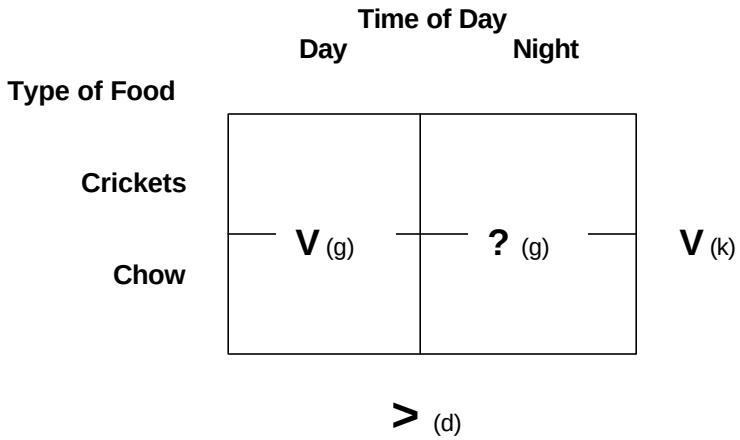
ANSWERS Practice with 2x2 Designs & BG ANOVA

n. The purpose of the study was to test for a joint effect (interaction) of Time of Day and Type of Food upon Painted turtles eating behavior. Thirty-two painted turtles were randomly assigned to receive either dry food (called "Trout Chow" and made by Purina from about the same stuff as "Dog Chow') or live crickets, and whether they would be offered the specific food during the light or dark period of the day. The DV is the number of "items" then eat (the pellets and crickets are about the same size, weight, etc.).

a. On the right draw the 2x2 box, label the IVs and label the conditions of each.



b. What effects will be examined in the factorial ANOVA?

Main effect for Time of Day
Main effect of Type of Food
Interaction of Time of Day & Type of Food

There were three hypotheses – answer the questions about each.

RH1: Turtles will eat less during the night than during the day

c. Is this a hypothesis about a main effect or an interaction? **Main effect – only one IV is mentioned.**

d. Use <, > and/or = to represent this RH: for the 2x2 box above. **See arrow marked (d) above.**

e. Are the results of this RH: test causally interpretable? Why or why not? **No – while we can turn the light on or off, we can not effectively manipulate the time of day it is (circadian rhythm and all that)**

RH2: During the light, turtles will eat more crickets (because they are attracted by the movement) than trout chow pellets, however during the dark, turtles will eat more pieces of trout chow (because the chow is stinky – they like stinky) than crickets

f. Is this a hypothesis about a main effect or an interaction? **Interaction – both IVs are mentioned.**

g. Use <, > and/or = to represent this RH: for the 2x2 box above. **See 2 arrows marked (g) above.**

h. Tell the set of simple effects that will provide the most direct test of this research hypothesis.

Simple effect of Type of Food at each level of Time of Day

i. Are the results of this RH: test causally interpretable? Why or why not?

No – both main effects must be causally interpretable in order to causally interpret an interaction, and the main effect of Time of Day is not causally interpretable (see above)

RH3: Turtles will eat more crickets than Trout Chow pellets. Turtles will eat less during the dark than during the light

j. Is this a hypothesis about a main effect or an interaction? **Main effect – only one IV mentioned**

k. Use <, > and/or = to represent this RH: for the 2x2 box above. **See arrow marked (k) above**

l. Are the results of this RH: test causally interpretable? Why or why not?

Yes – we can RA and effectively manipulate which type of food is offered to each animal.

Here is the SPSS output

m. Use the means to compose the usual 2x2 table – be sure to label everything!
Note: the <, > and = signs get added later, see below.

Descriptive

Dependent Variable: number of items

Time of	Food	Mean	Std. Deviatio	N
day	Crickets	25.125	5.5661	8
	Chow	18.375	4.6885	8
	Total	21.755	7.0757	16
night	Crickets	12.250	5.0638	8
	Chow	12.375	3.8521	8
	Total	12.312	4.3469	16
Total	Crickets	18.687	8.4041	16
	Chow	15.375	4.4253	16
	Total	17.031	7.0447	32

Time of Day

Type of Food	**Day**		**Night**	
Crickets	**25.13**	**> (t)**	**12.25**	**18.69**
	V (o)		**II (o)**	**V(w)**
Chow	**18.38**	**> (t)**	**12.38**	**15.38**
	21.76	**> (s)**	**12.31**	

Tests of Between-Subjects Effects

Dependent Variable: number of items eaten

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	884.344[a]	3	294.781	12.618	.000
Intercept	8482.531	1	8482.531	363.097	.000
TIMODAY	504.031	1	504.031	21.575	.000
FOOD	185.281	1	185.281	7.931	.009
TIMODAY * FOOD	195.031	1	195.031	8.348	.007
Error	654.125	28	23.362		
Total	10021.000	32			
Corrected Total	1538.469	31			

a. R Squared = .575 (Adjusted R Squared = .529)

n = **8**

Compute LSDmmd **5.041**

n. Is there an interaction? What tells you so? **Yes – p < .05 for the TIMODAY * FOOD F (the interaction F-test)**
o. Indicate in the table above the simple effects that correspond with the phrasing of the interaction RH: (using <, > and/or =)
see arrows marked (o)
p. Does the pattern of the interaction fully, partially, or not support the RH"? Why or why not?
Partial support – RH: supported for Day, but not for Night
q. Describe the pattern of the interaction, including support/nonsupport for the RH:

There is an interaction of Time of Day and Type of Food as they related to the number of food items eaten, F(1,28) = 8.348, p = .007, MSe = 23.362, cell mean comparisons are all based on an LSD minimum mean difference of 5.041. As hypothesized, turtles ate more crickets than trout chow pellets during the day, however, contrary to the hypothesis there was no difference between the number of the two food during the night.

r. Is there a main effect for Time of Day? What tells you so? **Yes – p < .05 for the TIMODAY F**
s. Indicate the table above the pattern of the main effect for Time of Day (using <, > and/or =) **see arrow marked (s)**
t. Indicate the pattern of the corresponding simple effects (using <, > and/or =). Is the main effect descriptive or misleading?
See the arrows marked (t) Descriptive -- the pattern of the main effect of time of day is descriptive for both crickets and for chow
u. Describe the pattern of the main effect for Time of Day, including support/nonsupport for the RH:

There is a main effect for Time of Day, F(1,28) = 21.575, p < .001, MSe = 23.362, with higher overall mean number of items taken during the day than during the night.

v. Is there a main effect for Type of food? What tells you so? **Yes – p < .05 for the FOOD F**
w. Indicate the table above the pattern of the main effect for Type of Food (using <, > and/or =) **see arrow marked (w)**
x. Indicate the pattern of the corresponding simple effects (using <, > and/or =). Is the main effect descriptive or misleading?
See arrows marked (o) Potentially misleading - the main effect for type of food is descriptive for day, but not for night
y. Describe the pattern of the main effect for Type of Food, including support/nonsupport for the RH:

There is a main effect for Type of Food, F(1,28) = 7.931, p = .009, MSe = 23.362, with more crickets than trout chow pellets eaten overall. However, this main effect is potentially misleading because it is descriptive for day but not for night.