Sample exam A

Stephanie Ranft S2459825

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Statistics 2
PSBE2-07

After the new Federal Budget was published, elderly people complained that the subsidies for health care were reduced for their age group. A study was conducted to determine if the number of doctor visits in a year is a financial detriment to elderly people, by analysing the number of doctor visits in a year for people under 40, between 40 and 60, and the elderly (60+). Use the following table for questions 1 to 3.

Table 1: ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1749.430				
Within Groups		249	65.573		
Total	17578.990	251			

1. Which is the correct value of the F statistic and how many degrees of freedom?
   (a) $F = 13.759$ with (2,249) degrees of freedom.
   (b) $F = 12.490$ with (2,249) degrees of freedom.
   (c) $F = 13.759$ with (249,2) degrees of freedom.
   (d) $F = 12.490$ with (249,2) degrees of freedom.
2. Using the F-table provided, what can you conclude about the significance of the calculated F?
   (a) It is not possible to know if it is or isn't significant without the p-value.
   (b) The calculated F is not significant at $\alpha = 0.05$.
   (c) The calculated F is significant at $\alpha = 0.05$.
   (d) The calculated F is significant at $\alpha = 0.025$.
3. Which inference is incorrect.
   (a) This test shows that elderly people like to complain, even when there is nothing to complain about.
   (b) Citizens can feel assured that their government has made wise decisions.
   (c) Health care subsidies should be provided to people aged 40+, and not only 60+.
   (d) Elderly people should have their health care subsidised.

Questions 4 to 8 are based on the following table:

Table 2: A research study was conducted to examine the impact of eating a high protein breakfast on adolescents' performance during a physical education fitness test. Half of the subjects received a high protein breakfast and half were given a low protein breakfast. All of the adolescents, both male and female, were given a fitness test with high scores representing better performance.

Group	**High protein**	**Low protein**
Males	10	5
	7	4
	9	7
	6	4
	8	5
Females	5	3
	4	4
	6	5
	3	1
	2	2

4. What can you infer about the main and interaction effects?
   (a) There are no main effects, only an interaction effect.
   (b) There is a main effect for both factors.
   (c) There is a main effect for only factor 'Protein'.
   (d) There is a main effect for only factor 'Gender'.

5. The hypothesis being tested is,
   (a) Eating a high-protein breakfast does not improve the physical fitness of young boys.
   (b) Students, male and female, should eat breakfast before undertaking physical exercise in the mornings.
   (c) Young peoples' athleticism is unaffected by the nutrition content of their breakfast or gender.
   (d) Males and females perform better in tests if they eat a healthy breakfast in the morning.

6. You calculate the F values for 'Protein' (8.89), 'Gender' (20.00) and the interaction (2.22), what can you infer (refer to the F-table)?
   (a) There is an observable distinction between those who do or do not maintain a diet rich in amino acids, despite obvious sex differences.
   (b) A high-calorie diet improves the physical fitness of young people, across the sexes.
   (c) Women who eat a lot of protein in the morning are more physically capable than their male counterparts who do not.
   (d) A nutritious breakfast does not ensure physical prowess.

7. What is the correct value of s_p?
   (*Hint:* first calculate $\mathrm{SS}_{\mathrm{gender}}$ using Table 2.)
   (a) 1.5
   (b) 2.36
   (c) 2.25
   (d) 1.87

8. The researchers wish to study the contrast between young boys who eat a lot of protein in the morning and young girls. What is the value of c and how is it distributed?
   (a) $c = 4.5$; t-test distributed with 16 degrees of freedom.
   (b) $c = 4.5$; F-test distributed with (1,16) degrees of freedom.
   (c) $c = 3$; F-test distributed with (1,16) degrees of freedom.
   (d) $c = 3$; t-test distributed with 16 degrees of freedom.

9. When running multiple comparisons in a 3x2 factorial design,
   (a) the number of tests equals the number of groups so the least squared differences approach suffices.
   (b) it is important to engage the Bonferroni method to increase the power of our test.
   (c) we compare the groups using a critical value of 2.35 at an overall significance level of 15% in a sample of size 200.
   (d) we compare the groups using a critical value of 2.60 at an overall significance level of 15% in a sample of size 200.

10. Which of the following components in an ANOVA table are not additive?
   (a) Sum of squares.
   (b) It is not possible to tell.
   (c) Mean squares.
   (d) Degrees of freedom.

