Multiple Choice Questions

Disclaimer: These 31 practice questions are meant to illustrate the format and approximate difficulty of typical questions on the actual exam (some exam questions may be more difficult). Not all topics covered on the exam are necessarily represented.

Source: Much of this review material is adapted from review materials prepared by Vivian Lew, Michael Tsiang and Linda Zanontian.

Problem 1 Please determine whether the variable would best be modeled as continuous or discrete: The number of tomatoes harvested each week from a greenhouse tomato plant.

(a) Continuous

(b) Discrete

Problem 2 Determine whether the variable would best be modeled as continuous or discrete: The volume of whipped cream that Leslie Knope puts on her waffles from JJ's Diner.

(a) Continuous

(b) Discrete

The following information is used in Problems 3, 4, and 5.

Male players at the high school, college, and professional ranks use a regulation basketball that weighs 22.0 ounces with a standard deviation of 1.0 ounce. Assume that the weights of basketballs are approximately Normally distributed.

Problem 3 Roughly what percentage of regulation basketballs weigh less than 20.7 ounces? Round to the nearest tenth of a percent.

(a) 4.3% of the basketballs will weigh less than 20.7 ounces.

(b) 22.3% of the basketballs will weigh less than 20.7 ounces.

(c) 9.7% of the basketballs will weigh less than 20.7 ounces.

(d) 5.7% of the basketballs will weigh less than 20.7 ounces.

Problem 4 If a regulation basketball is randomly selected, what is the probability that it will weigh between 20.5 and 23.5 ounces? Round to the nearest thousandth.

(a) .866

(b) .134

(c) .267

(d) .704

Problem 5 Would it be unusual to randomly select a regulation basketball and find that it weighs 17.9 ounces?

(a) Yes, this would be unusual.

(b) No, this would not be unusual.

Problem 6 The Normal model $N(58, 21)$ describes the distribution of weights of chicken eggs in grams. Suppose that the weight of a randomly selected chicken egg has a z-score of 1.78. What is the weight of this egg in grams? Round to the nearest hundredth of a gram.

(a) 95.38 grams

(b) 89.50 grams

(c) 65.25 grams

(d) 79.50 grams

The following information is used in Problems 7 and 8.
The mean travel time to work for a person working in Kokomo, Indiana, is 17 minutes. Suppose the standard deviation of travel time to work is 4.5 minutes and the distribution of travel time is approximately Normally distributed.
Problem 7 Approximately what percentage of people living and working in Kokomo have a travel time to work that is at least 20 minutes? Round to the nearest whole percent.

(a) 75%

(b) 25%

(c) 15%

(d) None of the above

Problem 8 Suppose that it is reported in the news that 12% of the people living and working in Kokomo feel that their commute is too long. What is the travel time to work that separates the top 12% of people with the longest travel times and the lower 88%? Round to the nearest tenth of a minute.

(a) 26.0 minutes

(b) 18.1 minutes

(c) 22.3 minutes

(d) None of the above

The following information is used in Problems 9, 10, 11, and 12.

Suppose that the probability that a person books a hotel using an online travel website is .7. Consider a sample of fifteen randomly selected people who recently booked a hotel.

Problem 9 What is the probability that exactly ten people out of fifteen people used an online travel website when they booked their hotel? Round to the nearest thousandth.

(a) .206

(b) .036

(c) .001

(d) .723

Problem 10 What is the probability that at least fourteen out of fifteen people used an online travel website when they booked their hotel? Round to the nearest thousandth.

(a) .206

(b) .036

(c) .001

(d) .723

Problem 11 What is the probability that no more than four out of fifteen people used an online travel website when they booked their hotel? Round to the nearest thousandth.

(a) .206

(b) .036

(c) .001

(d) .723

Problem 12 Out of fifteen randomly selected people, how many would you expect to use an online travel website to book their hotel, give or take how many? Round to the nearest whole person.

(a) 9 people, give or take 2 people

(b) 10 people, give or take 3 people

(c) 11 people, give or take 2 people

(d) 11 people, give or take 3 people

(e) 12 people, give or take 3 people

Problem 13 Skylar is interested in whether students at his college would like to see a portion of the campus preserved as green space. Using student dormitory room numbers, he randomly contacts 300 students and receives a response from 250. Of those who responded, 64% favored the preservation of green space on campus. This scenario is describing what type of bias?

