UNIT 5 — MILESTONE 5

Which of the following is an example of a parameter?

- ☐

   Half of the receipts at the coffee shop include web address for giving feedback.

- ☐

   9047 out of 531,310 citizens voted in the special election for city council.

- ☐

   3.5% of the restaurant goers are given a survey to fill out.

- ☑

   All of the members of the community watch group gave their availability to volunteer over the summer.

RATIONALE

Recall a parameter comes from the entire set of interest, the
population. Since they are looking at all members of a community here, their availability to volunteer would be an
example of a parameter.

CONCEPT

Sample Statistics and Population Parameters
I need help with this question
2

A school is gathering some data on its sports teams because it was believed that the distribution of boys and girls
were evenly distributed across all the sports. This table lists the number of boys and girls participating in each
sport.

	Boys	Girls
Tennis	18	30
Soccer	42	15
Swimming	12	18

Select the observed and expected frequencies for the boys participating in soccer.

- ☑

  Observed: 42

  Expected: 22.5

- ☑

  Observed: 42

  Expected: 24

- ☐

  Observed: 57

  Expected: 24

- ☐

  Observed: 57

  Expected: 22.5

RATIONALE

If we simply go to the chart then we can directly see the observed frequency for boys participating in soccer is 42.

To find the expected frequency, we need to find the number of
occurrences if the null hypothesis is true, which in this case, was that the three options are equally likely, or if the three options were all evenly distributed.

First, add up all the options in the boys column:

$18 + 42 + 12 = 72$

If each of these three options were evenly distributed among the 72 boys, we would need to divide the total evenly between the three options:

$72 \div 3 = 24$

This means we would expect 24 boys to choose tennis, 24 boys to choose soccer, and 24 boys to choose swimming.

CONCEPT

Sukie interviewed 125 employees at her company and discovered that 21 of them planned to take an extended vacation next year.

What is the 95% confidence interval for this population proportion? Answer choices are rounded to the hundredths place.

- ☐

  0.11 to 0.21

- ☑

  0.10 to 0.23

- ☐

  0.16 to 0.17

- ☐

  0.11 to 0.16

RATIONALE

In order to get the CI we want to use the following form.

 p with hat on top plus-or-minus z to the power of asterisk times square root of fraction numerator p with hat on top q with hat on top over denominator n end fraction end root

First, we must determine the corresponding z*score for 95% Confidence Interval. Remember, this means that we have 5% for the tails, meaning 5%, or 0.025, for each tail. Using a z-table, we can find the upper z-score by finding (1 - 0.025) or 0.975 in the table.

This corresponding z-score is at 1.96.

We can know p with hat on top comma space q with hat on top comma space a n d space n.

$$\hat{p} = \frac{21}{125} = 0.168$$
$$\hat{q} = 1 - \hat{p} = 1 - 0.168 = 0.832$$
$$n = 125$$

So putting it all together:

$$\hat{p} \pm z^* \sqrt{\frac{\hat{p}\hat{q}}{n}} = 0.168 \pm 1.96\sqrt{\frac{(0.168)(0.832)}{125}}$$

$$= 0.168 \pm 1.96\sqrt{\frac{0.140}{125}}$$

$$= 0.168 \pm 1.96\sqrt{0.00112}$$

$$= 0.168 \pm 1.96(0.033)$$

$$= 0.168 \pm 0.065$$

The lower bound is:

0.168-0.065 =0.103 or 0.10

The upper bound is:

0.168+0.065 =0.233 or 0.23

CONCEPT

4

Select the statement that correctly describes a Type II error.

- ☑

  A Type II error occurs when the null hypothesis is accepted when it is actually false.

- ☐

  A Type II error occurs when the null hypothesis is rejected when it is actually true.

- ☐

  A Type II error occurs when the null hypothesis is accepted when it is actually true.

- ☐

  A Type II error occurs when the null hypothesis is rejected when it is actually false.

RATIONALE

Recall a Type II error is when we incorrectly accept a false null hypothesis. In this case, we want to reject H_0 and conclude there is evidence H_a is correct.

CONCEPT

5

Henri has calculated a z-test statistic of -2.73.