A study is conducted to determine if there is some association between the age of the person and the number of hours per day they watch TV. The information following a regression has been summarised:

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	AGE OF RESPONDENT[b]	.	Enter

a. Dependent Variable: HOURS PER DAY WATCHING TV

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.157[a]	.025	.024	2.832

a. Predictors: (Constant), AGE OF RESPONDENT

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	263.067	1	263.067	32.790	.000[b]
	Residual	10381.370	1294	8.023		
	Total	10644.437	1295			

a. Dependent Variable: HOURS PER DAY WATCHING TV

b. Predictors: (Constant), AGE OF RESPONDENT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.878	.226		8.316	.000
	AGE OF RESPONDENT	.025	.004	.157	5.726	.000

a. Dependent Variable: HOURS PER DAY WATCHING TV

Figure 1

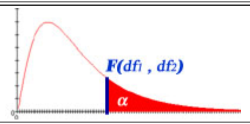
Use this table to answer questions 11 to 15.

11. The model $y = b_0 + b_1 x$
   (a) estimates the linear dependency of age on hours of TV watched.
   (b) estimates for the population the linear dependency between two independent variables.
   (c) estimates that two people born a year apart will differ by less than 2 minutes a day in terms of their daily TV habits.
   (d) is well suited to testing this relationship.

12. What proportion of the variation in the model is attributable to the variation in the actual and predicted values?
    (a) 2.5%
    (b) 15.7%
    (c) 2.8%
    (d) 0.4%
13. To test the null hypothesis $H_0 : R^2 = 0$, what applies to the critical value of this test at a 5% significance level?
    (a) 3.84
    (b) 1.96
    (c) 1.65
    (d) 3.00
14. What is the 95% confidence interval for the intercept β_0?
    (a) (1.07, 2.59)
    (b) (1.15, 2.51)
    (c) (1.21, 2.45)
    (d) (1.44, 2.32)
15. The 95% confidence interval for β_1 tells us,
    (a) we cannot reject our null hypothesis.
    (b) the variables are uncorrelated.
    (c) that there is a distinct relationship between x and y.
    (d) the relationship between x and y is best modelled using other means.

