Practice Coding Problems
with Answer
Factorial Analysis-of-Variance

This file contains the original problems and the answers for the one-way ANOVA coding problems. Note that many other answers are possible. In particular, any row for a code given below can be multiplied by any constant, including -1, to produce an equivalent contrast code in terms of orthogonality. For example, the code (1/3, 1/3, -2/3) is equivalent to the code (5, 5, -10) and to the code (-1, -1, 2). Also some problems allow you to ask alternative questions that might not be the same questions for which we have suggested codes.

1. An educational psychologist is interested in the effects of two factors on achievement. The first factor is gender (male, female). The second factor is the type of goal structure set up within the classrooms (individualistic, competitive or cooperative).

m,ind	m,com	m,coop	f,ind	f,com	f,coop	
1/2	1/2	1/2	-1/2	-1/2	-1/2	1. Male vs Female
2/3	-1/3	-1/3	2/3	-1/3	-1/3	2. Ind. vs Group
0	1/2	-1/2	0	1/2	-1/2	3. Comp vs Coop
1/3	-1/6	-1/6	-1/3	1/6	1/6	4. (#1)x(#2)
0	1/4	-1/4	0	-1/4	1/4	5. (#1)x(#3)

#4 asks whether the ind vs. group difference depends upon gender

#5 asks whether the competition vs. cooperation difference depends on gender

2. A clinical psychologist is interested in the effects of number of therapy sessions (1, 15, or 30) and type of therapy (Gestalt, psychoanalytic, Rogerian, or behavior modification) on clients' satisfaction with therapy.

Code	1,G	1,P	1,R	1,B	15,G	15,P	15,R	15,B	30,G	30,P	30,R	30,B
1	-1	-1	-1	-1	0	0	0	0	1	1	1	1
2	-1	-1	-1	-1	2	2	2	2	-1	-1	-1	-1
3	-1	-1	-1	3	-1	-1	-1	3	-1	-1	-1	3
4	-1	2	-1	0	-1	2	-1	0	-1	2	-1	0
5	-1	0	1	0	-1	0	1	0	-1	0	1	0
6	1	1	1	-3	0	0	0	0	-1	-1	-1	3
7	1	-2	1	0	0	0	0	0	-1	2	-1	0
8	1	0	-1	0	0	0	0	0	-1	0	1	0
9	1	1	1	-3	-2	-2	-2	6	1	1	1	-3
10	1	-2	1	0	-2	4	-2	0	1	-2	1	0
11	1	0	-1	0	-2	0	2	0	1	0	-1	0

Codes for Number of Sessions:

1. Linear Trend for Number of Sessions
2. Quadratic Trend for Number of Sessions

Codes for Therapy:

3. Behavior Mod vs. Other Therapies
4. Psychoanalytic vs. Rogerian and Gestalt
5. Rogerian vs. Gestalt

Interactions:

6. #1x#3
7. #1x#4
8. #1x#5
9. #2x#3
10. #2x#4
11. #2x#5

3. An exercise physiologist is interested in the effect of weight training on muscle development in women. Subjects are assigned to one of the four cells formed by the training variable (training or no training) crossed with an age variable (under 30 vs. over 30 years old).

T,<30	T,>30	NT,<30	NT,>30	
1/2	1/2	-1/2	-1/2	Training vs No Training
1/2	-1/2	1/2	-1/2	Under 30 vs Over 30
1/2	-1/2	-1/2	1/2	Interaction

4. A drug manufacturer is interested in the efficacy of a new product. The company is experimenting with three dosage levels (1 mg, 2 mg, and 3 mg) and three means of ingestion (capsules, tablets, and a liquid). The levels of these two factors are crossed experimentally and their effectiveness assessed.

