Table of z values and probabilities for the standard normal distribution. z is the first column plus the top row. Each cell shows $P(X \leq z)$. For example $P(X \leq 1.04) = .8508$. For $z < 0$ subtract the value from 1, e.g., $P(X \leq -1.04) = 1 - .8508 = .1492$.

z	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

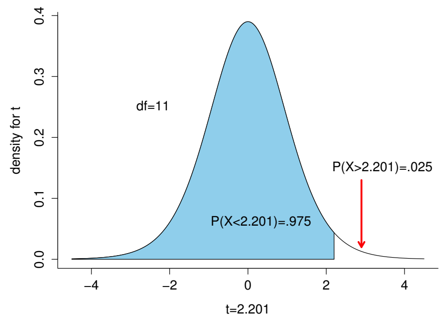

Table of t values and right tail probabilities. Degrees of freedom are in the first column (df). **Right tail probabilities** are in the first row. For example for $d.f. = 7$ and $\alpha = .05$ the critical t value for a two-tail test is 2.365 and for $d.f. = 10$ and $\alpha = .1$ the critical t value for a one-tail test is 1.372.					
df	.1	.05	.025	.01	.005
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
50	1.299	1.676	2.009	2.403	2.678
75	1.293	1.665	1.992	2.377	2.643
100	1.290	1.660	1.984	2.364	2.626

Table of F values for right tail probabilities of .05. Degrees of freedom for denominator are in the first column and degrees of freedom for the numerator are in the top row.										
denom.	numerator df									
df	1	2	3	4	5	7	10	15	50	100
1	161.45	199.5	215.71	224.58	230.16	236.77	241.88	245.95	251.77	253.04
2	18.51	19	19.16	19.25	19.3	19.35	19.4	19.43	19.48	19.49
3	10.13	9.55	9.28	9.12	9.01	8.89	8.79	8.7	8.58	8.55
4	7.71	6.94	6.59	6.39	6.26	6.09	5.96	5.86	5.7	5.66
5	6.61	5.79	5.41	5.19	5.05	4.88	4.74	4.62	4.44	4.41
6	5.99	5.14	4.76	4.53	4.39	4.21	4.06	3.94	3.75	3.71
7	5.59	4.74	4.35	4.12	3.97	3.79	3.64	3.51	3.32	3.27
8	5.32	4.46	4.07	3.84	3.69	3.5	3.35	3.22	3.02	2.97
9	5.12	4.26	3.86	3.63	3.48	3.29	3.14	3.01	2.8	2.76
10	4.96	4.1	3.71	3.48	3.33	3.14	2.98	2.85	2.64	2.59
11	4.84	3.98	3.59	3.36	3.2	3.01	2.85	2.72	2.51	2.46
12	4.75	3.89	3.49	3.26	3.11	2.91	2.75	2.62	2.4	2.35
13	4.67	3.81	3.41	3.18	3.03	2.83	2.67	2.53	2.31	2.26
14	4.6	3.74	3.34	3.11	2.96	2.76	2.6	2.46	2.24	2.19
15	4.54	3.68	3.29	3.06	2.9	2.71	2.54	2.4	2.18	2.12
16	4.49	3.63	3.24	3.01	2.85	2.66	2.49	2.35	2.12	2.07
17	4.45	3.59	3.2	2.96	2.81	2.61	2.45	2.31	2.08	2.02
18	4.41	3.55	3.16	2.93	2.77	2.58	2.41	2.27	2.04	1.98
19	4.38	3.52	3.13	2.9	2.74	2.54	2.38	2.23	2	1.94
20	4.35	3.49	3.1	2.87	2.71	2.51	2.35	2.2	1.97	1.91
21	4.32	3.47	3.07	2.84	2.68	2.49	2.32	2.18	1.94	1.88
22	4.3	3.44	3.05	2.82	2.66	2.46	2.3	2.15	1.91	1.85
23	4.28	3.42	3.03	2.8	2.64	2.44	2.27	2.13	1.88	1.82
24	4.26	3.4	3.01	2.78	2.62	2.42	2.25	2.11	1.86	1.8
25	4.24	3.39	2.99	2.76	2.6	2.4	2.24	2.09	1.84	1.78
26	4.23	3.37	2.98	2.74	2.59	2.39	2.22	2.07	1.82	1.76
27	4.21	3.35	2.96	2.73	2.57	2.37	2.2	2.06	1.81	1.74
28	4.2	3.34	2.95	2.71	2.56	2.36	2.19	2.04	1.79	1.73
29	4.18	3.33	2.93	2.7	2.55	2.35	2.18	2.03	1.77	1.71
30	4.17	3.32	2.92	2.69	2.53	2.33	2.16	2.01	1.76	1.7
40	4.08	3.23	2.84	2.61	2.45	2.25	2.08	1.92	1.66	1.59
60	4	3.15	2.76	2.53	2.37	2.17	1.99	1.84	1.56	1.48
100	3.94	3.09	2.7	2.46	2.31	2.1	1.93	1.77	1.48	1.39
1000	3.85	3	2.61	2.38	2.22	2.02	1.84	1.68	1.36	1.26