What is the p-value of the test statistic? Answer choices are rounded to the thousandths place.

z	0	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	0.0013	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	0.0228	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	0.1587	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	0.3829
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

- ☐ 0.004

- ☐ 0.006

- ☑ 0.003

- ☐ 0.394

RATIONALE

If we go to the chart and the row for the z-column for -2.7 and then the column 0.03, this value corresponds to 0.0032 or 0.003.

CONCEPT

6

One condition for performing a hypothesis test is that the observations are independent. Marta is going to take a sample from a population of 600 students.

How many students will Marta have to sample without replacement to treat the observations as independent?

- ☐

  540

- ☑

  60

- ☐

  120

- ☐

  300

RATIONALE

In general we want about 10% or less to still assume independence.

So size = 0.1*N = 0.1(600) = 60

A sample of 60 or less would be sufficient.

CONCEPT

7

Brad recorded the number of visitors at the local science museum during the week:

Day	Visitors
Tuesday	18
Wednesday	24
Thursday	28
Friday	30

He expected to see 25 visitors each day. To answer whether the number of visitors follows a uniform distribution, a chi-square test for goodness of fit should be performed. (alpha = 0.10)

$$x^2 = \sum \frac{(O-E)^2}{E}$$

What is the chi-squared test statistic? Answers are rounded to the nearest hundredth.

- ☐

  2.54

- ☐

  1.40

- ☑

  3.36

- ☐

  1.12

RATIONALE

Using the chi-square formula we can note the test statistic is

$$x^2 = \sum \frac{(O-E)^2}{E} = \frac{(18-25)^2}{25} + \frac{(24-25)^2}{25} + \frac{(28-25)^2}{25} + \frac{(30-25)^2}{25}$$

$$= \frac{(-7)^2}{25} + \frac{(-1)^2}{25} + \frac{3^2}{25} + \frac{5^2}{25}$$

$$= \frac{49}{25} + \frac{1}{25} + \frac{9}{25} + \frac{25}{25}$$

$$= \frac{84}{25}$$

$$= 3.36$$

CONCEPT

Chi-Square Test for Goodness-of-Fit
I need help with this question
8

What value of z* should be used to construct a 97% confidence interval of a population mean? Answer choices are rounded to the thousandths place.

z-score	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
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	0.8413	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	0.9772	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	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990

- ✓

  2.17

- ☐

  1.65

- ✓

  1.88 ✗

- ☐

  1.96

RATIONALE

Using the z-chart to construct a 97% CI, this means that there is
1.5% for each tail. The lower tail would be at 0.015 and the upper tail would be at (1 - 0.015) or 0.985. The value
of 0.9850 is actually on the z-table exactly.

0.9850 corresponds with a z-score of 2.17.

CONCEPT

9

Mike tabulated the following values for heights in inches of seven of his friends: 65, 71, 74, 61, 66, 70, and 72. Mike wishes to construct a 95% confidence interval.

What value of t* should Mike use to construct the confidence interval? Answer choices are rounded to the hundredths place.

					t-Distribution Critical Values						
					Tail Probability, p						
df	0.25	0.2	0.15	0.1	0.05	0.025	0.02	0.01	0.005	0.0025	0.001	0.0005
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	2.66	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
>1000	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%	99.50%	99.80%	99.90%
						Confidence Interval between -t and t						

- ✓ ✗
  1.94

- ☐
  2.37

- ☐

  4.58

- ✅ ✓

  2.45

RATIONALE

Recall that we have n = 7, so the df = n-1 = 6. So if we go to the
row where df = 7 and then 0.025 for the tail probability, this gives us a value of 2.447 or 2.45. Recall that a 95%
confidence interval would have 5% for the tails, so 2.5% for each tail.

We can also use the last row and find the corresponding confidence level (see 95%).

CONCEPT

How to Find a Critical T Value
I need help with this question
10

The data below shows the grams of fat in a series of popular snacks.

Snack	Grams of Fat
Snack 1	9
Snack 2	13
Snack 3	21
Snack 4	30
Snack 5	31
Snack 6	31
Snack 7	34
Snack 8	25
Snack 9	28
Snack 10	20

If Morris wanted to construct a one-sample t-statistic, what would the value for the degrees of freedom be?