1,C	2,C	3,C	1,T	2,T	3,T	1,L	2,L	3,L	
-1	0	1	-1	0	1	-1	0	1	1. Linear Dose
-1	2	-1	-1	2	-1	-1	2	-1	2. Quadratic Dose
1/3	1/3	1/3	1/3	1/3	1/3	-2/3	-2/3	-2/3	3. Solid vs Liquid
1/2	1/2	1/2	-1/2	-1/2	-1/2	0	0	0	4. Caps vs Tabl
-1/3	0	1/3	-1/3	0	1/3	2/3	0	2/3	5. (#1) x (#3)
-1/2	0	1/2	1/2	0	-1/2	0	0	0	6. (#1) x (#4)
-1/3	2/3	-1/3	-1/3	2/3	-1/3	2/3	-4/3	2/3	7. (#2) x (#3)
-1/2	1	-1/2	1/2	-1	1/2	0	0	0	8. (#2) x (#4)

5. Does the linear trend for dose depend on solid vs liquid
6. Does the linear trend depend on capsule vs tablet
7. Does the quadratic trend depend on solid vs liquid
8. Does the quadratic trend depend on capsule vs tablet

5. A statistics professor is interested in the effects of three forms of examinations (difficult items first, difficult items last, difficult items randomly scattered) and major (psych vs non-psych) on perfomance on the final exam.

First Psych	Last Psych	Random Psych	First Not	Last Not	Random Not	
1/2	1/2	1/2	-1/2	-1/2	-1/2	1. Psych vs Non-Psych
1/3	1/3	-2/3	1/3	1/3	-2/3	2. Random vs First/Last
1/2	-1/2	0	1/2	-1/2	0	3. First vs Last
1/6	1/6	-1/3	-1/6	-1/6	1/3	4. (#1) x (#2)
1/4	-1/4	0	-1/4	1/4	0	5. (#1) x (#3)

4. Does difference due to major, if any, depend upon whether the difficult items are randomly scattered or put first or last
5. Does difference due to major, if any, depend upon whether the difficult items are placed first or last

6. A researcher studied the effects on memory of two anesthetics normally administered before minor operations. The experimenter read words to the subjects while they were under the anesthetic. The dependent measure was the number of words correctly remembered two hours later. The first factor consisted of drug Y or drug X, the second factor consisted of words with low emotional impact or words with high emotional impact. The third factor was whether English was the subject's first language, second language, or only language. The dependent measure was number of words correctly remembered.

xlf	xls	xlo	xhf	xhs	xho	ylf	yls	ylo	yhf	yhs	yho	
Drug Code												
1/2	1/2	1/2	1/2	1/2	1/2	-1/2	-1/2	-1/2	-1/2	-1/2	-1/2	1.
Word Emotionality Code												
1/2	1/2	1/2	-1/2	-1/2	-1/2	1/2	1/2	1/2	-1/2	-1/2	-1/2	2.
Language Codes												
1/3	-2/3	1/3	1/3	-2/3	1/3	1/3	-2/3	1/3	1/3	-2/3	1/3	3.
1/2	0	-1/2	1/2	0	-1/2	1/2	0	-1/2	1/2	0	-1/2	4.
Drug x Emotionality Interaction Code (2-Way)												
1/4	1/4	1/4	-1/4	-1/4	-1/4	-1/4	-1/4	-1/4	1/4	1/4	1/4	5. (#1)x(#2)
Drug x Language Interaction Codes (2-Way)												
1/6	-1/3	1/6	1/6	-1/3	1/6	-1/6	1/3	-1/6	-1/6	1/3	-1/6	6. (#1)x(#3)
1/4	0	-1/4	1/4	0	-1/4	-1/4	0	1/4	-1/4	0	1/4	7. (#1)x(#4)
Emotionality x Language Interaction Codes (2-Way)												
1/6	-1/3	1/6	-1/6	1/3	-1/6	1/6	-1/3	1/6	-1/6	1/3	-1/6	8. (#2)x(#3)
1/4	0	-1/4	-1/4	0	1/4	1/4	0	-1/4	-1/4	0	1/4	9. (#2)x(#4)
Drug x Emotionality x Language Interaction Codes (3-Way)												
1	-2	1	-1	2	-1	-1	2	-1	1	-2	-1	/12 10. (#1)x (#2)x(#3)
1/8	0	-1/8	-1/8	0	1/8	-1/8	0	-1/8	1/8	0	-1/8	11. (#1) x (#2) x (#4)