Chapter 3:

sample mean: $\bar{x} = \sum_{i=1}^{n} x_i / n$

sample variance: $s^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}$.

sample standard deviation: $s = \sqrt{s^2}$.

Coefficient of Variation: $CV = \frac{s}{\bar{x}}\left(100\%\right)$

sample z-Score: $z = \frac{x_i - \bar{x}}{s}$

Interquartile Range: IQR $= Q_3 - Q_1$.

Sample Covariance: $s_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{n-1}$

Sample Correlation Coefficient: $r_{xy} = s_{xy}/(s_x s_y)$

Chapter 4:

The complement rule: $P(A) + P(A') = 1$

addition rule: $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

conditional probability: $P(A|B) = \frac{P(A \text{ and } B)}{P(B)}$

Bayes' Theorem

$$P(A_i|B) = \frac{P(A_i)P(B|A_i)}{P(A_1)P(B|A_1) + P(A_2)P(B|A_2) + \cdots + P(A_n)P(B|A_n)}$$

Combinations: ${}_nC_x = \frac{n!}{(n-x)!x!}$

Chapter 5:

Expected Value and mean of a Discrete Probability Distribution:

$$E(x) = \mu = \sum_{i=1}^{n} x_i P(x_i)$$

Variance of a Discrete Probability Distribution:

$$\sigma^2 = \sum_{i=1}^{n}(x_i - \mu)^2 P(x_i)$$

Chapter 5 continued:

Binomial Probability Dist.: $P(x, n) = \frac{n!}{(n-x)!x!} p^x (q)^{(n-x)}$

Mean of a Binomial Distribution: $\mu = np$

Standard Dev. of a Binomial Distribution: $\sigma = \sqrt{npq}$

Poisson Probability Distribution: $P(x) = \frac{\lambda^x e^{-\lambda}}{x!}$

Chapter 6:

Normal PDF: $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(1/2)[(x-\mu)/\sigma]^2}$

the z-score: $z = \frac{x - \mu}{\sigma}$

Exponential PDF: $f(x) = \lambda e^{-\lambda x}$

Exponential CDF: $P(x \leq a) = 1 - e^{-a\lambda}$

Standard Dev. of Exponential Dist.: $\sigma = \mu = \frac{1}{\lambda}$

Continuous Uniform PDF

$$f(x) = \begin{cases} \frac{1}{b-a} & \text{if } a \leq x \leq b \\ 0 & \text{otherwise} \end{cases}$$

Uniform CDF: $P(x_1 \leq x \leq x_2) = \frac{x_2 - x_1}{b - a}$

mean of the continuous uniform dist.: $\mu = \frac{a+b}{2}$

standard dev. of the continuous uniform dist.: $\sigma = \frac{b-a}{\sqrt{12}}$

Chapter 7:

standard error of the mean: $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$.

z-score for the mean: $z_{\bar{x}} = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}}$

Chapter 7 continued:

sample proportion: $\bar{p} = \frac{x}{n}$

standard error of the proportion: $\sigma_{\bar{p}} = \sqrt{\frac{p(1-p)}{n}}$

Chapter 8:

Confidence Interval for the mean (σ known):

$$\bar{x} \pm z_{\alpha/2}\sigma_{\bar{x}}$$

margin of error for a CI for the mean: $ME_{\bar{x}} = z_{\alpha/2}\sigma_{\bar{x}}$

approximate standard error of the mean: $\hat{\sigma}_{\bar{x}} = \frac{s}{\sqrt{n}}$.