(a) Bias due to not giving all students the same chance to be surveyed

(b) Bias due to relying on voluntary response

(c) Both biases from (a) and (b)

(d) None of the above

Problem 14 You have been assigned to conduct a survey of college and career intentions of high school students at a local high school. You need to start by drawing a simple random sample of 40 students. Which of the following is most likely to produce a simple random sample?

(a) Select the first 40 students to arrive at school in the morning

(b) Select every 10th student entering the school cafeteria until 40 students are selected

(c) Select 10 each of first-year, second-year, third-year, and fourth-year students

(d) Select the first 40 students to enter the library

(e) Select 40 students at random (by using software or a random number table) from the official school roster.

Problem 15 A certain population is approximately Normal. We want to estimate its mean, so we will collect a (random) sample. Which should be true if we use a large sample rather than a small one?

I. The distribution of our sample data will be approximately Normal.

II. The sampling distribution of the sample means will be approximately Normal.

III. The variability of the sample means will be smaller.

(a) I only

(b) II only

(c) III only

(d) II and III only

(e) I, II, and III

Problem 16 We have calculated a 95% confidence interval and would prefer that our next confidence interval has a smaller margin of error without a decrease in confidence. In order to do this, we can:

I. change the z^* multiplier to a smaller number.

II. take a larger random sample.

III. take a smaller random sample.

(a) I only

(b) II only

(c) III only

(d) I and II only

(e) I and III only

Problem 17 Historical data reveals that 47% of all adult women think they do not get enough time for themselves. A recent opinion poll interviews 1025 randomly chosen women and records the sample proportion of women who do not feel that they get enough time for themselves. This statistic will vary from sample to sample if the poll is repeated. Suppose the true population proportion is 0.47. In what range will the middle 68% of all sample results fall for samples of size 1025?

(a) 0.314 to 0.626

(b) −1 to +1

(c) 0.548 to 0.822

(d) 0.454 to 0.486

(e) 0.439 to 0.501

Free Response Questions

(This section is for practice only. The final exam will not have free response questions.) **The following information is used in Problems 18 and 26.**

A Washington Post article (Public option gains support, October 20, 2009) reports that "a new Washington Post-ABC News poll shows that support for a government-run health-care plan to compete with private insurers has rebounded from its summertime lows and wins clear majority support from the public." More specifically the article says "seven in 10 Democrats back the plan, while almost nine in 10 Republicans oppose it. Independents divide 52 percent against, 42 percent in favor of the legislation." There were were 819 democrats, 566 republicans and 783 independents surveyed.

Is there significant evidence to suggest that a higher proportion of democrats than independents support the public option plan?

Problem 18 Write the hypotheses in words and in symbols.
$H_0 : p_D = p_I$
$H_a : p_D > p_I$

Problem 19 Calculate the test statistic.
Z = 11.43

Problem 20 Find the p-value.
p-value ≈ 0

Problem 21 What do you conclude?
Reject the null hypothesis since our p-value is less than 0.05.

Problem 22 What type of error might you have committed? Choose only one answer.

(a) Type I

(b) Type II

Problem 23 Calculate a 95% confidence interval for the difference in proportions of Democrats and independents support the public option plan.
(0.232, 0.328)

Problem 24 Interpret the confidence interval in context.
We are 95% confident that the true proportion of Democrats support the plan is from 23.2% to 32.8% higher than independents.

Problem 25 Is there evidence of a higher proportion of democrats than independents support the plan?
Yes

Problem 26 Does this prove that a higher proportion of democrats support the plan than independents? Explain.
No, we can't because this was an observational study.

The following information is used in Problems 27 and 31.
Many office "coffee stations" collect voluntary payments for the food consumed. Rearchers at the University of Newcastle upon Tyne performed and experiment to see whether the image of eyes watching would change employee behavior. They alternated pictures of eyes looking at the viewer with pictures of flowers every other weekend on the cupboard behind the "donation" box. They recorded the amount of donations in pounds each week per estimated kilogram of food consumed.