END OF EXAM

F Table for $\alpha = 0.05$



/	df_1=1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
df_2=1	161.4476	199.5000	215.7073	224.5832	230.1619	233.9860	236.7684	238.8827	240.5433	241.8817	243.9060	245.9499	248.0131	249.0518	250.0951	251.1432	252.1957	253.2529	254.3144
2	18.5128	19.0000	19.1643	19.2468	19.2964	19.3295	19.3532	19.3710	19.3848	19.3959	19.4125	19.4291	19.4458	19.4541	19.4624	19.4707	19.4791	19.4874	19.4957
3	10.1280	9.5521	9.2766	9.1172	9.0135	8.9406	8.8867	8.8452	8.8123	8.7855	8.7446	8.7029	8.6602	8.6385	8.6166	8.5944	8.5720	8.5494	8.5264
4	7.7086	6.9443	6.5914	6.3882	6.2561	6.1631	6.0942	6.0410	5.9988	5.9644	5.9117	5.8578	5.8025	5.7744	5.7459	5.7170	5.6877	5.6581	5.6281
5	6.6079	5.7861	5.4095	5.1922	5.0503	4.9503	4.8759	4.8183	4.7725	4.7351	4.6777	4.6188	4.5581	4.5272	4.4957	4.4638	4.4314	4.3985	4.3650
6	5.9874	5.1433	4.7571	4.5337	4.3874	4.2839	4.2067	4.1468	4.0990	4.0600	3.9999	3.9381	3.8742	3.8415	3.8082	3.7743	3.7398	3.7047	3.6689
7	5.5914	4.7374	4.3468	4.1203	3.9715	3.8660	3.7870	3.7257	3.6767	3.6365	3.5747	3.5107	3.4445	3.4105	3.3758	3.3404	3.3043	3.2674	3.2298
8	5.3177	4.4590	4.0662	3.8379	3.6875	3.5806	3.5005	3.4381	3.3881	3.3472	3.2839	3.2184	3.1503	3.1152	3.0794	3.0428	3.0053	2.9669	2.9276
9	5.1174	4.2565	3.8625	3.6331	3.4817	3.3738	3.2927	3.2296	3.1789	3.1373	3.0729	3.0061	2.9365	2.9005	2.8637	2.8259	2.7872	2.7475	2.7067
10	4.9646	4.1028	3.7083	3.4780	3.3258	3.2172	3.1355	3.0717	3.0204	2.9782	2.9130	2.8450	2.7740	2.7372	2.6996	2.6609	2.6211	2.5801	2.5379
11	4.8443	3.9823	3.5874	3.3567	3.2039	3.0946	3.0123	2.9480	2.8962	2.8536	2.7876	2.7186	2.6464	2.6090	2.5705	2.5309	2.4901	2.4480	2.4045
12	4.7472	3.8853	3.4903	3.2592	3.1059	2.9961	2.9134	2.8486	2.7964	2.7534	2.6866	2.6169	2.5436	2.5055	2.4663	2.4259	2.3842	2.3410	2.2962
13	4.6672	3.8056	3.4105	3.1791	3.0254	2.9153	2.8321	2.7669	2.7144	2.6710	2.6037	2.5331	2.4589	2.4202	2.3803	2.3392	2.2966	2.2524	2.2064
14	4.6001	3.7389	3.3439	3.1122	2.9582	2.8477	2.7642	2.6987	2.6458	2.6022	2.5342	2.4630	2.3879	2.3487	2.3082	2.2664	2.2229	2.1778	2.1307
15	4.5431	3.6823	3.2874	3.0556	2.9013	2.7905	2.7066	2.6408	2.5876	2.5437	2.4753	2.4034	2.3275	2.2878	2.2468	2.2043	2.1601	2.1141	2.0658
16	4.4940	3.6337	3.2389	3.0069	2.8524	2.7413	2.6572	2.5911	2.5377	2.4935	2.4247	2.3522	2.2756	2.2354	2.1938	2.1507	2.1058	2.0589	2.0096
17	4.4513	3.5915	3.1968	2.9647	2.8100	2.6987	2.6143	2.5480	2.4943	2.4499	2.3807	2.3077	2.2304	2.1898	2.1477	2.1040	2.0584	2.0107	1.9604
18	4.4139	3.5546	3.1599	2.9277	2.7729	2.6613	2.5767	2.5102	2.4563	2.4117	2.3421	2.2686	2.1906	2.1497	2.1071	2.0629	2.0166	1.9681	1.9168
19	4.3807	3.5219	3.1274	2.8951	2.7401	2.6283	2.5435	2.4768	2.4227	2.3779	2.3080	2.2341	2.1555	2.1141	2.0712	2.0264	1.9795	1.9302	1.8780
20	4.3512	3.4928	3.0984	2.8661	2.7109	2.5990	2.5140	2.4471	2.3928	2.3479	2.2776	2.2033	2.1242	2.0825	2.0391	1.9938	1.9464	1.8963	1.8432
21	4.3248	3.4668	3.0725	2.8401	2.6848	2.5727	2.4876	2.4205	2.3660	2.3210	2.2504	2.1757	2.0960	2.0540	2.0102	1.9645	1.9165	1.8657	1.8117
22	4.3009	3.4434	3.0491	2.8167	2.6613	2.5491	2.4638	2.3965	2.3419	2.2967	2.2258	2.1508	2.0707	2.0283	1.9842	1.9380	1.8894	1.8380	1.7831
23	4.2793	3.4221	3.0280	2.7955	2.6400	2.5277	2.4422	2.3748	2.3201	2.2747	2.2036	2.1282	2.0476	2.0050	1.9605	1.9139	1.8648	1.8128	1.7570
24	4.2597	3.4028	3.0088	2.7763	2.6207	2.5082	2.4226	2.3551	2.3002	2.2547	2.1834	2.1077	2.0267	1.9838	1.9390	1.8920	1.8424	1.7896	1.7330
25	4.2417	3.3852	2.9912	2.7587	2.6030	2.4904	2.4047	2.3371	2.2821	2.2365	2.1649	2.0889	2.0075	1.9643	1.9192	1.8718	1.8217	1.7684	1.7110
26	4.2252	3.3690	2.9752	2.7426	2.5868	2.4741	2.3883	2.3205	2.2655	2.2197	2.1479	2.0716	1.9898	1.9464	1.9010	1.8533	1.8027	1.7488	1.6906
27	4.2100	3.3541	2.9604	2.7278	2.5719	2.4591	2.3732	2.3053	2.2501	2.2043	2.1323	2.0558	1.9736	1.9299	1.8842	1.8361	1.7851	1.7306	1.6717
28	4.1960	3.3404	2.9467	2.7141	2.5581	2.4453	2.3593	2.2913	2.2360	2.1900	2.1179	2.0411	1.9586	1.9147	1.8687	1.8203	1.7689	1.7138	1.6541
29	4.1830	3.3277	2.9340	2.7014	2.5454	2.4324	2.3463	2.2783	2.2229	2.1768	2.1045	2.0275	1.9446	1.9005	1.8543	1.8055	1.7537	1.6981	1.6376
30	4.1709	3.3158	2.9223	2.6896	2.5336	2.4205	2.3343	2.2662	2.2107	2.1646	2.0921	2.0148	1.9317	1.8874	1.8409	1.7918	1.7396	1.6835	1.6223
40	4.0847	3.2317	2.8387	2.6060	2.4495	2.3359	2.2490	2.1802	2.1240	2.0772	2.0035	1.9245	1.8389	1.7929	1.7444	1.6928	1.6373	1.5766	1.5089
60	4.0012	3.1504	2.7581	2.5252	2.3683	2.2541	2.1665	2.0970	2.0401	1.9926	1.9174	1.8364	1.7480	1.7001	1.6491	1.5943	1.5343	1.4673	1.3893
120	3.9201	3.0718	2.6802	2.4472	2.2899	2.1750	2.0868	2.0164	1.9588	1.9105	1.8337	1.7505	1.6587	1.6084	1.5543	1.4952	1.4290	1.3519	1.2539
∞	3.8415	2.9957	2.6049	2.3719	2.2141	2.0986	2.0096	1.9384	1.8799	1.8307	1.7522	1.6664	1.5705	1.5173	1.4591	1.3940	1.3180	1.2214	1.0000