Confidence Interval for the mean (σ unknown):

$$\bar{x} \pm t_{\alpha/2}\hat{\sigma}_{\bar{x}}$$

Sample Size needed to Estimate a population mean

$$n = \frac{(z_{\alpha/2})^2\sigma^2}{(ME_{\bar{x}})^2}$$

Sample Size needed to Estimate the population proportion

$$n = \frac{(z_{\alpha/2})^2\bar{p}(1-\bar{p})}{(ME_p)^2}$$

Chapter 9:

the z-test statistic for a hypothesis test for the population mean (when σ is known)

$$z_{\bar{x}} = \frac{\bar{x} - \mu_{H_0}}{\sigma/\sqrt{n}}$$

the t-test statistic for a hypothesis test for the population mean (when σ is unknown)

$$t_{\bar{x}} = \frac{\bar{x} - \mu_{H_0}}{s/\sqrt{n}}$$

Chapter 10:

the mean of the sampling distribution for the difference in means:

$$\mu_{\bar{x}_1-\bar{x}_2} = \mu_{\bar{x}_1} - \mu_{\bar{x}_2}$$

the standard error of the difference between two means:

$$\sigma_{\bar{x}_1-\bar{x}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

the z-test statistic for a hypothesis test for the difference between two means (σ_1 and σ_2 known)

$$z_{\bar{x}} = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)_{H_0}}{\sigma_{\bar{x}_1-\bar{x}_2}}$$

the t-test statistic for a hypothesis test for the difference between two means (σ_1 and σ_2 unknown but equal)

$$t_{\bar{x}} = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)_{H_0}}{\sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

pooled variance: $s_p^2 = \dfrac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{(n_1-1)+(n_2-1)}$

the t-test statistic for a hypothesis test for the difference between two means (σ_1 and σ_2 unknown and unequal)

$$t_{\bar{x}} = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)_{H_0}}{\sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}}$$

Confidence Interval for the difference between the means of two independent populations (σ_1 and σ_2 unknown but equal)

$$(\bar{x}_1 - \bar{x}_2) \pm t_{\alpha/2}\sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}}$$

the matched-pair difference: $d = x_1 - x_2$

the mean of matched-pair difference: $\bar{d} = \dfrac{\sum_{i=1}^n d_i}{n}$

the standard deviation of the matched-pair differences

$$s_d = \sqrt{\frac{\sum_{i=1}^n (d_i - \bar{d})^2}{n-1}}$$

the t-Test Statistic for a Matched-Pair hypothesis test for the mean

$$t_{\bar{x}} = \frac{\bar{d} - (\mu_d)_{H_0}}{s_d/\sqrt{n}}$$

Chapter 11:

the total sum of squares (SST): $SST = \sum_{j=1}^{k}\sum_{i=1}^{n_j}(x_{ij} - \bar{\bar{x}})^2$

the mean square total (MST): $MST = \dfrac{SST}{n_T - 1}$

the partitioning of the Total Sum of Squares (SST) for a One-Way ANOVA: SST=SSB+SSW.

sum of squares between (SSB): $SSB = \sum_{j=1}^{k} n - j(\bar{x}_j - \bar{\bar{x}})^2$

the mean square between (MSB): $MSB = \dfrac{SSB}{k-1}$

sum of squares within (SSW): $SSW = \sum_{j=1}^{k}\sum_{i=1}^{n_j}(x_{ij} - \bar{x}_j)^2$

the mean square within (MSW): $MSW = \dfrac{SSW}{n_T - k}$

the F-test statistic for One-Way ANOVA: $F_{\bar{x}} = \dfrac{MSB}{MSW}$

Tukey-Kramer critical range:

$$CR_{ij} = Q_\alpha\sqrt{\frac{MSW}{2}\left(\frac{1}{n_i} + \frac{1}{n_j}\right)}$$