- ✔

  9

- ☐

  5

- ☐

  10

- ☐

  11

RATIONALE

The degrees of freedom for a 1 sample t-test are df=n-1 where n is the sample size. In this case, n=10, then df = n-1 = 10-1 = 9.

CONCEPT

11

Emile has calculated a one-tailed z-statistic of -1.97 and wants to see if it is significant at the 5% significance level.

What is the critical value for the 5% significance level? Answer choices are rounded to the hundredths place.

- ☐

  -2.33

- ✔

  -1.64

- ☐

  -1.04

- ☑ ✗

  0

RATIONALE

Recall that when a test statistic is smaller than in a left-tailed
test we would reject Ho. The closest value to 5%, or 0.05, in the table would be between 0.0505 and 0.495.

0.0505 corresponds with a z-score of -1.64
0.0495 corresponds with a z-score of -1.65.

We need to calculate the average of the two z-scores to get a z-score of -1.645.

CONCEPT

12

Joe hypothesizes that the average age of the population of Florida is less than 37 years. He records a sample mean equal to 37 and states the hypothesis as $\mu = 37$ vs $\mu < 37$.

What type of test should Joe do?

- ☐

  Right-tailed test

- ☑

  Left-tailed test

- ☐

  Two-tailed test

- ☐

  Joe should not do any of the types of tests listed

RATIONALE

Since the Ha is a less than sign, this indicates he wants to run a 1

tailed test where the rejection region is the lower or left tail.
This can be called a left-tailed test.

CONCEPT

One-Tailed and Two-Tailed Tests
I need help with this question
13

Sukie interviewed 125 employees at her company and discovered that 21 of them planned to take an extended vacation next year.

What is the standard error of the sample proportion? Answer choices are rounded to the thousandths place.

- ☑

  0.033

- ☐

  0.080

- ☐

  0.015

- ☐

0.532

RATIONALE

We can note the SE of the proportion is

square root of fraction numerator p with hat on top q with hat on top over denominator n end fraction end root·

If we note that $\hat{p} = \dfrac{21}{125} = 0.168$, which means $\hat{q} = 1 - 0.168 = 0.832$.

So if we take all this information we can note SE $= \sqrt{\dfrac{\hat{p}\hat{q}}{n}} = \sqrt{\dfrac{0.168(0.832)}{125}} = 0.033$.

CONCEPT

Calculating Standard Error of a Sample Proportion
I need help with this question
14
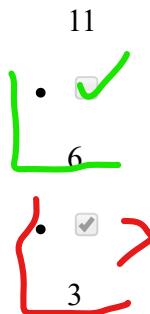
A researcher has a table of data with four column variables and three row variables.

The value for the degrees of freedom in order to calculate the χ^2 statistic is _____.

- ☐
  11

- ✓
  6

- ☑ ✗
  3

- ☐
  12

RATIONALE

Recall to get the degrees of freedom we use df = (r-1)(c-1) where c and r are the number of rows and columns. This means df = (4-1)(3-1) = 3*2 =6.

CONCEPT

Chi-Square Test for Association and Independence
I need help with this question
15

Maximus is playing a game. When he rolls the dice he wins if he gets an even number and loses if he gets an odd number.

Which of the following statements is FALSE?

- ☑

  The count of rolling an odd number from a sample proportion size of 100 can be approximated with a normal distribution

- ☐

  Rolling an even number is considered a success

- ☐

  The count of rolling an odd number can be approximated with a normal distribution

- ☐

  The count of rolling an even number can be approximated with a normal distribution

RATIONALE

If we look at the counts from a large population of success and failures (2 outcomes), this is called a binomial distribution. Since we are examining odds and evens, which are discrete non-numeric values, the normal distribution cannot be used here.

CONCEPT

[Distribution of Sample Proportions](#)
[I need help with this question](#)
16

George measured the weight of a random sample of 49 cartons of apples. The mean weight was 45.5 pounds, with a standard deviation of 3.

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$$

To see if the cartons have a significantly different mean weight from 46 pounds, what would the value of the z-test statistic be? Answer choices are rounded to the hundredths place.

