2)}{\sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right)\widehat{p}\,(1-\widehat{p}\,)}}$$

$$\widehat{p} = \frac{x_1 + x_2}{n_1 + n_2}$$

Answers

1. a
2. b
3. b 1% is the significance level, which has no connection to populations or samples.
4. a
5. b
6. b

   Redefine p as $p =$ proportion who <u>don't</u> attend. Then the alternative hypothesis becomes H_A: $p < 0.60$.
7. b
8. b CI $\implies$ more than 40.7% attend
9. b This is the definition for P-value.
10. e
11. a
12. b
13. d
14. a
15. e
16. b
17. b
18. b
19. b
20. e
21. b Let $\mu =$ average reduction in BP per patient, after taking medicine
22. b
23. b
24. b
25. d Use the estimate 4/5.