	Eyes	Flowers
# of weeks	5	5
$\bar{x}$	0.417	0.151
s	0.1811	0.067

Do these results provide evidence that there really is a difference in honesty even when it's only photographs of eyes that are "watching"?

Problem 27 Write the hypotheses in words and in symbols.
$H_0 : \mu_1 = \mu_2$
$H_a : \mu_1 \neq \mu_2$

Problem 28 Calculate the test statistic.
$t_4 = \frac{0.417-0.151}{0.086} = 3.093$

Problem 29 Find the p-value.
p-value ≈ 0

Problem 30 What do you conclude?
Reject the null hypothesis since our p-value is less than 0.05.

Problem 31 What type of error might you have committed? Choose only one answer.

(a) Type I

(b) Type II

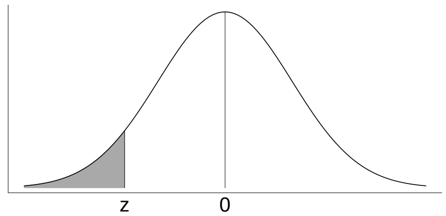
Binomial Probabilties

		p												
n	x	.01	.05	.1	.2	.3	.4	.5	.6	.7	.8	.9	.95	.99
5	0	.951	.774	.590	.328	.168	.078	.031	.010	.002	.000	.000	.000	.000
	1	.048	.204	.328	.410	.360	.259	.156	.077	.028	.006	.000	.000	.000
	2	.001	.021	.073	.205	.309	.346	.312	.230	.132	.051	.008	.001	.000
	3	.000	.001	.008	.051	.132	.230	.312	.346	.309	.205	.073	.021	.001
	4	.000	.000	.000	.006	.028	.077	.156	.259	.360	.410	.328	.204	.048
	5	.000	.000	.000	.000	.002	.010	.031	.078	.168	.328	.590	.774	.951

		p												
n	x	.01	.05	.1	.2	.3	.4	.5	.6	.7	.8	.9	.95	.99
10	0	.904	.599	.349	.107	.028	.006	.001	.000	.000	.000	.000	.000	.000
	1	.091	.315	.387	.268	.121	.040	.010	.002	.000	.000	.000	.000	.000
	2	.004	.075	.194	.302	.233	.121	.044	.011	.001	.000	.000	.000	.000
	3	.000	.010	.057	.201	.267	.215	.117	.042	.009	.001	.000	.000	.000
	4	.000	.001	.011	.088	.200	.251	.205	.111	.037	.006	.000	.000	.000
	5	.000	.000	.001	.026	.103	.201	.246	.201	.103	.026	.001	.000	.000
	6	.000	.000	.000	.006	.037	.111	.205	.251	.200	.088	.011	.001	.000
	7	.000	.000	.000	.001	.009	.042	.117	.215	.267	.201	.057	.010	.000
	8	.000	.000	.000	.000	.001	.011	.044	.121	.233	.302	.194	.075	.004
	9	.000	.000	.000	.000	.000	.002	.010	.040	.121	.268	.387	.315	.091
	10	.000	.000	.000	.000	.000	.000	.001	.006	.028	.107	.349	.599	.904

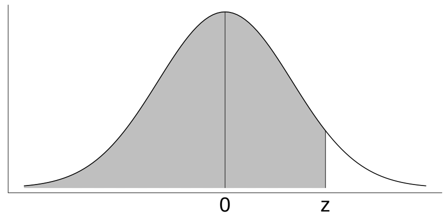
		p												
n	x	.01	.05	.1	.2	.3	.4	.5	.6	.7	.8	.9	.95	.99
15	0	.860	.463	.206	.035	.005	.000	.000	.000	.000	.000	.000	.000	.000
	1	.130	.366	.343	.132	.031	.005	.000	.000	.000	.000	.000	.000	.000
	2	.009	.135	.267	.231	.092	.022	.003	.000	.000	.000	.000	.000	.000
	3	.000	.031	.129	.250	.170	.063	.014	.002	.000	.000	.000	.000	.000
	4	.000	.005	.043	.188	.219	.127	.042	.007	.001	.000	.000	.000	.000
	5	.000	.001	.010	.103	.206	.186	.092	.024	.003	.000	.000	.000	.000
	6	.000	.000	.002	.043	.147	.207	.153	.061	.012	.001	.000	.000	.000
	7	.000	.000	.000	.014	.081	.177	.196	.118	.035	.003	.000	.000	.000
	8	.000	.000	.000	.003	.035	.118	.196	.177	.081	.014	.000	.000	.000
	9	.000	.000	.000	.001	.012	.061	.153	.207	.147	.043	.002	.000	.000
	10	.000	.000	.000	.000	.003	.024	.092	.186	.206	.103	.010	.001	.000
	11	.000	.000	.000	.000	.001	.007	.042	.127	.219	.188	.043	.005	.000
	12	.000	.000	.000	.000	.000	.002	.014	.063	.170	.250	.129	.031	.000
	13	.000	.000	.000	.000	.000	.000	.003	.022	.092	.231	.267	.135	.009
	14	.000	.000	.000	.000	.000	.000	.000	.005	.031	.132	.343	.366	.130
	15	.000	.000	.000	.000	.000	.000	.000	.000	.005	.035	.206	.463	.860