- ☐

  -0.13

- ☐

  1.17

- ☑

  -1.17

- ☐

  0.13

RATIONALE

If we first note the denominator of $\dfrac{\sigma}{\sqrt{n}} = \dfrac{3}{\sqrt{49}} = \dfrac{3}{7} = 0.429$

Then, getting the z-score we can note it is $z = \dfrac{\bar{x} - \mu}{0.429} = \dfrac{45.5 - 46}{0.429} = -1.17$

This tells us that 45.5 is 1.17 standard deviations below the value of 46.

CONCEPT

Z-Test for Population Means
I need help with this question
17

Which of the following assumptions for a two-way ANOVA is FALSE?

- ☐

  The groups must have the same sample size.

- ☐

  The sample populations must be normally or approximately normally distributed.

- ☑

  The samples must be dependent.

- ☐

  The variances of the populations must be equal.

RATIONALE

Inside of the one-way ANOVA we assume that we take an independent and identically distributed sample. So we don't assume dependence.

CONCEPT

One-Way ANOVA/Two-Way ANOVA
I need help with this question
18

Amanda is the owner of a small chain of dental offices. She sent out the yearly satisfaction survey to 600 randomly selected patients and received 544 surveys back. When looking through the results, she noticed that the downtown dental office staff had 84% of clients reporting satisfaction with services, while the uptown dental office staff had 76% of clients reporting satisfaction with services.

Which of the following sets shows Amanda's null hypothesis and alternative hypothesis?

- ☐

  Null Hypothesis: The proportion of clients satisfied at the uptown office is 76%.
  Alternative Hypothesis: There is no difference in the satisfaction between the uptown and the downtown clients.

- ☐

  Null Hypothesis: The proportion of clients satisfied at the downtown office is 84%.
  Alternative Hypothesis: Uptown clients are more satisfied with the dental office staff than downtown clients.

- ☑

  Null Hypothesis: The proportion of clients satisfied at the downtown office is equal to the proportion of clients satisfied at the uptown office.
  Alternative Hypothesis: There is a difference in the satisfaction between the uptown and the downtown clients.

- ☐

  Null Hypothesis: The proportion of clients satisfied at the downtown office is greater than the proportion of clients satisfied at the uptown office.
  Alternative Hypothesis: Downtown clients are less satisfied with the dental office staff than uptown clients.

RATIONALE

Recall that the null hypothesis is always of no difference.

So the null hypothesis (Ho) is that the proportion of patients satisfied at the uptown clinic = proportion satisfied at the downtown clinic. This would indicate no difference
between the two groups.

The alternative hypothesis (Ha) is that there is difference in the proportion of patients satisfied between the two groups.

CONCEPT

Hypothesis Testing
I need help with this question
19

The data below shows the daily low temperatures, in degrees Fahrenheit, of a city for one week.

Day	Low Temperature, in Fahrenheit
Monday	54.5
Tuesday	53
Wednesday	56.5
Thursday	54
Friday	52.5
Saturday	51
Sunday	53

The standard error of the sample mean for this set of data is _____. Answer choices are rounded to the hundredths place.

- ☐

  1.31

- ☐

  0.25

- ☑

  0.65

- ☐

  1.73

RATIONALE

In order to get the standard error of the mean, we can use the following formula:

fraction numerator s over denominator square root of n end fraction, where s is the standard deviation and n is the sample size.

Either calculate by hand or use Excel to find the standard deviation, which is 1.73. The sample size is seven days.

The standard error is then:

$$standard\ error = \frac{s}{\sqrt{n}} = \frac{1.73}{\sqrt{7}} = 0.65$$

CONCEPT

Calculating Standard Error of a Sample Mean
I need help with this question
20

A superintendent of a school district conducted a survey to find out the level of job satisfaction among teachers. Out of 53 teachers who replied to the survey, 13 claim they are satisfied with their job.

$$z = \frac{\hat{p} - p}{\sqrt{\dfrac{pq}{n}}}$$

The superintendent wishes to construct a significance test for her data. She finds that the proportion of satisfied teachers nationally is 18.4%.

What is the z-statistic for this data? Answer choices are rounded to the hundredths place.