Chapter 14: simple linear regression model for a population $y_i = \beta_0 + \beta_1 x_i + \epsilon_i$

$$\hat{y} = b_0 + b_1 x \qquad e_i = y_i - \hat{y}_i$$

sum of squares error: $SSE = \sum_{i=1}^{n}(y_i - \hat{y}_i)^2$

total sum of squares (SST): $SST = \sum(y - \bar{y})^2$

$$SST = SSR + SSE$$

sum of squares regression (SSR): $SSR = \sum(\hat{y} - \bar{y})^2$

Chapter 14 continued:

$$R^2 = \frac{SSR}{SST}$$

F-statistic for the coef. of determination: $F = \dfrac{SSR}{SSE/(n-2)}$

Standard Error of the Estimate, $s_e = \sqrt{SSE/(n-2)}$.
Confidence Interval (CI) for an average value of Y:

$$CI = \hat{y}^* \pm t_{\alpha/2}s_e\sqrt{\frac{1}{n} + \frac{(x-\bar{x})^2}{\sum x^2 - ((\sum x)^2/n)}}$$

Prediction Interval (PI) fpr a specific value of y:

$$PI = \hat{y}^* \pm t_{\alpha/2}s_e\sqrt{1 + \frac{1}{n} + \frac{(x-\bar{x})^2}{\sum x^2 - ((\sum x)^2/n)}}$$

t-test statistic for the regression slope: $t = \dfrac{b_1 - \beta_1}{s_b}$

the standard error of a slope: $s_b = \dfrac{s_e}{\sqrt{\sum x^2 - n(\bar{x})^2}}$

confid. interval for the pop. slope: $CI = b_1 \pm t_{\alpha/2}s_b$

Chapter 15:

mean square regression (MSR): $MSR = SSR/k$

mean square error (MSE): $MSE = SSE/(n-k-1)$

F-test stat. for the overall regression model: $F = \dfrac{MSR}{MSE}$

adjusted multiple coef. of det.: $R_A^2 = 1 - (1-R^2)\dfrac{n-1}{n-k-1}$

variance inflation factor: $VIF_j = \dfrac{1}{1-R_j^2}$

Other Math Rule Reminders:

$$e^x = \exp(x) \quad \text{and} \quad \ln 1 = 0 \quad \text{and} \quad \ln e = 1$$

$$x! = (x)(x-1)(x-2)\cdots(2)(1) \quad \text{and} \quad 0! = 1 \quad \text{and} \quad x^0 = 1$$

Use the output below to answer the appropriate questions in the exam. Be sure to check which table the question references.

ANOVA Table 1

	SS	DF	MS	F	p
Between	41.167	?	20.583	1.756	0.2271
Within	105.5	?	11.722		

Here is regression output from a model where years of education is the independent variable and starting salary is the dependent variable. The data are from employees at Harris Bank (source, Dielman 2005).

Regression Table 2

Regression Statistics	
R Square	?
Adjusted R Square	?
Standard Error	650.1120447
Observations	93

ANOVA

	SS	DF	MS	F	p
Regression	7862534.292	1	7862534.292	18.603	0.0000408
Residual	38460756.031	91	422645.671		

	coefficients	standard error	t stat	p-value
intercept	3818.5597936	377.4376581	?	0
years of education	128.0859322	29.6967122	?	0.00004

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NAME:____

VERSION B

Choose the best answer. Do not write letters in the margin or communicate with other students in any way. If you have a question note it on your exam and ask for clarification when your exam is returned. In the meantime choose the best answer. Neither the proctors nor Dr. Cox will answer questions during the exam.

Please check each question and possible answers thoroughly as questions at the bottom of a page sometimes run onto the next page. Please verify that your test version and scantron version are the same.