Standard Normal Distribution Table (Negative z)



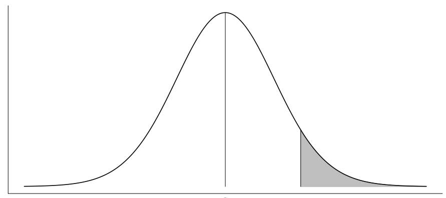
z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
−3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
−3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
−3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
−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
−.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
−.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
−.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
−.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
−.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
−.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
−.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
−.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
−.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

Standard Normal Distribution Table (Positive z)



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
.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

t-Distribution Table



	Confidence Level					
	80%	90%	95%	98%	99%	99.8%
	Right-Tail Probability					
df	0.100	0.050	0.025	0.010	0.005	0.001
1	3.078	6.314	12.706	31.821	63.657	318.309
2	1.886	2.920	4.303	6.965	9.925	22.327
3	1.638	2.353	3.182	4.541	5.841	10.215
4	1.533	2.132	2.776	3.747	4.604	7.173
5	1.476	2.015	2.571	3.365	4.032	5.893
6	1.440	1.943	2.447	3.143	3.707	5.208
7	1.415	1.895	2.365	2.998	3.499	4.785
8	1.397	1.860	2.306	2.896	3.355	4.501
9	1.383	1.833	2.262	2.821	3.250	4.297
10	1.372	1.812	2.228	2.764	3.169	4.144
11	1.363	1.796	2.201	2.718	3.106	4.025
12	1.356	1.782	2.179	2.681	3.055	3.930
13	1.350	1.771	2.160	2.650	3.012	3.852
14	1.345	1.761	2.145	2.624	2.977	3.787
15	1.341	1.753	2.131	2.602	2.947	3.733
16	1.337	1.746	2.120	2.583	2.921	3.686
17	1.333	1.740	2.110	2.567	2.898	3.646
18	1.330	1.734	2.101	2.552	2.878	3.610
19	1.328	1.729	2.093	2.539	2.861	3.579
20	1.325	1.725	2.086	2.528	2.845	3.552
21	1.323	1.721	2.080	2.518	2.831	3.527
22	1.321	1.717	2.074	2.508	2.819	3.505
23	1.319	1.714	2.069	2.500	2.807	3.485
24	1.318	1.711	2.064	2.492	2.797	3.467
25	1.316	1.708	2.060	2.485	2.787	3.450
26	1.315	1.706	2.056	2.479	2.779	3.435
27	1.314	1.703	2.052	2.473	2.771	3.421
28	1.313	1.701	2.048	2.467	2.763	3.408
29	1.311	1.699	2.045	2.462	2.756	3.396
30	1.310	1.697	2.042	2.457	2.750	3.385
40	1.303	1.684	2.021	2.423	2.704	3.307
50	1.299	1.676	2.009	2.403	2.678	3.261
60	1.296	1.671	2.000	2.390	2.660	3.232
80	1.292	1.664	1.990	2.374	2.639	3.195
100	1.290	1.660	1.984	2.364	2.626	3.174
∞	1.282	1.645	1.960	2.326	2.576	3.090