- ✔

○ 1.15 ✓

- ☐

  0.61

- ☐

  1.24

- ☑ ✗

  2.90

RATIONALE

To make things a little easier, let's first note the denominator $\sqrt{\dfrac{pq}{n}} = \sqrt{\dfrac{0.184(0.816)}{53}} = 0.053$

We can now note that $\hat{p} = \dfrac{13}{53} = 0.245$

Finally, subbing all in we find $z = \dfrac{\hat{p} - p}{\sqrt{\dfrac{pq}{n}}} = \dfrac{0.245 - 0.184}{0.053} = 1.15$

CONCEPT

Z-Test for Population Proportions
I need help with this question
21

What do the symbols p, σ, and μ represent?

- ☐

  Sample statistics

- ☐

  Defined variables

- ☑

  Population parameters

- ☐

  Variables of interest

RATIONALE

Recall that p is the population proportion, σ is the population standard deviation, and μ is the population mean. Since all these values come from the population, they are parameters.

CONCEPT

A table represents the number of students who passed or failed an aptitude test at two different campuses.

	South Campus	North Campus
Passed	42	31
Failed	58	69

In order to determine if there is a significant difference between campuses and pass rate, the chi-square test for association and independence should be performed.

What is the expected frequency of South Campus and passed?
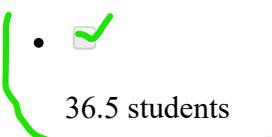
- ☐ 42 students

- ☑ 43.7 students ✗

- ☐ 50 students

- ☑ 36.5 students ✓

RATIONALE

In order to get the expected counts we can note the formula is:

$$Expected\ Count = \frac{Row\ total * column\ total}{total} = \frac{73 * 100}{200} = 36.5$$

CONCEPT

Adam tabulated the values for the average speeds on each day of his road trip as 60.5, 63.2, 54.7, 51.6, 72.3, 70.7, 67.2, and 65.4 mph. The sample standard deviation is 7.309.

Adam reads that the average speed that cars drive on the highway is 65 mph.

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}}$$

The *t*-test statistic for a two-sided test would be _____. Answer choices are rounded to the hundredths place.

- ☐

  -1.44

- ☐

  -1.39

- ☐

  -2.87

- ☑

  -0.70

RATIONALE

Using the information given, we need to find the sample mean:

$$\bar{x} = sample\ mean = \frac{60.5 + 63.2 + 54.7 + 51.6 + 72.3 + 70.7 + 67.2 + 65.4}{8} = 63.2$$

We now know the following information:

$\bar{x} = sample\ mean = 63.2$
$\mu = population\ mean = 65$
$s = sample\ standard\ deviation = 7.309$
$n = 8$

Let's plug in the values into the formula:
$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{63.2 - 65}{7.309/\sqrt{8}} = \frac{-1.8}{7.309/2.83} = \frac{-1.8}{2.58} = -0.70$$

CONCEPT

T-Tests
I need help with this question
24

Mrs. Pellegrin has weighed 5 packages of cheese and recorded the weights as 10.2 oz, 10.5 oz, 9.3 oz, 9.8 oz, and 10.0 oz. She calculated the standard deviation to be 0.45 oz.

Select the 95% confidence interval for Mrs. Pellegrin's set of data.

- ☐

9.34 to 10.44

- ✓ (checkmark)

9.4 to 10.52

- ☐

9.48 to 10.44

- ✓ ✗

9.53 to 10.39

RATIONALE

In order to get the 95% CI , we first need to find the critical t-score. Using a t-table, we need to find (n-1) degrees of freedom, or (5-1) = 4 df and the corresponding CI

Using the 95% CI in the bottom row and 4 df on the far left column, we get a t-critical score of 2.776.

We also need to calculate the mean:

$$\bar{x} = \frac{10.2 + 10.5 + 9.3 + 9.8 + 10}{5} = \frac{49.8}{5} = 9.96$$

So we use the formula to find the confidence interval:

$$CI = \bar{x} \pm t^* \left(\frac{s}{\sqrt{n}} \right) = 9.96 \pm 2.776 \left(\frac{0.45}{\sqrt{5}} \right) = 9.96 \pm 2.776 \left(\frac{0.45}{2.24} \right) = 9.96 \pm 2.776(0.20) = 9.96 \pm 0.56$$

The lower bound is:

9.96 -0.56 = 9.40

The upper bound is:

9.96+0.56 = 10.52

CONCEPT

Confidence Intervals Using the T-Distribution
I need help with this question

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