This exam has 25 questions. Cost for turning in exam late: 1st minute is 10 points; 2nd minute is 20 additional points (30 total); 3rd minute is 30 points (60 total) ; 4th minute is 40 points (100 total); 5th minute is 50 points (150 total); 6th minute is 80 points (230 total) and no exams are graded past that point.

1. I have checked that my ID is bubbled in correctly. If it is bubbled in incorrectly I will get this question wrong. I also understand that questions and their possible answers may run onto the next page and so I should always check the top of the next page for possible answers. I understand that if I have a question I should simply make a note on my exam and ask Dr. Cox afterwards. I should always choose the best answer.

   (a) False.
   (b) I didn't read the directions.
   (c) True.

2. Suppose that you collect data on television prices. You look at 46 different retailers and find a mean of 753 and a standard deviation of 150.2. Test the hypothesis, $H_0 : \mu = 731$ at the .05 level of significance.

   (a) the test statistic is 0.9934172 so we rejcet the null
   (b) the test statistic is 0.7140755 so we fail to reject
   (c) the test statistic is 0.9934172 so we fail to reject
   (d) the test statistic is 1.2027589 so we rejcet the null

3. Suppose you have a random variable that is exponentially distributed with a mean of 50. What is the probability of observing a random variable drawn from this distribution with a value of less than 36?

   (a) 0.4378576
   (b) 0.7630722
   (c) 0.5785272
   (d) 0.5132477

4. Consider the regression output in Table 2. What is the estimated increase in starting salary associated with a 1 unit increase in years of education ?

   (a) 18.603
   (b) 182.9799032
   (c) 98.5276402
   (d) 650.1120447
   (e) 128.0859322

5. Consider the regression output in Table 2. What is the estimated variance of the error term?

(a) 325.0560224
(b) 650.1120447
(c) 422645.6706699
(d) 18.603

6. Consider the regression output in Table 2. What is the percentage of variation in starting salary that can be explained by the variation in years of education?

   (a) 16.0607948%
   (b) −15.9731775%
   (c) 16.9731775%
   (d) 20.367813%

7. Consider the regression output in Table 2. What is the predicted or estimated starting salary for a when years of education is 16 years?

   (a) 5867.9347094
   (b) 5419.6339466
   (c) 5483.6769127
   (d) 6124.1065739
   (e) 4971.3331838

8. Consider the regression output in Table 2. Suppose you want to test the hypothesis that years of education is worth $150 per additional year (the data are from the early 1970s), i.e. $H_0 : \beta_1 = 150$. What is the test statistic for this hypothesis?

   (a) 0.9593078
   (b) −0.5165504
   (c) 4.3131351
   (d) −0.7379291
   (e) 0.7379291

9. Consider the regression output in Table 2. Suppose you want to test the hypothesis that years of education has no impact on starting salary, i.e. $H_0 : \beta_1 = 0$. What is you conclusion for this hypothesis test? (Use $\alpha = .05$.)

   (a) This is inconclusive unless we know whether it is a right tail or a left tail test.
   (b) This cannot be determined without the appropriate df.

(c) rejcet the null
(d) fail to reject

10. Pie charts are best for

(a) Time series data.
(b) Secondary data.
(c) Cross sectional data.
(d) Categorical data.
(e) Survey data.

11. Find the median for the following data, 2, 3, 4, 5, 6, 6.1.

(a) 4.
(b) 5.
(c) 4.35.
(d) 4.1.
(e) 4.5.

12. The maximum is always greater than the median.

(a) True.
(b) False.

13. X follows the uniform distribution with minimum of 70 and maximum of 140. Find $P(X < 80)$.

(a) 0.1242857
(b) 0.1357143
(c) 0.1285714
(d) 0.1428571.
(e) cannot be determined without μ.

14. X follows the uniform distribution with mean of 50 and $P(X < 50) = .5$. What is the minimum value for X?

(a) 0.
(b) 50.

(c) 60.
(d) 40.
(e) cannot be determined.

15. The probability that a z value is less than 0.23 is

    (a) 0.5690673
    (b) 0.7673049
    (c) 0.5909541
    (d) 0.3936679
    (e) 0.3935801

16. Consult Table 1. From the table you can conclude that the total sum of squares is ?

    (a) 105.5
    (b) 64.3333333
    (c) 73.3333333
    (d) 146.6666667

17. Consult Table 1. From the table you can conclude that the total number of observations used in this analysis/experiment was?