	Area in right tail = 0.25	Area in right tail = 0.20	Area in right tail = 0.15	Area in right tail = 0.10	Area in right tail = 0.05	Area in right tail = 0.025	Area in right tail = 0.02	Area in right tail = 0.01	Area in right tail = 0.005	Area in right tail = 0.0025	Area in right tail = 0.001	Area in right tail = 0.0005
DF	t-score	t-score	t-score	t-score	t-score	t-score	t-score	t-score	t-score	t-score	t-score	t-score
173	0.676	0.844	1.040	1.286	1.654	1.974	2.069	2.348	2.605	2.843	3.138	3.348
174	0.676	0.844	1.040	1.286	1.654	1.974	2.069	2.348	2.604	2.843	3.138	3.347
175	0.676	0.844	1.040	1.286	1.654	1.974	2.069	2.348	2.604	2.843	3.137	3.347
176	0.676	0.844	1.039	1.286	1.654	1.974	2.069	2.348	2.604	2.843	3.137	3.347
177	0.676	0.844	1.039	1.286	1.654	1.973	2.069	2.348	2.604	2.843	3.137	3.346
178	0.676	0.844	1.039	1.286	1.653	1.973	2.069	2.347	2.604	2.842	3.137	3.346
179	0.676	0.844	1.039	1.286	1.653	1.973	2.069	2.347	2.604	2.842	3.136	3.346
180	0.676	0.844	1.039	1.286	1.653	1.973	2.069	2.347	2.603	2.842	3.136	3.345
181	0.676	0.844	1.039	1.286	1.653	1.973	2.069	2.347	2.603	2.842	3.136	3.345
182	0.676	0.844	1.039	1.286	1.653	1.973	2.069	2.347	2.603	2.842	3.136	3.345
183	0.676	0.844	1.039	1.286	1.653	1.973	2.068	2.347	2.603	2.841	3.135	3.344
184	0.676	0.844	1.039	1.286	1.653	1.973	2.068	2.347	2.603	2.841	3.135	3.344
185	0.676	0.844	1.039	1.286	1.653	1.973	2.068	2.347	2.603	2.841	3.135	3.344
186	0.676	0.844	1.039	1.286	1.653	1.973	2.068	2.347	2.603	2.841	3.135	3.344
187	0.676	0.844	1.039	1.286	1.653	1.973	2.068	2.346	2.602	2.841	3.134	3.343
188	0.676	0.844	1.039	1.286	1.653	1.973	2.068	2.346	2.602	2.841	3.134	3.343
189	0.676	0.844	1.039	1.286	1.653	1.973	2.068	2.346	2.602	2.840	3.134	3.343
190	0.676	0.844	1.039	1.286	1.653	1.973	2.068	2.346	2.602	2.840	3.134	3.342
191	0.676	0.844	1.039	1.286	1.653	1.972	2.068	2.346	2.602	2.840	3.133	3.342
192	0.676	0.843	1.039	1.286	1.653	1.972	2.068	2.346	2.602	2.840	3.133	3.342
193	0.676	0.843	1.039	1.286	1.653	1.972	2.068	2.346	2.602	2.840	3.133	3.342
194	0.676	0.843	1.039	1.286	1.653	1.972	2.068	2.346	2.601	2.839	3.133	3.341
195	0.676	0.843	1.039	1.286	1.653	1.972	2.068	2.346	2.601	2.839	3.133	3.341
196	0.676	0.843	1.039	1.286	1.653	1.972	2.068	2.346	2.601	2.839	3.132	3.341
197	0.676	0.843	1.039	1.286	1.653	1.972	2.067	2.345	2.601	2.839	3.132	3.341
198	0.676	0.843	1.039	1.286	1.653	1.972	2.067	2.345	2.601	2.839	3.132	3.340
199	0.676	0.843	1.039	1.286	1.653	1.972	2.067	2.345	2.601	2.839	3.132	3.340
200	0.676	0.843	1.039	1.286	1.653	1.972	2.067	2.345	2.601	2.839	3.131	3.340
201	0.676	0.843	1.039	1.286	1.652	1.972	2.067	2.345	2.601	2.838	3.131	3.340
202	0.676	0.843	1.039	1.286	1.652	1.972	2.067	2.345	2.600	2.838	3.131	3.339
203	0.676	0.843	1.039	1.286	1.652	1.972	2.067	2.345	2.600	2.838	3.131	3.339