    (a) 12
    (b) 9
    (c) 10
    (d) 2

18. Consult Table 1. From the table what can you conclude concerning the null hypothesis?

    (a) cannot be determined
    (b) depends on the number of observations.
    (c) fail to reject
    (d) rejcet the null

19. Consult Table 1. What is the test statistic?

    (a) 1.7559242.

(b) 0.2270621.
(c) 0.8779621.
(d) 20.5833333.

20. Consult Table 1. What is the critical value for a test at the .05 level?

(a) 4.26
(b) 2.36
(c) 6.94
(d) 19

21. Suppose that the number of homework assigments a professor gives follows a Poisson distribution with a mean of 13. What is the probability of drawing a professor that gives exactly 9 assignments?

(a) 0.102087
(b) 0.0324072
(c) 0.0873644
(d) 0.066054

22. Suppose that you collect data on phone prices. You look at 46 different phones and find a mean of 376.5 and a standard deviation of 75.1. Construct a 95% confidence interval for the mean phone price. The interval is

(a) [356.1980529, 396.8019471]
(b) [354.1980529, 398.8019471]
(c) [351.1980529, 401.8019471]
(d) [318.7782476, 358.9217524]

23. The greater the value of α the wider will be a confidence interval.

(a) True.
(b) False.

24. In our treatment of regression analysis we made which assumption(s)

(a) ϵ and X are normally distributed.
(b) Y is normally distributed.

(c) X is normally distributed.

(d) ϵ is normally distributed.

(e) all of the above.

25. Suppose you have a data set with a variable X and you create a new variable $Y = 2X$. Suppose that the LL_x and UL_x are the lower limit and upper limit for a given confidence interval for μ_x, the mean of X. Suppose that for the same confidence coefficient LL_y and UL_y are the lower limit and upper limit for the confidence interval for μ_y, the mean of Y.

    (a) $LL_y > 2LL_x$ and $UL_y < 2UL_x$

    (b) $LL_y < 2LL_x$ and $UL_y > 2UL_x$

    (c) $LL_y = .5LL_x$ and $UL_y = .5UL_x$

    (d) $LL_y = 2LL_x$ and $UL_y = 2UL_x$

    (e) none of the above

The following 3 questions relate to the table below which shows the Fall 2016 students in my ECN221 classes.

Academic Level	Non-Resident	Resident	total
Freshman	14	9	23
Sophmore	275	269	544
Junior	30	126	156
Senior	2	21	23
Post-BAC undergrad.	0	4	4
Total	321	429	750

26. Use the class data. What is $P(\text{Senior}|\text{Resident})$?

    (a) 0.1398601

    (b) 0.7482517

    (c) 0.2331002

    (d) 0.2937063

    (e) 0.048951

27. Use the class data. What is $P(\text{Freshman} \cap \text{Senior})$?

    (a) 0

    (b) 0.756

(c) 0.3684211
(d) 0.0613333
(e) 0.04

28. Use the class data. What is $P(\text{Resident})$?

(a) 0.428
(b) 0.572
(c) 269
(d) 0.3586667
(e) 0.144

29. Calculate the coefficient of variation for the following data, 10, 20, 30, 33.

(a) 44.5862366%
(b) 42.3569247%
(c) 49.4907226%
(d) 52.6117591%
(e) 54.3952086%

30. The coefficient of variation is most useful when

(a) comparing two data sets with noticably different means.
(b) working with ratio data.
(c) working with interval data.
(d) the standard deviation and variance are close together.
(e) the variance is too large to yield a natural interpretation

Key

1. c
2. c.
3. d
4. e
5. c
6. c,
7. a
8. d
9. c
10. d
11. e
12. b
13. d
14. e,
15. c
16. d
17. a
18. c
19. a
20. a
21. d
22. b
23. b
24. d

25. d
26. e
27. a
28. b
29. a
30. a